Parks Canada Agency

Rankin Brook Bridge Replacement – Kouchibouguac National Park

Technical Specifications

ISSUED FOR TENDER

March 2018

Project Number: 1620

WSP Project #: 161-17014-00

LIST OF DRAWINGS

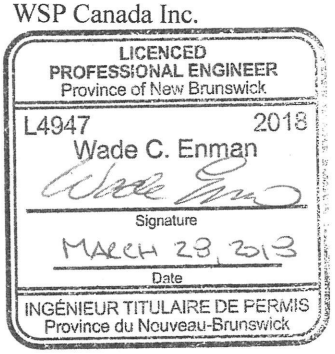
END OF SECTION

Specifications
Issued for Tender

Parks Canada Agency

Kollock Creek
Bridge Replacement
Kouchibouguac National Park

Project No. 1620
WSP Canada Inc.



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END OF SECTION

Part 1 General

1.1 PROJECT LOCATION

.1 The project is located in Kouchibouguac National Park, New Brunswick. The work is located on Route 117 at the Rankin Brook Bridge, crossing of Rankin Brook.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

.1 Parks Canada is preparing to replace the Rankin Brook Bridge which includes realigning a section of the Route 117.

.2 Work includes the construction of a new 27.20 meter single-span New England Bulb Tee Girder bridge complete with a composite 225 mm cast-in-place concrete deck crossing Rankin Brook. The new bridge is generally in the same location as the existing bridge and includes crash-tested steel barriers. The bridge superstructure is founded on fully integral piled abutments, supporting a reinforced concrete cap and cantilevered wingwalls along each edge of the abutment.

.1 The new bridge shall be constructed in a manner that results in an aesthetically pleasing structure. Care shall be taken when forming all exposed concrete surfaces.

.3 Demolition work includes the removal of the existing bridge crossing including concrete deck, abutments and retaining walls.

.1 Demolition design shall include all the access, safe removals, and mitigation measures required to complete the work in an environmentally friendly manner.

.2 All existing foundations shall be removed to a minimum depth of 1 meter below finished grade or streambed. All structural elements shall be fully removed that may interfere with the construction of the new bridge All materials shall be removed from site and disposed or recycled in an approved method.

.4 Route 117 roadwork generally includes the vertical realignment of approximately 310 meters of roadway to create the approaches to the new Rankin Brook Bridge and the removals and reshaping of the existing roadway embankments. Work also includes construction of a temporary detour to the south of the existing alignment to permit two way traffic during all phases of construction. Work shall also include:

.1 Final landscape finishing of all construction slopes.

.2 All signage, including footings and posts, as shown on the drawings.

.3 Temporary traffic control during all phases of construction.

.5 The above listed work is subject to the following constraints during construction:

.1 In-water work shall be in accordance with Basic Impact Analysis and accompanying documents completed for this project.

.2 In-water work is limited to dressing of the new front and side slopes surrounding each new abutment and the demolition activities surrounding the removal of the existing bridge structure foundations and dressing of the final slopes.

.3 Construction activities shall not detrimentally impact the surrounding environment or the river waterway and shall respect allowable windows for in-water work.

.6 The Contractor is responsible for the delineation of the construction zones and the existing highway.

.7 All work to be carried out in accordance with applicable federal, provincial regulations for those agencies having jurisdiction for the work. The work is subject to the National Park Act and Regulations, Canadian Environmental Protection Act, and the Code of Practice of the Department of Labour.

1.3 CONTRACT METHOD

.1 Construction work under combined unit price and lump sum items contract.

1.4 CODES

.1 Perform Work in accordance with National Parks Act, Code of Practice of the Department of Labour, as it pertains to the Temporary Workplace Traffic Control Manual (Department of Transportation & Infrastructure Renewal and any other code of federal, provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply).

.2 Materials and workmanship must conform to or exceed applicable standards of Canadian General Standards Board (CGSB), Canadian Standards Association (CSA), American Society for Testing and Materials (ASTM) and other standards organizations.

.3 Conform to latest revision of any referenced standard as re-affirmed or revised to date of specification. Standards or codes not dated shall be deemed editions in force on date of tender advertisement.

.4 Vehicle weights and dimensions shall conform to Public Highway Act (New Brunswick).

1.5 WORK WITHIN PARK BOUNDARIES

.1 The project is within a National Park, and it is essential that all lands remain as undisturbed as possible. The Contractor will be expected to use standards and methods beyond those for normal construction in order to protect the environment and ensure the aesthetics of the work. Contract limits shall be strictly adhered to and every precaution shall be taken to minimize environmental damage and disruption to vegetation, wildlife habitat, and structures or existing services, both on construction and storage sites.

.1 If any damage occurs during construction, bear the expense to immediately restore such damaged areas to the satisfaction of the Departmental Representative.

.2 If Contractor fails to repair damage to the satisfaction of the Departmental Representative, the Departmental Representative may complete repairs at the Contractor's expense.

.3 Confirm that contracted Work meets the standards outlined in the contract specification and drawings.

.4 All sources of aggregate and asphalt cement must be submitted to the Departmental Representative for approval prior to the pre-construction meeting.

.5 The Contractor is responsible to follow the Provincial requirements regarding the following:

.1 Pit and Quarry Guidelines;

.2 Environmental Construction Practice specifications

.6 Make arrangements with authorities or owners of private properties for quarrying and transporting materials and machinery over their properties and be responsible for obtaining and paying of fees.

1.6 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each of following:

.1 Contract drawings.

.2 Specifications.

.3 Addenda.

.4 Reviewed Shop Drawings.

.5 Change orders.

.6 Other modifications to Contract.

.7 Field Test Reports.

.8 Copy of Approved Work Schedule.

.9 Health and Safety Plan and Other Safety Related Documents.

.10 Plan Locating Underground Utilities.

.11 Other Documents as Specified.

.12 Environmental Control Plan.

.13 Record drawings (kept up to date on a daily basis).

1.7 SITE CONDITIONS

.1 The Contractor will be responsible to visit the roadway and review existing site conditions.

.2 For geotechnical and borehole information, refer to report prepared by WSP Canada Inc., dated January 10, 2017, attached in Appendix A. Any interpretations of its finding will be made at the Contractor's own risk and the Department Representative will not be held responsible for the interpretation of this document.

.3 Promptly notify Departmental Representative if subsurface conditions differ materially from those indicated in Contract Documents or a reasonable assumption of probable conditions based on thereon.

1.8 WASTE DISPOSAL

.1 All waste generated from this project will be disposed of outside of Park boundaries.

1.9 WORK SCHEDULE

.1 Provide to the Departmental Representative in writing and within 5 working days after Contract award, a detailed construction schedule and traffic control plan. The schedule

shall show proposed work to be undertaken and anticipated completion dates for each category of work in the Unit Price Table.

.2 After receiving the Contractor's plan and prior to start of construction, a meeting involving Contractor, Departmental Representative and Parks Canada will be held at a place and time to be determined by the Departmental Representative. This meeting will review implications of the contract, design, schedule of work, methods of construction, environment protection methods and traffic control.

.3 Complete all cutting and patching areas within the Park prior to the operation.

.4 New bridge structure must be open to traffic by October 31, 2018.

.5 The project completion date is November 30, 2018.

.6 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.

.7 No work will begin until the pre-construction meeting is held.

.8 Following the pre-construction meeting and approval of the schedule and traffic control plan, the work will be so scheduled to meet the time restraints and have the project completed on time.

1.10 PARTIAL OCCUPANCY OR USE

.1 The Contractor shall provide and maintain sanitary facilities for the use of workers at locations specified by the Departmental Representative. Provision of sanitary facilities shall meet requirements of provincial government and municipal statutes and authorities.

1.11 CONTRACTOR'S USE OF SITE

.1 Use of site: for execution of work within roadway right of way and those areas specified by the Departmental Representative. Project Limits/Construction Limits are as follows:

.1 Lateral: Clearing limits.

.2 The Contractor shall maintain the site in a tidy condition free from the accumulation of waste products and debris. Upon substantial performance of the work, remove surplus products, tools, machinery and equipment from the site. Completion of clean-up is required for total performance of the work.

.3 Contractor shall provide any and all traffic control services required for the project.

.4 Contractor to obtain all necessary permits to perform work and to comply with all permit requirements and conditions.

1.12 PROJECT MEETINGS

.1 The Contractor will arrange project meetings at the call of the Departmental Representative and assume responsibility for setting times and recording and distributing minutes in accordance with Section 01 31 19 – Project Meetings.

1.13 SETTING OUT OF WORK

.1 Contractor shall carry out all layouts.

.2 Contractor shall assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.

.3 Contractor shall supply such devices as straight edges and templates required to facilitate Departmental Representative's inspection of work.

.4 Provide coordinates, elevations and dimensions in the field, as required by the Departmental Representative

.5 Contractor shall supply pre and post construction cross sections at 20m intervals to ensure that lines and grades of the project can be checked by the Departmental Representative including centreline offset, edge of pave, rounding, etc.

1.14 EXISTING SERVICES

.1 The Contractor shall confirm all inverts and critical elevations in the field prior to construction.

.2 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work.

.3 Carry out work at times directed by authorities having jurisdiction, with minimum of disturbance to pedestrian and vehicular traffic.

.4 Before commencing work, establish location and extent of service lines in area of work and notify Departmental Representative of findings. The contractor is to review with the Departmental Representative details for closing or rerouting the bicycle trail.

.5 Submit schedule to and obtain approval from Departmental Representative for any shutdown or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.

.6 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

.7 Record locations of maintained, re-routed and abandoned service lines.

.8 Ensure pedestrian and other traffic is not unduly impeded, interrupted or endangered by execution or existence of work.

.9 Maintain existing signs at all times. When it is necessary to temporarily remove a sign, it shall be dismantled and re-established on a temporary post or stand set back from construction area. The work is considered to be incidental and no separate payment will be made for maintaining or moving signs.

1.15 EXISTING ROADWAY SIGNS

.1 The Contractor shall note that existing warning, regulatory and information signs exist along the roadway within the project limits.

.2 These signs shall be protected from damage.

.1 If any damage occurs during construction, the Contractor shall bear the expense to immediately replace such damaged signs and/or posts to the satisfaction of the Departmental Representative.

.3 If the Contractor needs to temporarily remove the existing signs in order to complete their work, the removal and reinstatement shall be considered incidental.

1.16 ADDITIONAL DRAWINGS

.1 Departmental Representative may furnish additional drawings for clarification. These additional drawings have same meaning and intent as if they were included with plans referred to in Contract documents.

1.17 STANDARD HOURS

.1 The Contractor must maintain existing site hours for the work unless otherwise authorized by Departmental Representative.

.2 Work that involves temporary disruption of services will be scheduled through the Departmental Representative. Give Departmental Representative minimum 72 hours' notice of any disruption of services.

1.18 RELICS, ANTIQUES & WILDLIFE HABITAT

.1 Protect relics, antiquities, wildlife habitat, items of historical or scientific interest such as cornerstones and contents, animal nesting sites, commemorative plaques, inscribed tablets, and similar objects found during course of work.

.2 Give immediate notice to Departmental Representative and await Departmental Representative's written instructions before proceeding with work in this area.

.3 Relics, antiquities and items of historical or scientific interest remain her Majesty's property.

1.19 MEASUREMENT OF QUANTITIES

.1 Linear: Items which are measured by metre or kilometre, such as pipe culverts will be measured along centreline of installation unless otherwise shown on plans.

.2 Area:

.1 Longitudinal and transverse measurements for areas to be measured horizontally.

.2 Longitudinal and transverse measurements for such items as clearing to be made on actual flat or sloped surface.

.3 Volume:

.1 In computing volumes of excavation, average end area method will be used unless otherwise directed by Departmental Representative in writing.

.2 Term: Litre shall mean 1000 mL or L.

.4 All volume measurements refer to in place measure unless specified elsewhere in specification.

.5 Mass:

.1 Term "tonne" shall mean 1000 kg.

.2 Materials which are specified for measurement by mass shall be weighed on scales at a location determined by the Contractor. Units used to haul material

being paid for by mass shall bear legible identification numbers plainly visible to scale person as it approaches and leaves scale-house.

.6 Time:

.1 Unless otherwise provided for elsewhere or by written authority of Departmental Representative, hourly rental of equipment will be measured in actual working time and necessary travelling time of equipment within limits of project at an all-inclusive rate. Equip each unit of mobile equipment with an approved device to register hours of operation. Devices which only measure hours of running of motor will not be accepted.

1.20 PERMITS/AUTHORITIES

.1 The Contractor shall obtain, and pay for, permits from authorities as required for all operations and construction. He shall also comply with all pertinent regulations of all authorities having jurisdiction over the work. The Contractor shall provide copies of all permits to the Departmental Representative prior to starting the work. The Contractor shall be responsible for obtaining all applicable permits, inspections and approvals required and shall pay all changes in connection therewith.

1.21 EQUIPMENT RENTAL RATES

.1 Upon written request, the Contractor will supply the Departmental Representative with a list of the rental equipment to be used on work beyond the scope of bid items. Equipment rental rates will be in accordance with current rates published by the New Brunswick Road Builders Association.

1.22 WORK SEQUENCE

.1 Provide to the Departmental Representative, in writing, and within 5 working days after contract award, a detailed Construction Schedule and Traffic Control Plan. The schedule shall show proposed work to be undertaken and anticipated completion dates for each category of work.

1.23 TRUCK MANAGEMENT PLAN

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit site-specific Truck Management Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Truck Management Plan shall include, but not limited to:

.1 Speed and Unsafe Driving: Contractor shall outline how they will monitor and discipline trucks for violations. The Plan must indicate the progressive steps that will be followed should violations occur.

.2 Over Weight Loads: Departmental Representative may periodically spot check and divert loads (i.e. any material without weigh slips) to scales for random compliance check.

.1 Any material hauled in excess of the maximum weight limits of Section 191, Weights and Dimensions of Vehicles Regulations under the NB Motor Vehicle Act, will be not paid for or considered eligible for payment as part of the work under any Section of the Contract.

.3 Tarping: All loads delivered to site shall be tarped. Loads delivered to site not tarped will not be paid for.

.3 The Contractor shall be responsible to provide a Daily Weighers Report to the Departmental Representative to cross reference delivered materials. The Report shall include, but not limited to:

.1 Driver name;

.2 Company;

.3 License plate number;

.4 Tare, including gross and net weight.

.4 Any work days with missing Daily Weighers Reports or weigh slips will not be paid for.

.5 Submit other data, information and documentation upon request as stipulated elsewhere in this Section.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

.3 Construction activities shall not detrimentally impact the surrounding environment or the river waterway and shall respect allowable windows for in-water work.

.6 The Contractor is responsible for the delineation of the construction zones and the existing highway.

.7 All work to be carried out in accordance with applicable federal, provincial regulations for those agencies having jurisdiction for the work. The work is subject to the National Park Act and Regulations, Canadian Environmental Protection Act, and the Code of Practice of the Department of Labour.

1.3 CONTRACT METHOD

.1 Construction work under combined unit price and lump sum items contract.

1.4 CODES

.1 Perform Work in accordance with National Parks Act, Code of Practice of the Department of Labour, as it pertains to the Temporary Workplace Traffic Control Manual (Department of Transportation & Infrastructure Renewal and any other code of federal, provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply).

.2 Materials and workmanship must conform to or exceed applicable standards of Canadian General Standards Board (CGSB), Canadian Standards Association (CSA), American Society for Testing and Materials (ASTM) and other standards organizations.

.3 Conform to latest revision of any referenced standard as re-affirmed or revised to date of specification. Standards or codes not dated shall be deemed editions in force on date of tender advertisement.

.4 Vehicle weights and dimensions shall conform to Public Highway Act (New Brunswick).

1.5 WORK WITHIN PARK BOUNDARIES

.1 The project is within a National Park, and it is essential that all lands remain as undisturbed as possible. The Contractor will be expected to use standards and methods beyond those for normal construction in order to protect the environment and ensure the aesthetics of the work. Contract limits shall be strictly adhered to and every precaution shall be taken to minimize environmental damage and disruption to vegetation, wildlife habitat, and structures or existing services, both on construction and storage sites.

.1 If any damage occurs during construction, bear the expense to immediately restore such damaged areas to the satisfaction of the Departmental Representative.

.2 If Contractor fails to repair damage to the satisfaction of the Departmental Representative, the Departmental Representative may complete repairs at the Contractor's expense.

.3 Confirm that contracted Work meets the standards outlined in the contract specification and drawings.

.4 All sources of aggregate and asphalt cement must be submitted to the Departmental Representative for approval prior to the pre-construction meeting.

.3 Tarping: All loads delivered to site shall be tarped. Loads delivered to site not tarped will not be paid for.

.3 The Contractor shall be responsible to provide a Daily Weighers Report to the Departmental Representative to cross reference delivered materials. The Report shall include, but not limited to:

.1 Driver name;

.2 Company;

.3 License plate number;

.4 Tare, including gross and net weight.

.4 Any work days with missing Daily Weighers Reports or weigh slips will not be paid for.

.5 Submit other data, information and documentation upon request as stipulated elsewhere in this Section.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

.6 Provide survey layout with stakes on both sides of the road/alignment at 20 metre station intervals (top of back slope, toe of slope, subgrade, granulars, shoulders, etc.) with centreline offset.

.7 Maintenance work on Contractor/Sub-Contractor equipment is prohibited within the National Park.

.8 If native topsoil is encountered during excavation, the Contractor shall salvage and stockpile such that embankments and designated areas can be dressed with the salvaged topsoil at the end of project prior to hydroseeding and dry mulch.

.9 Maintain roadways, detours and site signage at all times during the Contract (i.e. dust control and free from potholes, bumps, etc.)

.10 Repaving (asphalt paving to start and continue until completion within 21 days of completion of cold milling).

.11 To facilitate dust control, the Contractor shall place RAP as the temporary riding surface in distress and culvert replacement areas (75mm thickness to match adjacent grades).

.12 Guide rail shall be installed at the same locations from which existing guide rail was removed, unless noted otherwise on the Drawings or by the Departmental Representative.

.1 Where existing guide rail is to be removed and new guide rail is to be installed at the same location, the Contractor shall complete the installation within the same working day or provide full physical protection of the region with traffic barrier protection meeting the approval of the Departmental Representative.

.13 Work outside of normal working hours will require 48 hours written notice to the Departmental Representative. There are no restrictions on working on nights, weekends or statutory holidays.

1.6 SMOKING ENVIRONMENT

.1 Comply with smoking restrictions.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 Mobilization and Demobilization consists of preparatory work and operations including, but not limited to, those necessary for the movements of personnel, equipment, supplies and incidentals to and from the project sites.

.2 For those purposes of mobilization and demobilization, “project site” means the location.

1.2 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS OF THE BID AND ACCEPTANCE FORM

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

.2 All measurement shall be along a horizontal plane unless otherwise indicated.

.3 Overhaul will not be paid for on this project.

.4 The quantities listed in the Bid and Acceptance Form are approximate only and are for the purpose of tendering. Payment to the Contractor will be based on actual quantities of work completed in accordance with the Drawings and Specifications.

.5 The numbers of the items described below correspond to the numbers of the items in the Bid and Acceptance Form.

.6 Should the Contractor need to remove any existing regulatory/warning/information signs or posts in order to complete their Work, the removal and reinstatement of the signs and posts shall be considered incidental.

.7 There will be no measurement or payment for Work carried out beyond the limits defined on the Drawings.

1.2 MEASUREMENT AND PAYMENT

.1 Mobilization / Demobilization

.1 Unit of Measurement is Lump Sum

.2 50% of Lump Sum Contract Price for Mobilization and Demobilization to be paid when mobilization to site is complete. The remainder of the Lump Sum Price for Mobilization and Demobilization to be paid when work is complete and all materials, equipment, buildings, shops, offices, and other facilities have been removed from site and site cleaned and left in condition to the satisfaction of the Departmental Representative and all other Agencies having jurisdiction.

.2 Environmental Procedures

.1 Unit of Measurement is Lump Sum

.2 This item includes all environmental protection, sedimentation and erosion control measures required to complete the project, such as (but not limited to) diversion ditching, silt fences, steel sheet pile sediment containment walls, temporary ground covers and rock flow checks in accordance with Parks Canada National Best Management Practices – Roadway, Highway, Parkway and Related Infrastructure. Also included is the periodic and general maintenance of all erosion control measures or as directed by the Departmental Representative.

.3 Construction Facilities

.1 Unit of Measurement is Lump Sum

.2 This item includes the provision of construction facilities required to complete the project. This item includes:
- Provide and maintain adequate access to project site.
- Build and maintain temporary roads during period of Work.
- Upon completion of work, rehabilitate any temporary roads to the satisfaction of the Departmental Representative.
- Clean roads and parking areas where used by the Contractor or employees.
- Provide, erect and maintain project identification site signs, safety and instruction signs and notices.
- Provide sanitary facilities.
- Construction site trailer(s).
- Removal of temporary facilities from site as directed by the Departmental Representative.

.4 Sign and Sign Post Installation

.1 Unit of Measurement is Lump Sum (LS)

.2 This item includes supply and installation as indicated. Work considered incidental to this item are the removal of existing signs and posts being replaced including filling of holes and reinstatement of disturbed surfaces.

.5 Structure Demolition

.1 Unit of Measurement is Lump Sum

.2 This item includes demolition of the existing bridge superstructure (deck, curbs, railings, asphalt and girders) and the demolition of the existing foundations to 1 meter below the finished grade lines. This item also includes excavation of all material of whatever nature encountered to access existing foundations for the purpose of demolition, excavation and preparation of slopes for the placement of Armour Rip Rap and water control. This item also includes all permits required for demolition and disposal of material, including but not limited to creosote timber disposal permit.

.6 Temporary Panel Bridge

.1 Unit of Measurement is Lump Sum

This item includes supply of a temporary panel bridge for use as a detour during construction of the Rankin Brook Bridge. This item includes supply, transportation, erection of panel bridge, concrete abutments (and wingwalls / retaining walls) on steel piles, and all coordination, submittals and design required for a complete installation of a temporary panel bridge. Also included in this item is all maintenance, repair, and inspection required for the temporary panel bridge throughout its use and disassembling, removal and transportation of the panel bridge from the site. This item also includes supply, transportation, and installation of precast concrete jersey barriers for the temporary detour road. Also included in this item is all maintenance and repair required for the barriers throughout their use and removal and transportation of the barriers from the site once project is completed.

.7 Foundation Excavation Bridge

.1 Unit of Measurement is Lump Sum

.2 This item includes all excavation regardless of type (unclassified) for the construction of the abutments and placement of Fill Against Structure and Armour Rip Rap as shown on the drawings, including the disposal of all material resulting from this operation.

.8 Painted Traffic Lines and Markings

.1 Unit of Measurement is Lump Sum

.2 This item includes supply of all materials and application of all traffic lines and markings on the pavement for the approaches and bridge deck as indicated.

.9 Other Items Not Included in the Unit Price Table

.1 Unit of Measurement is Lump Sum

.2 This item includes all other work considered incidental to the work and which are not specifically mentioned or accounted for in the Unit Price Table or other items in the Lump Sum Table, but are necessary to complete the work in accordance with the Contract, the Drawings and Specifications. This item shall include, but are not limited to, the following: Project Layout and Surveying, Weigh Scales, Traffic Control, Permits, Temporary Structures, Cold Weather Protection and Curing of Materials, Water Control and Utility Conduit.

1.3 ITEMS – UNIT PRICE TABLE

.1 Cast-in-Place Reinforced Concrete

.1 Unit of Measurement is Cubic Meter (m^3)

.2 This item includes supply, formwork, reinforcing, placing, compacting and finishing of all concrete for the bridge abutments, wingwalls, pilasters, crash blocks, bridge deck (including curbs), approach slab, and approach baffle drains. This item shall also include the Parks Canada Beaver Decorative Stainless Steel Plaques that are to be anchored into each concrete end posts as shown on the Contract Drawings. Measurement shall be based on Contract Drawings with no deduction for displacement by reinforcement. Concrete joint sealant will not be measured separately and will be considered incidental to this pay item.

.2 Galvanized Armour Angles

.1 Unit of Measurement is Each

.2 This item includes shop drawings, supply and installation of the armour angle assembly at approach ends of approach slabs.

.3 Bridge Deck Waterproofing

.1 Unit of Measurement is Square Meter (m^2)

.2 This item includes preparation of surfaces, supply and installation of waterproofing system on bridge deck and approach slabs as applied to the bridge deck and approach slabs and extending 80 millimeters vertically on each curb. Measurement shall be based on contract drawings.

.4 Clearing

.1 Unit of Measurement is Hectare (ha)

.2 This item includes cutting and disposal of all trees, brush, and vegetative growth from areas identified.

.5 Grubbing

.1 Unit of Measurement is Hectare (ha)

.2 This item includes the removal and off-site disposal of all stumps, roots, visible rock fragments greater than 0.25 m^3, downed timber, embedded logs, humus, root mat and topsoil from areas identified.

.6 Unclassified Excavation Roadway and Drainage

.1 Unit of Measurement is Cubic Meter (m^3)

.2 This item includes excavation of unclassified material after removal of grubbing and topsoil and for placement and compacting of approved fill (common and rock) from on-site sources to lines and elevations indicated. This item shall also include excavation for the removal of culverts which will not be replaced.

.7 Borrow Common

.1 Unit of Measurement is Cubic Meter (m^3)

.2 This item includes loading, transportation, placement and compacting of approved common material from areas off site, required for construction of embankments or for other portions of work, to lines and elevations indicated. Measurement shall be based on cross sections taken at the source of the material.

.8 Fill Against Structure

.1 Unit of Measurement is Tonne (t)

.2 This item includes supply, placement and compaction of fill against abutments to lines and elevations identified. Supply and installation of perforated pipe drain system as shown on the Contract Drawings are included under this item.

.9 Hydraulic Seeding

.1 Unit of Measurement is Square Meter (m^2)

.2 This item includes supply of all materials, preparation of surface, application and maintenance to areas identified.

.10 Dry Mulch

.1 Unit of Measurement is Square Meter (m^2)

.2 This item includes supply of all materials, preparation of surface, application and maintenance to areas identified.

.11 Top Soil

.1 Unit of Measurement is Square Meter (m^2)

.2 This item includes salvage work of existing topsoil, preparation of surface, supply of imported topsoil if applicable, as per Departmental Representative directives, application and maintenance to areas identified.

.12 Steel W-Beam Guiderail

.1 Unit of Measurement is Meter (m)

.2 This item includes supply of all materials including Michigan Shoes, channel, reflectors, installation, backfilling, compaction, disposal of excess material and reinstatement of disturbed surfaces. Measurement shall be based on linear measure of the completed sections, end to end (including buried sections), regardless of the number of rails between individual posts. Removal of existing guiderail will not be measured and will be considered incidental to this pay item.

.13 Galvanized Steel Barrier and Metal Railings for Structures

.1 Unit of Measurement is Meter (m)

.2 This item includes supply and installation including galvanizing, nuts, bolts, washers, anchors, anchor plates, grouting, railing, posts, base plates, epoxy grout, and all other items necessary to complete the work and as detailed on the drawings.

.14 Precast Concrete Girders

.1 Unit of Measurement is Each (ea)

.2 This item includes the supply and installation as indicated and necessary for this work. Incidentals to this item includes bearing assemblies, joint reinforcing and grouting.

.15 Steel H-Piles (Supply and Install)

.1 This item is measured in Linear Meters (lm)

.2 This item includes the supply and installation of steel H-piles, pile shoes, cap plates and other items required to complete the work.

.3 Measure installation of piles in meters of pile acceptably incorporated into work following trimming and cutting of the piles. Measurement will be taken from the final pile tip elevation to the top of pile elevation remaining in the work.

.4 Supply and installation of pile shoes will be considered incidental to the work.

.5 Extra piling to replace damaged piles will be considered incidental to the work and will not be measured for payment.

.16 Asphalt Seal (40mm Type “D”)

.1 Unit of Measurement is Tonne (t)

.2 This item includes supply, transportation of all materials include asphalt tack coat and asphalt binder; production, handling, preparation of surface, placing (including material transfer device), rolling and compaction of asphalt concrete. This item also includes keyed joints at each end of construction and isolated areas of patch paving throughout construction. This item also includes the paving of the bridge deck (thickness as per drawings).

.3 There will be no payment for extra thickness or extra width of asphalt placed outside of the theoretical lines and grades as indicated on the drawings. Whenever, in the opinion of the Departmental Representative, there is extra thickness or extra width, the appropriate weight will be deducted.

.17 Asphalt Base (100mm Type “B”)

.1 Unit of Measurement is Tonne (t)

.2 This item includes supply, transportation of all materials include asphalt binder; production, handling, preparation of surface, placing (including material transfer device), rolling and compaction of asphalt concrete. This item also includes keyed joints at each end of construction and isolated areas of patch paving throughout construction.

.3 There will be no payment for extra thickness or extra width of asphalt placed outside of the theoretical lines and grades as indicated on the drawings. Whenever, in the opinion of the Departmental Representative, there is extra thickness or extra width, the appropriate weight will be deducted.

.18 Crushed Rock Base (31.5mm Minus)

.1 Unit of Measurement is Tonne (t)

.2 This item includes supply, haulage, placement and compaction of crushed rock base granular material to the limits and at the locations indicated on the drawings. There will be no payment for extra thickness of base material placed outside of the theoretical lines and grades as indicated on the drawings. Whenever, in the opinion of the Departmental Representative, there is extra thickness, the appropriate weight will be deducted.

.19 Crushed Rock Subbase (75mm Minus)

.1 Unit of Measurement is Tonne (t)

.2 This item includes supply, haulage, placement and compaction of crushed rock subbase granular material to the limits and at the locations indicated on the drawings. There will be no payment for extra thickness of subbase material placed outside of the theoretical lines and grades as indicated on the drawings. Whenever, in the opinion of the Departmental Representative, there is extra thickness, the appropriate weight will be deducted.

.20 Shouldering (31.5mm Minus)

.1 Unit of Measurement is Tonne (t)

.2 This item includes supply, haulage, placement and compaction of shouldering material to the limits and at the locations indicated on the drawings. There will be no payment for extra thickness of shoulder material placed outside of the theoretical lines and grades as indicated on the drawings. Whenever, in the opinion of the Departmental Representative, there is extra thickness, the appropriate weight will be deducted.

.21 Crusher Tailing for Trail (6mm Minus)

.1 Unit of Measurement is Tonne (t)

.2 This item includes supply, haulage, placement and compaction of crusher tailing for trail to the limits and at the locations indicated on the drawings. There will be no payment for extra thickness of crusher tailing material placed outside of the theoretical lines and grades as indicated on the drawings. Whenever, in the opinion of the Departmental Representative, there is extra thickness, the appropriate weight will be deducted.

.22 Wooden Pedestrian Fence

.1 Unit of Measurement is Meter (m)

.2 This item includes supply and installation including, pressure treated timber railing and posts, galvanized hardware, fasteners, nuts, bolts, washers, anchors, anchor plates, railing, posts, and all other items necessary to complete the work and as detailed on the drawings.

.23 1200mm dia Culvert Pipe

.1 Unit of Measurement is Meter (m)

.2 This item includes supply and installation of culvert pipe, including all excavation, compaction, end treatments, grading, and all other items necessary to complete the work and as detailed on the drawings.

.24 Rip Rap R5

.1 Unit of Measurement is Cubic Meter (t)

.2 This item includes supply and placement where indicated. This item also includes the supply and installation of geotextile material beneath the armour rip rap. Measurement shall be based on contract drawings.

.25 Rock fill – R100 Rip-Rap

.1 Unit of Measurement is Cubic Meter (t)

.2 This item includes supply and placement where indicated. This item also includes the supply and installation of geotextile material beneath the R100 rip-rap as required. Measurement shall be based on contract drawings.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1	Section 31 05 16	Aggregate Materials
.2	Section 31 23 33.01	Excavating, Trenching and Backfilling
.3	Section 31 24 13	Roadway Embankments
.4	Section 32 11 16.01	Granular Sub-Base
.5	Section 32 11 23	Aggregate Base Courses
.6	Section 32 12 13.16	Asphalt Tack Coat
.7	Section 32 12 16	Asphalt Paving

.8 Particular requirements for inspection and testing to be carried out by testing laboratory designated by the Departmental Representative are specified under various sections.

1.2 APPOINTMENT AND PAYMENT

.1 The Departmental Representative will appoint and pay for services of testing laboratory except as follows:

- .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
- .2 Inspection and testing performed exclusively for Contractor's convenience.
- .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
- .4 Mill tests and certificates of compliance.
- .5 Tests specified to be carried out by Contractor under the supervision of the Departmental Representative.

.2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by the Departmental Representative to verify acceptability of corrected work.

1.3 CONTRACTOR’S RESPONSIBILITIES

.1 Provide labour, equipment and facilities to:

- .1 Provide access to Work for inspection and testing.
- .2 Facilitate inspections and tests.
- .3 Make good Work disturbed by inspection and test.
- .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.

.2 Notify the Departmental Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.

.3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

.4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by the Departmental Representative.

1.4 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

.1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.

.2 Prepare agenda for meetings.

.3 Distribute written notice of each meeting two days in advance of meeting date to Departmental Representative.

.4 Provide physical space and make arrangements for meetings.

.5 Preside at meetings.

.6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.

.7 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and Departmental Representative.

.8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

.1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.1 Schedule of Work: in bar (GANTT) Chart format.

.2 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.

.3 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.4 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.

.5 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.

.6 Monthly progress claims, administrative procedures, photographs, hold backs.

.7 Appointment of inspection and testing agencies or firms.

.8 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

.1 During course of Work and one week prior to project completion, schedule progress meetings bi-weekly.

.2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.

.3 Notify parties minimum two days prior to meetings.

.4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within three days after meeting.

.5 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems which impede construction schedule.

.5 Corrective measures and procedures to regain projected schedule.

.6 Revision to construction schedule.

.7 Progress schedule, during succeeding work period.

.8 Review submittal schedules: expedite as required.

.9 Maintenance of quality standards.

.10 Review proposed changes for effect on construction schedule and on completion date.

.11 Other business.

1.4 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are co-ordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.

.10 Keep one reviewed copy of each submission on site.

.11 Make any changes in submissions which Departmental Representative may require to be consistent with Contract Documents and resubmit as directed by Departmental Representative.

.12 Notify Departmental Representative, in writing, when resubmitting of any revisions other than those requested by Departmental Representative.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 Submit drawings stamped and signed by professional engineer registered or licensed in New Brunswick of Canada.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which

adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 10 days for Departmental Representative's review of each submission.

.5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

.7 Accompany submissions with transmittal letter, containing:

- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.8 Submissions include:

- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.

.9 After Departmental Representative's review, distribute copies.

.10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

.11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been within one year of date of contract award for project.

.13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of project contract complete with project name.

.14 Submit electronic copies of manufacturers' instructions for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

.16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.18 Delete information not applicable to project.

.19 Supplement standard information to provide details applicable to project.

.20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.3 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative's business address.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic copy of colour digital photography in jpg format, standard resolution, monthly with progress statement as directed by Departmental Representative.

.2 Project identification: name and number of project and date of exposure indicated.

.3 Number of viewpoints:

.1 Viewpoints and their location as determined by Departmental Representative.

1.5 WORK SCHEDULE

.1 Provide within 5 working days after contract award, schedule showing anticipated progress stages and final completion of work within time period required by Contract Documents.

.2 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.

1.6 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1	Section 31 24 13	Roadway Embankments
.2	Section 32 11 16.01	Granular Sub-base
.3	Section 32 11 23	Aggregate Base Courses
.4	Section 32 12 16	Asphalt Paving
.5	Section 33 42 13	Pipe Culverts

1.2 REFERENCES

.1 New Brunswick Department of Transportation and Infrastructure (NBDTI):

.1 New Brunswick Work Area Traffic Control Manual, latest edition.

.2 The Departmental Representative reserves the right to direct the Contractor to reduce either the number or length of traffic control work areas during peak traffic volumes or when cumulative delays exceed the specified maximum.

1.3 PROTECTION OF PUBLIC TRAFFIC

.1 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment.

.2 When working on travelled way:

.1 Place equipment in position to minimize interference and hazard to travelling public.

.2 Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.

.3 Do not leave equipment on travelled way overnight.

.3 Close lanes of road only after receipt of written approval from Departmental Representative.

.1 Before re-routing traffic erect suitable signs and devices to NBDTI Work Area Traffic Control Manual.

.4 Keep travelled way graded, free from pot holes and of sufficient width for required number of lanes of traffic.

.1 Provide 7 m wide minimum temporary roadway for traffic in two-way sections through Work and on detours.

.2 Provide 4.5 m wide minimum temporary roadway for traffic in one-way sections through Work and on detours.

.5 Provide gravelled detours or temporary roads as indicated, to facilitate passage of traffic around restricted construction area:

.1 Grade for detour in accordance with Section 31 24 13 - Roadway Embankments.

.2 Place and compact granular sub-base in accordance with Section 32 11 16.01 - Granular Sub-base.

.3 Place and compact granular base in accordance with Section 32 11 23 - Aggregate Base Courses.

.6 Provide and maintain road access and egress to property fronting along Work under Contract and in other areas as indicated, except where other means of road access exist that meet approval of Departmental Representative.

1.4 INFORMATIONAL AND WARNING DEVICES

.1 Provide and maintain signs, flashing warning lights, variable message signs and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project Work which requires road user response.

.1 Construction of temporary pads, if required for the placement of temporary traffic control devices or portable variable message signs shall be supplied by the Contractor. Temporary pad sites shall be approved by the Departmental Representative.

.2 Supply and erect signs, delineators, barricades and miscellaneous warning devices to NBDTI Work Area Traffic Control Manual.

.3 Place signs, delineators, barricades and miscellaneous warning devices in locations recommended in NBDTI Work Area Traffic Control Manual.

.1 If situation on site changes, revise to approval of Departmental Representative.

.4 The Contractor shall provide a Temporary Workplace Signer (TWS), who has successfully completed the Temporary Workplace Traffic Control Training Course, to be on site at all times when active construction is taking place. The Temporary Workplace Signer will be responsible to assess condition, prepare, implement and review traffic control plans for construction. The Temporary Workplace Signer will be responsible for ongoing compliance with the NBDTI Work Area Traffic Control Manual and for ensuring the safe regulation of traffic and safe passage of pedestrians at temporary workplaces. The Temporary Workplace Signer is considered part of the Contractor's supervision and administration staff and compensation for the provision of this individual is considered incidental to the work.

.5 A traffic control plan and emergency response plan must be submitted for review by the Departmental Representative prior to the pre-construction meeting.

.6 Continually maintain traffic control devices in use:

.1 Check signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.

.2 Remove or cover signs which do not apply to conditions existing from day to day.

1.5 CONTROL OF PUBLIC TRAFFIC

.1 Provide competent flag personnel who have a valid provincial license, trained in accordance with, and properly equipped to NBDTI Work Area Traffic Control Manual for situations as follows:

.1 When public traffic is required to pass working vehicles or equipment that block all or part of travelled roadway.

.2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and a traffic control signal system is not in use.

.3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.

.4 Where temporary protection is required while other traffic control devices are being erected or taken down.

.5 For emergency protection when other traffic control devices are not readily available.

.6 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.

.7 At each end of restricted sections where pilot cars are required.

.2 All Traffic Control Personnel shall be equipped with portable radios of sufficient range to ensure continuous communication within the traffic control zone.

.3 All construction vehicles shall operate in accordance with and are subject to traffic control restrictions and operations in place on the project.

1.6 OPERATIONAL REQUIREMENTS

.1 Existing conditions for traffic within right-of-way containing work in this Contract are indicated by following descriptions:

.1 Section within Park Boundaries within contract limits are asphalt concrete surfaced two lane undivided trunk roadway with posted speeds up to 60 km/h.

.2 Maintain existing conditions for traffic throughout period of contract except that, when required for construction under contract and when measures have been taken as specified and approved by Departmental Representative to protect and control public traffic, existing conditions for traffic may be restricted as follows:

.1 In accordance with NBDTI Work Area Traffic Control Manual.

.2 The maximum cumulative traffic delay associated with work carried out under this Contract shall not exceed 10 minutes (between 0900hrs and 1600hrs) through the Contract limits during peak season (1 July to 30 August). The Departmental Representative is to be advised 10 days in advance prior to any required scheduled delays of more than 10 minutes.

.3 Maintain existing conditions for traffic crossing right-of-way containing work except that, when required for construction under this Contract and when measures have been taken as specified herein and approved by Departmental Representative to protect and control public traffic.

.3 At the end of each day of work, traffic must be returned to two-lane two-way traffic. Restrictions of one lane traffic overnight or outside of work hours will not be permitted, unless approved otherwise by Departmental Representative.

.4 Temporary structures shall be constructed as indicated on approved shop drawing submitted to Departmental Representative. All existing dimensions to be verified prior to construction with any discrepancies reported to the Departmental Representative.

.5 The Contractor shall provide for services 24 hrs per day, 7 days per week.

.6 Major responsibilities of the traffic accommodation person:

.1 Maintain traffic control devices and signs during regular shutdown on weekends and at night throughout the week.

.2 Clean signs, flares, barricades, etc. used to control and accommodate traffic.

.7 Contact proper authorities in the event of an emergency, i.e., 911, Contractor's Supervisor, Park Warden, and Departmental Representative.

1.7 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

.2 Province of New Brunswick:

.1 Occupational Health and Safety Act, - Updated 2017.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Results of site specific safety hazard assessment.

.2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.

.3 Submit electronic copies of Contractor's authorized representative's work site health and safety inspection reports to authority having jurisdiction and Departmental Representative.

.4 Submit copies of reports or directions issued by Federal and Provincial health and safety inspectors.

.5 Submit copies of incident and accident reports.

.6 Submit WHMIS MSDS - Material Safety Data Sheets.

.7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within seven days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within five days after receipt of comments from Departmental Representative.

.8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.

.10 On-site Contingency and Emergency Response Plan: Address standard operating procedures to be implemented during emergency situations.

.11 Submit other data, information and documentation upon request as stipulated elsewhere in this Section.

1.3 FILING OF NOTICE

.1 File Notice of Project and any other required Notices with the Provincial Authorities prior to commencement of the work. Provide the Departmental Representative with a copy of the filed Notice(s) prior to commencement of the work.

1.4 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project.

1.5 MEETINGS

.1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work. Have Contractor's site safety supervisor in attendance. Departmental Representative will advise of time, date and location of the meeting and will be responsible for recording and distributing the minutes.

.2 Conduct site specific occupational health and safety meetings as required by the Nova Scotia Occupational Health and Safety Act, and the Regulations made pursuant to the Act for the duration of the work.

.3 Record and post minutes of all meetings in plain view on the work site. Make copies available to Departmental Representative upon request.

.4 Conduct an orientation meeting with all workers prior to start-up of the Work to ensure everyone is aware of the Health and Safety issues for this specific project. Each new worker to receive the same orientation briefing prior to performing any work on this project.

1.6 PROJECT/SITE CONDITIONS

.1 Work at site will involve contact with:

.1 Continuous movement of public traffic through the construction site at all hours of the day and night with the exception of dates listed in Section 01 11 00.

.2 The above list shall not be construed as being complete and inclusive of all safety and health hazards encountered as a result of Contractor's operations during the course of work. Include above items into the hazard assessment program specified herein.

1.7 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Health and Safety Plan shall contain the following three (3) parts:

.1 Part 1: List of individual health risks and safety hazards identified by hazard assessments.

.2 Part 2: List of specific measures to control or mitigate each hazard and risk identified in part one of Plan. Describe the engineering controls, personnel protective equipment and safe work practices to be implemented and followed when performing work related to each identified hazard or risk.

.3 Part 3: Emergency Measures and Communications Procedures as follows:

.1 Emergency Measures: on-site operating procedures, evacuation measures and emergency response to be implemented in the occurrence of an incident. Procedures to be specific and relevant to identified hazards. Measures to complement and be integrated with the facility and tenants Emergency Response Plans in place at site. Obtain information on existing emergency and evacuation plans from Departmental Representative and incorporate appropriate data.

.2 Communication Procedures:

.1 List of names and telephone numbers of designated officials, to be contacted should an incident or emergency situation occur, including the following.

.1 General Contractor and all Subcontractors.

.2 Federal and Provincial Departments and local emergency resources organizations, as resources organizations, as applicable laws and regulations.

.3 Officials from Parks Canada. Departmental Representative will provide list of names to be included.

.2 Procedures implemented at site to communicate and share information between workers, subcontractors, and General Contractor on work activities and in particular those which might endanger workers and Facility employees.

.3 Develop Health and Safety Plan in Collaboration with all subcontractors. Address all work and activities of subcontractors as they arrive on site. Immediately update Plan and submit to Departmental Representative.

.4 Implement, maintain and enforce compliance with requirements of the Health and Safety Plan until final completion of work and demobilization from site.

.5 As work progresses, review and update Plan addressing additional health risks and safety hazards identified by on-going hazard assessments.

.6 Submit revised versions of Plan to Departmental Representative.

.7 Post a typed written copy, including all updates of the Health and Safety Plan in a common visible location at work site.

.8 Submission of the Health and Safety Plan, and updates to the Departmental Representative is for review and information purposes only. Its submission shall not be construed to imply approval by Departmental Representative, be interpreted as a warranty of being complete, accurate and legislate compliant and shall not relieve the Contractor of his legal obligations for the provision Health and Safety of the Construction Project.

.9 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.8 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Comply with Occupational Health and Safety Act, Occupational Safety General Regulations.

.3 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

.4 Carry out work placing emphasis on health and safety of the public, Parks Canada employees, site personnel and protection of the environment.

.5 The Contractor is responsible to manage safety of the work site to ensure that any persons, including but not limited to, the general public circulating adjacent to the work operations are protected against harm due to the extent that they may be affected by conduct of the work.

.6 Prior to commencement of work, provide site safety orientation sessions for all workers and other authorized persons.

.7 The Contractor is responsible to ensure Contractor employees and sub-contractors accessing the work site are in possession of and wear appropriate personnel protective equipment (PPE).

1.9 UNFORESEEN HAZARDS

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety co-ordinator and follow procedures in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

1.10 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:

.1 Have site-related working experience specific to activities associated with pavement rehabilitation projects completed with live traffic.

.2 Have working knowledge of occupational safety and health regulations.

.3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

.4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

.5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

.2 The Health and Safety Co-ordinator shall be required to conduct regularly scheduled safety inspections of the work site as follows:

.1 Informal inspections on a minimum daily basis noting deficiencies and remedial actions taken in a log book or diary. Make the log book and/or diary available for the Departmental Representative's viewing as requested.

.2 Formal inspections on a minimum weekly basis, and shall provide a written report to the Departmental Representative for each formal inspection, document deficiencies, remedial action needed and assign responsibility for rectification to the appropriate party.

1.11 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

1.12 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.13 BLASTING

.1 Blasting or other use of explosives is not permitted.

1.14 WORK STOPPAGE

.1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

1.15 SITE CONTROL AND ACCESS

.1 Control work site and entry points. Grant and allow entry to only workers and other persons so authorized. Immediately stop unauthorized persons from circulating within construction areas and remove from site.

.2 Implement procedures for granting permission to enter into work site to all persons who require access. Procedures to include the provision of a site safety orientation session.

.3 Delineate and isolate construction areas from other areas of site by use of appropriate means. Erect barricades, fences, hoarding and temporary lighting as required.

.4 Erect signage at entry points and at other strategic locations around site, clearly identifying construction area(s) as being "off limits" to unauthorized persons. Signage must be professionally made in both official languages or by use of well-understood graphic symbols.

.5 Secure site at night time or provide security guard(s) as deemed necessary to protect site against entry.

.6 Ensure persons granted access are fitted and wear appropriate personnel protective equipment (PPE). Be responsible for the provision of such PPE to persons who require access to conduct work or perform inspections.

1.16 PROTECTION

.1 Provide temporary facilities for protection and safe passage of public pedestrians and vehicular traffic around adjacent work site during all times except during full road closure periods as specified in Section 01 11 00.

.2 Provide safety barricades, lights and signage on work site as required to provide a safe working environment for workers.

.3 Carry out work placing emphasis on health and safety of public, site personnel and protection of the environment.

.4 Should unforeseen or peculiar safety related hazard or condition become evident during performance of work, immediately take measures to rectify the situation and prevent damage or harm. Advise Departmental Representative verbally and in writing.

1.17 PERMITS

.1 Obtain permits, licenses and compliance certificates, at appropriate times and frequency as stipulated by authorities having jurisdiction.

.2 Where particular permit or compliance certificate cannot be obtained at the required stage of work, notify Departmental Representative in writing and obtain Departmental Representative's approval to proceed prior to carrying out that portion of the Work.

1.18 MINIMUM SITE SAFETY RULES

.1 Notwithstanding the requirement to abide by federal and provincial health and safety regulations, the following safety rules shall be considered minimum requirements at the work site and obeyed by all persons granted access:

.1 Wear personal protective equipment (PPE) appropriate to function and task on site; the minimum requirements being hard hat, safety vest and safety footwear. Wear eye protection where appropriate.

.2 Immediately report unsafe activities, conditions, near-miss accidents, injuries and damages.

.3 Maintain site in tidy condition.

.4 Obey warning signs and safety tags.

.1 Brief workers on site safety rules, and on the disciplinary measures to be taken for violation or non-compliance of such rules. Post such information on site.

1.19 TOOLS AND EQUIPMENT SAFETY

.1 Implement and follow a scheduled tool and equipment inspection/maintenance program at work site. Regularly check tools, equipment and machinery for safe operation and perform maintenance at pre-established time and frequency intervals as recommended by manufacturer. Include subcontractors equipment as part of the inspection process.

.2 Use standardized checklists to ensure established safety checks are stringently followed.

.3 Immediately tag and remove items found faulty or defective off site.

.4 Maintain written documentation on each inspection. Make available to Departmental Representative upon request.

1.20 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information Systems (WHMIS).

.2 Keep MSDS data sheets on site. Provide copies of all data sheets to Departmental Representative upon receipt of materials on site.

.3 Put all MSDS data sheets on site, in a common area, visible to workers.

1.21 PROJECT / SITE CONDITIONS

.1 The following are known or potential project related safety hazards at site:

.1 Highway Traffic.

.2 Fractured and loose rock overhead. Contractor should be aware that the potential for falling rocks exists.

.2 Obtain from Departmental Representative, copy of MSDS Data sheets of existing hazardous materials stored on site or being used by Facility and Tenant personnel in the course of their operations.

.3 Above lists shall not be construed as being complete and inclusive of safety and health hazards encountered as a result of Contractor's operations during the course of work. Include above items into the hazard assessment program specified herein.

1.22 ACCIDENT REPORTING

.1 Investigate and report incidents and accidents as outlined in Provincial Occupational Safety and Health Act and Regulations.

.2 Investigate and immediately report to Departmental Representative incidents and accidents which results, or has the potential of resulting in:

.1 Injuries requiring medical aid.

.2 Property damage in excess of $5,000.00.

.3 Required notification to Workers Compensation Board or other regulatory agencies as stipulated by applicable regulations.

1.23 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the work.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Definitions:

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.

.2 Erosion: A combination of processes in which materials of the earth's surface are loosened, dissolved, or worn away, and transported from one place to another by natural agents.

.3 Sedimentation: The addition of soils to water bodies by natural and human related activities.

.4 Storm Water Runoff: Precipitation that does not soak into the ground or evaporate, but flows along the ground surface as runoff.

.5 Erosion and Sediment Control Plan: Plan identifying the applicable stabilization and structural strategies that shall be employed to limit sediment and erosion during construction.

.6 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water and air; biological and cultural resources; and includes management of visual aesthetics, noise, solid, chemical, gaseous and liquid waste; radiant energy and radioactive material as well as other pollutants.

.7 Deleterious Substance: defined by the Fisheries Act as any substance that, if added to water, makes the water deleterious to fish or fish habitat or any water containing a substance in such quantity or concentration or has been changed by heat or other means, that if added to water makes that water deleterious to fish or fish habitat.

.8 Contaminant: means any solid, liquid, gas, micro-organism, odour, heat, sound, vibration, radiation or combination of any of them, present in the environment.

.9 Contaminants and Deleterious substances includes, but are not limited to: sediment or sediment-laden water, petroleum products, paints, thinners, heated water, concrete wash water, salt, heavy metals, wood preservatives, cleaning supplies, pesticides, wood and food waste, and fecal matter.

.10 Environmental incidents or emergencies include:

.1 Chemical or Petroleum spills;

.2 Poisonous or Caustic Gas Emission;

.3 Biological or Chemical Explosion;

.4 Hazardous Material Spill;

.5 Sewage Spill;

.6 Contaminated Water into Waterways;

.7 Explosion and Ammunition.

.2 Reference Standards:

.1 Parks Canada National Best Management Practices – Roadway, Highway, Parkway and Related Infrastructure.

.1 Document is included in Technical Specifications as Appendix A.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Prior to the pre-construction meeting, submit Environmental Protection Plan for review and approval by Departmental Representative.

.3 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.

.4 Address topics at level of detail commensurate with environmental issue and required construction tasks.

.5 Include in Environmental Protection Plan:

.1 Name of person responsible for ensuring adherence to Environmental Protection Plan.

.2 Name and qualifications of person responsible for manifesting hazardous waste to be removed from site.

.3 Name and qualifications of person responsible for training site personnel.

.4 Descriptions of environmental protection personnel training program.

.5 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws.

.6 Drawings indicating locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

.7 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather.

.1 Plans to include measures to minimize amount of material transported onto paved public roads by vehicles or runoff.

.8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.

.1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.

.9 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.

.12 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Waste Water Management Plan identifying methods and procedures for management discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water and dewatering of ground water.

.14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

1.3 SENSITIVE AREAS

.1 Site clearing, ground disturbance, and heavy equipment traffic shall not occur within Sensitive Areas unless absolutely required and authorized by Departmental Representative.

.2 Contractors must make all efforts to prevent contaminants and deleterious substances arising from their work from directly or indirectly entering those areas indicated as sensitive areas on drawings (e.g. watercourses and wetlands). This may include mitigative measures such as altering; work schedules, methods of undertaking the work, materials used, and installation of mitigative structures (e.g. sediment control fence, check dams, mulching, etc.).

.3 Failure to comply can lead to charges under various legislation, including the federal Fisheries Act, Parks Canada Act, and the New Brunswick Clean Water Act.

1.4 FIRES

.1 Fires and burning of rubbish on site is not permitted.

.2 Immediately report all fires to the Departmental Representative. The Contractor is held responsible to make all reasonable efforts to extinguish any fires on the site.

.3 The Contractor is required to comply with the Fire Protection Regulations of the National Parks Act.

.4 In accordance with these Regulations, the Park Superintendent may restrict activities, or access to work areas, in the interest of fire prevention.

.5 The Contractor's equipment must be in proper working condition, and be used in such a manner as to minimize the potential for ignition of vegetation.

.6 Vehicles and stationary equipment must be equipped with fire suppression equipment such as an operable fire extinguisher.

.7 If storage and/or operation of in-Park equipment during a high fire hazard season is of concern to the Park, the Contractor may be required to prepare and implement a Fire Suppression Contingency Plan.

1.5 DISPOSAL OF WASTES

.1 Littering is prohibited.

.2 Dispose of rubbish and waste materials at authorized site.

.3 Do not dispose of waste, volatile or deleterious materials into waterways, wetlands, storm or sanitary sewers.

.4 All refuse from demolition is the property of the Contractor and shall be removed and disposed of in a legal manner.

.5 All Hazardous materials shall be sealed as dictated by authorities having jurisdiction, and disposed of off-site, unless otherwise instructed by the Departmental Representative.

.6 Garbage must be collected and removed daily from the worksite to keep the site sanitary and to prevent unwanted interactions with Park fauna (e.g. bears).

1.6 DRAINAGE

.1 Provide temporary drainage and pumping required to keep excavations and site free from water.

.2 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.

.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.7 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties as indicated.

.2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.

.3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.

.1 Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal to areas designated by Departmental Representative.

1.8 WORK ADJACENT TO WETLANDS AND WATERCOURSES

.1 Construction equipment to be operated on land only.

.2 Use of borrow material from watercourses or wetlands is prohibited.

.3 Do not alter or draw any water from a watercourse or wetland without first obtaining necessary permits or approvals.

.4 Do not dump excavated fill, waste material or debris in watercourses or wetlands.

.5 Design and construct temporary crossings to minimize erosion to watercourse or wetland. All temporary crossings must be pre-approved by Departmental Representative prior to construction.

.6 Do not skid logs or construction materials across watercourses or wetland.

.7 Avoid indicated spawning beds when constructing temporary crossings of waterways.

.8 Do not blast under watercourses or wetland within 100 m of spawning beds without obtaining necessary permits or approvals.

.9 Provide a buffer zone in combination with appropriate erosion and sedimentation control when working adjacent to watercourses and wetlands. Consult with regulatory agencies.

1.9 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this Contract.

.2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.

.3 Prior to the pre-construction meeting, prepare an Environmental Protection Plan, which addresses procedures to follow in the event of a pollution incident and ensure all staff are aware of these procedures. Provide copy of contingency plan to the Departmental Representative.

.4 Maintain temporary erosion and pollution control devices installed under this contract until the Work is completed as specified in the Project Documents.

.5 Remove temporary erosion and pollution control measures just prior to project completion unless directed otherwise. Chemicals used in dust control must have prior approval of the Departmental Representative.

.6 Control emissions from equipment to requirement of authority having jurisdiction.

.7 Provide temporary enclosures to protect environment from effects of abrasive blasting.

.8 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

.9 Keep paved surfaces clean. Control dust by application of calcium chloride or water.

1.10 PETROLEUM, OIL AND LUBRICANT STORAGE

.1 Take precautions to avoid contamination of the site from Petroleum, Oil and Lubricants (POL's).

.2 The management of POL's and chemicals must meet with the requirements of the New Brunswick Transportation of Dangerous Goods Act and all other appropriate provincial and federal regulations to include but not be limited to the following:

.1 Temporary POL storage sites are to be located a minimum 200 m from any watercourse or wetland.

.2 Fuel storage containers must be accompanied by impermeable structures that would provide containment of 125% of the container capacity in the event of a leak or spill.

.3 The Departmental Representative must be immediately contacted after a spill of more than 10 L of fuel or lubricant, and after any amount of other chemical products has escaped.

.4 Storage of large amounts of fuel (more than 900 L) in the Park is not permitted.

.5 Storage of hazardous material, including explosives, shall not be permitted within the Park, except for quantities which shall normally be expected to be utilized in a day of Work, and which are not permitted to stockpile.

1.11 REFUELING AND SPILL CONTAINMENT

.1 Take precautions to avoid contamination of the site from fuel. Keep and maintain hydrocarbon containment and cleanup materials on site for the duration of construction activities. Ensure that Contractor's personnel are trained in the proper use of such materials.

.2 Establish suitable fueling and maintenance areas and obtain approval from the Departmental Representative.

.3 Do not refuel or maintain equipment adjacent to or within 200 meters of any sensitive areas.

.4 Monitor on site vehicles for fluid leaks. Implement a preventative maintenance program to keep vehicles free from leaks.

.5 Refueling of on-line equipment from storage facilities located outside Park boundaries is strongly preferred. Storage of any fuel has to occur only in previously approved locations, and with Departmental Representative consent. The Contractor must submit plans for fuel management and a Spill Contingency Plan seven days prior to the start of the Work. The Contractor is expected to be prepared to effect the containment and cleanup of all spills related to the Work.

.6 Emulsion storage tanker and transfer of emulsion from tanker to spray vehicle are not permitted within National Park.

1.12 EQUIPMENT MOVEMENT AND MAINTENANCE

.1 Maintenance work on Contractor/Sub-Contractor equipment is prohibited within National Park.

.2 Waste oil and solvents are to be properly contained until they are removed from the site by qualified companies for recycling or disposal.

.3 Any leaking equipment must be taken out of service until repaired.

.4 Limit the number and length of temporary access and construction roads.

1.13 AIRBORNE POLLUTION AND PARTICULATE CONTROL

.1 Keep dust and inconvenience to site occupants to a minimum.

.2 Control emissions from equipment to local emission requirements.

.3 Do grading activities to minimize dusting. Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

1.14 NOISE CONTROL

.1 Operate construction equipment to prevent excessive noise.

.2 To reduce potential negative impacts on Park fauna (especially moose), noise control measures, such as properly functioning mufflers on equipment, must be in place.

1.15 BLASTING

.1 Blasting is prohibited.

1.16 SEWAGE DISPOSAL

.1 Provide and maintain temporary sanitary facilities for site personnel.

.2 Obtain all approvals required for the disposal of sanitary waste from any facilities, including offices, washrooms, and temporary site trailers.

.3 Remove sanitary facilities from site when no longer required.

1.17 FISHERIES AND WILDLIFE

.1 Wildlife shall not be fed or harassed.

.2 All refuse shall be disposed of at an approved facility to avoid the attraction of nuisance animals.

.3 In case of persistent wildlife encounters, the Contractor shall inform the Departmental Representative, who will notify Parks Canada of the situation. Care shall be taken to avoid the animal.

.4 All observed fish shall be removed from the isolated reach of the channel prior to dewatering operations.

1.18 UNFORESEEN SITE STOPPAGES

.1 If contaminated sites, heritage sites, archeological resources, or other unforeseen site conditions are encountered in the work site area, work will immediately cease until investigations are completed and permission to continue is granted from the Departmental Representative.

1.19 HISTORICAL/ARCHAEOLOGICAL CONTROL

.1 Provide historical, archaeological, cultural resources, biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.

.2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

1.20 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection Plan.

.2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.

.1 Take action only after receipt of written approval by Departmental Representative.

.3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

1.21 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 SEDIMENT CONTROL FENCE

.1 Provide and maintain sediment control fence where required or as directed, prior to construction. Coordinate locations with Departmental Representative. Do not remove control features until authorized by the Departmental Representative.

.2 Sediment Control fence: preassembled sediment control fence with industrial woven geotextile fabric (Type W1) pre-stapled to wood posts spaced as indicated.

2.2 EROSION CONTROL STRUCTURES

.1 Provide and maintain erosion control structures where required or as directed, prior to construction. Coordinate locations with Departmental Representative. Do not remove control features until authorized by the Departmental Representative.

.2 Geotextile: non-woven, needle-punched polyester filter fabric (Type N1).

.3 Random rip-rap shall be supplied in accordance with Section 31 37 00 – Rip-rap.

.4 Construct erosion control structures to the cross sections indicated on the Project Documents.

Part 3 Execution

3.1 SEDIMENT CONTROL

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

.2 The Contractor shall install additional sediment control fence as directed by the Contractor's on-site environmental representative, as well as per applicable permits and regulations.

.3 The sediment control fence shall be installed as indicated on the Contract Documents and prefabricated sediment control fence shall be installed as per the manufacturer's instructions.

.1 In areas of potential sheet flow runoff where construction activity may cause the drainage run-off to transport sediment(s), and the Contract Documents do not provide for sediment control fences in these areas, the Contractor shall ensure that sediment control fences are properly located in effective runoff control.

.4 The Contractor shall maintain the sediment control fence in a functional condition continuously from the time of installation until the completion of the Contract or removal.

.5 The Contractor shall inspect all sediment control fences after each rainfall and at least daily during periods of prolonged rainfall.

.6 The Contractor shall immediately repair any damage to sediment control fences or parts thereof.

.7 The Contractor shall remove retained sediment prior to it having accumulated to a level approximately but not exceeding one-half the height of the fence, and this sediment shall be disposed of at a location at least 30m from any watercourse, and in such manner that the sediment will not be returned to the Work Area or the watercourse; or

.1 Subject to the approval of the Departmental Representative, the Contractor may install a second, back-up sediment control fence, at his/her expense.

.8 The Contractor shall remove all sediment control fence and the time of such removal shall be subject to the Departmental Representative approval but in all cases shall occur prior to the completion of the Contract.

.1 Sediment control fence removed shall become property of the Contractor and shall be disposed of outside of the Work Site.

.2 If the Departmental Representative notified the Contractor in writing, prior to the completion of the Contract, that all or any part of the sediment control fence is to remain in place, the Contractor shall be deemed to have completed her/his obligations for that portion of the sediment control fence under his Item and the sediment control fence shall become the property of the Owner.

.9 At the time of removal, the Contractor shall excavate any remaining sediment and dispose of it at a location at least 30m from any watercourse, and in such manner that the sediment will not be returned to the Work Area or the watercourse and shall dress and seed the area of the removed fence and sedimentation, to the satisfaction of the Departmental Representative.

3.2 EROSION CONTROL

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

.2 The Contractor shall install additional erosion control structures as directed by the Contractor's on-site environmental representative, as well as per applicable permits and regulations.

.3 Erosion control structures shall be constructed as indicated on Contract Documents.

.4 Erosion control structures may be installed in natural swales prior to ditch construction, in temporary or partially constructed ditches, and/or in completed ditches.

.1 In areas of potential sheet flow runoff where construction activity may cause the drainage run-off to transport sediment, and the Contract Documents do not provide for erosion control structures in these areas, the Contractor shall ensure that erosion control structures are properly located for effective runoff control.

.5 The Contractor shall carry out the Work in accordance with Contract Documents.

.6 The application, construction details and clean-out requirements for different types of erosion control structures shall be carried out as indicated in Table 1.4.1 and Clause 1.4.7.

Table 1.4.1

Erosion Control Structures

Type	Application	Clean-Out Requirements
"A"	Type A structures shall be installed as spillways of dykes that are built to pond runoff from ditches or from grubbed areas, or at the end of a cut where runoff leaves the ditch to flow down a natural slope.	The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point within 300mm of the crest of the spillway.
"B"	Type B structures are typically installed in rock ditches where stakes required for Type C and D structures cannot be driven.	The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point within 100mm of the crest of the notch.
"C"	Type C structures are typically installed in earth ditches or swales.	The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point of 100mm of the crest of the notch.
"D"	Type D structures are typically installed in earth ditches or swales.	The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point of 100mm of the crest of the notch.

.7 Clean-out consists of removal of sediment deposits retained by the structure and disposal of the removed materials in accordance with Clause 1.4.11.

.1 Sediment removal shall be performed so as to cause minimal disturbance to the ground or any part of the erosion control structure, and in the case of Type A structures, to the sediment pond dyke.

.8 The Contractor shall maintain erosion control structure(s) in a functional condition from the time of installation until their removal.

.1 All erosion control structures shall be kept in place until the grass on hydroseeded slopes and ditches is stabilized as an effective erosion deterrent, or as directed by the departmental representative.

.1 In Work Areas that are hydroseeded up to but no later than September 15th, erosion control structures Types B, C, and D shall be kept in place until the day on which the ground is prepared for hydroseeding, as approved by the Departmental Representative.

.2 All erosion control structure(s) shall be removed as follow:

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

.2 Scheduling of the removal of the erosion control structures shall be subject to the approval of the Departmental Representative.

.1 Erosion control structures removed shall become property of the Contractor and shall be disposed of outside of the Work Site.

.2 If the Departmental Representative notified the Contractor in writing, prior to the completion of the Contract, that all or any of the erosion control structure(s) are to remain in place, the Contractor shall be deemed to have completed his/her obligations for the portion of the Work under this Item and the erosion control structure(s) indicated shall become the property of the Owner.

.3 At the time of the removal the Contractor shall excavate any remaining sediment and dispose of it at a location at least 30m from any watercourse, and in such manner that the sediment will not be returned to the Work Area or the watercourse.

.4 The Contractor is the ensure that all possible care is taken to ensure that ground disturbance is maintained at a minimum during the erosion control structure removal operation and that all necessary precaution is taken to ensure that no sediment release occurs as a result of this removal activity.

.5 The Contractor shall be responsible to match the affected ditches and Slopes with the Slopes and ditch grades of the adjacent Work Area(s).

.6 The Contractor shall restore the area of the removed erosion control structure, deposited sedimentation and other disturbed ground within the Work Area, to the satisfaction of the Departmental Representative within 48 hours following the removal of the erosion control structure.

.9 The Contractor shall inspect all erosion control structure(s) after each rainfall and at least daily during periods of prolonged rainfall.

.10 The Contractor shall immediately repair any damage to erosion control structure(s) or parts thereof.

.11 The Contractor shall dispose of the excavated sediment at a location, at least 30m away from any watercourse, and in such manner that the sediment will not be returned to the Work Area or watercourse.

.12 The Contractor shall not remove any erosion control structure without the authorization of the Departmental Representative.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1	Section 31 23 33.01	Excavating, Trenching and Backfilling
.2	Section 31 24 13	Roadway Embankments
.3	Section 32 01 16.13	Reshaping Asphalt Pavement
.4	Section 32 11 16.01	Granular Sub-base
.5	Section 32 11 23	Aggregate Base Courses
.6	Section 32 12 16	Asphalt Paving
.7	Section 33 05 16	Maintenance Holes and Catch Basin Structures
.8	Section 33 41 00	Storm Utility Drainage Piping
.9	Section 33 42 13	Pipe Culverts

1.2 INSPECTION

.1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.3 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and

irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and re-inspection

1.4 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.5 PROCEDURES

.1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.6 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.7 REPORTS

.1 Submit 4 copies of inspection and test reports to Departmental Representative.

.2 Provide copies to subcontractor of work being inspected or tested.

1.8 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

1.9 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.2 INSTALLATION AND REMOVAL

.1 Provide construction facilities in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.3 SCAFFOLDING

.1 Scaffolding in accordance with CAN/CSA-S269.2.

.2 Provide and maintain scaffolding, ramps, ladders, platforms and temporary stairs as required.

1.4 HOISTING

.1 Provide, operate and maintain hoists required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.

.2 Hoists to be operated by qualified operator.

1.5 SITE STORAGE / LOADING

.1 Contractor's use of site storage and loading shall be limited to an area within limits of traffic diversion. Any conditional areas required shall be approved by Departmental Representative prior to use.

.2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.6 DEPARTMENTAL REPRESENTATIVE'S SITE OFFICE

.1 Contractor to provide Departmental Representative's office trailer/space. Minimum office trailer/space size is 3.0 m x 12.5 m.

.2 Insulate building and provide heating system to maintain 22 degrees C inside temperature at -20 degrees C outside temperature.

.3 Finish inside walls and ceiling with plywood, hardboard or wallboard and paint in selected colors. Finish floor with 19 mm thick plywood.

.4 Install electrical lighting system to provide min 750 lx using surface mounted, shielded commercial fixtures with 10% upward light component.

.5 Contractor to arrange and pay for telephone, internet connection and photocopier in Departmental Representative's office for its exclusive use. Capacity of internet to be suitable for business applications.

.6 Contractor to equip office with two 1 m x 2 m tables, one 1 m x 2 m drafting table, 4 chairs, 6 m of shelving 300 mm wide, one 3 drawer filing cabinet, one plan rack and one coat rack and shelf.

.7 Upon completion of the Contract; all equipment and furniture provided by the Contractor shall be returned to it.

.8 Supply of the Departmental Representative's office, supplies and services will be incidental to the work.

.9 Contractor to provide laboratory space for the Departmental Representative at the aggregate crushing operation, laboratory to include the following.

.1 Ability to secure laboratory.

.2 Minimum laboratory trailer/space size is 3.0 m x 7.5 m.

.3 Contractor to supply continual access to clean water.

.4 One work desk and one chair.

.5 Contractor to supply continual access to electricity and lighting. Sufficient electricity and outlets to power two 120v/240v warming ovens, one 120v hot plate, one electronic scale, one 120v sieve shaker and three table fans simultaneously.

.6 Sink for washing samples.

.7 Secure storage for a nuclear density gauge.

.8 Minimum 1.0 m x 3.0 m work bench.

.10 Contractor to provide laboratory space for the Departmental Representative at the Asphalt Plant, laboratory to include the following.

.1 Ability to secure laboratory.

.2 Minimum laboratory trailer/space size is 3.0 m x 10.0 m.

.3 Contractor to supply continual access to clean water.

.4 One work desk and one chair.

.5 Contractor to supply continual access to electricity and lighting. Sufficient electricity and outlets to power one NCAT 240v ignition oven, two 120v/240v warming ovens, one 120v hot plate, one electronic scale, one 120v sieve shaker, one 120v vacuum pump and three table fans simultaneously.

.6 Sink for washing samples.

.7 Secure storage for a nuclear density gauge.

.8 Minimum 1.0 m x 5.0 m work bench.

1.7 CONTRACTOR'S CAMP

.1 The Contractor will not be permitted to set up a camp within Kouchibouguac National Park.

1.8 CONSTRUCTION PARKING

.1 Parking will be permitted in the area of the site provided it does not disrupt performance of Work and after obtaining agreement with the Departmental Representative.

.2 Provide and maintain adequate access to project site.

.3 Keep parking areas clean and maintained during period of Contract.

1.9 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.10 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.11 CONSTRUCTION SIGNAGE

.1 No other signs or advertisements, other than warning signs, are permitted on site.

.2 Signs and notices for safety and instruction in both official languages graphic symbols to CAN/CSA-Z321.

.3 Maintain approved signs and notices in good condition for duration of project, and dispose of off-site on completion of project or earlier if directed by Departmental Representative.

1.12 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Refer to Section 01 35 00.06 – Special Procedures for Traffic Control.

1.13 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

.3 Clean dirt or mud tracked onto paved or surfaced roadways.

.4 Store materials resulting from demolition activities that are salvageable.

1.14 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Government of Canada Weights and Measures Act 1985.

.2 Government of Canada Weights and Measures Regulations 1990.

1.2 CERTIFICATION

.1 Prior to use, Contractor shall have weigh scales certified as meeting requirements of Statutes of Canada, Weights and Measures Act. Display certificate in a visible location.

1.3 OPERATION

.1 Contractor shall provide a weigher at scale location to issue tickets and prepare a daily summary sheet to submit to Departmental Representative. Tickets shall include information to identify the truck and registered weight along with tare, gross and net weights.

.1 Tickets shall not be issued to vehicles which exceed the vehicle's registered weight.

Part 2 Products

2.1 EQUIPMENT

.1 Weigh scales: of sufficient capacity to weigh loaded vehicles in a single operation. The weigh scale shall be calibrated in SI units.

.2 Scale house:

.1 To enclose mass indicator and where weigher can perform work and maintain records.

.2 Waterproof, one sliding window facing scale platform, one other window for cross ventilation, entrance door not to fact on to scale platform.

.3 Approved weigh tickets, in triplicate, with consecutive serial numbers shall be provided by Contractor.

Part 3 Execution

3.1 INSTALLATION

.1 Provide, install and maintain scales and scale house at location approved by Departmental Representative.

.2 Remove scales and scale house when no longer required and as directed by Departmental Representative. Level approach ramps.

.3 The work shall include installation of the anchorage assemblies.

3.2 MAINTENANCE

.1 Maintain scale platform and scale mechanism clean and free from gravel, asphalt, snow, ice and debris.

.2 Maintain approach ramps in good condition free from sags and ruts.

.3 Have scales re-tested and re-certified if requested by Departmental Representative.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.3 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations and open edges of structures, or as indicated in Contract Documents.

.2 Provide as required by governing authorities and as directed.

1.4 ACCESS TO SITE

.1 Provide and maintain access roads, ramps and construction runways as may be required for access to Work.

1.5 PUBLIC TRAFFIC FLOW

.1 Provide and maintain competent Traffic Control Persons, traffic control signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public.

1.6 FIRE ROUTES

.1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.7 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.8 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Within text of each specifications section, reference may be made to reference standards.

.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be borne by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

.5 Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date or issue is specifically noted.

1.2 QUALITY

.1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.

.3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

.5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions.

1.3 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.5 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

.2 Transportation cost of products supplied by Owner will be paid for by Departmental Representative. Unload, handle and store such products.

1.6 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.7 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.8 CO-ORDINATION

.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

1.9 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.10 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and pedestrian and vehicular traffic.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

1.11 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Owner's identification of existing survey control points and property limits.

1.2 QUALIFICATION OF SURVEYOR

.1 Qualified registered land surveyor, licensed to practice in Province of New Brunswick, acceptable to Departmental Representative.

1.3 SURVEY REFERENCE POINTS

.1 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.

.2 The Contractor shall be satisfied, before commencing any Work, as to the meaning, intent and accuracy of any control points, control lines and benchmarks established by the Departmental Representative.

.1 Records of control point check surveys will contain all electronic survey files, reports and other relevant survey data showing closures.

.3 Should the Contractor discover or suspect any errors in any control points, control lines, benchmarks, and data provided by the Departmental Representative, the Contractor shall at once discontinue the affected work until such errors are investigated by the Departmental Representative and, if necessary, rectified.

.4 No separate payment will be made for layout work and the cost thereof will be considered incidental to the various items of work to be performed in the Contract.

.5 Make no changes or relocations without prior written notice to Departmental Representative.

.6 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.7 Require surveyor to replace control points in accordance with original survey control.

1.4 SURVEY REQUIREMENTS

.1 The Contractor shall be responsible for establishing all secondary control points and/or lines, all slope stakes, the establishment of line and grades for subgrade and the various granular aggregate layers, layout by line and grade of all structures, culverts, and underground utilities, and shall perform all other layout and measurement necessary for the proper execution of the Contract.

.2 Secondary control point accuracy shall be:

.1 Minimum horizontal requirement is 3.0 cm ± 1:20,000 at a 95% confidence level.

.2 Minimum vertical requirement for a closed level loop is 0.008 times the square root of the distance leveled in kilometres.

.3 The staking of all works shall be of a sufficient accuracy and frequency for the Departmental Representative to carry out its quantity measurements and quality assurance program.

.4 On request of the Departmental Representative, the Contractor shall submit documentation to verify the accuracy of the layout work.

.5 Provide survey layout with stakes on both sides of the road/alignment at 20 metre station intervals (top of back slope, toe of slope, subgrade, granulars, shoulders, etc.) with centreline offset.

.6 Record elevation and location of all existing and installed end caps of abandoned underground services.

1.5 EXISTING SERVICES

.1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.

1.6 RECORDS

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 On completion of site works, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

.3 Record locations of maintained, re-routed and abandoned service lines.

1.7 SUBMITTALS

.1 Submit name and address of Surveyor to Departmental Representative.

.2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.

1.8 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

.1 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.2 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.3 Provide on-site containers for collection of waste materials and debris.

.4 Dispose of waste materials and debris off site.

.5 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.6 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.7 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.8 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

.1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris other than that caused by Owner or other Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Sweep and wash clean paved areas.

1.3 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 CLEANING DURING CONSTRUCTION

.1 The Contractor shall ensure that adequate dust control is provided at all times during the Contract to avoid any hazardous situations and shall immediately implement any measures as directed by the Departmental Representative to control dust problems. Any damages or costs incurred as a result of excessive dust shall be paid for by the Contractor.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 35 43 – Environmental Procedures

.2 Section 02 41 13 – Selective Site Demolition

.3 Section 03 30 00 – Cast-in-Place Concrete

1.2 WASTE MANAGEMENT PLAN

.1 Prior to commencement of work, prepare Waste Management Work Plan.

.2 Work Plan to include:

.1 Waste audit;

.2 Waste reduction practices;

.3 Material source separation process;

.4 Procedures for sending recyclables to recycling facilities;

.5 Procedures for sending non-salvageable items and waste to approved waste processing facility or landfill site;

.6 Training and supervising workforce on waste management at site;

.7 Contaminated soil removal and disposal.

.3 Work Plan to incorporate waste management requirements specified herein and in other sections of the specifications.

.4 Develop Work Plan in collaboration with all sub-contractors to ensure all waste management issues and opportunities are addressed.

.5 Submit copy of Work Plan to Departmental Representative for review and approval.

.1 Make revisions to Plan as directed by Departmental Representative.

.6 Implement and manage all aspects of Waste Management Work Plan for duration of work.

.7 Revise Plan as work progresses addressing new opportunities for diversion of waste from landfill.

1.3 WASTE AUDIT

.1 At project start-up, conduct waste audit of:

.1 Site conditions identifying salvageable and non-salvageable items and waste resulting from demolition and removal work.

.2 Projected waste resulting from product packaging and from material left over after installation work.

1.4 WASTE REDUCTION

.1 Based on waste audit, develop waste reduction program.

.2 Structure program to prioritize actions, with waste reduction as first priority, followed by salvage and recycling effort, then disposal as solid waste.

.3 Identify materials and equipment to be:

.1 Protected and turned over to Departmental Representative when indicated;

.2 Salvaged for resale for Contractor;

.3 Sent to recycling facility;

.4 Sent to waste processing/landfill site for their recycling effort;

.5 Disposal of an approved landfill site.

.4 Reduce construction waste during installation work. Undertake practices which will minimize waste and optimize full use of new materials on site, such as:

.1 Use of a central cutting area to allow for easy access to off-cuts;

.2 Use of off-cuts for blocking and bridging elsewhere;

.3 Use of effective and strategically placed facilities on each site for storage and staging of leftover or potentially cut materials (such as gypsum board, plywood, ceiling tiles, insulation, etc.) to allow for easy incorporation into work whenever possible, avoiding unnecessary waste.

1.5 MATERIAL SOURCE SEPARATION PROCESS

.1 Develop and implement material source separation process at commencement of work as part of mobilization and waste management at each site.

.2 Provide on-site facilities to collect, handle and store anticipated quantities of reusable, salvageable and recyclable materials.

.1 Use suitable containers for individual collection of items based on intended purpose;

.2 Locate to facilitate deposit, but without hindering traffic or other site operations;

.3 Clearly mark containers and stockpiles as to purpose and use.

.3 Perform demolition and removal of existing structure components and equipment following a systematic deconstruction process.

.1 Separate materials and equipment at source, carefully dismantling, labelling and stockpiling alike items for the following purposes:

.1 Reinstallation into the work where indicated;

.2 Salvaging reusable items not needed in project which Contractor may sell to other parties. Sale of such items not permitted on site;

.3 Sending as many items as possible to locally available recycling facility;

.4 Segregating remaining waste and debris into various individual waste categories for disposal in a “non-mixed state” as recommended by waste processing/landfill sites.

.4 Isolate product packaging and delivery containers from general waste stream. Send to recycling facility or return to supplier/manufacturer.

.5 Send leftover material resulting from installation work for recycling whenever possible.

.6 Establish methods whereby hazardous and toxic waste materials, and their containers, encountered or used in the course work are properly isolated, stored on site and disposed in accordance with applicable laws and regulations from authorities having jurisdiction.

.7 Isolate and store existing materials and equipment identified for re-incorporation into the work. Protect against damage.

1.6 WORKER TRAINING AND SUPERVISION

.1 Provide adequate training to workforce, through meetings and demonstrations, to emphasize purpose and worker responsibilities in carrying out the Waste Management Plan.

.2 Waste Management Coordinator: designate full-time person on site, experienced in waste management and having knowledge of the purpose and content of Waste Management Plan to:

.1 Oversee and supervise waste management during work;

.2 Provide instructions and directions to all workers and sub-contractors on waste reduction, source separation and disposal practices.

.3 Post a copy of the Plan in a prominent location on each site for review by workers.

1.7 CERTIFICATE OF MATERIAL DIVERSION

.1 Submit to Departmental Representative, copies of certified weigh bills from authorized waste processing sites and sale receipts from recycling/reuse facilities confirming receipt of construction materials and quantity of waste diverted from landfill.

.2 Submit data at pre-determined project milestones as determined by Departmental Representative.

.3 Compare actual quantities diverted from landfill with projections made during waste audit.

1.8 DISPOSAL REQUIREMENTS

.1 Burying or burning of rubbish and waste materials is prohibited.

.2 Disposal of waste, volatile materials, mineral spirits, oil, paint, paint thinner or unused preservative material into waterways, storm, or sanitary sewers is prohibited.

.3 Do not dispose of preservative treated wood through incineration.

.4 Do not dispose of preservative treated wood with other materials destined for recycling or reuse.

.5 Dispose of treated wood, end pieces, wood scraps and sawdust at a sanitary landfill.

.6 Dispose of waste only at approved waste processing facility or landfill sites approved by authority having jurisdiction.

.7 Contact the authority having jurisdiction prior to commencement of work, to determine what, if any, demolition and construction waste materials have been banned from disposal in landfills and at transfer stations. Take appropriate action to isolate such

banned materials at site of work and dispose in strict accordance with Provincial and Municipal regulations.

.8 Transport waste intended for landfill in separated condition, following rules and recommendations of landfill operator in support of their effort to divert, recycle and reduce amount of solid waste placed in landfill.

.9 Collect, bundle and transport salvaged materials to be recycled in separated categories and condition as directed by recycling facility. Ship materials only to approved recycling facilities.

.10 Sale of salvaged items by Contractor to other parties not permitted on site.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:

.1 Contractor's Inspection: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.

.2 Request Departmental Representative's inspection.

.2 Departmental Representative Inspection:

.1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.

.2 Contractor to correct Work as directed.

.3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:

.1 Work: completed and inspected for compliance with Contract Documents.

.2 Defects: corrected and deficiencies completed.

.3 Certificates required by jurisdictional authorities have been submitted.

.4 Work is complete and ready for Final Inspection.

.3 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

1.2 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:

.1 Convene meeting one week prior to contract completion with Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:

.1 Verify Project requirements.

.2 Review warranty requirements.

.2 Departmental Representative to establish communication procedures for:

.1 Notifying construction warranty defects.

.2 Determine priorities for type of defects.

.3 Determine reasonable response time.

.3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.

.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.2 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative, one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to Contract.

.5 Reviewed shop drawings, product data, and samples.

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction.

.1 Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.

.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition.

.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

1.3 RECORD DRAWINGS

.1 Departmental Representative will provide two sets of white prints for record drawing purposes.

.2 Maintain project record drawings and record accurately deviations from Contract documents.

.3 Record changes in red. Mark on one set of prints and at completion of project and prior to final inspection, neatly transfer notations to second set and submit both sets to the Departmental Representative.

.4 Record following information:

.1 Field changes of dimension, detail and elevation.

.2 Changes made by Change Order or Field Order.

.3 Other significant deviations which are concealed in construction and cannot be identified by visual inspection

.5 At completion of project and prior to final inspection, neatly transfer "as-recorded" records to second set of white prints using fine, red marker. Neatly print lettering and numbers in size to match original. Lines may be drawn free-hand but shall be neat and accurate. Add at each drawing title block note: "AS-RECORDED". Also, circle on List of Drawings each title and number of drawing marked with "as-recorded" records.

.6 Submit this set of "as-recorded" drawings to Departmental Representative.

.7 At the completion of construction the Contractor shall complete a topographic as-recorded survey of the project areas and submit the survey data in an acceptable form to the Departmental Representative.

.8 If project is completed without significant deviations from contract drawings, declare this in writing and submit to Departmental Representative in lieu of record drawings.

.9 The Departmental Representative will review the progress of the record drawings as part of each payment certificate authorization. Should the drawings not be properly updated, payment will be withheld for each payment certificate until the work is completed to the satisfaction of the Departmental Representative.

.10 Provide digital photos, if requested, for site records.

.11 Contract Drawings and shop drawings: mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish road elevation.

.2 Measured horizontal and vertical locations of underground utilities, guiderail and appurtenances, referenced to permanent surface improvements.

.3 Field changes of dimension and detail.

.4 Changes made by change orders.

.5 Details not on original Contract Drawings.

.6 References to related shop drawings and modifications.

1.4 FINAL SURVEY

.1 Submit final site survey certificate, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.5 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 - Excavating, Trenching and Backfilling

1.2 REFERENCES

.1 Definitions:

.1 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well-being or environment if handled improperly.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Arrange for site visit with Departmental Representative to examine existing site conditions adjacent to demolition work, prior to start of Work.

.2 Scheduling: meet project time lines without compromising specified minimum rates of material diversion.

.1 Notify Departmental Representative when unforeseen delays occur.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Prior to beginning of Work on site, submit detailed Waste Reduction Workplan in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Submit 2 copies of certified receipts from authorized disposal sites and reuse and recycling facilities for material removed from site upon request of Departmental Representative.

.1 Written authorization from Departmental Representative is required to deviate from haulers and receiving organizations listed in Waste Reduction Workplan.

.4 Where required by authorities having jurisdiction, submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.

.5 An engineered demolition plan is required. The demolition plan shall be designed by an engineer licensed to practice in the Province of New Brunswick, Canada. Submit drawings stamped and signed by qualified professional engineer registered in or licensed in the Province of New Brunswick, Canada. Environmental controls shall be shown on the plan which will be subject to review and approval by DFO. The demolition plan shall be submitted to the Departmental Representative four (4) weeks prior to initiating removal of the existing structure.

1.5 QUALITY ASSURANCE

.1 Refer to Section 01 45 00 – Quality Control.

.2 Regulatory Requirements: Ensure Work is performed in compliance with CEPA, CEAA, TDGA, applicable Provincial/Territorial and Municipal regulations.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with Section 01 35 43 - Environmental Procedures.

.2 Storage and Protection.

.1 Protect in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost to Departmental Representative.

.3 Remove and store materials to be salvaged, in manner to prevent damage.

.4 Store and protect in accordance with requirements for maximum preservation of material.

.5 Handle salvaged materials as new materials.

1.7 SITE CONDITIONS

.1 Site Environmental Requirements.

.1 Perform work in accordance with Section 01 35 43 - Environmental Procedures.

.2 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.

.3 Do not dispose of waste or volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.

.1 Ensure proper disposal procedures are maintained throughout the project.

.4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.

.5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities as directed by Departmental Representative.

.6 Protect trees, plants and foliage on site and adjacent properties where indicated.

.2 Existing Conditions.

.1 Remove contaminated or hazardous materials as defined by authorities having jurisdiction from site, prior to start of demolition Work, and dispose of in safe manner in accordance with applicable regulatory requirements.

1.8 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 EQUIPMENT

.1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

Part 3 Execution

3.1 PROTECTION

.1 Prevent movement, settlement or damage of adjacent structures.

.1 Provide bracing, shoring and underpinning as required.\

.2 Repair damage caused by demolition as directed by Departmental Representative.

.2 Support affected structures and, if safety of structure being demolished or adjacent structures or services appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.

.3 Prevent debris from blocking surface draining system.

3.2 PREPARATION

.1 Do work in accordance with Section 01 35 29.06 – Health and Safety.

.2 Contact Utilities prior to commencing work. Coordinate removals and relocations with respective Utilities.

.3 Disconnect any Utility affected by the required work.

.1 Post warning signs on electrical lines and equipment which must remain energized to serve other properties during period of demolition.

.4 Disconnect and cap any Utility to remain.

.5 Do not disrupt active or energized Utilities designated to remain undisturbed.

.6 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during demolition.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after completion of demolition work.

.7 Protection of in-place conditions:

.1 Work in accordance with Section 01 35 43 – Environmental Procedures.

.2 Prevent movement, settlement or damage of adjacent structures, services, walks, paving, trees, landscaping, adjacent grades, properties.

3.3 DEMOLITION

.1 Demolish structure as indicated on drawings.

.2 Demolition of the existing structure includes the entire superstructure (deck, curbs, railings, asphalt, and girders) and the demolition of the existing foundations to 1 meter below the finished grade lines.

.3 At end of each day's work, leave work in safe and stable condition.

.4 Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative.

.5 Remove structural components and asphaltic material.

.6 Only dispose of material specified by selected alternative disposal option as directed by Departmental Representative.

.7 Dispose of materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.8 Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.

3.4 SAFETY CODE

.1 Blasting operations not permitting during demolition.

3.5 REMOVAL OF HAZARDOUS WASTES

.1 Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

3.6 REMOVAL OPERATIONS

.1 Remove items as indicated.

.2 Do not disturb items designated to remain in place.

.3 Excavate at least 300 mm below pipe invert, when removing pipes under existing or future pavement area.

.4 Culverts, pipe sewers, drains and catch basins removed shall become property of the Contractor and shall be disposed of outside the work site.

.5 Backfill:

.1 Backfill in areas as indicated and in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.7 REMOVAL OF GUIDERAIL

.1 Guiderail, offset blocks, hardware and delineators shall be dismantled to individual components.

.2 The dismantling and removal shall be carried out in a manner so as to avoid damage to the adjacent and surrounding roadway.

.1 The Contractor shall be responsible, at their own expense, to repair any such damage resulting from the work.

.3 Dismantled guiderail, hardware and delineators shall become the property of the Contractor and shall be disposed of outside the work site.

.4 The Contractor shall organize the work such that the removal and reinstatement of any length of guiderail section is completed in the same day.

3.8 REMOVAL OF GUIDE POSTS

.1 The removal shall be carried out in a manner so as to avoid damage to the adjacent and surrounding roadway.

.1 The Contractor shall be responsible, at their own expense, to repair any such damage resulting from the work.

.2 All materials shall become property of the Contractor and shall be disposed of outside the work site.

.3 The Contractor shall be responsible to completely backfill the hole resulting from the guide post removal with compacted aggregate base material (crushed rock 0-31.5mm), compact during placement and shall finish the backfilled area to match the surrounding grade.

.1 The Contractor shall fill and compact all holes left from post removal before nightfall.

.2 The Contractor shall shape and grade the shoulder by removing excess materials that have accumulated over time and shall leave the work site in a uniform and consistent grade matching the adjacent surface.

3.9 REMOVAL OF SIGN POSTS / POLES

.1 The removal shall be carried out in a manner so as to avoid damage to the adjacent and surrounding roadway.

.1 The Contractor shall be responsible, at their own expense, to repair any such damage resulting from the work.

.2 All materials shall become property of the Contractor and shall be disposed of outide the work site, unless indicated otherwise on the Contract Drawings.

.3 The Contractor shall be responsible to completely backfill the hole resulting from the sign post/pole removal with compacted aggregate base material (crushed rock 0-31.5mm), compact during placement, and shall finish the backfilled area to match the surrounding grade.

.1 The Contractor shall fill and compact all holes left from post/pole removal before nightfall.

.2 The Contractor shall shape and grade the shoulder by removing excess materials that have accumulated over time and shall leave the work site in a uniform and consistent grade matching the adjacent surface.

3.10 STOCKPILING

.1 Label stockpiles, indicating material type and quantity.

.2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.

.3 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.

.4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

3.11 REMOVAL FROM SITE

.1 Remove stockpiled material as directed by Departmental Representative, when it interferes with operations of project.

.2 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.

3.12 RESTORATION

.1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.

.2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.13 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Remove debris, trim surfaces and leave work site clean, upon completion of Work

.3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.14 PROTECTION

.1 Repair damage to adjacent materials or property caused by selective site demolition.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Methods for removal of existing asphalt pavement.

1.2 RELATED SECTIONS

.1 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Divert unused asphalt materials from landfill to local quarry or facility approved by the Departmental Representative.

1.4 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 EQUIPMENT

.1 Use cold milling, planning or grinding equipment with automatic grade controls capable of operating from stringline, and capable of removing part of pavement surface to depths or grades indicated.

Part 3 Execution

3.1 PREPARATION

.1 Prior to beginning removal operation, inspect and verify with Departmental Representative areas, depths and lines of asphalt pavement to be removed.

3.2 PROTECTION

.1 Protect existing pavement not designated for removal. In event of damage, immediately replace or make repairs to approval of the Departmental Representative at no additional cost.

3.3 EXECUTION

.1 Remove existing asphalt pavement located within project limit.

.2 Use cold milling equipment.

.3 Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.

.4 Provide the suppression of dust generated by removal process.

.5 Stockpile reclaimed asphalt concrete needed for making of the shoulders, if applicable.

.6 Care shall be taken not to contaminate or consolidate the reclaimed asphalt concrete stockpile.

.1 The height of the reclaimed asphalt concrete not to exceed 3 m to limit consolidation of the stockpiled material and no loaders, crawler tractors, trucks or other equipment is permitted to travel on the stockpile.

.7 Dispose of unused asphalt materials.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 74 21 – Construction/Demolition Management and Disposal

.3 Section 03 20 00 – Concrete Reinforcing

.4 Section 03 30 00 – Cast-in-Place Concrete

.5 Section 07 92 00 – Concrete Joint Sealant

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 The measurement and payment procedure for this section shall meet the requirements in Section 01 29 00 - Payment Procedures.

1.3 REFERENCES

.1 Canadian Standards Association (CSA):

.1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA-O86-14, Engineering Design in Wood.

.3 CSA O121-08(R2013), Douglas Fir Plywood.

.4 CSA O151-09(R2014), Canadian Softwood Plywood.

.5 CSA O153-13, Poplar Plywood.

.6 CAN/CSA-O325-07(R2012), Construction Sheathing.

.7 CSA O437 Series-93(R2011), Standards for OSB and Waferboard.

.8 CAN/CSA-S269.1-1975 (R2003), Falsework for Construction Purposes.

.9 CAN/CSA-S269.3-M92(R2013), Concrete Form- work, National Standard of Canada.

1.4 ACTION AND INFORMATION SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit shop drawings for formwork and falsework.

.1 Submit drawings and calculations stamped and signed by a Professional Engineer registered or licensed in the Province of Prince Edward Island, at least four (4) weeks before construction. The submission is intended for information purposes only and shall in no way relieve the Contractor of full responsibility to carry out work related in accordance with CSA S269.3 for Concrete Formwork and CSA S269.1 for Falsework.

.2 In addition to the design of the formwork, the formwork designer shall also provide calculations that consider the local load transfer of formwork loads to the girder section such that the local load effects do not locally overstress the girder flanges or webs and that the loads can be safely transferred into the girder section / global system.

.3 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed

finishes, ties, liners, and locations of temporary embedded parts. Comply with CAN/CSA-S269.3 for formwork drawings.

.4 Indicate formwork design data: permissible rate of concrete placement and temperature of concrete in forms.

.5 Indicate sequence of erection and removal of formwork/falsework as directed by formwork Engineer.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with jurisdictional requirements.

.2 Deliver, handle and store formwork materials to prevent weathering, warping or damage detrimental to the strength of the materials or to the surface to be formed.

.3 Ensure that formwork surfaces which will be in contact with concrete are not contaminated by foreign material. Handle and erect the fabricated formwork so as to prevent damage.

.4 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/ Demolition, Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

.4 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low volatile organic compounds (VOC's).

Part 2 Products

2.1 MATERIALS

.1 Formwork Materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CAN/CSA O121, CAN/CSA-O86.

.2 For concrete with special architectural features, such as the end crash block pedestals and exposed sides of bridge deck and curbs, use formwork materials to CSA A23.1/A23.2.

.3 Rigid insulation board between approach slab and wingwalls.

.4 Formwork shall be constructed from lumber devoid of warped defects in order to achieve a face alignment free of distortion. This shall apply to all panel forms including prefabricated boards, plywood and steel panels.

.5 Formwork on exposed concrete surfaces shall be new or like new to achieve a quality aesthetically pleasing finish.

.2 Form Ties:

.1 For concrete not designated "Architectural", use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25mm diameter in concrete surface.

.2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs (applied before concrete sealers and costings are applied).

The exposed surfaces of the concrete on the deck, curbs, abutments, and wingwalls are to be considered "Architectural Concrete" for this project.

.3 Form Release Agent: chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete from sticking to forms. Form release agents must be compatible with waterproofing systems where applicable.

.4 Falsework Materials: to CSA S269.1.

.5 Sealant: to Section 07 92 00 – Concrete Joint Sealant.

Part 3 Execution

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centers before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Fabricate and erect falsework in accordance with CSA S269.1.

.3 Do not place shores and mud sills on frozen ground.

.4 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.5 Fabricate and erect formwork in accordance with CAN/CSA S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1/A23.2.

.6 Align form joints and make watertight.

.1 Keep form joints to minimum.

.7 Use 25 mm chamfer strips on external corners and/or 25mm fillets at interior corners, joints, unless specified otherwise.

.8 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.9 Construct forms for architectural concrete as indicated.

.1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

.10 Built in anchors, sleeves, and other inserts required to accommodate work specified in other sections.

.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.2 Anchors and inserts cast into the concrete shall either be isolated from dissimilar metals by either a 30mm cleaer spacing or denso tape barrier on the formwork anchors/inserts.

.11 Clean formwork in accordance with CSA A23.1/A23.2 before placing concrete.

3.2 REMOVAL AND RESHORING

.1 Notify Departmental Representative prior to form removal.

.2 Form removal times are dependent on proper curing in accordance with CAN/CSA A23.1 and CAN/CSA S269.3. Provide written evidence of concrete strength to the Departmental Representative 24 hours prior to form removal to show the suitable strength

has been achieved. Contractor shall pay for the concrete cylinder strength tests to demonstrate concrete strength prior to form removal.

.3 Leave formwork in place for the following minimum periods of time after placing concrete:

.1 Two (2) days for walls.

.2 Four (4) days for beam soffits, slabs, decks and other structural members, or two (2) days when replaced immediately with adequate shoring to standard specified for falsework.

.3 Two (2) days for footings and abutments.

.4 Remove formwork when concrete has reached 70% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring. No vehicle loading or backfilling of abutments shall take place until concrete reaches design strength, unless otherwise approved in writing by Departmental Representative.

.5 If formwork is used to aid curing, it shall not be removed until seven (7) days after the concrete placement.

.6 Reuse formwork and falsework subject to requirements of CSA A23.1/A23.2.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 45 00 – Quality Control

.3 Section 03 10 00 – Concrete Forming and Accessories

.4 Section 03 30 00 – Cast-in-Place Concrete

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Payment for this item shall be included in the contract unit price, per cubic meter, for Cast-in-Place Concrete.

1.3 REFERENCES

.1 American Concrete Institute (ACI)

.1 SP-66-04, ACI Detailing Manual 2004.

.1 ACI 315-99, Details and Detailing of Concrete Reinforcement.

.2 ACI 315R-04, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.

.2 American Society for Testing and Materials International (ASTM).

.1 ASTM A143/A 143M-07 (2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.3 Canadian Standards Association (CSA International)

.1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA-A23.3-14, Design of Concrete Structures.

.3 CAN/CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement, A National Standard of Canada.

.4 CSA-G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles, A National Standard of Canada.

.6 CSA W186-M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.7 CSA S6-14, Canadian Highway Bridge Design Code.

.4 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315, except as noted herein. Shop drawings are to be submitted at least four (4) weeks prior to commencing fabrication for review and approval. The Contractor retains

responsibility for correctly detailing reinforcement, but the shop drawings must be approved for conformity with the design. Fabrication shall not proceed until the final approval of shop drawings. Shop drawings shall be stamped by a Professional Engineer licensed to practice in the Province of Prince Edward Island.

.3 Submit shop drawings, including placing of reinforcement, and indicate:

.1 Bar bending details (Reference Table 3.3.1, Minimum Bend Diameter for Reinforcing Steel (400W)).

.2 Lists.

.3 Quantities of reinforcement.

.4 Sizes, spacings, locations of reinforcement and mechanical splices as specified, if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.

.5 Indicate sizes, spacings and locations of chairs, spacers and hangers.

.4 Detail lap lengths and bar development lengths to CSA-S6-14, unless otherwise indicated.

.1 Provide Class B tension lap splices unless otherwise indicated.

1.5 QUALITY ASSURANCE

.1 Submit in accordance with Section 01 45 00 – Quality Control, and as described in Part 2.3 – Source Quality Control.

.1 Mill Test Report: Provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum four (4) weeks prior to beginning reinforcing work.

.2 Upon request, submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

Part 2 Products

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Departmental Representative.

.2 Reinforcing Steel: billet steel, grade 400W (weldable), deformed bars to CAN/CSA G30.18, unless indicated otherwise.

.3 All reinforcing steel shall be hot dipped galvanized in accordance with CAN/CSA G-164-M with a minimum zinc coating of 610 g/m2 permitted after coating. All minor damage to the galvanizing shall be touched up with organic zinc paint.

.4 Cold-drawn Annealed Steel Wire Ties: to ASTM A497/ A497M. All tie-wires, chairs and bar supports and other material used for the installation of galvanized reinforcing bars shall be covered, either with powdered epoxy resin, or acceptable material, at all contact points and within 50mm of exposed faces, or be comprised of an acceptable non-metallic material to avoid galvanic reaction with galvanized repair/damage to galvanized coating.

.5 Chairs, bolsters, bar supports, spacers: to CSA A23.1/ A23.2.

.6 Anchor Bolts and Pilaster Cap Dowels: to ASTM A307 (or better). Anchor bolts and pilaster cap dowels to be galvanized as per this specification.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA A23.1/ A23.2, ACI 315 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada, except as noted herein (see Table 3.3.1).

.2 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum four (4) weeks prior to beginning reinforcing work.

.2 Upon request, inform Departmental Representative of proposed source of material to be supplied.

Part 3 Execution

3.1 PREPARATION

.1 All steel reinforcing bars shall have the necessary net sectional area, and shall be cut to the exact lengths, and bent cold to the exact forms and dimensions shown on the approved plans, or otherwise required, before galvanizing or being placed in position. Bending shall be accurately done, in a bending machine and no welding or heating or any bars shall be allowed, except with written approval from the Departmental Representative. All stirrups and hoops shall accurately fit the rods, and all bends shall be taken out of bars to be used as straight members.

3.2 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.

.2 When field bending is authorized, bend without heat, apply slow and steady pressure.

.3 Replace bars which develop cracks or splits.

3.3 PLACING REINFORCEMENT

.1 Place reinforcement steel as indicated on placing drawings.

.2 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.

.3 Ensure cover to reinforcement is maintained during concrete pour.

.4 All reinforcing bars shall be placed and held rigidly in the exact positions in the forms as shown on the approved plans, or otherwise required, and there shall be no displacement

of the same by the placing and tamping of the concrete. Adjusting or moving the bars, while the concrete is being placed shall not be permitted, unless specified on the plans. Concrete protection required for reinforcing steel shall be in accordance with the contract documents or as directed by the Departmental Representative. All bars shall be tied and properly braced to prevent displacement. No concrete shall be placed until the reinforcement, after being cleaned and placed in position, has been examined and approved by the Departmental Representative. The minimum bend diameter shall conform to Table 3.3.1 below. Bending of galvanized reinforcing steel will not be permitted after coating.

.5 To avoid contact between dissimilar metals, galvanized reinforcing shall either be separated from black steel (uncoated steel; ie., steel girder top flange studs) with a clear space of at least 30mm, otherwise the galvanized reinforcing shall be locally wrapped with denso tape to provide the required separation.

Table 3.3.1
Minimum Bend Diameter for Reinforcing Steel (400W)

Bar Size (mm)	Bend Diameter (mm)
10	70
15	90
20	150
25	200
30	250
35	300
45	450
55	600

3.4 FIELD TOUCH-UP

.1 Touch up damaged and cut ends of galvanized reinforcing steel with zinc rich paint that is a compatible finish to provide continuous coating. Cold galvanizing touch-up procedure and product shall meet with the approval of the Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Section 03 10 00 – Concrete Forming and Accessories

.2 Section 03 20 00 – Concrete Reinforcing

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 The measurement and payment procedure for this section shall meet the requirements in Section 01 29 00 - Payment Procedures.

1.3 REFERENCES

.1 ACI-211.1-91, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.

.2 ASTM C260-10a, Standard Specification for Air- Entraining Admixtures for Concrete.

.3 ASTM C457-10a, Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete.

.4 ASTM C494-10a, Standard Specification for Chemical Admixtures for Concrete.

.5 ASTM C1202-10, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.

.6 ASTM D1751-04(2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

.7 CAN/CGSB 51.34-M86 AMEND, Vapour Barrier, Polyethylene Sheet for use in Building Construction.

.8 Canadian Standards Association (CSA International):

.1 CSA A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.

.2 CSA A283-06, Qualification Code for Concrete Testing Laboratories.

.3 CSA A3000-08, Cementitious Materials Compendium.

1.4 ABBREVIATIONS AND ACRYNYMS

.1 Cement: hydraulic cement or blended hydraulic cement (XXb – where b denotes blended).

.1 Type GU or GUb – General use cement.

.2 Type MS or MSb – Moderate sulphate-resistant cement.

.3 Type MH or MHb – Moderate heat of hydration cement.

.4 Type HE or HEb – High early-strength cement.

.5 Type LH or LHb – Low heat of hydration cement.

.6 Type HS or HSb – High sulphate-resistant cement.

.2 Fly Ash:

.1 Type F – with CaO content less than 8%.

.2 Type CI – with CaO content ranging from 8 to 20%.

.3 Type CH – with CaO greater than 20%.

.3 GGBFS – Ground, granulated blast-furnace slag.

1.5 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit copies of WHMIS MSDS, Material Safety Data Sheets.

1.6 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 – Quality Control.

.2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.

.1 When plant does not hold valid certification, provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.

.3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on the following items:

.1 Falsework erection;

.2 Hot weather concrete;

.3 Cold weather concrete;

.4 Curing;

.5 Finishes;

.6 Formwork removal;

.7 Joints.

.4 Health and Safety Requirements: Do construction occupational health and safety requirements in accordance with Section 01 35 29 – Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Concrete Hauling Time: deliver to site of work and discharge within 120 minutes maximum after batching.

.1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by Departmental Representative.

.2 Concrete Delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

Part 2 Products

2.1 MATERIALS

.1 Cement: to CSA A3000, Type GU.

.2 Water: to CSA A23.1.

.3 Aggregates: to CSA A23.1/A23.2.

.4 Admixtures:

.1 Air Entraining Admixture: to ASTM C260.

.2 Chemical Admixture: to ASTM C494. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.5 Shrinkage Compensating Grout: MasterEmaco 928 non- shrink grout or approved equivalent.

.1 Compressive Strength: 50 MPa at 28 days.

.6 Chemical Adhesive Anchoring System: Hilti RE500 Chemical Adhesive Anchoring System or approved equivalent.

.7 Curing Compound: to CSA A23.1/A23.2 white, Type 1 – chlorinated rubber.

.8 Pre-Moulded Joint Fillers:

.1 Bituminous Impregnated Fiber Board: to ASTM D1751.

.2 Sponge Rubber: to ASTM D1752, Type I, firm grade.

.9 Dampproofing:

.1 Emulsified asphalt, mineral colloid type, unfilled.

.10 Polyethylene Film: 0.15mm thickness to CAN/CGSB 51.34.

2.2 MIXES

.1 Mixture proportions shall be selected on the basis of a 75 year design life and all concrete in the structure shall have a minimum compressive strength of 45 MPa in 28 days. The Contractor shall perform all tests required to demonstrate the long-term performance and durability of the materials and concrete mixtures.

.2 Performance Method for specifying Concrete: to meet Departmental Representative performance criteria to CAN/CSA A23.1/A23.2 and CSA S6.

.3 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative #1. High Performance Concrete in bridge decks, curbs, abutments, wingwalls and approach slabs shall be proportioned using Portland cement, Type SF silica fume, fine and coarse aggregates, air entraining, water reducing, and/or set regarding admixtures. Concrete mixtures shall be designed to meet the following:

.1 Minimum Compressive Strength at 28 days: 45 MPa.

.2 Design life of 75 years.

.3 Class of Exposure: C1.

.4 Chemical Admixtures: type as approved and in accordance with ASTM C494.

.5 Normal Size of Coarse Aggregate: 20mm.

.6 Maximum Water to Cement Ratio: 0.35.

.7 Cementitious Content: minimum 420 kg/m3, maximum 480 kg/m3.

.8 Air Content: 6 +/- 1% (7 +/- 1% with super- plasticizer).

.9 Maximum Slump before Superplasticizer: 60 mm.

.10 Slumps after Superplasticizer: 180 +/- 30 mm.

.11 Maximum spacing factor of hardened concrete not to exceed 230 μm.

.12 Chloride Ion Permeability @ 56 days: <1000 coulombs.

.13 Maximum Concrete Temperature (from delivery equipment):

.1 Thickness >2 meters: 18oC.

.2 Thickness <2 meters: 25^{o}C.

.14 Maximum Concrete Temperature (in situ): 70oC.

.15 Maximum Temperature Gradient: 20oC/meter.

.16 Superplasticizer shall be used in all concrete.

Part 3 Execution

2.3 PREPARATION

.1 Obtain Departmental Representative's written approval before placing concrete.

.1 Provide 48 hours minimum notice prior to placing of concrete.

.2 Place concrete reinforcing in accordance with Section 03 20 00 – Concrete Reinforcing.

.3 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilities placing with minimum of re-handling and without damage to existing structure or work.

.4 Pumping of concrete will not be permitted, and is permitted only after approval of equipment and mix.

.5 Ensure reinforcement and inserts are not disturbed during concrete placement.

.6 Prior to placing of concrete, obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.7 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.8 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.

.1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.

.9 Do not place load upon new concrete until authorized by Departmental Representative.

.10 Apply bonding agent to all existing concrete surfaces in accordance with manufacturer's instructions prior to the placement of new concrete.

2.4 INSTALLATION/APPLICATION

.1 Do cast-in-place concrete work to CSA A23.1/A23.2.

.2 Sleeves and Inserts:

.1 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.

.2 Sleeves and openings greater than 100x100mm not indicated, must be reviewed by Departmental Representative.

.3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.

.4 Confirm locations and sizes of sleeves and openings shown on drawings.

.5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.3 Anchor Bolts:

.1 Set anchor bolts to templates in coordination with appropriate trade prior to placing concrete.

.2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Departmental Representative.

.3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

.4 Set bolts and fill holes with epoxy grout.

.5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.

.4 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.

.5 Finishing and Curing:

.1 Finish concrete to CSA A23.1/A23.2.

.2 Use procedures as reviewed by Departmental Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.

.3 Use curing compounds compatible with applied finish on concrete surfaces.

.6 Joint Fillers:

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.

.2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.3 Install joint filler.

2.5 SURFACE TOLERANCE

.1 Concrete tolerance to CSA A23.1.

2.6 FIELD QUALITY CONTROL

.1 Site Tests: conduct tests as follows in accordance with Section 01 45 00 – Quality Control and submit report as described in PART 1 – ACTION AND INFORMATIONAL SUBMITTALS.

.1 Concrete pours

.2 Slump

.3 Air content

.4 Compressive strength at 7, 28 and 56 days.

.2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/ A23.2.

.1 Ensure testing laboratory is certified to CSA A283.

.3 Owner will pay for costs of tests as specified in Section 01 29 83 – Payment Procedures for Testing Laboratory Services.

.4 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.5 Inspection or testing by Owner will not augment or replace Contractor quality control, nor relieve Contractor of his contractual responsibility.

2.7 CLEANING

.1 Clean in accordance with Section 01 74 11 – Cleaning.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

.3 Section 03 20 00 – Concrete Reinforcing

.4 Section 03 30 00 – Cast-in-Place Concrete

1.2 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for disposal in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Divert unused plasticizers, water-reducing agents and air-entraining agents materials from landfill to official hazardous material collections site as reviewed by the Departmental Representative.

.4 Unused plasticizers, water-reducing agents and air-entraining agents materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

Part 2 Products

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with Section 03 30 00 – Cast-in-Place Concrete.

.2 Reinforcing steel: in accordance with Section 03 20 00 – Concrete Reinforcing.

Part 3 Execution

3.1 CONSTRUCTION

.1 Do concrete work in accordance with Section 03 30 00 – Cast-in-Place Concrete.

.2 Place concrete at temperatures limits to CSA-A23.1 / A23.2.

.3 Do not place concrete:

.1 When air temperature is above 22 degrees C.

.2 During rain or excessive wind or dust.

.3 When conditions, as reviewed by Departmental Representative, seem detrimental to concrete.

.4 When air temperature falls below 5 degrees C, comply with cold weather requirements.

.5 Maintain temperature of concrete during discharge between 10 degrees C and 18 degrees C unless permitted otherwise by Departmental Representative.

.1 Maintain temperature of mix below maximum temperature of 18 degrees C by adding ice to mix which does not alter design water-cement ratio.

.6 Immediately prior to placing concrete, thoroughly wet down substances with clean water.

.7 Consolidate deck concrete with mechanical vibration even when vibratory drum type finishing machines are used.

.8 Cast and finish deck with mechanical bridge deck finisher, approved by Departmental Representative. Deck finisher to be self-propelled using GOMACO 450, or equivalent.

.9 Ensure that rate of placing is sufficient to complete proposed placing, finishing and curing operations within scheduled time.

.10 Ensure that experienced finishing machine operators and concrete finishers are provided to finish deck.

.11 Do not place concrete until rails for support and operation of finishing machines and headers for hand operated strike-off devices are in place and firmly secured:

.1 Rails or headers to be of type, and so installed, that no springing or deflection will occur due to weight of finishing equipment and so located that finishing equipment can operate without interruption over entire bridge roadway deck being finished.

.2 Extend rails for finishing machines beyond both ends of scheduled length of concrete placement sufficient distance to permit float of finishing machine to fully clear concrete to be placed.

.3 Set rails or headers to elevations, with allowance for anticipated settlement, camber, and deflection of falsework, as required to produce bridge roadway deck true to required grade and cross section.

.12 Immediately prior to placing, check falsework and wedges and make necessary adjustments:

.1 Provide suitable means, such as telltales, to readily permit measurement by Departmental Representative of settlement and deflection.

.13 Place concrete in uniform heading approximately normal to structure centerline, or in case of screed supported on transverse headers, parallel to centreline:

.1 Limit rate of placing to that which can be finished before beginning of initial set.

.14 Immediately after concrete has been placed and consolidated, strike off surface:

.1 Correct immediately improper adjustment and operation which results in unsatisfactory consolidation and smoothness.

.2 Unsatisfactory performance may be cause for rejection of equipment and removal of concrete in place.

.15 Use floats to remove roughness and minor irregularities left by strike board or finishing machine and to seal concrete surface to approval of Departmental Representative.

.16 Adjust rails or headers as necessary to correct for settlement or deflection, which occurs during finishing operations:

.1 Operate finishing floats from transverse bridges that span area being floated. Provide sufficient number and type of bridges, as reviewed by Departmental Representative, to permit operation of floats without undue delay.

.2 Provide minimum of two bridges when hand operated float boards are used.

.3 When finishing machine is used for longitudinal floating, supply one bridge for use by Departmental Representative.

.17 Finishing bridge deck slab: when concrete has hardened sufficiently to prevent dislodgement of coarse aggregate particles, give surface uniform broom finish free from porous spots, irregularities, depressions, small pockets or rough spots.

3.2 PROTECTION

.1 Protection and curing for concrete placed between October 1 and May 1 comply with following requirements in addition to cold weather requirements of CSA-A23.1/A23.2:

.1 Protect concrete with windproof shelter of canvas or other material to allow free circulation of inside air around fresh concrete.

.2 Do not let walls of shelter touch formwork.

.3 Provide sufficient space for removal of formwork for finishing.

.4 Use heating equipment approved by Departmental Representative.

.5 Vent products of combustion outside protective shelter: equipment to be capable of keeping inside air at constant temperature sufficiently high to maintain concrete at following curing temperatures:

.1 For initial 3 days: minimum temperature of 15 degrees C, maximum of 27 degrees C at concrete surfaces.

.2 For concrete abutments, solid piers, footings: cure at 10 degrees C for additional 4 days.

.3 For superstructure: maintain concrete at 10 degrees C for additional 14 days.

.6 Keep concrete surfaces continually moist while protected.

.7 Provide fogging equipment to allow for mist spray curing before start of bridge deck pour.

.2 Unformed surfaces: cure with burlap and water:

.1 Place two layers of damp burlap on surface of concrete.

.2 Overlap each strip by minimum 75 mm and secure against displacement by wind.

.3 Maintain burlap in place and keep thoroughly wet for seven days after placement.

.3 Formed surfaces:

.1 No additional curing will be required if formwork is left in place for seven days or more.

.2 If formwork removed in less than seven days, cure in manner specified for unformed surfaces for remainder of seven day period.

.4 During curing period, only uncover areas needed for finish treatment. Re-cover and continue curing.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 74 21 – Construction/Demolition, Waste Management and Disposal

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM):

.1 ASTM A185/A185M-05a, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

.2 ASTM A775/A775M-04a, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

.3 ASTM C260-01, Standard Specification for Air-Entraining Admixtures for Concrete.

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.40-97, Anticorrosive Structural Steel Alkyd Primer.

.2 CAN/CGSB-1.181-99, Ready Mixed Organic Zinc-Rich Coating.

.3 Canadian Standards Association (CSA International):

.1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA-A23.4-04(R2010), Design of Concrete Structures.

.3 CSA-A23.4-09, Precast Concrete – Materials and Construction.

.4 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005):

.1 CSA-A3001-08, Cementitious Materials for Use in Concrete.

.5 CAN/CSA-G30.18-09, Carbon Steel-Bars for Concrete Reinforcement.

.6 CAN/CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel.

.7 CAN/CSA-S6-14, Canadian Highway Bridge Design Code.

.8 CSA-W47.1-09, Certification of Companies for Fusion Welding for Steel.

.9 CAN/CSA W48-06(R2011), Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau.

.10 CSA-W59-03(R2008), Welded Steel Construction (Metal Arc Welding) (Metric version).

.11 CSA-W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 The Master Painters Institute (MPI) – Architectural Painting Specification Manual (ASM) – February 2004:

.1 MPI #18, Organic Zinc Rich Primer.

.2 MPI #23, Oil Alkyd Primer.

.5 Underwriters' Laboratories of Canada (ULC):

.1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.2 American Association of State Highway and Transportation Officials (AASHTO):

.1 LRFO Bridge Design Specifications.

1.3 DESIGN REQUIREMENTS

.1 Design precast elements to CSA-A23.3/CSAA23.4 to carry handling stresses.

.2 Provide detailed calculations and design drawings for typical precast elements and connections as described in PART 1 – SUBMITTALS.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit WHMIS MSDS – Material Safety Data Sheets:

.1 Details of prestressed and non-prestressed members, reinforcement and their connections.

.2 Camber.

.3 Finishing schedules.

.4 Methods of handling, erection and sealing.

.5 Openings, sleeves, inserts and related reinforcement.

.6 Plain elastomeric bearings.

.3 Shop Drawings: submit drawings stamped and signed by qualified professional engineer registered or licensed in the Province of New Brunswick.

1.5 QUALITY ASSURANCE

.1 Quality Control Plan: submit written report, as described in PART 3 – VERIFICATION, to Departmental Representative verifying compliance that concrete provided meets performance requirements of concrete as established in PART 2 – PRODUCTS.

1.6 QUALIFICATIONS

.1 Fabricate and erect precast concrete beams by manufacturing plant certified in appropriate categories according to CSA-A23.4.

.2 Precast concrete manufacturer to be certified in accordance with CSA's certification procedures for precast concrete plants prior to submitting tender and to specifically verify as part of tender that plant is currently certified in appropriate categories.

.3 Only precast beams fabricated in such certified plants to be acceptable to Departmental Representative and plant certification to be maintained for duration of fabrication, erection until warranty expires.

.4 Welding companies certified to CSA-W47.1.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, handle and store precast/prestressed units according to manufacturer's instructions.

.2 Protect unit corners from contacting earth to prevent from staining.

.3 Waste Management and Disposal:

.1 Separate waste materials for reuse in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MANUFACTURED UNITS

.1 Manufacture units in accordance with CSA-A23.4.

.2 Mark each precast beam to correspond to identification mark on shop drawings for location with date cast on part of unit not be exposed.

.3 Provide hardware suitable for handling elements.

.4 Shop prime anchors and steel inserts after fabrication and touch up primer on anchors after welding. Do not apply primer to embedded portion of anchor or inserts.

.5 The elastomer used in the bearings shall be 100% virgin natural polyisoprene of nominal 55 +/- 5 durameter hardness having properties conforming to the requirements of CAN/CSA S6.

.6 The elastomer compound used in the bearings shall conform to Grade 5 low temperature behaviour.

.7 The elastomers shall conform to the following:

.1 The physical properties of the polyisoprene used shall conform to the following requirements:

Property	Test	Requirements
Hardness, Shore A	ASTM D2240	55 +/- 5
Tensile Strength, MPa	ASTM D412	Min. 17.0
Ultimate Elongation, %	ASTM D412	Min. 400
Heat Resistance	ASTM D573	70h at 70°C
Change in hardness, Shore A		Max. +10
Change in tensile strength, %		Max. -25
Change in ultimate elongation, %		Max. -25
Compression Set, %	ASTM D395 Method B	22 hr at 70°C max. 25

Property	Test	Requirements
Ozone	ASTM D518 Mounting Procedure A 20% strain 40 +/- 2°C	25 ppm, 48h no cracks
Bond between steel and Elastomer laminates, N. mm^{-1}	ASTM D429 Method B	Min. 7.0
Brittleness at -40°C	ASTM D746 Procedure B	No failure
Low temperature crystallization increase in hardness, Shore A	ASTM D2240	168h at -25°C Max. +15

2.2 SOURCE QUALITY CONTROL

.1 Provide Departmental Representative with certified copies of quality control tests related to this project as specified in CSA-A23.4 and CSA-G279.

.2 Provide records from in-house quality control programme based upon plant certification requirements to Departmental Representative for inspection and review.

.3 Provide Departmental Representative with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.

.4 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and provide to Departmental Representative for review upon request.

Part 3 Execution

3.1 ERECTION

.1 Erect, fasten and join precast elements in accordance with manufacturer's instruction, and as indicated on reviewed shop drawings.

.2 Do precast concrete work in accordance with CSA-A23.4/CSA-A23.3 and CAN/CSA-S6.

.3 Do welding in accordance with CSA-W59, for welding to steel structures and CSA-W186, for welding of reinforcement.

.4 Non-cumulative erection tolerances in accordance with CSA-A23-4.

.5 Set elevations and alignment between beams to within allowable tolerances before connecting beams for stability.

3.2 VERIFICATION

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in PART 2 – PRODUCTS, by Departmental Representative and provide verification of compliance as described in PART 1 – QUALITY ASSURANCE.

3.3 CLEANING

.1 Use cleaning methods as reviewed by Departmental Representative before cleaning soiled precast concrete surfaces.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 45 00 – Quality Control.

.3 Section 01 74 11 – Cleaning.

.4 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.5 Section 03 20 00 – Concrete Reinforcing.

.6 Section 03 30 00 – Cast-In-Place Concrete.

.7 Section 03 30 51 – Concrete Bridge Decks.

1.1 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

1.2 REFERENCES

.1 Canada Standard Association Standards:

.1 CAN/CSA S806-02 (R2007) – Design and Construction of Building Components with Fibre-Reinforced Polymers.
.2 CAN/CSA-S6-14 – Canadian Highway Bridge Design Code
.3 American Society for Testing and Materials Standards
.4 D4065 Practice for Determining and Reporting Dynamic Mechanical Properties of Plastics.
.5 D570 Standard Test Method for Water Absorption of Plastics.
.6 D618 Standard Practice for Conditioning Plastics for Testing.
.7 D695 Standard Test Method for Compressive Properties of Rigid Plastics
.8 D696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer.
.9 D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
.10 D792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
.11 D2584 Standard Test Method for Ignition Loss of Cured Reinforced Resins.
.12 D2734 Void Content of Reinforced Plastics.
.13 D3171 Standard Test Method for Constituent Content of Composite Materials.
.14 D3410 Standard Test Method for Compressive Properties of Polymer Matrix Composite Materials with Unsupported Gage Section by Shear Loading.
.15 D3418 Test Method for Transition Temperatures of Polymers by Thermal Analysis (DTA or DSC).

.16 D4476 Standard Test Method for Flexural Properties of Fiber Reinforced Pultruded Plastic Rods.
.17 D5028 Curing Properties of Pultrusion Resin by Thermal Analysis.
.18 D5117 Standard Test Method for Dye Penetration of Solid Fiberglass Reinforced Pultruded Stock.
.19 D7205 Standard Test Method for Tensile Properties of Fiber Reinforced Polymer Matrix Composite Bars.
.20 E831 Standard Test Method for Linear Thermal Expansion of Solid Materials by Thermomechanical Analysis.
.21 E1131 Standard Test Method for Compositional Analysis by Thermogravimetry.
.22 E1640 Standard Test Method for Assignment of the Glass Transition Temperature by Dynamic Mechanical Analysis.

.2 American Concrete Institute Publications:

.1 ACI 440.3R-04, (2004), "Guide Test Methods for Fiber-Reinforced Polymers (FRPs) for Reinforcing or Strengthening Concrete Structures," American Concrete Institute, Farmington Hills, Michigan, USA, 41 p.
.2 ACI 440.3R-04, Test Method B.2, Test Method for Longitudinal Tensile Properties of FRP Bars.
.3 ACI 440.3R-04, Test Method B.3, Test Method for Bond Strength of FRP Bars by Pullout Testing.
.4 ACI 440.3R-04, Test Method B.4, Test Method for Transverse Shear Strength of FRP Bars.
.5 ACI 440.3R-04, Test Method B.5, Test Method for Strength of FRP Bent Bars and Stirrups at Bend Locations.
.6 ACI 440.3R-04, Test Method B.6, Accelerated Test Method for Alkai Resistance of FRP Bars.
.7 ACI 440.3R-04, Test Method B.7, Test Method for Tensile Fatigue of FRP Bars.
.8 ACI 440.3R-04, Test Method B.8, Test Method for Creep Rupture of FRP Bars.
.9 ACI 440.3R-04, Test Method B.12, Test Method for Determining the Effect of Corner Radius on Tensile Strength of FRP Bars.

1.3 DEFINITIONS

.1 For the purposes of this specification, the following definitions apply:

.1 Glass Fibre Reinforced Polymer: means a fibre-reinforced composite with a polymeric matrix and continuous fibre reinforcement of glass.

.2 Glass Transition Temperature: means the midpoint of the temperature range over which an amorphous material changes from a brittle and vitreous state to a plastic state, or vice versa.

.3 Guaranteed Tensile Properties: means the fifth percentile tensile properties based on tests.

1.4 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 At least three weeks prior to the commencement of fabrication of GFRP bars, the Contractor shall submit to the Departmental Representative two copies of the following:

.1 For all the relevant mechanical properties specified in Table 2, a complete report on tests conducted in accordance with the standards also given in Table 2, shall be provided. The manufacturer shall certify that all the qualification tests have been carried out in accordance with this specification and that the requirements herein have been met.

.2 For all the relevant physical and durability properties specified in Table 3, a complete report on tests conducted in accordance with the standards also given in Table 3, shall be provided. The manufacturer shall certify that all the qualification tests have been carried out in accordance with this specification and that the requirements herein have been met.

.3 A statement from the manufacturer testifying that they are specialized in the manufacture of GFRP reinforcement, and prove that their quality control process is certified by organizations such as ISO 9001-2000, or other independent organizations and professionals acceptable to the ministry.

.3 At the time of material delivery to site, the Contractor shall submit two copies of quality control test reports from the manufacturer for each lot of material that contains the following information, together with a certification from the manufacturer stating that each production lot of each product has been manufactured in accordance with this specification:

.1 With regard to materials, the manufacturer's quality control test report shall include:

.1 Bar diameter and grade supplied.
.2 Type of resin.
.3 Primary fibre type.
.4 Secondary fibre type, if any.
.5 Fibre content by volume for primary and secondary fibres separately.

.2 With regard to production, the manufacturer's quality control test report shall include:

.1 Type of manufacturing process used (e.g. pultrusion)
.2 The definition of a production lot 1.
.3 Total linear meters/feet produced in each production lot.
.4 The date of beginning and end of production for each production lot of material.

.3 With regard to the product characterization, the manufacturer's quality control test reports shall include:

.1 Number of samples tested.

.2 The result of every test required for quality control according to clause 5.5.

.3 The average and standard deviation of test results.

.4 Minimum tensile strength, where applicable, defined as the average minus 2.6 standard deviations.

.5 Mode of failure if applicable.

.6 Any deviations from the standard test method.

.7 A statement explaining whether the FRP tested meets the specification requirements for each property measured.

.4 With regard to the test setup, if applicable, the manufacturer's quality control test report shall include:

.1 Details of the apparatus used to perform tests, capacity of test machine and date of calibration.

.2 The type of extensometer used to perform the tests for tensile modulus of elasticity.

.3 Lengths of the samples tested, the free length and anchor length used.

.4 At least three weeks before the commencement of installation of GFRP bars, the Contractor shall submit to the Departmental Representative the following:

.1 Three sets of placing drawing. These drawings shall include quantity, bar size, location and spacing for all GFRP bars. All submission shall bear the seal and signature of an Engineer licensed in the Province of Nova Scotia.

.2 Six copies of GFRP bar schedule. GFRP bar schedule shall include quantity, bar size, type, length and bending dimensions. All submissions shall bear the seal and signature of an Engineer licensed in the Province of Nova Scotia.

.5 Upon completion of placing GFRP reinforcement for each component and prior to placing of concrete, the Contractor shall submit to the Departmental Representative a Certificate of Conformance sealed, signed and dated by the Quality Verification Engineer. The Certificate shall state that the Work has been carried out in general conformance with the sealed and signed placing drawings and contract documents.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Delivery, storage and handling of GFRP bars shall be in accordance with the manufacturer's instructions to prevent damage.

.2 The bars shall be lifted using multiple pickup points to prevent sags. Nylon slings or padded rope slings shall be used to lift bars. Lifting of bundles of bars shall be with a strong back, spreader bar, multiple supports or a platform bridge. The bars shall not be dragged or dropped.

.3 The bars shall be stored clear of the ground on timbers or other suitable protective cribbing spaced to prevent sags in the bundles.

.4 The GFRP bars shall be covered with opaque white polythene during site storage.

.5 Stacks of bundles of straight bars shall have adequate blocking to prevent contact between the layers of bundles.

.6 GFRP bars shall be stored separately from reinforcing steel bars, with the bar tags maintained and clearly visible until ready for placing.

.7 GFRP reinforcing bars shall be protected from any abrasive blasting operation in its immediate vicinity by adequate covering or wrapping with protective material.

Part 2 Products

2.1 MATERIALS

.1 Supplier:

.1 GFRP straight bars shall be V-Rod High Modulus (HM) straight bars or approved equal.

.2 GFRP bent bars shall be V-Rod Grade III (HM) or approved equal.

.3 All GFRP bars in the same structural component shall be supplied by the same manufacturer; there shall be no mixing of products from different manufacturers in a component unless permitted in the contract drawings.

.2 Glass fibre reinforced polymer bars:

.1 Binding material for GFRP bars shall be composed of thermostat vinyl ester resin that is homogeneous throughout the cross-section of the bar. The wet glass transition temperature of the resin shall not be less than 100°C.

.2 Fibre reinforcement in the GFRP bars shall be continuous E-glass fibres with a minimum volume fraction of 55 percent.

.3 GFRP bars shall have the following minimal tensile strength and modulus specified in Table 1, confirmed by the appropriate test method according to CSA S806-02 (R2007).

.4 The tensile strength of all bent bars shall meet the requirements according to Table 2.

.3 Associated hardware:

.1 Fastening of GFRP bars shall be with coated tie wire, stainless steel wire or nylon ties.

.2 Bar chairs for supporting GFRP bars shall be plastic or non-corrosive chairs.

2.2 FABRICATION

.1 The manufacturer shall label each GFRP bar and container/packaging with the following information:

.1 Manufacturer's name and symbol.

.2 Type of fibre.

.3 Nominal bar diameter.

.4 Strength grade.

.5 Designated Modulus of Elasticity Production lot or batch number.

Table 1. Minimum tensile strength and modulus of GFRP straight bars

Designate Bar Size	Minimum Guaranteed Tensile Strength (MPa)	Minimum Guaranteed Tensile Modulus (GPa)
#3 GFRP	1372	65.1 ± 2.5
#4 GFRP	1312	65.6 ± 2.5
#5 GFRP	1184	62.6 ± 2.5
#6 GFRP	1105	63.7 ± 2.5
#7 GFRP	1059	62.6 ± 2.5
#8 GFRP	1000	66.4 ± 2.5
#10 GFRP	1093	65.1 ± 2.5

Table 2. Minimum tensile strength and modulus of GFRP bent bars

Designate Bar Size	Minimum Guaranteed Tensile Strength – Straight Portion (MPa)	Minimum Guaranteed Tensile Strength – Bend Portion (MPa)	Minimum guaranteed Tensile Modulus – Straight Portion (GPa)
#3 GFRP	1022	460	50
#4 GFRP	1019	459	50
#5 GFRP	1001	450	50
#6 GFRP	1028	463	50
#7 GFRP	1005	452	50
#8 GFRP	992	446	50

2.3 SOURCE QUALITY CONTROL

.1 Determination of properties:

.1 For the determination of each of the mechanical and durability properties for qualification, the minimum number of samples required shall be fifteen with a minimum of five samples from each of three different lots unless otherwise specified in Table 3 and 4.

.2 For the determination of each of the mechanical and durability properties for manufacturer's quality control tests, the minimum number of samples required shall be five from each lot unless otherwise specified in Table 3 and 4.

.2 Mechanical properties:

.1 Mechanical properties of GFRP bars for various tests and reporting shall be determined as specified in Table 3. The limits of the various properties shall be as also specified in Table 3.

.3 Physical and durability properties:

.1 The physical and durability properties of GFRP for various tests and reporting shall be determined as specified in Table 4. The limits of the various properties shall be as also specified in Table 4.

Table 3: Specifications for determining mechanical properties of GFRP bars

Property	Requirement				Test Standard	Specified Limits
	1	2	3	4		
Cross-sectional area	Yes	Yes		Yes	CSA-S806-02, Annex A, Determination of Cross-Sectional Area of FRP Reinforcement.	N/A
Longitudinal tensile strength for bars	Yes	Yes	Yes		ASTM D7205 Standard Test Method for Tensile Properties of Fibre Reinforced Polymer Matrix Composite Bars; or CSA-S806-02, Annex C, Test Method for Tensile Properties of FRP Reinforcements.	Minimum values defined in Table 1
Longitudinal tensile modulus and ultimate elongation	Yes	Yes	Yes		ASTM D7205 Standard Test Method for Tensile Properties of Fibre Reinforced Polymer Matrix Composite Bars; or CSA-S806-02, Annex C, Test Method for Tensile Properties of FRP Reinforcements.	Minimum values of tensile modulus defined in Table 1; the ultimate elongation shall not be less than 1.2%.
Bond strength	Yes				ACI 440.3R-04, Test Method B.3, Test Method for Bond Strength of FRP Bars by Pullout Testing; or CSA-S829-02, Annex H, Test Method for Bond Strength of FRP Rods by Pullout Testing.	9.65 MPa
Transverse shear strength	Yes				ACI 440.3R-04, Test Method B.4, Test Method for Transverse Shear Strength of FRP Bars; or CSA-S806-02, Annex N, Test Method for Shear Properties for FRP Rods	125 MPa

Property	Requirement				Test Standard	Specified Limits
	1	2	3	4		
Strength of FRP bent bars and stirrups at bend locations	Yes				ACI 440.3R-04, Test Method B.5, Test Method for Strength of FRP Bent Bars and Stirrups at Bend Locations; or CSA-S806-02, Annex E, Test Method for FRP Bent Bars and FRP Stirrups	Minimum strength at the bend shall be at least 45% of the minimum strength of straight FRP bars manufactured by the same process as the bent bars.
Longitudinal tensile strength and modulus of FRP bent bars at bend locations	Yes	Yes			ACI 440.3R-04, Test Method B.12, Test Method for Determining the Effect of Corner Radius on Tensile Strength of FRP Bars.	Minimum strength at the bend shall be at least 40% of the minimum strength of straight FRP bars manufactured by the same process as the bent bars.
Longitudinal tensile properties at cold temperature	Yes				Conditioning of Specimens: ASTM D618, Standard Practice for Conditioning Plastics for Testing (-40^{o}C), and ASTM D7205 Standard Test Method for Tensile Properties of Fibre Reinforced Polymer Matrix Composite Bars; or CSA-S806-2, Annex C, Test Method for Tensile Properties of FRP Reinforcements.	As compared to properties at room temperature, there shall be no significant loss of properties at specified low temperatures.
Flexural strength and modulus				Yes	ASTM D790 Test Method for Flexural Properties of Unreinforced Plastics and Electrical Insulating Materials; or ASTM D4476 Test Method for Flexural Properties of Fibre Reinforced Pultruded Plastic Rods	N/A
Compressive strength and modulus				Yes	ASTM D695 Test Method for Compressive Properties of Rigid Plastics; or ASTM D3410 Tests Method for Compressive Properties of Polymer Matrix Composite Materials	N/A

1 – Qualification tests; 2 – Manufacturer's quality control tests; 3 – Owner's quality assurance tests; 4 – To be provided at request.

Table 4. Specifications for determining physical and durability properties of GFRP

Property	Requirement				Test Standard	Specified Limits
	1	2	3	4		
Fibre content	Yes	Yes	Yes		The relevant of the following: ASTM D3171 Constituent Content of Composite (Method 1 of Procedure G); Glass Fibre; ASTM E1131 Compositional Analysis by TGA; Glass and Carbon Fibres; Aramid Fibre: Indicated theoretical percentage; and ASTM D2584 (by weight) Standard Test Method for Ignition Loss of Cured Reinforced Resins	Fibre volume content 55% for GRFP bars and rods. For ASTM D2584 method, glass fibre volume content 55% by weight.
Longitudinal coefficient of thermal expansion	Yes			Yes	ASTM E831 Linear Thermal Expansion of Solid Materials by Thermo-mechanical Analysis (TMA) at temperature = 0.1-0.3 Tg; or ASTM D696 Coefficient of Linear Thermal Expansion of Plastics between -30C and 30C with a vitreous silica dilatometer	Maximum longitudinal coefficient of thermal expansion 10 x $10^{-6\,o}C^{-1}$
Transverse coefficient of thermal expansion	Yes				ASTM E831 Linear Thermal Expansion of Solid Materials by Thermo-mechanical Analysis (TMA) at temperature = 0.1-0.3 Tg; or ASTM D696 Coefficient of Linear Thermal Expansion of Plastics between -30C and 30C with a vitreous silica dilatometer	Transverse coefficient of thermal expansion 25 x $10^{-6\,o}C^{-1}$
Density				Yes	ASTM D792 Density and Specific Gravity (relative density) of Plastics by Displacement	N/A
Void content	Yes	Yes	Yes		ASTM D2734 Void Content of Reinforced Plastics; or ASTM D5117 Standard Test Method for Dye Penetration of Solid Fiberglass Reinforced Pultruded Stock	1%
Water absorption (long-term immersion at 50°C)	Yes	Yes	Yes		ASTM D570 Water Absorption of Plastics	1.0%

Property	Requirement				Test Standard	Specified Limits
	1	2	3	4		
for both straight and bent bars and grids						
Cure ratio	Yes	Yes	Yes		ASTM D5028 Curing Properties of Pultrusion Resin by Thermal Analysis	95%
Glass transition temperature	Yes	Yes	Yes		D3418 Test Method for Transition Temperatures of Polymers by Thermal Analysis; or ASTM E1640 Assignment of the Glass Transition Temperature by DMA	DMA = 110°C DSC = 100°C
Alkali resistance in high pH solution (without load)	Yes				ACI 440.3R-04, Test Method B.6, Accelerated Test Method for Alkali Resistance of FRP Bars; or CSA-S806-02, Annex O, Test Method of Alkali Resistance of FRP Rods (Test duration: 3 months)	Tensile capacity retention 80%
Alkali resistance in high pH solution (with load)	Yes				ACI 440.3R-04, Test Method B.6, Accelerated Test Method for Alkali Resistance of FRP Bars; or CSA-S806-02, Annex O, Test Method of Alkali Resistance of FRP Rods (The sustained tensile stress should be set to induce a tensile stain equal to 3000 micro-strain; test duration: 3 months)	Tensile capacity retention 70% of UTS
Creep rupture strength	Yes				ACI 440.3R-04, Test Method B.8, Test Method for Creep Rupture of FRP Bars; or CSA-S806, Annex J, Test Methods for Creep of FRP Rods	Creep rupture strength: 35% UTS (Glass)
Creep	Yes			Yes	ACI 440.3R-04, Test Method B.8, Test Method for Creep Rupture of FRP Bars; or CSA-S806, Annex J, Test Methods for Creep of FRP Rods (Two sustained tensile stress levels to be used: 20 and 40% of UTS for GFRP for a test duration of 10000 hours)	Report creep strain values at 1000 hr, 3000 hr and 10000 hr.

Property	Requirement				Test Standard	Specified Limits
	1	2	3	4		
Fatigue strength	Yes				ACI 440.3R-04, Test Method B.7, Test Method for Tensile Fatigue of FRP Bars; or CSA-S806-02, Annex L, Test Method for Tensile Fatigue of FRP Rods	Fatigue strength at 2 million cycles: 35% UTS (Glass)

1 – Qualification tests; 2 – Manufacturer's quality control tests; 3 – Owner's quality assurance tests; 4 – To be provided at request.

2.4 PREPARATION

.1 GFRP bars at the time the concrete is placed shall be free of mud, oil, and other contaminants that adversely affect bonding strength. Removal of materials present on the bars shall be according to the methods and materials recommended by the bar manufacturer.

2.5 PLACING REINFORCEMENT

.1 GFRP bars shall be accurately placed in the positions shown in the contract and held in the correct location during the operations of placing and consolidating concrete.

.2 Bars shall be tied at least at every third intersection. The maximum untied length of any bar shall be 900 mm. Bar support chairs shall not exceed 900 mm average spacing in each direction.

.3 GFRP bars within the formwork shall be secured to prevent movement during concrete placement. The bars must be adequately supported or tied to resist settlement, floating upward, or movement in any direction during concrete placement.

.4 Field bending shall not be allowed.

.5 Field cutting will be permitted only with the approval of the Departmental Representative. The field cutting shall be with a high speed cutter, fine blade saw, diamond blade or masonry saw. The bars shall not be shear cut.

.6 The GFRP bars shall be placed in accordance with Section 03 20 00 – Concrete Reinforcing unless otherwise specified.

2.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.

.2 Leave Work area clean at end of each day.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

.4 Waste Management: separate waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 STEELWORK INCLUDES

.1 Anchors, Anchor Bolts and Spacers.

.2 Sole Plates, Masonry Plates and Bevelled Plates.

.3 Barrier Cover/Armour Plates.

.4 Miscellaneous Steel Components.

1.2 RELATED SECTIONS

.1 Section 01 29 00 - Payment Procedures

.2 Section 01 33 00 - Submittal Procedures

.3 Section 01 35 33 - Bridge Rehabilitation Special Procedures

.4 Section 01 15 43 - Environmental Procedures

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 The measurement and payment procedure for this section shall meet the requirements in Section 01 29 00 - Payment Procedures.

1.4 REFERENCES

.1 CSA International:

.1 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel.
.2 CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
.3 CAN/CSA S6-06, Canadian Highway Bridge Design Code.
.4 CSA S16-09, Design of Steel Structures.
.5 CSA W59, Welded Steel Construction.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for structural steel and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit copies of WHMIS MSDS in accordance with Section 01 35 29 - Health and Safety Requirements, and Section 01 35 43 - Environmental Procedures.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by a Professional Engineer registered or licensed within the Province of Prince Edward Island.

.2 Indicate shop and erection details including shop splices, cuts, copes, connections, holes, bearing plates, threaded fasteners, rivets and welds. Indicate welds by CSA W59, welding symbols.

.3 Proposed welding procedures to be stamped and approved by Canadian Welding Bureau.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Storage and Handling Requirements:

.1 Provide protective blocking for lifting, transportation and storing.

.1 Exercise care during fabrication, transportation and erection of joints and bicycle railings.

.2 Do not cause excessive stresses.

.2 Mark mass on members weighing more than three (3) tonnes.

.3 Protect unpainted weathering steel, before erection, with waterproof covering.

.4 Ensure that no portion of steel comes into contact with ground.

1.7 QUALITY ASSURANCE

.1 Pre-construction Testing:

.1 Provide suitable facilities and cooperate with the Departmental Representative in carrying out inspection and tests required.

Part 2 Products

2.1 BEARING SOLE, MASONRY AND BEVELLED PLATES

.1 Structural Steel Plates: to CSA G40.21, Grade 300W galvanized.

.2 Hot Dip Galvanizing: to CSA G164, Table 1, minimum zinc coating of 600 g/m2.

.3 Field touch-up of galvanizing at field weld locations to be minimum two coats of brush applied zinc rich epoxy.

.4 Welding: to CSA W59.

2.2 BEARING ANCHOR RODS

.1 Anchor Rods: to ASTM F1554 Grade 105 galvanized.

.2 Hot Dip Galvanizing: to CSA G164, Table 1, minimum zinc coating of 600 g/m2.

2.3 STEEL BICYCLE RAILINGS, CONNECTION BRACKETS, AND BARRIER COVER PLATES

.1 All steel bicycle railings, connections brackets, and barrier cover plates shall be supplied, fabricated and installed in accordance with the design drawings.

.2 Structural Steel HSS: to CSA G40.21, Grade 350W Class C galvanized.

.3 Structural Steel Plates: to CSA G40.21, Grade 300W galvanized.

.4 High Strength Bolts, Nuts and Washers: to ASTM A325M galvanized.

.5 Anchor Bolts: to ASTM F1554 Grade 55 galvanized.

.6 Hot-Dip Galvanizing: to CSA G164, Table 1, minimum zinc coating of 600 g/m2.

.7 Welding: to CSA W59.

2.4 MISCELLANEOUS STEEL WORK

.1 All other miscellaneous steel work shall be supplied, fabricated and installed in accordance with applicable CSA International Provisions.

2.5 SOURCE QUALITY CONTROL

.1 Steel Producer Qualifications: certified in accordance with CSA G40.21/G40.21.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for structural steel installation in accordance with manufacturer's written instructions.

.1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Clean steel surfaces as directed by Departmental Representative when staining or defacing occurs.

.2 Prepare areas for field welding in accordance with CSA W59.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning. Leave work area clean at end of each day.

.2 Final Cleaning: upon completion, remove foreign materials, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 29 00 - Payment Procedures

.2 Section 01 33 00 - Submittal Procedures

1.2 PRICE AND PAYMENT PROCEDURES

.1 The measurement and payment procedure for this section shall meet the requirements in Section 01 29 00 - Payment Procedures.

1.3 REFERENCES

.1 CAN/CSA-S6-06 Section 11 - Joints and Bearings.

1.4 SUBMITTALS

.1 Submit certified mill test reports for all bearing materials.

.2 Submit certified reports for short-duration and long- duration compression test of fabricated bearings.

Part 2 Products

2.1 ELASTOMERIC BEARINGS

.1 All laminated elastomeric bearings shall conform to CAN/CSA-S6-06 Section 11.

.2 Elastomer shall be virgin natural rubber (polyisoprene), 55+/-4 durometer, in accordance with Table 11.5 of CAN/CSA-S6-06.

.3 The laminae of steel reinforced elastomeric bearings shall conform to CSA G40.21 Grade 250MPa.

.4 Grout shall be non-shrink cementitious grout with a minimum compressive strength of 20MPa at 48 hours, and 45 MPa at 28 days.

.5 All elastomeric bearings shall be fabricated in accordance with the design drawings.

Part 3 Execution

3.1 INSTALLATION

.1 Elastomeric bearings shall be installed as per the design drawings and manufacturer’s instructions/specifications.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures

1.2 REFERENCE STANDARDS

.1 ASTM A307-14, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.

.2 CAN/CSA-080 Series 2008 (R2012), Wood Preservation (including CSA preliminary standard O80.31-M1989).

.3 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.4 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.5 Copper naphthenate containing 2% copper for Brush or Spray Treatment for Field Cuts.

.6 CSA 086-14, Engineering Design in Wood (Limit States Design).

.7 NLGA Standard grading rules for Canadian Lumber 1980 edition or most recent at time of tendering.

.8 ASTM D4637-15, EPDM Sheet used in Single-Ply Roof Membrane.

.9 ASTM B111-1974 (R2001) Wire Nails, Spikes and Staples.

.10 CAN/CSA-G164-M92 (or latest edition) – Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 SUBMITTALS

.1 At least two (2) weeks prior to finalizing timber order, submit drawings, clearly indicating installation details.

.2 Submit methodology for field treatment.

.3 Provide submissions in accordance with Section 01 33 00.

1.4 MEASUREMENT FOR PAYMENT

.1 The measurement and payment procedure for this section shall meet the requirements in Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Softwood Timber: Graded and stamped to National Lumber Grading Authority (NLGA) No. 1 Structural, Eastern Hemlock, Western Hemlock or Douglas Fir species only will be used.

.2 Hardwood Timber: Sound merchantable grade yellow birch, hard maple, red or white oak conforming to grading rules approved by the National Hardwood Lumber Association.

.3 Timber Treatment:

.1 Preservative treatment to CAN/CSA-080 Series-08 for Marine Construction Coastal Waters. Where assay retentions are not indicated, they are to be taken as 1.5 times the indicated gauge retention.

.2 Make arrangements for testing of timber by:

.1 Plant Inspection: Provide treatment plant identification, date of treatment, list of various pieces in the charge, charge number, plant assay testing results, concentration and type of preservative used, duration of treatment, gauge retention, species of wood; and make arrangements with the treatment plant to locate bundles, move bundles, break open bundles and carry out other measures to facilitate the inspection.

.2 Filling and submitting a pre-printed form, agreed to by the Departmental Representative, containing the above information.

.3 Comply with AWPA M4 and revisions specified in CSA O80 Series, Supplementary Requirements to AWPA M2.

.4 Treat all field cuts with two (2) coats of clear copper napthenate or 5% pentachlorophenol solution, water repellent preservative.

.5 Remove chemical deposits on treated wood to receive applied finish.

.4 Miscellaneous Hardware: Hardware must meet the following specifications:

.1 Machine bolts, lag bolts, drift bolts, anchor bolts, nuts, round plate washers: to ASTM A307.

.2 Spikes: to CSA B111.

.3 Hot dip galvanized hardware, bolts, nuts, washers and spikes to CSA G164, with minimum zinc coating of 600 g/m2.

.4 All hardware will be galvanized unless otherwise shown on plans.

Part 3 Execution

3.1 GENERAL

.1 Supply and install dimension timbers to details shown on drawings or as specified. Treated timber to be supplied in pre-cut lengths to suit. Install lag bolts in sound existing timber. All fasteners to be galvanized for exterior use.

.2 Boreholes for lag bolts to be same diameter as shank for unthreaded portion and 0.70 times the shank diameter for the threaded portion. Threaded portion of lag bolts will be installed using a wrench, not by driving.

.3 All countersunk holes and cuts shall receive two coats of Copper naphthenate, allowing sufficient time between applications to permit total absorption. The cost of supply and application of Copper naphthenate will not be measured for payment, but will be considered incidental to the work.

3.2 HANDLING TIMBER

.1 Timber will be protected during handling, shipping, off loading and field handling, by use of suitable equipment and procedures. Use rope or fabric strap slings on site for moving bundles or individual timbers, rather than metal grabs, chains or cables.

.2 Tops of vertical untreated timber to be field treated with minimum two liberal coats of Copper naphthenate.

3.3 HANDLING TREATED TIMBER

.1 Handle treated material to avoid damage causing alteration in original treatment.

.2 Treat in field, spike holes, boreholes, plugged holes, cuts and any damage to treated material, using Copper naphthenate, as specified herein, regardless of plant treatment type. Fill all unused bored holes and any other holes with tight fitting treated wooden plugs prior to any exposure to water containing marine borers.

.3 Provide methodology pertaining to heating and application. Apply to dry surfaces wherever possible.

.4 Treat boreholes using a pressurized container with an extension rod to produce a fine spray in the holes with one application. Alternately, a cylindrical brush may be used.

.5 Treat field cuts and any abrasions with minimum of two (2) liberal applications of approved preservative, using either spray or brush.

.6 In addition, field cuts and underwater damaged areas will receive a coating of plastic compound, capped with lead flashing secured with galvanized roofing nails. Plastic compound not to be water soluble and is subject to approval.

.7 Environmental Concern: Ensure no spillage or excess application of field preservative. Provide workmen with sufficient training and protective gear to properly and safely handle the treated materials and to apply field treatment, so as to prevent undue hazard to themselves, others, or to the environment.

.8 Contain all debris and leachates (films on water surface) within the area of the work by using containment facilities such as floating booms or screens.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Section 01 30 00 – Cast-in-Place Concrete

.2 Section 07 92 00 – Concrete Sealer and Coating

.3 Section 32 12 16 – Asphalt Paving

.4 Section 32 12 13.16 – Asphalt Tack Coat

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 The measurement and payment procedure for this section shall meet the requirements in Section 01 29 00 - Payment Procedures.

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM International)

.1 ASTM E96/E96M-14, Standard Test Methods for Water Vapour Transmission of Materials.

.2 ASTM D4541-09e1, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.

.3 ASTM D638-14, Standard Test Method for Tensile Properties of Plastics.

.4 ASTM C836-12, Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Water- proofing Membrane for Use with Separate Wearing Course.

.5 ASTM 4258-12, Standard Practice for Surface Cleaning Concrete for Coating.

.6 ASTM D4259-88(2012), Standard Practice for Abrading Concrete.

.2 Canadian General Standards Board (CGSB International)

.1 CAN/CGSB 37.50 M89, Hot-Applied, B=Rubberized Asphalt for Roofing and Waterproofing.

1.4 SUBMITTALS

.1 Submit as per Section 01 33 00 – Submittal Procedures.

.1 Latest edition of Manufacturer's literature, including performance data and installation procedures.

.2 Manufacturer list of five (5) significant highway bridge structure projects with the same materials in North America submitted, completed and performing properly for more than ten (10) years under similar climate/traffic conditions.

.3 Manufacturer to provide the Departmental Representative with contact information for each of the five (5) bridges referenced.

.4 A sample of the waterproofing membrane shall be tested and approved prior to incorporation into the work.

.5 The color, texture and thickness of a 75mm square sample of the proposed membrane shall be representative of the overall appearance.

.6 The Contractor shall give a minimum of 48 hours notice, in writing, prior to commencement of any waterproofing operations.

.7 Copy of Applicator's certification issued by the manufacturer stating that the Applicator is a qualified installer of the manufacturer's system.

.8 Copy of all tests conducted in accordance with Clause 3.4 Field Quality Control.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packaging and Shipping

.1 All components of the system shall be delivered to the site in the manufacturer's packaging, clearly identified with the products type and batch number.

.2 Storage and Protection

.1 The applicator shall be provided with a storage area for all components. The area shall be cool, dry and out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.

.2 Copies of Material Safety Data (MSDS) for all components shall be kept on site for review by the Departmental Representative or other personnel.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste material in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 Primer

.1 The MMA primer/healer sealer shall be 100% solvent-free reactive methyl-methacrylate based, two- component resin capable of a full cure in 40 minutes at 20^{o}C (68^{o}F).

.2 Membrane, a 3mm (120 mils) two coat, methyl-methacrylate, cold liquid spray applied, seamless elastomeric waterproofing membrane.

.1 The membrane shall be 100% solvent free reactive, methyl-methacrylate, two component, spray applied material.

.2 The membrane shall meet or exceed the following properties as related to laboratory-prepared samples tested at 20°C (68°F) and 24 hour cure where applicable:

PROPERTY	TEST METHOD	UNITS
Gel Time		6-11 minutes
Cure Time		30 minutes
Water Vapour Transmission	ASTM E96-00, Method A	1.048 g/m^2/day
Adhesion to Concrete	ASTM D4541	0.7 MPa (100psi) min. with failure in concrete
Tensile Strength	ASTM D638-91 Die C - Typical - Heat Aging at 160°F (4 weeks)	11.8 MPa (1700 psi) 0% change
Elongation at Break	ASTM D638-91 Die C - Typical - Heat Aging at 160°F (4 weeks)	130% at break 0% change
Low Temperature Flexibility	CAN CSGB 37.50 M89	Pass 6.5mm (1/4 inch) Mandrel at -25°C (-13°F)
Dynamic Crack Bridging	ASTM C836-00	Pass at 10 cycles, 3.2 mm (1/8 inch), -26°C (-15°F)

.3 Tack Coat

.1 A polymer modified bitumen hot melt adhesive tack coat shall be provided by the waterproofing membrane manufacturer and be fully compatible with the MMA liquid membrane.

Part 3 Execution

3.1 INSPECTION

.1 Prior to priming of the surface, the Departmental Representative, Contractor and Applicator shall inspect and approve the prepared substrate:

.1 Random tests for adequate tensile bond strength shall be conducted on the substrate by the Applicator at the job site using an approved adhesion tester suitable with 2 inch dollies. A minimum of eight (8) tests shall be conducted.

.2 Adequate surface preparation will be indicated by tensile bond strengths of primer to the substrate greater than or equal to 0.7 MPa.

.3 Should the tensile bond strengths be lower than the minimum specified, the Departmental Representative may request additional substrate preparation.

.4 Joints shall be treated in accordance with the Manufacturer's recommendations as approved or directed by the Departmental Representative.

3.2 PREPARATION

.1 Sequencing and Scheduling

.1 The Applicator, Contractor and the Departmental Representative shall agree upon a schedule for coordination between trades working in the area to receive the system.

.2 Safety Requirements

.1 All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.

.2 "No Smoking" signs shall be posted at the entrances to the work.

.3 Non-product and/or application-related personnel in the work area shall be kept to a minimum.

.3 Protection

.1 The Applicator shall be responsible for the protection of the equipment and adjacent areas from overspray or other contamination.

.4 Surface Preparation

.1 Surfaces shall be free of any oil, grease, curing compounds, laitance, loose particles and friable matter, moss and algal growth, dirt, bituminous products, and previous waterproofing materials. If required, degreasing shall be performed via detergent washing in accordance with ASTM D4258.

.2 New concrete shall have a minimum 7 day cure time.

.3 There shall be no visible moisture present on the surface at the time of the application of the system. Compressed oil-free air and/or a light passing of a propane torch may be used to dry the substrate.

.4 Removal of contaminants and surface preparation shall be performed by means approved by the Departmental Representative to an agreed standard.

.5 All horizontal and vertical surfaces of application shall be abrasively cleaned, in accordance with ASTM D4259, to provide a substrate free from laitance.

.6 The substrate shall be sounded and all spalls repaired prior to placement of the primer coat. Spalls shall be repaired with rapid-cure concrete patch materials as per the Departmental Representative's and Manufacturer's recommendations.

.7 Voids and blowholes on vertical surfaces shall be repaired in the same manner.

.8 The surface profile of the concrete is not to exceed 6mm (1/4 inch) peak-to-valley, and areas of minor surface deterioration of 13mm (1/2 inch) and greater shall also be repaired to prevent excessive product usage. The extent and location of thin surface patches shall require the approval of the Departmental Representative before the system is applied.

.5 Related Material

.1 The Manufacturer shall be consulted to determine feasibility of application and recommended preparation.

3.3 APPLICATION

.1 Application can proceed while air and substrate temperatures are between 0°C and 40°C providing the substrate is above the dew point. Outside of this range, the manufacturer shall be consulted.

.2 The system shall be applied in four distinct steps as listed below:

.1 Substrate preparation

.2 MMA Primer application

.3 Membrane application

.4 Tack Coat application

.3 Immediately prior to the application of any components of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using clean, dry, oil free, compressed air or industrial vacuum.

.4 Where the area to be treated is bound by a vertical surface (ie., curb or wall), the system may be continued up the vertical as necessary.

.5 The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations or as approved or directed by the Departmental Representative.

.6 A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

.7 MMA Primer Application

.1 The MMA primer/sealer healer shall consist of one coat with an overall coverage rate of approximately 3.0m^2/lt.

.2 All components shall be measured and mixed in accordance with the Manufacturer's recommendations.

.3 The primer shall be applied using a roller or by a single component spray system approved for use by the Manufacturer. If required by site conditions, brush application shall be allowed.

.4 Porous concrete may require a second coat of primer should the first coat be absorbed to provide a gloss finish.

.8 Membrane Application

.1 The membrane shall be comprised of two liquid components – A and B, and a hardener powder – which is to be added to Component B in accordance with the Manufacturer's recommendations.

.2 The waterproofing membrane shall consist of two color-coded coats; the first coat followed by a second contrasting color coat. Each coat shall have a nominal wet film thickness of 1.5mm (60 mils) to achieve an overall coverage rate of 0.33 m^2/lt.

.3 The substrate shall be coated in a methodical manner. Checks for wet film thickness shall be carried out typically once every 9 m^2.

.4 If substrate conditions are rough with voids determined by Manufacturer representative on site, the second coat of membrane shall be applied in a reverse direction.

.9 Tack Coat Application

.1 The membrane to be coated shall be clean and free from loose debris, moisture or other contaminants. Oil, diesel or grease shall be removed with solvent approved by the Manufacturer.

.2 The Tack Coat shall be applied as per the membrane manufacturer application guidelines, and all guidance regarding surfacing must be followed.

.10 Repairs

.1 If an area is left untreated or the membrane becomes damaged, a patch repair shall be carried out to restore the integrity of the system. The damaged area shall be cut back to sound materials and wiped with solvent (ie., acetone) up to a width of at least 50 mm on the periphery, removing any contaminants. The substrate shall be primed as necessary, followed by the application of the membrane. A continuous layer shall be obtained over the substrate with a 50mm overlap onto existing membrane.

.2 Where the membrane is to be joined to existing cured material and at day joints, the new application shall overlap the existing one by at least 50mm. No preparation shall be necessary unless the existing materials are contaminated with tack coat or dirt, in which case the repair/overlap shall first be wiped with solvent (ie., acetone).

3.4 FIELD QUALITY CONTROL

.1 A certified Manufacturer's representative shall be present at all times during the installation of the membrane.

.2 The following tests shall be conducted by the Applicator and recorded on a form to be submitted to the Departmental Representative.

.1 Temperature: Air, substrate temperatures and dew point. Dew point shall be calculated from temperature and humidity using standard tables.

.2 Adhesion Tests: Adhesion tests of the cured membrane to the substrate shall be checked as per Clause 3.1.1.

.3 Membrane Thickness: Wet film thickness shall be checked every 9.3 m^2 using a gauge pin standard comb-type thickness gauge.

.4 Coverage rates for all layers shall be monitored by checking quantity of materials used against the area covered. All areas to be cleared marked prior to the application of each material placed to verify quantities used against area of application.

.5 All drums and pails of material shall be consecutively numbered to help verify usage rates during application.

.3 Departmental Representative may take samples for testing at any time during installation of waterproofing membrane.

3.5 FINAL REVIEW

.1 The Departmental Representative, Contractor and Applicator shall jointly review the deck area(s) to which the completed system has been installed. Any irregularities or other items that do not meet the requirements of the Departmental Representative shall be addressed at this time.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 74 21 – Construction/Demolition, Waste Management and Disposal

.3 Section 03 30 00 – Cast-in-Place Concrete

1.2 REFERENCES

.1 NCHRP 244, Condition Evaluation of Concrete Bridges Relative to Reinforcement Corrosion, Volume 5: Methods of Evaluating the Effectiveness of Penetrating Sealers.

1.3 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit manufacturer's instructions in accordance with Section 01 33 00 – Submittal Procedures.

1.4 WASTE MANAGEMENT

.1 Separate waste materials for disposal in accordance with Section 01 74 21 – Construction/Demolition, Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facility.

.3 Unused sealer material must not be disposed of into the river, onto the ground or in other locations where it will pose health or environmental hazard.

.4 Divert unused sealer material from landfill to official hazardous material collections site approved by Departmental Representative.

Part 2 Products

2.1 MATERIALS

.1 Clear penetrating silane sealer to be a clear water repellant silane sealer which prevents water and chlorine intrusion into the concrete and conforms to the following requirements:

- .1 Penetration into Concrete: 3 – 6 mm.
- .2 Surface Appearance: no visual change after application.
- .3 Water Vapour Transmission: 100% transmitted (NCHRP 244).
- .4 Chloride Absorption Reduction: 80% improvement over control.
- .5 Water Absorption: 90% improvement over control (NCHRP 244).
- .6 Ensure silane sealer compatible with waterproofing membrane.

.2 Concrete coating system to be a waterborne, highly flexible, high performance coating for new concrete formulated with internally cross-linked acrylic copolymer, that is highly

breathable, resistant to carbon dioxide diffusion, exceptional UV light resistant, dirt resistant and provides chemical resistance in acid environment, provides no chalking/leaching and has a high resistance to water ponding. Colour to be 241P Parchment. Provide colour swatch to Departmental Representative for acceptance prior to placing order:

.1 The concrete coating system shall consist of a prime coat followed by a coloured top coat.

.2 Install to manufacturer's recommendations.

Part 3 Execution

3.1 APPLICATION

.1 Apply clear penetrating sealant to top surface of concrete bridge deck:

.1 Do not apply if surface ambient temperature is 4°C or below, or when humidity is over 90%.

.2 Apply to manufacturer's recommendations.

.2 Apply concrete coating to tops and sides of curbs and crash blocks, outside edges of the bridge deck for the full length of the bridge; underside of the bridge deck from the exterior girder lines to the outside edges of the bridge only (each side of deck, full length of the bridge); and exposed surfaces of wingwalls and abutments, projecting down 600mm (min) below finished grades. Coordination to be made with deck waterproofing system to ensure compatibility.

.3 Do not apply if rain is imminent.

.4 Surface ambient temperature must not be less than 7°C or above 32°C during 24 hours after the application.

.5 Fresh concrete must be cured for ten days prior to application.

.6 Install to manufacturer's recommendations.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section includes:

.1 Materials and installation for Temporary Panel Detour Bridge Superstructure.

.2 Materials and installation for Temporary Panel Bridge Abutments.

1.2 RELATED REQUIREMENTS

.1	Section 01 33 00	Submittal Procedures
.2	Section 01 55 26	Traffic Regulations
.3	Section 02 41 16	Structure Demolition
.4	Section 03 20 00	Concrete Reinforcing
.5	Section 03 30 00	Cast-in-Place Concrete
.6	Section 31 11 00	Clearing and Grubbing
.7	Section 31 23 33.01	Excavating, Trenching and Backfilling
.8	Section 31 24 14	Fill Against Structure
.9	Section 31 32 19.07	Geotextile
.10	Section 31 61 13	Pile Foundations, General Requirements
.11	Section 31 62 16.16	Steel H-Piles

1.3 REFERENCES

.1 CAN/CSA S6-14, Canadian Highway Bridge Design Code

.2 ASTM A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

.1 Contractor responsible for the design, supply, installation, assembly, removal, inspections and maintenance for the following:

.1 Provide a temporary modular panel bridge steel superstructure complete with decking and barriers to CAN/CSA S6-14. All live loads (CL 625 Design Vehicle) and dead loads to be considered per CAN/CSA S6-14. TL-2 Barrier System on bridge not to be fastened directly to panel bridge trusses, but rather the transom beams. A seamless and continuous transition from the approach guiderails to the bridge barrier shall be provided at each end and each side of the bridge.

.2 Provide a temporary panel bridge reinforced concrete abutment supported on battered steel piles to CAN/CSA S6-14. All live loads and dead loads to be considered per CAN/CSA S6-14.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data: submit manufacturer's printed product literature and specifications for temporary panel bridge components.

.3 Closeout Submittals: submit maintenance and engineering data for storage by Parks Canada for future re-use of temporary panel bridge.

.4 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.6 Manufacturer's Field Services: submit reports within 3 days of receipt from manufacturer.

.7 Instructions: submit manufacturer's installation instructions.

.8 Bridge Supplier to provide:

.1 Copies of the design and assembly drawings and instructions, including required geometry of backwalls at each abutment for abutment design.

.2 A package containing schematics of each part, limited to one part per page with dimensions.

.3 One illustrated method to install the bridge (including installation loads).

.4 A complete parts list with the mass of each part.

.5 A proof of valid welding certification in accordance with CSA W47.1 for structural steel or CSA W47.2 for aluminum or approved equivalent(s).

.6 Launching nose requirements, if required.

.7 Proof of verification of methods and materials used in fabrication for compliance to the approved design drawings.

.8 Mass of structure.

.9 Design calculations indicating that the bridge conforms to the requirements of CAN/CSA S6-14.

1.6 QUALITY ASSURANCE

.1 Quality Control:

.1 Meet quality requirements in Section 01 45 00 – Quality Control.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 – Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Handle components with care to avoid damage. All slings shall be non-metallic and to be designed and placed so as to not overstress any members or connection per manufacturer's recommendations.

.2 Bolts, nuts, washers and small components shall be separated by type for storage. Identical units shall be provided in plastic containers, or other approved by the Departmental Representative, suitable for handling and storage. Containers shall be labelled identifying each container's contents.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition, Waste Management and Disposal.

Part 2 Products

2.1 TEMPORARY PANEL BRIDGE

.1 Contractor to supply temporary panel bridge with the following characteristics (design, supply and installation by Contractor):

.1 Modular type steel panel bridge complete with TL-2 crash-tested barrier system and steel decking with epoxy anti-slip coating.

.1 Total Span: 45.0 metres. Contractor may supply a longer structure depending on supplier's standard details.

.2 The panel bridge superstructure shall also be furnished with all necessary "fixed" and "free" bearing assemblies designed, detailed and fabricated to accommodate all loads and movements according to CAN/CSA S6-14. The bearings shall be designed to provide longitudinal restraint at one abutment ('fixed') while allowing for longitudinal movement at the opposite abutment ('free'). Transverse restraint shall be provided at both abutments. If any additional supports are required for the end transom beams, then the Contractor shall also provide the design, details and fabricated assemblies with the panel bridge.

.2 Structure Depth Limit: The depth between the top of the roadway surface and the underside of the superstructure shall not exceed 1100mm.

.3 Clear width between barriers: 9.144m minimum.

.4 Rail System/Barriers: TL-2 to CAN/CSA S6-14. Barrier posts to be mounted on transoms and not directly to truss panels. The traffic barrier system shall be a crash tested design and the anchorage shall be designed in accordance with CAN/CSA S6-14. A seamless and continuous transition from the approach guiderails to the bridge barrier shall be provided at each end and each side of the bridge.

.5 Deck Type: Steel deck modules.

.6 Deck Coating: Sikaflex epoxy/trap rock anti-skid coating or approved equal.

.7 Deck Curbs: provide steel curbs to match deck system, two curbs (one each side) per panel bridge bay.

.8 Connections: High-strength bolted connection and hardware.

.1 All bolts to be pretensioned in accordance with CAN/CSA S6- Latest Edition.

.9 All bridge components to be galvanized in accordance with ASTM A123M.

.2 Abutments: Reinforced concrete pile cap, bearing seat and backwall supported on battered piles founded on bedrock.

.1 Concrete as per Section 03 30 00 with minimum compressive strength at 28 days: 35 MPa (minimum).

.2 Aggregate size: 20mm maximum.

.3 Air Entrainment: 6% +/- 1%.

.4 Max Water-Cement ratio: 0.35.

.5 Reinforcing steel as per Section 03 20 00.

.6 Piles, minimum yield strength: 350 MPa. Reference Section 31 61 13 and Section 31 62 16.16 for further requirements.

Part 3 Execution

3.1 TEMPORARY PANEL BRIDGE

.1 Contractor to design, fabricate, ship, install, maintain during construction and remove the temporary panel bridge according to the requirements of the contract documents and as directed by the Departmental Representative.

.2 Superstructure:

.1 The panel bridge shall be designed in accordance with CAN/CSA S6-14, Canadian Highway Bridge Design Code for CL625 live load and all other applicable loadings and movements.

.2 Superstructure shall be provided with positive camber to counter the effects of dead load deflection for a 45.0 metre span.

.3 The design shall include bearing reactions at SLS and ULS (dead, live, 1 in 50 year wind load and braking at minimum) with the abutments. The design shall also include all bearing component details and installation requirements. The anchor bolts and anchor bolts in the base plates shall be designed, detailed and fabricated to accommodate the loads and movements prescribed in CAN/CSA-S6-14. Modelling of the superstructure shall account for the appropriate stiffness of all supports rather than using absolute support tools available in modelling software. Absolute longitudinal supports shall not be used to model the ‘fixed’ bearings since this practice can lead to incorrect model behaviour, resulting in potentially under conservative load effects in parts of the superstructure and longitudinally ‘free’ abutment, and excessively conservative ‘fixed’ bearing and ‘fixed’ abutment designs.

.4 Construction and material specifications shall be in accordance with the Canadian Highway Bridge Design Code CAN/CSA S6-14, or as otherwise agreed upon by the Departmental Representative.

.5 The Contractor shall provide design shop drawings and engineering calculations for review by the Departmental Representative in PDF format. Once reviewed and approved by the Departmental Representative, the Contractor shall submit one complete set of design drawings marked "issued for Construction". The drawings shall be reviewed and stamped by a Professional Engineer licensed to practice in the Province of New Brunswick and they shall be provided in both electronic AutoCAD and PDF formats.

.6 Expansion joints, bridging plates or other approved means shall be provided at the abutments if the opening between the deck and the backwall is larger than the minimum specified in the CAN/CSA S6-14 (including rotation and thermal movement effects).

.7 The Traffic Barrier shall be a TL-2 crash tested design and the anchorage shall be designed in accordance with CAN/CSA S6-14. Panel bridge superstructure shall come complete with galvanized traffic barriers along with all mounting hardware required to secure the barrier to the structure. The barrier shall be fabricated to fit the structure. The barrier system shall include posts fastened to the bridge transoms such that the barrier load is not transferred to the bridge trusses.

.3 Substructure:

.1 At least one pile per detour bridge abutment shall be tested. Dynamic pile monitoring using PDA (Pile Driving Analyzer) is to be carried out to verify that overstressing does not occur, that the hammer is operating within normal efficiencies, and that the estimated resistance is achieved at the set criteria. Note that required pile capacities, and pile driving criteria are the responsibility of the Contractor. Based on capacities required and pile sizes provided per Contractor design, these capacities and criteria may not be the same as for the bridge abutment piles and care should be taken by the Contractor to obtain appropriate expertise and to set limits appropriate to the temporary abutment piles.

.1 Contractor to provide PDA quality control testing to verify capacities and criteria for abutment pile design.

.2 Contractor to design, install, maintain during construction, and remove the temporary concrete abutments and battered piles according to the requirements of the contract documents and as directed by the Departmental Representative.

.3 Slopes to be dressed to meet the requirements of the new bridge following removal of temporary panel bridge abutments.

.4 The abutments shall be designed in accordance with CAN/CSA S6-14, Canadian Highway Bridge Design Code for CL625 live load and all other applicable loadings and movements.

.5 The abutment design shall include protection to prevent scour.

.6 Construction and material specifications shall be in accordance with the Canadian Highway Bridge Design Code CAN/CSA S6-14 or as otherwise agreed upon by the Departmental Representative.

.7 The Contractor shall prepare design drawings and engineering calculations for review by the Departmental Representative in PDF format. Once reviewed and approved by the Department, the Contractor shall submit one complete set of design drawings marked "Issued for Construction". The drawings shall be reviewed and stamped by a Professional Engineer licensed to practice in the Province of New Brunswick and they shall be provided in both electronic AutoCAD and PDF formats.

.4 Approaches and Maintenance:

.1 The Contractor is responsible for the construction and constant maintenance of the detour structure and approaches.

.1 Constant maintenance of the structure is defined as the following: Any requirements from the manufacturer to maintain the structure over the duration of the project. The Contractor shall contact the manufacturer to determine what is required for maintenance of the bridge throughout the installation period before bidding. In addition, for the purposes of bidding, the Contractor shall assume bridge and bracing connections will require re-torqueing (tightening) every 10 weeks of in-service use for the duration of the project.

.2 Additional maintenance on the structure (excluding any requirements from the manufacturer) deemed necessary by the Engineer shall be negotiated and agreed upon with the Departmental Representative.

.2 The clearance under the detour bridge shall be as indicated on the drawings.

.3 The Contractor shall be responsible for the design and installation of connections to provide a smooth transition between the bridge rail and the approach rail and channel.

.4 Contractor to disturb existing ground as little as possible and provide geotextile separation between existing ground and fills required for the approaches to the superstructure. Restore original ground as closely as possible to undisturbed condition following disassembly of detour structure and abutments and removal of approach fills and geotextile separation layer.

.5 Manufacturer's Representative:

.1 A Manufacturer's representative shall be present during all phases of construction of the temporary panel bridge. The Contractor shall be responsible to coordinate all site visits as required by the Departmental Representative.

.6 Certification:

.1 Prior to opening the temporary bridge to traffic and payment for the temporary detour bridge item, the Contractor shall provide the Departmental Representative with a stamped letter from a Professional Engineer licensed to practice in New Brunswick certifying the temporary bridge and abutments have been properly constructed, in conformance with the stamped construction drawings/ manufacturer's instructions, and is capable of carrying the required loadings.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 Aggregate materials shall be composed of crushed quarry stone. The materials shall be transported and placed upon the subgrade, subbase or shoulder and compacted as directed and in accordance with these specifications.

.2 The Contractor shall be responsible for Quality Control (QC) testing to ensure that all materials used meet the physical and production requirements of these specifications.

.3 The Owner will conduct Quality Assurance (QA) testing for physical properties and production requirements.

1.2 RELATED REQUIREMENTS

.1	Section 31 24 13	Roadway Embankments
.2	Section 32 11 16.01	Granular Sub-Base
.3	Section 32 11 23	Aggregate Base Courses

1.3 REFERENCES

.1 Standard Specifications for Highway Construction and Maintenance, New Brunswick Department of Transportation and Infrastructure.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Samples:

.1 Provide Departmental Representative with access to source and processed material for sampling.

.2 The Contractor shall make available all equipment necessary for the Departmental Representative to obtain representative samples of the material proposed for supply. Allow continual sampling by Departmental Representative during production.

.3 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.

Part 2 Products

2.1 MATERIALS

.1 Aggregate shall be composed of clean, hard, sound, durable, uncoated particles that do not contain friable, soluble or reactive minerals or other deleterious materials or conditions that would make the aggregate prone to decomposition or disintegration, or present any environmental hazard, from the presence of the parent material or its by-products, when exposed to the natural elements after placement in the Work.

2.2 BLENDING OF AGGREGATES

.1 Blending of aggregates shall be permitted to meet the grading requirements or increase the percentage of crushed particles.

.2 Blending shall not be permitted if required solely to improve the results of material quality tests (Freeze/Thaw, Plasticity Index and Micro-Deval).

.3 Blending shall be permitted only at the crusher, and the method and location of introducing the blending material into the crushing process shall be submitted in writing to the Departmental Representative for approval, prior to production of any blended product.

.4 The blending material shall be added such that the rate of blending is controlled and measurable.

.5 Blending materials shall be granular materials having a dust content not exceeding 20% when tested in accordance with ASTM C117.

.1 The blending materials shall individually meet the Freeze/Thaw sand Plasticity Index requirements of Section 32 11 23 – Aggregate Base Courses.

.6 Natural sand or gravel used as blending material in the production of the crushed rock aggregates shall not exceed 20% by mass of the blended aggregate produced.

.7 Blending of aggregates shall produce a consistently graded product.

2.3 SOURCE QUALITY CONTROL

.1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks minimum before starting production.

.2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.

.3 Advise Departmental Representative 4 weeks minimum in advance of proposed change of material source.

.4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

Part 3 Execution

3.1 PREPARATION

.1 Aggregate source preparation:

.1 Off-site quarry.

.2 Processing:

.1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.

.2 Blend aggregates, as required, including reclaimed materials that meet physical requirements of specification is permitted in order to satisfy gradation requirements for material and, percentage of crushed particles, or particle shapes specified.

.1 Use methods and equipment approved in writing by Departmental Representative.

.3 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate gradation.

.4 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.

.1 Use only equipment approved in writing by Departmental Representative.

.5 Stockpiling:

.1 Stockpiling of aggregates on-site will not be permitted unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.

.2 Stockpile aggregates in sufficient quantities to meet project schedules.

.3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.

.4 Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.

.5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

.6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 Clearing: cutting, chipping and disposal of all designated trees and brush within the right-of-way and other areas as indicated including felled trees, previously up-rooted trees, and surface debris.

.2 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.

.3 Grubbing consists of excavation and disposal of stumps and roots, embedded timber, rock fragments, to not less than specified depth below existing ground surface.

1.2 QUALITY ASSURANCE

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.3 STORAGE AND PROTECTION

.1 Prevent damage to existing natural features, pavement, utility lines, site appurtenances, watercourses and root systems of trees which are to remain.

.1 Repair damaged items to approval of Departmental Representative.

.2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

1.4 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Soil Material for Fill:

.1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.

.2 Remove and store soil material for reused.

Part 3 Execution

3.1 PREPARATION

.1 Inspect site and verify with Departmental Representative, items designated to remain.

.2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.

.1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.

.2 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.

.3 Notify utility authorities before starting clearing.

.4 Keep roads and walks free of dirt and debris.

3.2 CLEARING

.1 Areas to be cleared shall be clearly marked using high-visibility ribbons or similar means prior to work commencing.

.2 Comply with conditions of all permits.

.3 Do not remove trees or brush from outside limits indicated except for any tree or branch considered unsafe.

.4 Cut trees and brush close to ground leaving no stump higher than 300 mm.

.5 Clearing shall not be permitted within 30 metres of a wetland unless work is underway on a permitted watercourse crossing or such areas are frozen hard, except to provide access through the buffers, as approved by the Departmental Representative.

.6 The Contractor shall not use heavy Equipment for clearing within 30 metres of stream banks or wetlands and shall do cutting herein by hand or by Equipment able to "reach in" and cut and yard out the timber.

.7 There shall be no long skids of timber on steep slopes adjacent to watercourses or wetlands, and no felling or skidding trees across a watercourse or wetland.

.8 Non-merchantable trees not felled by cutting may be shredded in place (to a stump height not higher than 300mm) using equipment designed for that purpose, but shall not be bulldozed down.

.1 No shredding, chipping or placement of shredded or chipped material shall occur within 30 metres of a watercourse or wetland.

.2 All trees, brush and slash are not permitted to be removed from the Park and shall be shredded or chipped and evenly distributed over the ground within the clearing limits or over an area as indicated by the Departmental Representative.

.9 Disposal by burning is not permitted.

3.3 GRUBBING

.1 Remove and dispose of roots, matted roots, and designated stumps from indicated grubbing areas.

.2 Grub out stumps and roots to not less than 300 mm below ground surface.

.3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m^3.

.4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

.5 No materials removed during grubbing shall be permitted to be placed within 30 metres of a watercourse or wetland.

.6 Grubbed materials shall only be stockpiled at locations approved by Departmental Representative.

.7 The Contractor shall be responsible, at his/her own expense, to carry out any remedial measures necessary to redress any areas grubbed beyond the specified limits, including but not limited to extra shaping, hydraulic seeding, and/or mulching of the exposed ground, and removal of trees which have fallen as a result of root severance due to the over-width grubbing.

3.4 FINISHED SURFACE

.1 Leave ground surface in condition suitable for immediate grading operations to approval of Departmental Representative.

.2 Make good, to satisfaction of Departmental Representative, any area damaged during clearing and grubbing operation as directed by Departmental Representative.

3.5 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1	Section 02 41 13	Selective Demolition
.2	Section 32 11 16.01	Granular Sub-base
.3	Section 33 42 13	Pipe Culverts

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C117, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3).

.5 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA-A3000, Cementitious Materials Compendium.

.2 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete**.**

.4 Standard Specifications for Highway Construction and Maintenance, New Brunswick Department of Transportation and Infrastructure.

1.3 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock: solid material in excess of 1.00 m^3 and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m^3 bucket. Frozen material not classified as rock.

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.2 Topsoil:

.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.3 Waste material: excavated material unsuitable for use in work or surplus to requirements.

.4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.

.5 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

.6 Unsuitable materials:

.1 Weak, chemically unstable, and compressible materials.

.2 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM C136: Sieve sizes to CAN/CGSB-8.2.

.2 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

.7 Unshrinkable backfill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Preconstruction Submittals:

.1 Submit construction equipment list for major equipment to be used in this section prior to start of work.

.2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field and clearance record from utility authority, as required.

.3 Samples:

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Inform Departmental Representative at least 2 weeks prior to beginning work, of proposed source of fill materials and provide access for sampling.

1.5 EXISTING CONDITIONS

.1 Buried services:

.1 Before commencing work, establish location of buried services on and adjacent to site.

.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.

.3 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.4 Prior to beginning excavation work, notify utility companies to establish location and state of use of buried utilities and structures. Utility companies to clearly mark such locations to prevent disturbance during work.

.5 Confirm locations of buried utilities by careful test excavations.

.6 Maintain and protect from damage, water, electric, telephone and other utilities and structures encountered.

.7 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing. Costs for such work to be paid by Owner.

.8 Record location of maintained, re-routed and abandoned underground lines.

.9 Confirm locations of recent excavations adjacent to area of excavation.

.2 Existing buildings and surface features:

.1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by work.

.2 Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

.3 Where required for excavation, cut roots or branches as directed by Departmental Representative.

1.6 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Backfill:

.1 Crushed Gravel Subbase material in accordance with Section 32 11 16.01 – Granular Sub-Base.

.2 Unshrinkable backfill: proportioned and mixed to provide:

.1 The maximum percentage passing the 80 μm sieve shall not exceed 9%.

.2 The Portland cement content shall be 25 kg/m^3.

.3 The slump at point of discharge shall be minimum 150 mm.

.4 The specified compressive strength at 28 days shall be maximum 1.0 MPa.

.5 The use of fly ash, in addition to the noted Portland cement content, may be used in such proportion so as not to exceed the specified compressive strength.

.6 Coarse aggregates, if used in the mixture, are exempt from evaluation for contribution to alkali aggregate reactivity (AAR).

.3 Geotextiles: to Section 31 32 19.01 - Geotextiles.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction and sediment and erosion control plan, specific to site, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

.2 Cut pavement neatly along limits of proposed excavation in order that surface may break evenly and cleanly in accordance with Section 02 41 13 - Selective Demolition.

3.3 PREPARATION/PROTECTION

.1 Protect existing features in accordance with applicable local regulations.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.

.4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.5 Protect buried services that are required to remain undisturbed.

3.4 STOCKPILING

.1 Stockpile fill materials in areas designated by Departmental Representative.

.1 Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from moisture and contamination.

.3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.5 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

.1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 - Health and Safety Requirements and Occupational Health and Safety Act for the Province of New Brunswick.

.2 Obtain permit from authority having jurisdiction for temporary diversion of watercourse.

.3 Construct temporary works to depths, heights and locations as indicated or directed by Departmental Representative.

.4 During backfill operation:

.1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.

.2 Do not remove bracing until backfilling has reached respective levels of such bracing.

.3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.

.5 When sheeting is required to remain in place, cut off tops at elevations as indicated.

.6 Upon completion of substructure construction:

.1 Remove cofferdams, shoring and bracing.

.2 Remove excess materials from site and restore watercourses as directed by Departmental Representative.

3.6 DEWATERING AND HEAVE PROTECTION

.1 Keep excavations free of water while work is in progress.

.2 Provide for Departmental Representative's approval details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.

.1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.

.4 Protect open excavations against flooding and damage due to surface run-off.

.5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures and in manner not detrimental to public and private property, or portion of Work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

3.7 EXCAVATION

.1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.

.2 Excavate to lines, grades, elevations and dimensions as specified or shown on the Drawings.

.3 Remove paving and other obstructions encountered during excavation in accordance with Section 02 41 13 - Selective Demolition.

.4 Excavation must not interfere with bearing capacity of adjacent foundations.

.5 Do not disturb soil within branch spread of trees or shrubs that are to remain.

.1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.6 Trenches for piping, conduit, and related excavations shall be of sufficient width and depth at all points to allow pipes to be laid, joints to be formed, and appurtenant structures to be built in a workmanlike manner, and when needed, to allow for sheeting and shoring, pumping, draining, and for removing and replacing all materials unsuitable for foundations.

.7 Excavate trenches so pipe can be laid to the alignment and depth required. Unless otherwise authorized by Departmental Representative in writing, excavation length to be not more than pipe length that can be laid and backfilled in one day. Brace and drain trench so workers may work safely and efficiently.

.8 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.

.9 Restrict vehicle operations directly adjacent to open trenches.

.10 Dispose of surplus and unsuitable excavated material off site.

.11 Do not obstruct flow of surface drainage or natural watercourses.

.12 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.13 Notify Departmental Representative when bottom of excavation is reached.

.14 Obtain Departmental Representative approval of completed excavation.

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

.16 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.17 Correct unauthorized over-excavation with approved select backfill compacted to minimum of 95% of the maximum dry density in accordance with ASTM D698.

.18 Hand trim, make firm and remove loose material and debris from excavations.

.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

.2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

.19 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

3.8 BACKFILLING

.1 Do not proceed with backfilling operations until completion of following:

.1 Departmental Representative has inspected and approved installations.

.2 Departmental Representative has inspected and approved of construction below finish grade.

.3 Inspection, testing, approval, and recording location of underground utilities.

.4 Removal of concrete formwork.

.5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Backfilling around installations:

.1 Place bedding and surround material as specified elsewhere.

.2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.

.3 Place layers simultaneously on both sides of installed work to equalize loading.

.4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:

.1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative.

.2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.

.5 Backfill trench from top of bedding to top of subgrade with layers of approved material.

.6 Place backfill in 150 mm layers and compacted to a minimum of 95% of the maximum dry density in accordance with ASTM D698. Thoroughly compact each layer before placing next layer.

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

.8 Place unshrinkable backfill in areas as indicated. Consolidate and level unshrinkable backfill with internal vibrators.

.9 Install filter system in backfill as indicated as directed by Departmental Representative.

3.9 RESTORATION

.1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.

.2 Replace topsoil as directed by Departmental Representative.

.3 Reinstate pavements disturbed by excavation to thickness, structure and elevation which existed before excavation and/or as per Contract Documents.

.4 Clean and reinstate areas affected by work as directed by Departmental Representative.

.5 Use temporary plating to support traffic loads over unshrinkable backfill for initial 24 hours.

.6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

.7 Dispose of surplus material off-site, unless otherwise directed by the Contract Documents.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 11 16.01 Granular Sub-base

.2 Section 32 11 23 Aggregate Base Courses

1.2 REFERENCES

.1 Definitions:

.1 Rock: in situ bedrock, and naturally occurring boulders that are 1 m^3 or larger in volume. Frozen material will not be classified as rock.

.2 Common material: excavated soil which is not rock, unsuitable or topsoil.

.3 Embankment: material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.

.4 Borrow Material: material obtained from areas off of Parks Canada property and required for construction of embankments or for other portions of work.

.5 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.6 Unsuitable material: all material which is not suitable for use in work and must be disposed of as directed by the Departmental Representative.

.7 Surplus material: excavated material not required for re-use.

.8 Subgrade: the surface of mass excavation and embankment finished to lines and elevations indicated.

.2 Reference Standards:

.1 ASTM International

.1 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort ((12,400ft-lbf/ft^3 (600kN-m/m^3)).

.2 Standard Specifications for Highway Construction and Maintenance, New Brunswick Department of Transportation and Infrastructure.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

1.4 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Embankment materials require approval by Departmental Representative.

.2 Granular Sub-base – in accordance with Section 32 11 16.01 – Granular Sub-base.

.3 Aggregate Base – in accordance with Section 32 11 23 – Aggregate Base Courses.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that condition of substrate is acceptable for roadway embankment Work:

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 COMPACTION EQUIPMENT

.1 Compaction equipment: vibratory rollers or vibrating plate compactors capable of obtaining required density in materials on project.

.1 Demonstrate compaction equipment effectiveness on specified material and lift thickness by documented performance of test-strip before start of Work.

.2 Replace or supplement equipment that does not achieve specified densities.

.2 Operate compaction equipment continuously in each embankment when placing material.

3.3 WATER DISTRIBUTORS

.1 Apply water with equipment capable of uniform distribution.

3.4 PREPARATION

.1 Temporary erosion and sedimentation control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction and sediment and erosion control plan, specific to site, that complies with requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.2 Protection of in-place conditions:

.1 Protect excavations from freezing.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative's approval.

.4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.5 Protect buried services that are required to remain undisturbed.

3.5 EXCAVATING

.1 Notify Departmental Representative when waste materials are encountered and remove to depth and extent directed.

.2 Excavate all types of materials to lines and elevations indicated and as necessary for construction.

.3 Notify Departmental Representative if in doubt as to definition of material.

.4 Select method of excavation, support, and dewatering unless otherwise indicated or directed. Protect property and structures from damage.

.5 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial regulations whichever is more stringent.

.6 Where Subgrade requires undercutting, sub-excavation shall be carried out to the specified depth below subgrade on a plane parallel to the Subgrade cross-slope.

.7 Excavate as required to carry out work.

.1 Do not disturb soil or rock below bearing surfaces.

.2 Notify Departmental Representative when excavations are complete.

.3 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.

.8 Drainage:

.1 Maintain profiles, crowns and cross slopes to provide good surface drainage.

.2 Provide ditches as work progresses to provide drainage.

.3 Construct interceptor ditches as indicated or as directed before excavating or placing embankment in adjacent area.

.9 Handle materials in a manner that will not endanger the public, personnel, property or the work. Do not reduce sight distances, or obstruct roadways or utilities. Do not obstruct flow of surface drainage or natural watercourses

.10 Hauling of common excavation over Granular Sub-Base and Aggregate Base Courses shall not be permitted, unless authorized.

.11 The Contractor shall shape ditches to the lines and grades specified, and any grade conditions that would cause water to pond shall be removed.

.12 Take care to protect granular material from the elements.

.13 Prior to the placement of any fill, the exposed subgrade surface must be allowed to dry and shall be proof rolled and compacted. The subgrade preparation should occur during dry weather. The Contractor is expected to work the fill materials including scarifying

and drying as required to achieve a moisture content sufficient to achieve the specified minimum compaction.

.14 All excavated materials shall become property of the Contractor and shall be disposed of outside the work site.

.15 Obtain appropriate permits and written approval of Departmental Representative before proceeding with blasting.

.16 Borrow Excavation:

.1 Completely use in embankments, suitable materials removed from right-of-way excavations before taking material from borrow areas.

3.6 DEWATERING

.1 Keep bottom of excavation free of water by draining or pumping.

.2 Dewater excavation in a manner which will not endanger stability of the work.

.3 Dispose of water from excavation in a manner that is not injurious to property, public health or any operation of the work. Prevent water pumped out of an excavation from entering a watercourse or wetland. Discharge from pumped water shall be in a well vegetated area in excess of 30 metres from a watercourse or wetland.

.4 Take precautions to prevent uplift of pipe or structures.

3.7 EMBANKMENTS

.1 Scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces.

.1 Method used to be to be pre-approved in writing by Departmental Representative.

.2 Break up or scarify existing road surface prior to placing embankment material.

.3 Do not place material which is frozen nor place material on frozen surfaces except in areas authorized by Departmental Representative.

.4 Maintain crowned surface during construction to ensure ready run-off of surface water.

.5 Drain low areas before placing materials.

.1 Place and compact to full width in layers not exceeding 200 mm loose thickness. Departmental Representative may authorize thicker lifts if specified compaction can be achieved and if material contains more than 25% by volume stone and rock fragments larger than 100 mm.

.6 Where material consists of rock:

.1 Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case is layer thickness to exceed 1 m.

.2 Distribute rock material to fill voids with smaller fragments to form compact mass.

.3 Fill surface voids at subgrade level with rock spalls or selected material to form earth-tight surface.

.4 Do not place boulders and rock fragments with dimensions exceeding 200 mm within 300 mm of subgrade elevation.

.7 Deductions from excavation will be made for overbuild of embankments.

3.8 COMPACTION

.1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.

.2 Deposit, spread, and level, embankment material in layers 200 mm maximum thickness before compaction.

.1 Compact each layer of embankment until compaction equipment achieves no further significant consolidation.

.2 Ensure required compaction for each layer before placing any material for next layer.

.3 Use specialized compaction equipment supplemented by routing, hauling, and leveling equipment over each layer of fill.

.4 Obtain written approval from Departmental Representative before using specialized compaction equipment such as tamping rollers, vibratory rollers, or other alternate compaction equipment that produces the required results.

.5 Compact each layer to minimum 95% maximum dry density ASTM D698 except top 150 mm of subgrade.

.1 Compact top 150 mm to 100% maximum dry density.

.6 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.

3.9 PROOF ROLLING

.1 The subgrade shall be proof rolled by means of a vibratory roller with a minimum static mass of 8 tonnes and dynamic mass of 20 t.

.2 Obtain written approval from Departmental Representative to use non-standard proof rolling equipment.

.1 If use of non-standard proof rolling equipment is approved, Departmental Representative to determine level of proof rolling.

.3 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.4 Where proof rolling reveals areas of defective subgrade:

.1 Remove subgrade material to depth and extent as directed by Departmental Representative.

.2 Backfill excavated subgrade with granular sub-base material and compact in accordance with Section 32 11 16.01 - Granular Sub-Base.

.3 Replace with new materials in accordance with this Section at no extra cost.

3.10 FINISHING

.1 Finished subgrade surface to be within plus or minus 25 mm of established grade and cross section but not uniformly high or low.

.2 Finish slopes and ditch bottoms true to lines, grades and drawings where applicable. Scale slope by removing loose fragments, for cut slopes in bedrock steeper than 1:1.

.3 Remove rocks over 150 mm in dimension from slopes and ditch bottoms.

.4 Hand finish slopes that cannot be finished satisfactorily by machine.

.5 Round top of backslope 1.5 m both sides of top of slope.

.6 Run tractor tracks over slopes exceeding 3 m in height to leave tracks parallel to centreline of highway.

.7 Trim between constructed slopes and edge of clearing to provide drainage and free of humps, sags and ruts.

3.11 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.12 PROTECTION

.1 Maintain finished surfaces in condition conforming to this section until acceptance by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 24 13 Roadway Embankments

.2 Section 33 42 13 Pipe Culverts

1.2 REFERENCES

.1 ASTM International

.1 ASTM D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

.2 ASTM D4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

.3 ASTM D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

.4 ASTM D4716, Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.

.5 ASTM D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

.6 ASTM D5261, Standard Test Method for Measuring Mass per Unit Area of Geotextiles

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-4.2 No. 11.2-M89, Textile Test Methods - Bursting Strength - Ball Burst Test.

.2 CAN/CGSB-148.1, Method of Testing Geosynthetics

.1 No.2, Methods of Testing Geosynthetics - Mass per Unit Area.

.2 No.3, Methods of Testing Geosynthetics - Thickness of Geotextiles.

.3 No.6.1, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.

.4 No.7.3, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.

.5 No. 10, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.

.3 Standard Specifications for Highway Construction and Maintenance, New Brunswick Department of Transportation and Infrastructure, Item 601.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Submit following samples 2 weeks prior to beginning Work.

.1 Minimum length of 1 m of roll width of geotextile.

.2 Methods of joining.

.4 Test and Evaluation Reports:

.1 Submit copies of mill test data and certificate at least 2 weeks prior to start of Work.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect geotextiles from direct sunlight and UV rays.

.3 Replace defective or damaged materials with new.

1.5 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIAL

.1 Geotextile: synthetic fibre fabric, supplied in rolls.

.1 Width: 4.69 m minimum.

.2 Composed of minimum 85% by mass of polypropylene and resistant to ultraviolet degradation and to biological and chemical environments normally found in soils.

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

.3 Thread for the seams shall be equal to or better than the geotextile in resistance to chemical and biological degradation and both factory and field sewn or sealed seams shall have a grab tensile strength equal to 90% of that of the geotextile.

2.2 WOVEN GEOTEXTILES

.1 Type W1, W2 and W3 geotextile shall be a sheet of woven plastic yarn, as per Table 601-1 of the New Brunswick Department of Transportation and Infrastructure Standard Specifications for Highway Construction and Maintenance.

2.3 NON-WOVEN GEOTEXTILES

.1 Type N1, N2, N3 and N4 geotextile shall be a pervious sheet of non-woven plastic yarn, as per Table 601-1 of the New Brunswick Department of Transportation and Infrastructure Standard Specifications for Highway Construction and Maintenance.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for geotextile material installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with sandbags.

.2 The areas to be covered with geotextile shall be prepared by shaping the ground to present a uniform and regular surface free from bumps and depressions.

.1 Geotextile shall not be placed on stumps, brush, limbs, ice or other material that may tear or puncture the fabric.

.2 The geotextile shall be placed so as to create a surface that is smooth and free of tension stress, folds, wrinkles and creases.

.3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.

.4 The manufacturer's installation procedures shall be the standard of installation that shall be applied except as follows:

.1 Where more than one width of fabric is used, the fabric shall be joined by sewing or by an overlap of at least 600 mm and all overlap joints shall be securely held in place.

.5 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.

.6 After installation, cover with overlying layer within 4 hours of placement.

.7 The Contractor shall immediately repair damaged geotextile to approval of Departmental Representative.

.1 The damaged area shall be covered with a patch of the same fabric type extending a minimum of one metre beyond the perimeter of the damaged area.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.4 PROTECTION

.1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 05 16 Aggregate Materials

.2 Section 31 24 13 Roadway Embankments

1.2 REFERENCES

.1 ASTM International

.1 ASTM C117, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C127, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.

.3 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

.5 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.3 Ministry of Transportation of Ontario (MTO)

.1 MTO LS-614, Method of Test for Freezing and Thawing of Coarse Aggregate

.4 Standard Specifications for Highway Construction and Maintenance, New Brunswick Department of Transportation and Infrastructure, Items 201 and 203.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with 31 05 16 - Aggregate Materials.

1.5 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Granular Sub-Base: material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:

.1 Approved hard, durable crushed quarried stones and sand particles.

.2 The aggregate shall be free from flat, elongated or other objectionable pieces and shall be approved by the Departmental Representative prior to utilization.

.3 Gradations to be within limits specified when tested in accordance with ASTM C117 and C136.

.1 Gradation to follow Table 201-2 (Crushed Rock) for Granular Sub-Base.

.4 Gravel Base shall have a minimum of 40% of the particles, by mass, having at least one fractured face, when tested in accordance with ASTM D5821.

.5 Rock and Gravel materials shall conform to the physical properties of Table 201-1 of the NBDTI Standard Specifications.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of existing subgrade are acceptable for Granular Sub-Base installation.

.1 Visually inspect subgrade in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PLACING

.1 Place Granular Sub-Base after subgrade is inspected and approved in writing by Departmental Representative.

.2 Construct Granular Sub-Base to depth and grade in areas indicated.

.3 The Contractor shall satisfy himself that the existing grade has been constructed to the lines and grades as indicated in the Contract Documents prior to the commencement of the work.

.1 Any deficiencies in grade shall be noted and submitted in writing prior to the commencement of the work.

.4 Granular Sub-Base materials shall not be placed on inundated, soft, muddy, potholed, rutted or frozen surfaces and work shall progress only once the work area has been approved by the Departmental Representative.

.1 Any ruts or potholes which appear in advance of the Aggregate placement shall be eliminated by scarifying, shaping and compacting, or if necessary, by excavating the unsuitable material and placing and compacting new material of the same quality.

.5 Prior to the placement of Granular Sub-Base, the slopes and ditches in the work area shall have been shaped to the satisfaction of the Departmental Representative, including any topsoil that may be required.

.6 The Granular Sub-Base shall be spread evenly and compacted in lifts minimizing the potential for segregation.

.1 The maximum Granular Sub-Base lift thickness shall be 300 mm.

.7 Each lift of Granular Sub-Base shall be bladed, shaped and compacted to produce the required profile and cross section.

.8 The final grade after shaping and compaction shall be to the specified tolerances.

.9 Spreading, shaping and compacting operations shall proceed simultaneously with the dumping operations and the Contractor shall, at the completion of any day, ensure that all material placed is shaped and compacted to the specified density.

.10 Crawler tractors and scrapers shall not be permitted for hauling or placing of Granular Sub-Base.

.11 The foreslope in the Granular Sub-Base layer shall be constructed to be free of ruts, ridges and/or undulations, to form a straight line slope in cross section.

.12 Granular Sub-Base materials shall not be bladed onto the subgrade foreslope.

.13 Any deterioration of the placement grade which appears during the course of the work and is directly or indirectly attributable to the Contractor shall be repaired to the satisfaction of the Departmental Representative before any work may continue over this area.

.14 The Contractor shall remove, from the work site, excess material and oversize stones which have been bladed to the sides of the layer

.15 The Contractor shall maintain the finished grade to the specified tolerances and to the specified density until the completion of the Contract.

.16 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

.17 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.

3.3 COMPACTION

.1 Compaction Equipment:

.1 Ensure compaction equipment is capable of obtaining required material densities.

.2 Compact to a minimum of 100% of the Standard Proctor Density in accordance with ASTM D698.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.4 Apply water as necessary during compacting to obtain specified density.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by Departmental Representative.

.6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.4 PROOF ROLLING

.1 The top of Granular Sub-Base shall be proof rolled using a standard roller of 45,400 kg gross mass with four pneumatic tires each carrying 11,350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.

.2 Obtain written approval from Departmental Representative to use non-standard proof rolling equipment.

.1 If use of non-standard proof rolling equipment is approved, Departmental Representative to determine level of proof rolling.

.3 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.4 Where proof rolling reveals areas of defective Granular Sub-Base:

.1 Remove sub-base and subgrade material to depth and extent as directed by Departmental Representative.

.2 Backfill excavated subgrade and sub-base with Granular Sub-Base materials and compact in accordance with this Section.

.3 Excavate and replace with new materials in accordance with this Section at no extra cost.

3.5 SITE TOLERANCES

.1 Finished base surface to be within plus or minus 25 mm of established grade and cross section but not uniformly high or low.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.7 PROTECTION

.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until Granular Sub-Base is accepted by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 05 16 — Aggregate Materials

.2 Section 31 24 13 — Roadway Embankments

.3 Section 32 11 16.01 — Granular Sub-base

1.2 REFERENCES

.1 ASTM International

.1 ASTM C117, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C127, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.

.3 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

.5 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.3 Ministry of Transportation of Ontario (MTO)

.1 MTO LS-614, Method of Test for Freezing and Thawing of Coarse Aggregate

.4 Standard Specifications for Highway Construction and Maintenance, New Brunswick Department of Transportation and Infrastructure, Items 201 and 203.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with 31 05 16 - Aggregate Materials.

1.5 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Aggregate Base, Shoulder Material and Crusher Tailings: material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:

.1 Approved hard, durable crushed quarried stones and sand particles.

.2 The aggregate shall be free from flat, elongated or other objectionable pieces and shall be approved by the Departmental Representative prior to utilization.

.3 Gradations to be within limits specified when tested in accordance with ASTM C117 and C136.

.1 Gradation to follow Table 201-2 (Crushed Rock) of the NBDTI Standard Specifications for Aggregate Base.

.2 Gradation to follow Table 201-6 of the NBDTI Standard Specifications for Shoulder Material.

.3 Gradation to be approved by Departmental Representative for Crusher Tailings (0-6mm).

.4 Gravel Base shall have a minimum of 40% of the particles, by mass, having at least one fractured face, when tested in accordance with ASTM D5821.

.5 Rock and Gravel materials shall conform to the physical properties of Table 201-1 of the NBDTI Standard Specifications.

Part 3 Execution

3.1 AGGREGATE BASE PLACING

.1 Place Aggregate Base after sub-base surface is inspected and approved in writing by Departmental Representative.

.2 Construct Aggregate Base to depth and grade in areas indicated.

.3 The Contractor shall satisfy himself that the existing grade has been constructed to the lines and grades as indicated in the Contract Documents prior to the commencement of the work.

.1 Any deficiencies in grade shall be noted and submitted in writing prior to the commencement of the work.

.4 Aggregate Base materials shall not be placed on inundated, soft, muddy, potholed, rutted or frozen surfaces and work shall progress only once the work area has been approved by the Departmental Representative

.1 Any ruts or potholes which appear in advance of the Aggregate Base placement shall be eliminated by scarifying, shaping and compacting, or if necessary, by excavating the unsuitable material and placing and compacting new material of the same quality.

.5 Prior to the placement of Aggregate Base, the slopes and ditches in the work area shall have been shaped to the satisfaction of the Departmental Representative, including any topsoil that may be required.

.6 The Aggregate Base shall be spread evenly and compacted in lifts minimizing the potential for segregation.

.7 Each lift of Aggregate Base shall be bladed, shaped and compacted to produce the required profile and cross section.

.8 The final grade after shaping and compaction shall be to the specified tolerances.

.9 Spreading, shaping and compacting operations shall proceed simultaneously with the dumping operations and the Contractor shall, at the completion of any day, ensure that all material placed is shaped and compacted to the specified density.

.10 Crawler tractors and scrapers shall not be permitted for hauling or placing of Aggregate Base.

.11 The foreslope in the Aggregate Base layer shall be constructed to be free of ruts, ridges and/or undulations, to form a straight line slope in cross section.

.12 Aggregate Base materials shall not be bladed onto the subgrade foreslope.

.13 Any deterioration of the placement grade which appears during the course of the work and is directly or indirectly attributable to the Contractor shall be repaired to the satisfaction of the Departmental Representative before any work may continue over this area.

.14 The Contractor shall remove, from the work site, excess material and oversize stones which have been bladed to the sides of the layer

.15 The Contractor shall maintain the finished grade to the specified tolerances and to the specified density until the completion of the Contract.

.16 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

.17 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.

3.2 COMPACTION

.1 Compaction Equipment:

.1 Ensure compaction equipment is capable of obtaining required material densities.

.2 Compact to a minimum of 100% of the Standard Proctor Density in accordance with ASTM D698.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.4 Apply water as necessary during compacting to obtain specified density.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by Departmental Representative.

.6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 PROOF ROLLING

.1 The top of Aggregate Base course shall be proof rolled using a standard roller of 45,400 kg gross mass with four pneumatic tires each carrying 11,350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.

.2 Obtain written approval from Departmental Representative to use non-standard proof rolling equipment.

.1 If use of non-standard proof rolling equipment is approved, Departmental Representative to determine level of proof rolling.

.3 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.4 Where proof rolling reveals areas of defective Aggregate Base course:

.1 Remove base, sub-base and subgrade materials to depth and extent as directed by Departmental Representative.

.2 Backfill excavated subgrade and sub-base with granular sub-base materials and compact in accordance with Section 32 11 16.01 - Granular Sub-base.

.3 Backfill excavated base with Aggregate Base course materials and compact in accordance with this Section.

.4 Excavate and replace with new materials in accordance with Section 32 11 16.01 - Granular Sub-base and this Section at no extra cost.

3.4 SHOULDER MATERIAL PLACEMENT

.1 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 their expense, to repair any damage to the adjacent and/or abutting finished surfaces resulting from this work.

.2 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.

.3 The Contractor shall spread the Shoulder Material evenly in lifts not exceeding 150mm uncompacted thickness and shall employ methods to limit segregation.

.1 Where surplus Aggregate Base has been windrowed along the shoulder during the fine grading work, the Contractor shall spread, shape and compact the windrowed material on the shoulder at this/her own expense, prior to placing any Shoulder Material under this Section.

.4 Shoulder material shall be compacted to a minimum of 100% of the Standard Proctor Density in accordance with ASTM D698 and shall be shaped with a blade grader while being compacted.

.5 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.

.1 Where the difference in elevation between the asphalt concrete and the Shoulder exceeds 70mm in any portion of the work, the Shoulder Material placement operation shall commence within 48 hours of the placement of the asphalt concrete.

.6 Shoulder material shall be placed in driveways and around guide rail posts and sign posts as directed by the Departmental Representative.

.1 The Contractor shall undertake all handwork that may be necessary to complete the work.

.7 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.

.8 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.

3.5 CRUSHER TAILINGS PLACEMENT

.1 The placement of crusher tailings shall be carried out in a manner so as to avoid damage to the adjacent and surrounding property.

.1 The Contractor shall be responsible, at their expense, to repair any damage to the adjacent and/or abutting finished surfaces resulting from this work.

.2 The Contractor shall spread the crusher tailings evenly in lifts not exceeding 100mm uncompacted thickness and shall employ methods to limit segregation.

.3 Crusher tailings shall be compacted with a static roller.

.4 The Contractor shall undertake all handwork that may be necessary to complete the work.

.5 The Contractor shall keep clean the adjacent surfaces.

3.6 SITE TOLERANCES

.1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.8 PROTECTION

.1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 12 16 Asphalt Paving

1.2 REFERENCES

.1 ASTM International

.1 ASTM D140/D140M, Standard Practice for Sampling Bituminous Materials.

.2 ASTM D244, Standard Test Methods and Practices for Emulsified Asphalts.

.3 ASTM D977, Standard Specification for Emulsified Asphalt.

.4 ASTM D2397, Standard Specification for Cationic Emulsified Asphalt.

.2 Standard Specifications for Highway Construction and Maintenance, New Brunswick Department of Transportation and Infrastructure, Item 259.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 The Contractor shall notify the Departmental Representative at least 3 days in advance of the application of asphalt tack coat.

.3 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for asphalt tack coat and include product characteristics, performance criteria, physical size, finish and limitations.

.4 Samples:

.1 Submit two - 4 L samples of asphalt tack coat material proposed for use in new, clean, airtight, sealed, wide mouth jars to Departmental Representative, at least 2 weeks prior to beginning Work.

.2 Sample asphalt tack coat material to: ASTM D140.

.3 Provide access on tank truck for Departmental Representative to sample asphalt material to be incorporated into Work to ASTM D140.

1.4 QUALITY ASSURANCE

.1 Upon request from, submit manufacturer's test data and certification that asphalt tack coat material meets requirements of this Section.

.2 Any contamination of the emulsified asphalt and/or deviation from this specification shall be corrected to the satisfaction of the Departmental Representative and at no cost to the Owner.

.3 Such deficiencies may be noted from samples of emulsified asphalt taken by the Departmental Representative. Any necessary remedial measures shall be done by the Contractor at no expense to Parks Canada and to the satisfaction of the Departmental Representative.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect asphalt tack coat.

.3 Replace defective or damaged materials with new.

.4 Deliver, store and handle materials in accordance with ASTM D140.

.5 Provide, maintain and restore asphalt storage area.

1.6 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Tack coat shall conform to the specifications for RS-1 or CRS-1 Grade asphalt emulsion and shall conform in all aspects to the provisions of ASTM D977 and D2397, respectively.

2.2 EQUIPMENT

.1 Equipment required for Work of this Section to be in satisfactory working condition and maintained for duration of Work.

.2 Pressure distributor:

.1 Shall be a self-powered pressure asphalt distributor, capable of applying the asphalt tack coat within ±5% of established application rates, and at a continuous and uniform rate both longitudinally and transversely. It shall consist of a fully insulated tank, permanently and rigidly mounted on a truck or trailer, capable of accurately maintaining any speed required for spraying.

.2 The distributor shall be provided with the following minimum equipment:

.1 Proper hand spray attachments to uniformly apply emulsion to any areas missed by the distributor.

.2 Measuring stick graduated in litres.

.3 An efficient and positive means of heating the asphalt tack coat uniformly to any selected temperature up to 100ºC, and maintaining the contents constantly at this temperature without any local overheating and including a satisfactory method of circulating the contents during the entire heating process.

.4 An approved thermometer with a minimum range of 10ºC to 100ºC, graduated in intervals of not more than 10ºC, so placed as to accurately show the temperature of the distributor contents, and to be accessible to the Departmental Representative.

.1 An approved tachometer, driven from a fifth wheel, mounted so that it is readily visible to the driver so that it clearly and accurately registers distances traveled when spraying emulsion, and so that it enables the driver to maintain a constant speed required to ensure the specified rate of application of the emulsion.

.5 A pressure gauge indicating the pressure in the spray bar within 15 kPa.

.6 A rear mounted spray bar set parallel to the surface to be sprayed, and capable of adjustment to provide any required spraying widths from 2.5 m to 3.5 m. The distributor shall be equipped with a spray bar heating and circulating device, to ensure uniform viscosity and pressure of the emulsified asphalt at each nozzle, both before and during spraying operations. The spray bar shall be provided with a positive shut-off to prevent dripping

.3 The circulating system shall also be provided with a strainer to prevent clogging of the bar and nozzles. The spray bar height shall be adjustable and shall be set at such a height that the spray fan from any nozzle overlaps the spray fan from the adjacent nozzle by two-thirds for triple-lap so that a uniformly sprayed surface will result. This height shall be set when the distributor is one-half full, and shall be changed only when permitted by the Departmental Representative.

.4 Spray bar nozzles shall be designed and set so as to ensure uniform fan shaped sprays. The nozzles shall not be set so as to produce such a fine mist that the asphalt tack coat will blow away and not provide an even spread. All spray nozzles shall be of the same and shall be provided with valves capable of instant full opening and positive cut-off. All spray nozzles shall be set in the bar so that the nozzle slots make the same horizontal angle (30º) with the longitudinal axis of the bar. Before work commences, and periodically as required during spraying operations, the nozzles on the spray bar shall be removed, cleaned sufficiently to remove all congealed asphalt and to free the nozzle opening. Each nozzle shall be inspected and approved by the Departmental Representative and reinstalled on the spray bar at the correct angle.

.5 A strainer shall be provided in the filling line to prevent entry of foreign material into the tank.

.6 A sampling valve shall be fitted on the spray bar or circulating line, and shall be readily accessible to allow samples of the emulsion to be obtained directly from the distributor.

.7 The distributor shall be checked for calibration by the Departmental Representative before being used on the work.

.8 An alternate means of application may be permitted for small or isolated areas at the discretion and approval of the Departmental Representative (for example, by brushing or spraying at longitudinal and transverse joint locations).

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for asphalt tack coat installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 APPLICATION

.1 Apply asphalt tack coat only on clean and dry surface.

.1 Immediately prior to the application of the asphalt tack coat, the Contractor shall clean surfaces to be tacked by means of a rotary power broom or hand brooms to remove all dirt, sand, dust or other objectionable matter.

.2 Apply asphalt tack coat only on unfrozen surface.

.3 The Contractor shall protect through traffic and adjacent highway/structure appurtenances from any asphalt tack coat overspray.

.1 The Contractor shall be responsible to remove any tack coat adhering to these surfaces.

.4 The Contractor shall apply a uniform cover, without streaking, of the RS-1 or CRS-1 asphalt tack coat with a distributor at a rate of 0.15 to 0.25 L/m^2, or as directed by the Departmental Representative, and at a temperature not less than 38ºC nor more than 66ºC.

.5 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt tack coat material.

.6 Evenly distribute localized excessive deposits of tack coat by brooming as directed by Departmental Representative.

.7 Asphalt tack coat shall be allowed to cure for such a time as approved the Departmental Representative, and traffic shall be diverted around freshly sprayed surfaces until the asphalt tack coat has set.

.8 Asphalt shall not be placed upon the asphalt tack coated areas until the asphalt tack coat has dried to a condition of tackiness.

.9 No more tack coat shall be applied than can be covered with asphalt concrete wearing surface in any one day.

.10 Asphalt tack coat application widths shall be such that approximately one-half the pavement width is left open to traffic with no tack coat applied.

.1 Asphalt tack coat applications shall be strictly limited in length, to minimize the inconvenience to the public and shall be kept within the asphalt concrete work area.

.2 The Contractor shall be responsible to reinstate any asphalt tack coat surface which becomes fouled due to weather and/or traffic. Re-tack contaminated or disturbed areas as directed by Departmental Representative.

.3 Control traffic in accordance with Section 01 35 00.06 - Special Procedures for Traffic Control.

.11 Submit summary report within 7 days minimum of date of application and include information as follows:

.1 Total area tack coated.

.2 Quantity of tack coat used.

.3 Mean application rate.

.4 Actual product quantity used when using equipment on pressure distributors.

.5 Dipstick measurements or electronic printouts are acceptable.

.12 Carry out measurements in presence of Departmental Representative upon request.

.13 Inspect tack coat application to ensure uniformity.

.1 Re-spray areas of insufficient or non-uniform tack coat coverage as directed by Departmental Representative.

.2 Ensure tack coating performed using hand held devices is consistent in appearance with adjacent areas of machine applied material

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section covers asphalt concrete paving on reconstructed and asphalt cold milled roadbeds and shall meet the general requirement of New Brunswick Department of Transportation and Infrastructure, Type "B" and "D" except where noted. It also covers the construction of other required asphalt work.

.2 Paving operations shall be completed no later than October 22, 2018 and may only extend beyond this date if weather and temperature conditions permit and only if authorized by the Departmental Representative.

1.2 RELATED REQUIREMENTS

.1	Section 02 41 13.14	Asphalt Paving Removal
.2	Section 31 05 16	Aggregate Materials
.3	Section 32 12 13.16	Asphalt Tack Coat
.4	Section 32 17 23	Pavement Markings

1.3 REFERENCES

.1 American Association of State Highway and Transportation Officials (AASHTO)

- .1 AASHTO M156, Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
- .2 AASHTO MP1, Standard Specification for Performance Graded Asphalt Binder.
- .3 AASHTO PP6, Standard Practice for Grading or Verifying the Performance Grade of an Asphalt Binder.
- .4 AASHTO T245, Standard Method of Test for Resistance to Plastic Flow of Asphalt Mixtures Using Marshall Apparatus.

.2 Asphalt Institute (AI)

- .1 AI MS-2, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.

.3 ASTM International

- .1 ASTM C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
- .2 ASTM C117, Standard Test Method for Material Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
- .3 ASTM C123, Standard Test Method for Lightweight Particles in Aggregate.
- .4 ASTM C127, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.
- .5 ASTM C128, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Fine Aggregate.

.6 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.7 ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

.8 ASTM C207, Standard Specification for Hydrated Lime for Masonry Purposes.

.9 ASTM D75, Standard Practice for Sampling Aggregates.

.10 ASTM D140,Standard Practice for Sampling Bituminous Materials.

.11 ASTM D2041, Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.

.12 ASTM D2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

.13 ASTM D2726, Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.

.14 ASTM D2950, Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.

.15 ASTM D3549, Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.

.16 ASTM D3665, Standard Practice for Random Sampling of Construction Materials.

.17 ASTM D4469, Standard Practice for Calculating Percent Asphalt Absorption by the Aggregate in an Asphalt Pavement Mixture.

.18 ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

.19 ASTM D6926, Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus.

.20 ASTM D6927, Standard Test Method for Marshall Stability and Flow of Asphalt Mixtures.

.21 ASTM D7113, Standard Test Method for Density of Bituminous Paving Mixtures in Place by the Electromagnetic Surface Contact Methods.

.4 Standard Specifications for Highway Construction and Maintenance, New Brunswick Department of Transportation and Infrastructure, Item 260.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

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

.1 The Contractor shall be responsible to deliver all samples obtained for testing to the Owner.

.3 The Contractor shall notify the Departmental Representative 3 days in advance of the commencement of the production of the asphalt concrete mix.

.4 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 (2L/mix) and a sample of any proposed admixtures, 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, this proposed change prior to using the new asphalt binder supply in the work.

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

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

1.5 DELIVERY, STORAGE AND HANDLING

.1 Handling and Stockpiling Aggregates:

.1 The coarse aggregate, fine aggregate and blending sand shall each be stockpiled separately.

.2 Stockpiles shall be placed on a level, well drained base and constructed in such a manner that segregation and contamination does not occur.

.3 Segregated or contaminated stockpiles shall not be incorporated into the work.

.4 Production or asphalt concrete shall not commence until all of the aggregate types are produced and in stockpile, unless specifically designated in writing by the Departmental Representative.

.5 Aggregates shall be loaded into cold feed bins so as to prevent the intermixing of separate sizes.

.6 Mixing of materials or loading of more than one type of material into a single bin shall not be permitted.

.2 There will be no separate payment for mobilization and demobilization to site.

1.6 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.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 M320, Table 1 – Performance Graded Asphalt Binder Specification.

.4 When the anti-stripping admixtures are required, the asphalt binder grade shall meet the specified requirements of 2.1.1.3, after the addition of the required admixtures.

.5 The contractor shall provide one sample of asphalt binder per Contract, taken in accordance with ASTM D140 from the Contractor's asphalt binder storage tanks.

.1 The sample containers and labels shall be supplied by the Departmental Representative.

.2 Sampling shall be on a random basis, as determined by and in presence of the Departmental Representative.

.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 4.75mm sieve, tested in accordance with ASTM C136, and shall meet the physical requirements of Table 2-1.

Table 2-1

Superpave Asphalt Concrete Mix Requirements

Sieve Size ASTM Designation		**Type B**	**Type C**	**Type D**
		% (by mass) Passing Each Sieve		
Coarse Aggregate	25.0mm	100	-	-
	19.0mm	84.0-98.0	-	-
	16.0mm	72.0-94.0	100	-
	12.5mm	60.0-87.0	88.0-98.0	100
	9.5mm	51.0-75.0	68.0-90.0	76.0-98.0
	6.3mm	41.0-66.0	54.0-77.0	60.0-84.0
Fine Aggregate	4.75mm	34.0-60.0	46.0-69.0	52.0-70.0
	2.36mm	22.0-50.0	28.0-58.0	36.0-65.0
	1.18mm	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	2.0-6.0	2.0-6.0
Physical Requirements for Asphalt Concrete				
Air Voids (%)		3.0-5.0	3.0-5.0	3.0-5.0
VMA % (min)		13.5	14.5	15.5
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

Table 2-1 continued

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)			
	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
Absoption %(max)	ASTM C 127	1.50	1.50	1.50
*Note: Not mandatory, the Owner reserves the right to obtain a Petrographic No.				

Physical Requirements for Fine Aggregate	**Type B**	**Type C**	**Type 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.			

.4 For ≥ 3 million Design ESALs, coarse aggregate may be produced from pit run gravel by crushing the fraction retained on the 31.5mm sieve, provided no more than 10% of the retained material passes the 31.5mm sieve, as determined by the 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 4.75mm sieve, when tested in accordance with the ASTM C117 and C136, and shall meet the physical requirements in Table 260-1.For ≥ 3 million Design ESALs, fine aggregate may be produced from pit run gravel by crushing the fraction retained on the 6.3mm

sieve, provided that no more than 5% of the retained material passes the 6.3mm sieve, as determined by ASTM C136 and C117.

.4 Material produced as per 2.1.3.3 and passing the 4.75mm sieve may be used as fine aggregate.

.5 Fine aggregate may also be accepted or rejected on the basis of past performance.

.4 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 2-1 and the source shall be approved by the Departmental Representative before the material is incorporated into the asphalt concrete mix.

.3 The maximum mass of blending sand to be used in the total asphalt concrete mix shall not exceed 10% of total mass.

.4 Blending sand shall have 100% passing the 9.5mm sieve prior to the introduction into the cold feed at the plant.

.5 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 anti-stripping admixtures listed in table 2-2 for use in the Work.

Table 2-2
Approved Anti-stripping Admixtures

Product
Redicote 82-S Redicote C 3280 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.

2.2 EQUIPMENT

.1 General:

.1 Equipment shall be on site and available for inspection, testing and approval before paving operations start.

.2 The Contractor shall provide safe access to the plant and Equipment for purposes pertaining to the Work.

.2 Haul Trucks:

.1 Sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:

.1 Boxes with tight metal bottoms, free of foreign materials.

.2 Vehicles shall be equipped with tarpaulins of water repellant material with a maximum mesh size of 0.5 mm when stretched, a minimum melting point of 200 °C and of sufficient size to completely cover truck bodies from edge of box to edge of box and overlap the tailgate. Tarps shall be in good condition and shall have no holes or tears. The tarps shall be securely tied down so there is no visible opening between the truck box and tarp to prevent air infiltration.

.3 Vehicles shall also be equipped with wind deflectors at the front of the truck box. If it is raining or if the temperature of the asphalt concrete drops more than 10 °C between the time of leaving the plant and placing on the road, tarpaulins shall be used. Tarpaulins shall be used at any other time at the Departmental Representative's request.

.4 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

.5 Tarpaulins shall be rolled back and the asphalt concrete shall be uncovered immediately prior to dumping the load into the material transfer vehicle.

.6 Use only trucks which can be weighed in single operation on scales supplied.

.3 Material Transfer Vehicle (MTV):

.1 Material transfer vehicles 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.

.2 The Contractor shall use a material transfer vehicle for the placement of all asphalt concrete.

.4 Placing Equipment:

.1 Mechanical self-powered pavers shall be capable of spreading mix true to line, grade and cross-Slope.

.2 Pavers shall be equipped with hoppers and distributing screws to place mix evenly in front of the screeds.

.3 Pavers shall be equipped with vibrating screeds and shall be capable of spreading mixes, without segregation and with a smooth and uniform textured surface, to the required thickness and in widths from 3 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 for the control of longitudinal grade and transverse slope.

.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 of 12 m ski/floating beam or an approved equivalent for the 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 3m.

.1 Hydraulic strike-off extensions are only acceptable when laying mats of irregular widths outside of driving lanes.

.2 Screed cut off shoes may be used when placing widths less than 3m.

.5 Compaction Equipment:

.1 All rollers shall be of types specifically designed for asphalt compaction.

.2 Rollers shall be in good condition and capable of reversing without backlash.

.3 Steel wheeled rollers shall be equipped with a means of supplying a controlled flow of water to the wheels to prevent adhesion of the asphalt mix.

.4 Pneumatic-tired rollers shall be equipped with a means of supplying a controlled flow of water to the wheels to prevent adhesion of the asphalt mix.

.5 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.

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

.1 Vibratory roller

.2 Pneumatic tire roller

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

.6 Hand tools:

.1 Lutes or rakes with covered teeth for spreading and finishing operations.

.2 Tamping irons having mass 12 kg minimum and bearing area not exceeding 310 cm^2 for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by Departmental Representative, may be used instead of tamping irons.

.3 Straight edges, 4.5 m in length, to test finished surface.

2.3 MIX DESIGN

.1 Responsibility for Design Mix Formula:

.1 Preparation and submission of the asphalt Design Mix Formula (DMF) for the Owner's approval is the responsibility of the Contractor.

.1 The Contractor shall use Professional Engineering services and a qualified Laboratory to assess the aggregate materials proposed for use and to carry out the design on the asphalt concrete mix.

.2 Requirements for Design Mix Formula:

.1 The Design Formula is the Laboratory determination of the precise proportions of asphalt binder and aggregates to be blended together to meet the requirements in Table 2-1.

.1 The asphalt concrete mix design shall follow AASHTO R35 Standard Practice for Superpave Volumetric Design for Hot-Mix Asphalt (HMA), AASHTO R30 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 Gyratory Compactor.

.3 Approval of Design Mix-Formula/Aggregate Source Approval:

.1 The Contractor shall submit the DMF including the following I information/materials to the Departmental Representative for approval at a location(s) designated by the Departmental Representative.

.1 A list of all constituent materials, including aggregate source(s), blending sand source(s), asphalt binder source(s) and anti-stripping admixtures 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 2-1.

.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)-18kg samples of fine aggregates, (2)-18kg samples of blending sand, and 0.5L of anti-stripping admixture, if necessary.

.8 A sample of the asphalt binder (4L/mix).

.2 If the DMF does not meet requirements of Table 2-1 it shall be rejected

.1 The Departmental Representative 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 Departmental Representative for approval.

.3 The Departmental Representative shall not accept any asphalt concrete mix produced prior to the Contractor receiving written approval of the DMF from the Departmental Representative.

.4 Job Mix Formula:

.1 The Job Mix Formula (JMF) establishes the single definite percentage for the 4.75mm and 75µm sieve fractions of the aggregate and for the asphalt binder that shall produce the desired asphalt concrete mix properties under field conditions.

.1 The JMF is established by producing one or more trial asphalt concrete mixes using the plant proposed for the Work.

.2 The Design Asphalt Binder Content is the asphalt binder content established by the DMF.

.3 The Approved Asphalt Binder Content is the asphalt binder content determined by the JMF.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for asphalt paving.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with placement only after unacceptable conditions have been remedied.

3.2 PRODUCTION

.1 Production or Aggregates:

.1 Grading Requirements

.1 Pit run gravel or quarried rock shall be crushed and separated into coarse and fine aggregates.

.2 Washed Aggregates

.1 Washed materials or materials excavated from underwater shall be stored for at least 24 hours to allow free water to drain from the aggregate and allow the material to attain a uniform moisture content.

.3 Blending 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.

.2 Physical Requirements for Asphalt Concrete:

.1 Once the JMF has been designated by the Departmental Representative, the Contractor shall produce an asphalt concrete mix to the mix control tolerances as shown in Tables 2-1 and 3-1

Table 3-1
Acceptance Criteria

Test Properties	Criteria
Air Voids	2.50%-5.00%
Asphalt Binder Content	JMF ± 0.40
Percent Passing 4.75mm Sieve	JMF ± 6.0
Percent Passing 75µm Sieve	JMF ± 1.0

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

.3 Plant Calibration and Trial Mix:

.1 The Contractor shall provide to the Departmental Representative a copy of the plant calibration.

.2 The trial mix based on the Design Mix Formula shall be prepared by the Contractor for testing by the Departmental Representative and shall only be carried out during normal working hours.

.3 Continuous placement of asphalt concrete in the Work shall only be permitted after the Departmental Representative is satisfied that the mix properties are in accordance with the applicable specified requirements.

.4 Trial mixes are the property of the Contractor and shall be placed outside of the Work Site, unless otherwise authorized by the Departmental Representative for the purpose of padding or patching.

.4 Mixing Times and Temperatures:

.1 For batch plants, the wet mixing time, beginning when the asphalt binder is introduced into the pugmill, shall be 35 seconds, longer if required, to produce a homogeneous mix where all of the aggregate is thoroughly coated with asphalt binder.

.2 The mixing time for drum mix plants shall be such to produce a homogeneous mix where all of the aggregate is thoroughly coated with asphalt binder.

.3 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 ± 5° of the temperature requirement of the DMF, unless otherwise authorized by the Departmental Representative.

.1 The maximum mixing temperature for Hot Mix Asphalt Concrete shall be 165°C or the temperature recommended by the asphalt binder supplier.

.4 During paving operations the Contractor shall produce only asphalt concrete mix(es) in the Contract.

.5 Moisture Content:

.1 The maximum moisture content allowed in the asphalt concrete mix as it is discharged from the mixing unit shall not exceed 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.

3.3 PREPARATION

.1 When paving over existing asphalt surface, clean pavement surface to approval of Departmental Representative.

.1 When levelling course is not required, patch and correct depressions and other irregularities to approval of Departmental Representative before beginning paving operations.

.2 Apply tack coat in accordance with Section 32 12 13.16 - Asphalt Tack Coat prior to paving.

.3 Prior to laying mix, clean surfaces of loose and foreign material.

3.4 TRANSPORTATION OF MIX

.1 Transport mix to job site in vehicles as per 2.2.2.

.2 Deposit mix from surge or storage silo to trucks in multiple drops to reduce segregation.

.1 Do not dribble mix into trucks.

.3 Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.

.4 Deliver loads continuously in covered vehicles and immediately spread and compact.

.1 Deliver and place mixes at temperature within range not less than 135°C.

3.5 PLACING

.1 Timing of Paving Operations:

.1 Paving operations shall not commence in the spring until the DTI Weight Restrictions are lifted or continue after October 22nd without written permission of the Departmental Representative.

.2 Paving operations shall only be conducted during daylight hours unless specifically altered by written approval by the Departmental Representative.

.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.

.2 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.

.3 When paving on an Aggregate Base, the Aggregate Base must be free from standing water and at least 300 m of prepared base shall be maintained ahead of pavers.

.4 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 Contract Documents prior to the placing of the asphalt concrete.

.5 Existing approaches to railway crossings and bridges, 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 Departmental Representative.

.1 The removed materials shall be disposed of and the exposed surfaces shall be prepared as identified in the Contract Documents or as directed by the Departmental Representative.

.6 Contact edges of existing mats and contact faces of curb, gutter, manholes, sidewalks and bridge structures shall receive an application of tack coat before placing the asphalt concrete.

.7 The temperature of the hot mixed asphalt concrete shall be a minimum of 115°C prior to initial compaction.

.8 The maximum temperature of the hot mixed asphalt concrete mix shall be 165°C or the temperature recommended by the asphalt binder supplier.

.9 When laying base and/or surface course the alignment of the paver shall be controlled by an approved method, such as following a stringline, placed by the Contractor from an alignment designated by the Departmental Representative.

.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 ±0.5% (±15mm when measured over 3 m, perpendicular to the centerline) of the cross slope specified in the Contract Documents or provided by the Departmental Representative.

.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 the 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 Departmental Representative.

.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 Departmental Representative.

.15 Adjacent asphalt concrete mats, including those placed on shoulders, shall be completed to approximately the same location at the end of each day's paving.

.16 For ESAL counts equal to or greater than 3 million, no traffic shall be permitted on the 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 under this Item.

.17 Damage to the mat as a result of a contaminant spills from the Contractor's Equipment shall be immediately repaired by the Contractor to the satisfaction of the Departmental Representative.

.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 Departmental Representative.

.19 The speed of the paver shall be matched to the production of the asphalt plant to ensure continuous operation of the paver.

3.6 COMPACTING

.1 Compact asphalt concrete continuously using established rolling pattern.

.2 Do not change rolling pattern unless mix changes or lift thickness changes.

.1 Inform Departmental Representative prior to making changes to rolling pattern.

.3 General:

.1 Provide at least three rollers and as many additional rollers as necessary to achieve specified pavement density.

.2 Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.

.3 Operate roller slowly initially to avoid displacement of material. Do not exceed 5 km/h for breakdown and intermediate rolling for static steel-wheeled and pneumatic tired rollers. Do not exceed 8 km/h for finish rolling.

.4 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 25 impacts per metre of travel. For lifts less than 50 mm thick, impact spacing not to exceed compacted lift thickness.

.5 Overlap successive passes of roller by by at least one half width of roller and vary pass lengths.

.6 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water and do not use diesel fuel.

.7 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.

.8 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.

.9 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side.

.1 Ensure that all points across width of pavement receive essentially equal numbers of passes of compactors.

.10 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

.11 Do not refuel rollers on fresh asphalt concrete.

.4 Breakdown rolling:

.1 Begin breakdown rolling with vibratory roller immediately following rolling of transverse and longitudinal joint and edges.

.2 Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.

.3 Operate breakdown roller with drive roll or wheel nearest finishing machine. Exceptions may be made when working on steep slopes or super-elevated sections.

.4 Use only experienced roller operators.

.5 Intermediate rolling:

.1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.

.2 Rolling to be continuous after initial rolling until mix placed has been thoroughly compacted.

.3 Conduct rolling operations in close sequence.

.6 Finish rolling:

.1 Use static finish roller to remove roller marks and achieve smooth driving surface.

.7 All asphalt concrete shall be compacted to 92.5% of Theoretical Maximum Relative Density (TMRD) in accordance with ASTM D3203.

.8 The Contractor will supply additional compaction equipment if required density is not achieved.

3.7 JOINTS

.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 join construction or other Work activity, outside the work site before the end of each week.

.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 mix 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 condition noted above; a smooth 1.5 m long taper shall be paved.

.3 When paving resumes, tapers from the 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 the Contract Documents.

.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 Contract Drawings between the existing and new asphalt concrete Pavement, at the beginning and at the paving limits and other locations, as determined by the Departmental Representative.

.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 1.5 m long taper at the joint area, as shown in Contract Drawings.

.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 Contract Documents.

.2 When the elevation of the new asphalt concrete pavement is 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.

.4 Longitudinal Joint:

.1 Longitudinal joints are not be permitted between the edges of the driving lanes.

3.8 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 Contract Drawings.

.4 The Contractor shall submit a rolling pattern for the approval of the Departmental Representative.

.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 and turning.

.8 The mat shall be finish rolled to remove any marks.

3.9 FINISH TOLERANCES

.1 Finished asphalt surface to be within 6 mm of design elevation but not uniformly high or low.

3.10 TEMPORARY MARKINGS

.1 The Contractor shall place temporary pavement markings before sunset following each day's work. Marking material, spacing and type shall be approved by the Departmental Representative.

3.11 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 3 mm as measured with a 3 m straight edge.

.2 Any obvious defects, as determined by the Departmental Representative, shall be cause for rejection of the pavement course.

.1 Multiple defects within a 10 metre section shall be considered as one defect.

.2 If a defect is continuous beyond 10 metres it shall be considered as one defect.

.3 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 on the mat;

.10 Flushed areas; and

.11 Pneumatic-tired roller pickup.

.4 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required.

.5 Repairs to correct surface defects shall carried out by removal and replacement with the same asphalt concrete mix designation as that which is removed or by routing and crack sealing. The method of repair shall be determined by the Departmental Representative.

.1 The full thickness of the appropriate lift of rejected pavement course shall be removed by cold milling or other means as approved by the Departmental Representative.

.2 All joints shall be tack-coated.

.3 Repair 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 it outside the work site.

3.12 DEFECTIVE WORK

.1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form a true and even surface and compact immediately to specified density.

.2 Repair areas showing checking or rippling. Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

3.13 QUALITY ASSURANCE/PAYMENT ADJUSTMENT

.1 Quality Assurance testing for payment adjustment to be performed by Departmental Representative.

.2 Mix Tolerance:

.1 Sampling and Testing of Asphalt Concrete Mix:

.1 Loose mix samples will be collected every 500 tonnes by Departmental Representative, with a minimum of one (1) per day.

.1 Departmental Representative will determine sampling locations.

.2 Asphalt concrete mix production shall be monitored throughout the period of the work and shall be accepted or rejected on the basis of the testing performed by the Departmental Representative, as per NBDTI Manual: Sampling and Testing of Asphalt Concrete Mix and Pavement Cores, Item 260.

.3 The Contractor shall be provided a copy of all test results as soon as they are available and shall be notified if any test results indicates that materials are being produced outside of the specified limits.

.2 Control of Asphalt Concrete Mix Production:

.1 Once a test result indicates that the material being produced does not meet the specified limits in Tables 2-1 and 3-1, the material shall be handled as follows:

.1 The Departmental Representative may suggest changes to the constituent materials to return test properties within the specified limits.

.2 The Contractor may suggest changes to asphalt plant settings to return test properties within specified limits.

.2 Regardless of changes being made, a second mix sample shall be obtained from plant production and tested within one hour of notification that the asphalt concrete mix test results do not meet specified limits.

.3 If the test result from the second sample indicates that the mix does not meet the specified limits, plant production may be suspended.

.1 Plant production of asphalt concrete mix shall not resume until an acceptable trial mix is produced in accordance with 3.2.2 and 3.2.3.

.4 The Departmental Representative may request the asphalt concrete mix be removed if it is determined that asphalt concrete placed is not within specified limits.

.3 Asphalt Compaction:

.1 The Contractor shall be responsible for quality control testing to ensure that the density conforms with the requirements of this Item.

.2 Compaction testing will be based on the average compaction of three (3) cores from stratified random locations each day of paving as determined by the Departmental Representative.

.3 Theoretical maximum density will be based on the average of the day's loose mix samples.

.4 Payment adjustment as per the following table:

Average Compaction (% of maximum theoretical density)	Adjustment $/Tonne
> 93.0	+0.50
92.5 – 93.0	+0.25
92.5	0.00
92.0 – 92.4	-0.25

91.5 – 91.9	-1.00
91.0 – 91.4	-2.00
90.5 – 90.9	-4.00
90.0 – 90.4	-6.00
89.5 – 89.9	-11.00
89.0 – 89.4	-16.00
< 89.0	Reject

.5 Rejected hot mix asphalt will not be paid by the Owner and Contractor will bear the cost of repairs. Only original contract quantity will be paid.

3.14 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Standard Specifications for Highway Construction and Maintenance, New Brunswick Department of Transportation and Infrastructure, Item 191.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.1 Supply calcium chloride in quantities and at times as directed by Departmental Representative.

.2 Deliver calcium chloride to site in moisture-proof bags. Indicate name of manufacturer, name of product, net weight or mass, and percentage of calcium chloride guaranteed by manufacturer.

.3 Storage and Handling Requirements:

.1 Store bags of calcium chloride in weather-proof enclosures.

1.4 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Calcium chloride, Type I: to CAN/CGSB-15.1, flake or 35% aqueous solution.

.2 Water: in accordance with Departmental Representative's approval.

.1 Water for dust control can be obtained from within the Park Boundaries and shall be approved by and coordinated with the Departmental Representative.

Part 3 Execution

3.1 APPLICATION

.1 Apply calcium chloride and water with equipment approved by Departmental Representative at rate of 1 l/m^2 for liquid when directed by Departmental Representative.

.2 Apply water with distributors equipped with means of shut-off and with spray system to ensure uniform application.

.3 Failure to provide adequate dust control measures resulting in suspension of the work will be the responsibility of the Contactor.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International

.1 ASTM D711, Standard Test Method for No-Pick-Up Time of Traffic Paint.

.2 ASTM D868, Standard Practice for Determination of Degree of Bleeding of Traffic Paint.

.3 ASTM D1155, Standard Test Method for Roundness of Glass Spheres.

.4 ASTM D1210, Standard Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage.

.5 ASTM D1214, Standard Test Method for Sieve Analysis of Glass Spheres.

.6 ASTM D1309, Standard Test Method for Settling Properties of Traffic Paints during Storage.

.7 ASTM E1347, Standard Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry.

.2 Canadian General Standards Board

.1 CGSB 1-GP-1-71, Method of Testing Paints and Pigments

.3 New Brunswick Work Area Traffic Control Manual.

.4 Transportation Association of Canada, Manual of Uniform Traffic Control Devices for Canada.

.5 Standard Specifications for Highway Construction and Maintenance, New Brunswick Department of Transportation and Infrastructure, Item 571.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature and data sheets for pavement markings and include product characteristics, performance criteria, physical size, finish and limitations for paint and glass beads.

.2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Samples:

.1 Submit to Departmental Representative following material sample quantities.

.1 A one litre sample of each of the yellow and white paint, in sealed air tight containers, from the paint truck on site, and a 15 kg bag of the glass beads.

.2 Once the Departmental Representative has approved the suppliers and materials to be used, the Contractor shall be responsible for additional testing costs should they change suppliers.

.3 Samples may be taken from shipments at any time. At the discretion of the Departmental Representative, the samples may be tested and analysed by an independent authority or otherwise. Results obtained from the analysis showing non-conformity to this specification shall be cause for rejection of all or a portion of the shipment.

.2 Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, MPI specification number and formulation number and batch number.

.4 Testing:

.1 Testing costs shall be borne by the Owner if test results are satisfactory, and by the Contractor if test results fail. In the latter case, samples from another batch of paint and/or glass beads shall be taken for new tests.

.2 Should the Contractor wish to appeal any test results, such appeal may be made only once and in writing within 48 hours of his receipt of test results.

.1 The Contractor shall make provision for the Departmental Representative to obtain additional samples for the appeal testing, the results of which shall be binding both on the Owner and the Contractor.

.2 Testing costs from the appeal shall be borne by the Owner if test results are satisfactory and by the Contractor if test results fail.

.5 The Contractor shall submit, in writing, certification that the equipment proposed for the work is capable of applying the Pavement markings as outlined in this Section.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

.4 Disposal of empty containers according to Environmental Regulations shall be the responsibility of the Contractor.

1.4 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Paint:

.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 below:

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 (minimum in kg/L): Pigment Description Silicon dioxide (as SiO_2) Titanium dioxide	 Yellow 0.20 0.075	 White 0.20 0.15
4.14	Change ASTM E97 to ASTM E1347. Add: yellow not less than 60%		
4.15	Paint colours to match samples provided by Owner, as applicable		
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 600mg/kg			

.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.

.6 The chemical composition shall be determined by the paint manufacturer but shall comply with the requirements of the table below:

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 DR-250NA Emulsion, or Engineer-approved equivalent		
White Paint	100		
Titanium Dioxide (g/L)[2]			
Yellow Paint			
Titanium Dioxide (g/L)[2]	75		

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 600mg/kg

.7 The physical properties shall comply with the table below:

Physical Properties of Waterborne Traffic Paint

Property	Min	Max	Test Method
No-Pickup Time, minutes		8	ASTM D711
Non-tracking Time, seconds[1]		60	
Volatile Organic Compound (VOC) Content excluding water, g/L		150	ASTM D3960
Freeze-Thaw Resistance	Pass		ASTM D2243
Viscosity, Krebs Unit (KU) @ 25°C	80	100	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): 250µm 150µm	 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		ASTM E1357
NOTE: Non-tracking time for Regular Water Based striping paint based on 375µm (15 mils) wet film thickness applied on dry pavement having temperature > 10°C, under humidity conditions ≥80%.			

.2 Glass Beads:

.1 The beads shall be true spheres and their surface shall be smooth, lustrous and free from cavities and scratches. The beads shall be manufactured from glass of a composition designed to be resistant to the effects of traffic wear and weathering. No foreign material shall be contained in or among the beads.

.2 The glass beads shall be colourless to the extent that they do not impart a noticeable hue to the paint.

.3 The index of refraction of the glass beads shall not be less than 1.50 when tested in accordance with Method 49.1 of CGSB 1-GP-71.

.4 The glass beads shall meet the following gradation requirements:

.1 Gradation to:

Sieve Opening, µm	Percent Passing
850	100
600	80 – 100
300	20 – 35
150	0 – 8
75	0 – 2

.5 Tests for gradation shall be made in accordance with ASTM D1214. The sample size shall not be less than 50 g or more than 100 g

.6 A minimum of 75% by mass of the glass beads shall be true spheres. The percentage of true spheres shall be determined by ASTM D1155, or, on a sample of approximately 1000 beads contained loosely in a culture dish, by counting the number of true spheres under reflected light and magnification as follows:

.1 Retained on the 300 µm sieve size, under 50X magnification;

.2 Passing the 300 µm sieve size, under 100X magnification.

.7 Failure to meet roundness requirements by either method will be cause for rejection.

.8 The surface of the beads shall be smooth, lustrous and free from film, cavities, scratches and pits. Not more than 25% of the true spheres shall have imperfections in the form of milkiness, air inclusions, dark specks and incipient fractures. These properties shall be determined using Method 149.1 of CGSB 1-GP-71.

.9 The beads shall not agglomerate during storage and application. They shall be treated in such a manner as to overcome the effect of water, both as a vapour and a liquid, on the beads before the beads are added to the paint stripe. They shall flow freely from dispensing equipment at any time when surface and atmosphere conditions are satisfactory for painting. Moisture resistance shall be tested by the method described as follows:

.1 A 100 g sample of glass beads shall be placed in a 500 ml beaker and an equivalent volume of distilled water shall be added to the beaker. The beaker shall then stand for 5 minutes at the end of which time the water shall be carefully poured off and the glass beads transferred to a clean dry beaker and allowed to stand for 5 minutes. The beads shall then be poured slowly into a standard 125 mm glass funnel having a stem of 125 mm length and 10 mm inside diameter.

.2 The beads shall flow through the stem without stoppage. Slight initial agitation to start the flow through the funnel at the beginning of the test is permissible.

.10 When the glass beads are exposed to atmospheric conditions, humidity, diluted acid or alkali solutions or paint film constituents, there shall be no dulling of the surface which would adversely affect reflective properties of the beads.

.1 Calcium chloride resistance shall be determined in the following manner:

.1 Place 10 g of beads in a 1000 ml beaker;

.2 Cover the sample with 500 ml of calcium chloride (1.0 Normal Solution);

.3 Let the beads soak for three hours;

.4 Rinse the beads three times with 100 ml of distilled water and dry;

.5 Examine the beads under a microscope and compare them with an untreated sample.

.2 Dulling of the surface or other detrimental effects shall constitute failure of this test.

.11 The beads shall have both a moisture resistant coating, and an adhesion-promoting silane coating. The beads shall pass the moisture resistance test (per 2.1.2.9), and the adherence coating test.

.12 The adherence coating test shall use a solution of 0.2 g of dansyl chloride dissolved in 25 ml of acetone. This solution may be used for several tests during the day if kept refrigerated in a closed dark container between uses. A fresh solution shall be made daily.

.13 The adherence coating test shall be performed as follows:

.1 Weigh 10 g of beads and place in aluminum trays.

.2 Saturate the beads with dansyl chloride solution using an eyedropper.

.3 Dry the beads in an oven at 60 °C for 15 minutes. (Beads will be yellow and agglomerated.)

.4 Rinse the beads in a funnel lined with new filter paper and pour 100 mL of acetone over them. Use suction during this step.

.5 Remove the beads from the funnel and place in aluminum trays.

.6 Over-dry the beads until free flowing

.7 Place the glass beads on filter paper and inspect colour under ultra-violet light in a dark room. A yellow-green fluorescence will be observed if adherence coating is present.

.14 If all beads have a yellow-green fluorescence, the adherence coating is properly applied and the beads are acceptable. If only some of the beads have a yellow-green fluorescence, the beads are not properly coated and this is cause for rejection. If no yellow-green fluorescence is seen adherence coating was not applied and this is a cause for rejection.

.15 The glass beads shall be furnished in clean, durable, waterproof bags containing 25 kg each. Bags shall be of one of the following types:

.1 Woven polypropylene, lined inside with a sprayed polyethylene coating of 0.25 mm thickness

.2 285 gram jute, with polyethylene liner of 0.50 mm

.3 22.67 kg basis weight, multi-walled kraft paper, with polyethylene liner of 0.50 mm thickness.

.4 These bags shall be able to withstand handling and storage between packaging and application of the beads, and shall be constructed so as to avoid contamination of the beads with foreign materials. Both ends of the bags shall be securely sealed to prevent leakage.

.5 Bags of glass beads shall be supplied on nonreturnable wood pallets, 40 - 60 bags per pallet, and shall be lashed or secured to the pallet.

Part 3 Execution

3.1 PAVEMENT MARKING DRAWINGS

.1 Where a pavement marking drawing is provided, the Contractor is required to paint markings as indicated on the Drawing. Where a pavement marking drawing is not

provided, the Contractor is to accurately inventory existing markings by topographic survey methodologies. Departmental Representatives' approval of the Contractor's inventory drawing is required prior to the cold milling or pulverization of the existing asphalt pavement. In locations where a pavement marking drawing is not provided, the following shall apply to assist the Contractor in establishing uniformity in the development of pavement marking drawings/descriptions. This checklist should be used as a guide to ensure that all of the basic elements are covered.

.1 For locations which require a scaled and surveyed drawing:

.1 The Contractor shall submit a pavement marking drawing that is to a 1:500 scale. Drawings shall be submitted in PDF form and printed to either an 11 x 17 or A-1 size. The pavement marking drawing shall be produced from a survey and shall inventory the existing pavement markings. The Contractor shall be responsible for including any revisions as directed by the Departmental Representative. The inventory shall include pavement markings at the project limits, except for continuous center or lane lines.

.2 The pavement marking drawing shall be submitted no later than 10 business days before scheduled cold milling or pulverization.

.3 The pavement marking drawing shall include:

.1 Project name, highway, limits, tender number and date.

.2 Indicate north arrow and scale.

.3 Use a legend to define all symbols.

.4 Show colours, sizes and configurations of existing pavement markings (arrows, solid/dashed lines, hatching, bicycle symbols, etc.).

.5 Dimension individual lane widths, bike lane widths, length/width of hatching, stop bar setbacks, etc.

.6 Layout pavement markings in accordance with the Manual of Uniform Traffic Control Devices for Canada, unless otherwise indicated.

3.2 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates and surfaces to receive pavement markings previously installed under other Sections or Contracts are acceptable for product installation in accordance with MPI instructions prior to pavement markings installation.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Pavement surface: dry, free from water, frost, ice, dust, oil, grease and other deleterious materials.

.2 Proceed with Work only after unacceptable conditions have been rectified.

3.3 EQUIPMENT REQUIREMENTS

.1 The Contractor shall supply a mobile highway striping truck which is capable of striping centre, lane and edge line markings to the required thickness and at widths of 100 or 200 mm, as a uniform stripe with sharp edges.

.2 The truck shall have a glass bead dispenser and shall be capable and of applying overlay-type glass beads to the wet painted line uniformly at the recommended rate by means of pressurized bead dispensers.

.3 The truck shall be fitted with a paint heater capable of heating paint to any temperature up to 80ºC and maintaining a constant temperature during spraying operations.

.4 The truck shall have a metering device to measure the number of litres of paint applied.

.5 Equipment shall be made available for removal of Pavement markings as ordered by the Departmental Representative, or as required to correct markings applied in error or non-conformance as per this Section. The equipment shall be capable of removing markings with minimal damage to the pavement surface.

3.4 APPLICATION

.1 Pavement markings: layout by Contractor.

.2 Pavement markings shall be applied within the following time frames after completion of paving under this 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 shoulder material placement.

.2 No later than 21 days.

.3 Pavement markings shall be applied only on clean and dry surfaces. Any contaminants such as dirt, loose particles and oily residue shall be removed before painting.

.4 All Pavement markings shall be accurately placed based on pre-markings, and shall present a crisp, uniform appearance in daylight and darkness.

.5 The applied markings shall be to the satisfaction of the Departmental Representative with respect to paint thickness, retro-reflectivity, the straightness and spacing of lines, the accuracy of dimensions and positioning of other markings, and absence of overspray and tracking.

.6 Longitudinal lines shall be of the types and widths as follow:

Line Type	Colour	Width (mm)
Single Solid	Yellow White	100 100/200
Single Broken	Yellow White	100 100/200
Combination (Solid beside Broken)	Yellow	100
Double Solid	Yellow	2 lines x 100

.1 Single broken 100 mm-wide lines between traffic lanes shall have a "skip" pattern of 1:3 (3 m line and 9 m space).

.2 Single broken 200 mm-wide lines that mark the edge of travelled lane through a taper, auxiliary lane or intersection shall have a skip pattern of 1:1 (3 m line and 3 m space).

.7 Pavement marking shall be applied only on dry pavement having a surface temperature as follows:

.1 For Oil-based Paint, 5 °C and rising; or

.2 For Water-based Paint 5 °C and rising

.8 Paint shall be applied to the pavement surface to a minimum dry thickness of 255 µm ± 25 µm.

.9 Overlay glass beads shall be applied at a rate of 0.7 kg/L of paint for Oil-based paint and 0.8 kg/L of paint for water-based paint.

.10 Retro-reflectivity shall meet the following requirements when tested no sooner than two (2) weeks and no later than four (4) weeks after application of markings.

.1 Yellow Paint 200 mcd/m^2/lx

.2 White Paint 250 mcd/m^2/lx

.11 Pavement markings shall be applied in a manner that reduces tracking by the wheels of vehicles that cross over the painted markings

.1 Tracking longitudinal centre, lanes and edge lines shall not exceed 3% of line length as determined by the Departmental Representative.

.12 Pavement markings that do not conform to the requirements of this Section and/or as specified by the Departmental Representative shall be removed and/or replaced as directed by the Engineer.

3.5 TRAFFIC CONTROL

.1 Traffic Control shall be the responsibility of the Contractor and shall be carried out in accordance with the NBDTI's Work Area Traffic Control Manual.

3.6 TRAFFIC LINES

.1 All pavement lines and markings shall be in accordance with the Transportation Association of Canada's Manual of Uniform Traffic Control Devices for Canada (MUTCDC).

3.7 TOLERANCE

.1 Paint markings: within plus or minus 12 mm of dimensions indicated.

.2 Remove incorrect markings as per Departmental Representative directives. The equipment used for this work shall be capable of removing markings with minimal damage to the pavement surface

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.9 PROTECTION OF COMPLETED WORK

.1 Protect pavement markings until dry.

.2 The Contractor shall be responsible for control of the paint spray during application so that it does not get on vehicles or other private property. In the event that this occurs, the Contractor shall be responsible for the costs of removing the paint off the private property and the repair of any damage that occurs as a result of the paint or its removal.

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 This section specifies topsoil, topsoil amendments, the stripping of topsoil, the preparation of existing grades, the placement of topsoil, and finish grading.

1.2 RELATED SECTIONS

.1 Section 32 92 19.16 – Hydraulic Seeding

1.3 REFERENCES

.1 Standard Specifications for Highway Construction and Maintenance, New Brunswick Department of Transportation and Infrastructure, Item 613.

1.4 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

1.5 TESTING

.1 All soil and sand used in this project shall be tested for compliance with texture specification by a laboratory designated by the Owner. Soil sampling, testing and analysis to be in accordance with Provincial regulations and standards. Contractor will arrange and pay for cost of tests.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Divert unused soil amendments from landfill to official hazardous material collections site approved by Departmental Representative.

.3 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 TOPSOIL

.1 Topsoil for this project to consist of topsoil stripped from site and imported topsoil to be supplied by the Contractor, if required. The Contractor shall obtain imported topsoil locally and obtain approval from the Departmental Representative prior to importing

topsoil. The Departmental Representative will verify the location and/or stockpile of imported topsoil for any invasive species of plant that could be present.

.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 75mm 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 25mm in greatest dimension.

2.2 SOURCE QUALITY CONTROL

.1 The Contractor shall notify the Departmental Representative 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.

Part 3 Execution

3.1 STRIPPING OF TOPSOIL

.1 Commence topsoil stripping of areas after all wood brush and grasses have been removed from site.

.2 Strip and pulverize topsoil to depths as indicated. Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.

.3 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2 metres.

.4 Unused topsoil is to remain on site.

.5 Protect stockpiles from contamination and compaction.

3.2 PREPARATION OF EXISTING GRADE AND PLACEMENT OF TOPSOIL

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

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

.3 Topsoil placement in the Work Area shall be completed prior to the placement of any Roadbed materials above Subgrade, unless otherwise approved by the Departmental Representative.

.4 Topsoil shall be spread on the prepared area(s) to a depth of 100mm±25mm 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 Borrow "A" quality material as identified in the Contract Documents; and on backslopes or as directed by the Departmental Representative.

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

.5 Topsoil shall not be placed after the end of the week in which September 30th occurs without approval of the Departmental Representative.

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

3.3 ACCEPTANCE

.1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.4 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

.2 Clean all exposed rock and boulder surfaces to approval of Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 33 42 13 Pipe Culverts

1.2 REFERENCES

.1 Standard Specifications for Highway Construction and Maintenance, New Brunswick Department of Transportation and Infrastructure, Items 614, 615 and 616.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for seed, mulch, tackifier, fertilizer, liquid soil amendments and micronutrients.

.2 Submit 2 copies of WHMIS MSDS in accordance with Sections 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.

.3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.4 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Labelled bags of seed and fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number. Alternatives to the specified seed and fertilizer mixes will not be accepted without prior approval of the Departmental Representative. The Departmental Representative may sample the seed and fertilizer for analysis and verification.

.2 Inoculant containers to be tagged with expiry date.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Seed and fertilizer shall be kept dry and protected from direct sunlight and other detrimental conditions.

.1 Seed and fertilizer that have been subjected to moisture shall not be used.

1.5 WARRANTY

.1 For seeding, 12 months warranty period is extended to 1 full growing season.

.2 Contractor hereby warrants that hydroseeding will remain free of defects in accordance with General Conditions CCDC GC 12.3, but for 1 full growing season.

.3 End-of-warranty inspection will be conducted by Departmental Representative.

1.6 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

2.1.1 Seed

.1 All materials shall be supplied by the Contractor.

.2 Seed mix shall be as per Table 614-1 (Roadside Mix) of the NBDTI Standard Specifications, which includes the following species, by mass:

.1 40% Creeping Red Fescue;

.2 20% Hard Fescue;

.3 15% Canada Blue Grass;

.4 5% Alsike or White Clover;

.5 15% Annual Rye Grass;

.6 5% Red Top

.3 Fertilizer shall be a 15-25-15 (N-P-K) mix for seeding done May 1st to Labour Day and 10-20-20 (N-P-K) thereafter.

.4 Water shall be free of any impurities which would inhibit germination of the seed.

.5 Hydraulic mulch for hydroseeding as specified in Table 614-3 shall be a product made primarily for use in hydroseeding, and shall consist of shredded wood fibres, shredded newsprint coloured green with an environmentally acceptable dye, or shredded straw mixed with raw cotton fibres and/or shredded newsprint.

.1 Hydraulic mulch shall form a homogeneous slurry when agitated or mixed in water with the other specified materials and shall contain no growth-inhibiting chemicals or compounds.

.6 When applied, the hydroseeding mix shall be capable of forming an absorptive mat, which will allow moisture to percolate into the underlying soil.

.7 Binder (organic tackifier) acts as an adhesive to bind soil, fiber and seed particles together and to temporarily control the effects of wind and water erosion during seed germination and plant establishment. It may be supplied in liquid or powder form and shall be applied at the manufacturer's recommended application rate. It shall not contain any toxic or growth inhibiting chemicals or compounds.

.8 Binder may be supplied in liquid, flake or powder form.

.9 Applications rates shall be as per Table 614-3 of the NBDTI Standard Specifications and may vary by ±15%, depending on ground conditions.

.1 The application rate for the seed mix shall be a minimum of 125 kg/ha.

.2 The application rate for fertilizer shall be a minimum of 375 kg/ha.

.3 The application rate for the hydraulic mulch shall be a minimum of 500 kg/ha.

.4 The application rate for the binder shall be as per manufacturer's recommendations.

2.1.2 Mulch

.1 All materials shall be supplied by the Contractor.

.2 Mulch shall be hay or straw and supplied in either of the following forms:

.1 Unprocessed form such as bales or rolls, free of noxious weeds and other undesirable material, and not so wet, decayed or compacted so as to inhibit even and uniform spreading; or

.2 Approved equivalent

.3 When applied the mulch shall form an absorptive mat, which will allow moisture to percolate into the underlying soil.

.4 Binder for mulch must be capable of joining together the mulch particles to secure the mulch to the ground and shall remain effective for 60 days from the time of application.

.5 Binder for mulch shall not form an impervious seal which would prevent the penetration of moisture to the underlying soil.

.6 Binder may be supplied in liquid, flake or powder form

.7 Water shall be contaminant-free and obtained from a source approved by the appropriate regulatory agency.

.8 Approved unprocessed hay or straw mulch shall be spread evenly and uniformly at a rate of 4500kg/ha ±15%.

.1 Lumps and thick clumps of mulch shall be broken apart and dispersed.

.2 Binder shall be mixed in a solution of water with sufficient green dye or green-coloured wood-fibre or paper mulch and sprayed uniformly over the mulched ground.

.3 Binder application shall be completed within 48 hours after the unprocessed hay or straw has been placed

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections are acceptable for hydraulic seeding in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PROTECTION OF EXISTING CONDITIONS

.1 Protect structures, signs, guide rails, fences, plant material, utilities and other surfaces not intended for spray.

.2 Immediately remove any material sprayed where not intended as directed by Departmental Representative.

3.3 PREPARATION OF SURFACES

.1 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water or temperatures which inhibit seed germination unless otherwise approved by the Departmental Representative.

.2 Areas to be hydroseeded shall be free of ruts, ridges, and deleterious materials such as weeds, sticks, roots and large rocks which would impede growth of the seed mix and mowing.

.1 Stones greater than 75mm in the least dimension shall be removed and disposed of outside the work area.

.3 Final shaping of slopes shall include loosening of the top 50 mm of soil and scarification to minimize runoff velocities.

.1 Scarifications shall be parallel to the contour of the slope with a minimum indentation (high to low) of 25 mm and at a maximum spacing of 150 mm no sooner than 2 days prior to hydroseeding. Scarifying can be made by means of dozer treads or any other mechanical means such that scarifications meet the above noted specifications.

.2 Hydroseeding will not permitted on hardened, crusted or rutted soil.

.4 Ensure areas to be seeded are moist to depth of 150 mm before seeding.

3.4 HYDRAULIC SEEDING

.1 The Contractor shall carry out the work as indicated in the Contract Documents and/or as specifically directed by the Departmental Representative.

.2 The hydraulic mulch, seed, fertilizer and binder shall be thoroughly mixed with water in a hydroseeding tank capable of continually agitating the mixture during the hydroseeding operation to ensure that a homogeneous slurry is produced. The hydroseed mix shall be prepared on site and applied immediately. It shall not be left in the tank for longer than 6 hours before being used.

.3 Binder shall be used for all hydroseeding work.

.4 The Contractor shall proportion the ingredients in the hydroseeding tank according to the size of the tank and the area anticipated to be covered with each tankful of mix, so that the materials are applied at the prescribed rates. The Contractor shall adjust the quantities of ingredients per tankful as required if the actual coverage (m^2/tank) is different from that anticipated.

.5 The mixture shall be applied uniformly onto prepared surfaces from a hydroseeder which shall be capable of spraying the extremities of slopes or other areas of exposed ground, whether through the tower gun nozzle or extension hose.

.6 Hydroseeding shall be carried out in all cases withing 2 days after completion of the surface preparation, as defined by Section 3.3.

.1 The Departmental Representative shall approve and pre-measure all areas to be hydroseeded, in advance of the commencement of the hydroseeding of any area.

.2 The Departmental Representative shall be notified at least 24 hours in advance of the application of the hydroseeding.

.7 Hydroseeding done between May 1st and Labour Day must produce a satisfactory growth over at least 95% of the area hydroseeded in the growing season of that year.

.1 Areas of poor or no growth shall be reseeded as determined by the Departmental Representative.

.8 After Labour Day, and up to the end of the week in which September 30th occurs, only Hydroseed BM (Municipal Mix), incorporating a 10-20-20 fertilizer mix as per 2.1.1.3.

.1 The hay/straw mulching operation, which forms part of the Hydraulic Seeding, shall be carried out within 48 hours of the hydroseeding operation.

.2 Growth will be based on the performance during the next growing season as per the conditions of 3.4.7.

.9 No hydroseeding shall be carried out after the week of September 30th without the prior approval of the Departmental Representative.

3.5 MULCH

.1 The Contractor shall carry out the work as indicated in the Contract Documents and/or as specifically directed by the Departmental Representative.

.2 Mulch shall be applied with binder at the manufacturer's recommended application rate.

.3 The Contractor shall maintain the mulched areas until mulch is no longer required during the Contract period.

.1 The Contractor shall apply additional mulch as required, to restore the area(s) exposed after the initial application of mulch.

.4 Ditches and areas requiring the hand placement of mulch may, subject to the approval of the Departmental Representative, be placed without binder.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning. At all times:

.1 Leave Work area clean at end of each day.

.2 Keep pavement and adjacent areas clean and free from mud, dirt and debris.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

.1 Clean and reinstate areas affected by Work.

3.7 PROTECTION

.1 Protect seeded areas from trespass until plants are established.

.2 Remove protection devices as directed by Departmental Representative.

3.8 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Ensure maintenance is carried out under supervision of certified Landscape Maintenance Supervisor.

.2 Perform following operations from time of seed application until acceptance by Departmental Representative.

.3 Grass Mixture:

.1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.

.2 Fertilize seeded areas after 10 weeks after germination provided plants have mature true leafs in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles.

3.9 ACCEPTANCE

.1 Seeded areas will be accepted by Departmental Representative provided that:

.1 Grass is uniformly established.

.2 Area is free of bare and dead spots.

.2 Areas seeded in fall will achieve final acceptance in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

3.10 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period:

.1 Repair and reseed dead or bare spots to satisfaction of Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Section 31 05 16 – Aggregate Materials

.4 Section 31 23 33.01 – Excavating, Trenching and Backfilling

.5 Section 31 24 13 – Roadway Embankments

.6 Section 31 32 19.01 – Geotextiles

.7 Section 31 37 00 – Rip-Rap

1.2 REFERENCES

.1 AASHTO

.1 AASHTO M196, Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains.

.2 ASTM International

.1 ASTM C76M, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).

.2 ASTM C443M, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).

.3 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

.4 ASTM F667, Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings.

.3 CSA International

.1 CAN/CSA A3000, Cementitious Materials Compendium.

.2 CAN/CSA A257 Series, Standards for Concrete Pipe and Manhole Sections.

.3 CAN/CSA B182.8, Profile Polyethylene (PE) Storm Sewer and Drainage Pipe and Fittings.

.4 Standard Specifications for Highway Construction and Maintenance, New Brunswick Department of Transportation and Infrastructure.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for pipes and bedding and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Inform Departmental Representative at least 2 weeks before beginning Work, of proposed source of bedding materials and provide access for sampling.

.4 Certification: to be marked on pipe.

.5 Test and Evaluation Reports:

.1 Submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with this Section and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect pipes from damage.

.3 Replace defective or damaged materials with new.

1.5 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 CORRUGATED ALUMINUM ALLOY PIPE

.1 Corrugated aluminum alloy pipe shall conform to AASHTO M196.

.2 The nominal wall thickness for corrugated aluminum alloy pipe shall be:

Diameter (mm)	Wall Thickness (mm)
300	2
300	2
500	2
600	2
800	2.8
900	2.8
1000	2.8
1200	3.5

.3 The couplers shall be corrugated band couplers or universal dimple couplers complete with angle flanges and bolted connectors. Couplers shall be 600mm wide for all pipe sizes. If corrugated couplers are used the pipe ends shall be recorrugated to accept the coupler.

2.2 CONCRETE PIPE

.1 Reinforced concrete pipe: to CAN/CSA A257 and shall be one of three classes: 65D, 100D or 140D as specified in the contract tender items.

.2 Rubber gaskets for joints: to CAN/CSA A257.

.3 Pipe up to 1800 mm nominal ID shall have a minimum 70 mm diameter lift hole at the centre of gravity, and shall be equipped with a tapered concrete or rubber plug that does not protrude beyond the inside wall of the pipe.

2.3 CORRUGATED HIGH-DENSITY POLYETHYLENE PIPE

.1 High Density Polyethylene (HDPE) Pipe shall be double walled, with a smooth interior surface, conforming to CAN/CSA-B182.8.

.1 HDPE shall have a minimum stiffness of 320 kPa.

.2 HDPE Pipe supplied for use as Driveway Culvert Pipe shall have an open end area equivalent to or greater than the open end area for the corresponding diameter of corrugated steel pipe.

.2 Joints: Bell and spigot with integrated gasket.

2.4 GRANULAR BEDDING

.1 Granular bedding and backfill material to the following requirements:

.1 Bedding to be as per NBDTI Standard Specifications.

.2 Backfill to be Borrow "A" quality material as per Section 32 11 16.01 – Granular Sub-Base.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for pipe culvert installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties, according to requirements of authorities having jurisdiction and

sediment and erosion control plan or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TRENCHING

.1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Obtain Departmental Representative's approval of trench line and depth prior to placing bedding material or pipe.

3.4 BEDDING

.1 Dewater excavation, as necessary, to allow placement of culvert bedding in dry condition.

.2 Place 200 mm minimum thickness of approved granular material on bottom of excavation and compact to 95% minimum of maximum density to ASTM D698.

.3 Shape bedding to fit lower segment of pipe exterior so that width of at least 50% of pipe diameter is in close contact with bedding and to camber as indicated or as directed by Departmental Representative, free from sags or high points.

.4 Place bedding in unfrozen condition.

3.5 LAYING CORRUGATED ALUMINUM ALLOY CULVERTS

.1 Begin pipe placing at downstream end.

.2 Ensure bottom of pipe is in contact with shaped bed or compacted fill throughout its length.

.3 Lay pipe with outside circumferential laps facing upstream and longitudinal laps or seams at side or quarter points.

.4 Do not allow water to flow through pipes during construction except as permitted by Departmental Representative.

3.6 JOINTS: CORRUGATED ALUMINUM ALLOY CULVERTS

.1 Corrugated aluminum alloy pipe:

.1 Match corrugations or indentations of coupler with pipe sections before tightening.

.2 Tap couplers firmly as they are being tightened, to take up slack and ensure snug fit.

.3 Insert and tighten bolts.

3.7 LAYING CONCRETE PIPE CULVERTS

.1 Pipes shall be joined in a straight line using standard industry methods, proceeding from the downstream end of culvert with bell end of first pipe section facing upstream. Each pipe section shall be set into place and positioned together as recommended by the lifting device manufacturer.

.2 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.

.3 Ensure barrel of each pipe is in contact with shaped bed throughout its length.

.4 Allow water to flow through pipes during construction only as permitted by Departmental Representative.

.5 Lifting anchor recesses shall be entirely grouted in with non-shrink grout.

3.8 JOINTS: CONCRETE PIPE CULVERTS

.1 Joints may be made with rubber gaskets.

.1 Rubber gasket joints:

.1 Install in accordance with manufacturer's written recommendations.

.2 Ensure that tapered ends are fully entered into flanged ends.

3.9 LAYING CORRUGATED HIGH-DENSITY POLYETHYLENE PIPE CULVERTS

.1 Begin laying at downstream end of culvert.

.2 Install pipe in trench by lowering.

.3 Ensure bottom of pipe is in contact with shaped bedding throughout pipe length.

.4 Allow water to flow through pipes during construction only as permitted by Departmental Representative.

3.10 JOINTS FOR HIGH-DENSITY POLYETHYLENE CULVERTS

.1 Install couplings in accordance with manufacturer's instructions.

3.11 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

APPENDIX

A GEOTECHNICAL REPORT

PROJECT NO. 161-17014

PROPOSED RANKIN BRIDGE REPLACEMENT

KOUCHIBOUGUAC NATIONAL PARK

Parks Canada Parcs Canada

Final Geotechnical Investigation Report

DECEMBER 14, 2017

WSP

PROPOSED RANKIN BRIDGE REPLACEMENT

KOUCHIBOUGUAC NATIONAL PARK

Parks Canada Parcs Canada

Final Geotechnical Investigation Report

Project No: 161-17014
Date: December 14, 2017

WSP Canada Inc.
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WSP

December 14, 2017

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(By Email: jason.angel@pc.gc.ca)

Subject: **Final Geotechnical Investigation Report**
Proposed Rankin Bridge Replacement
Kouchibouguac National Park, New Brunswick

Dear Mr. Angel,

At your request WSP completed a geotechnical investigation for the proposed replacement of Rankin Bridge at Kouchibouguac National Park, in New Brunswick. The attached report details the findings of the investigation as well as design and construction recommendations.

We trust this report meets your present requirements. If you have any questions with the information in the report, please do not hesitate to contact us at your convenience. This report was prepared by WSP Canada Inc.

Yours truly,

Clayton J. Rogers, P.Eng
Manager, Geotechnical - Dartmouth

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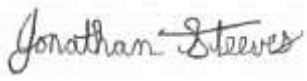

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TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION AND BACKGROUND

At the request of Parks Canada, WSP Canada Inc. (WSP) has completed a geotechnical investigation for the proposed replacement of Rankin Bridge, in Kouchibouguac National Park, New Brunswick. The purpose of this investigation was to obtain information on subsurface soil and bedrock conditions at the site and provide geotechnical recommendations for earthworks, site preparation, geotechnical design and construction. Soil and bedrock samples were collected at various depths and submitted for analysis of properties such as moisture content, gradation, Atterberg limits and unconfined compressive strength (UCS) for bedrock.

Fieldwork for the subsurface investigation was conducted on December 5 and 6, 2016 and consisted of drilling four (4) boreholes at the approximate locations as shown on the attached Figure 1. This report presents the results of the field investigation and laboratory testing programs.

2 SITE DESCRIPTION

The site is located along Highway No.117 at the Kouchibouguac National Park, in New Brunswick. It is understood that Rankin Bridge has been identified by as being in relatively poor condition and in need of replacement.

The Rankin Brook Bridge was constructed in 1963 and has received rehabilitations in 2003 and 2015. The bridge is of monolithic rigid frame design with concrete T-beams monolithic with the deck and abutments. The span length is 14.56m (face to face of abutments) and the bridge is on a 33 degree +/- skew.

The bridge accommodates two traffic lanes and two shoulders with a curb-to-curb width of 9.14 m. There is a sidewalk supported off of the east side of the bridge intended for pedestrian and bicycle traffic. There is a 0.91m wide safety curb on each side with concrete panel railings. The overall structure width is 12.97m.

In 2015 the bridge was rehabilitated. Some of the rehabilitations included new steel traffic barriers, new concrete crash blocks, new deck drains and general structure repairs.

2.1 GEOLOGY

Available surficial geologic soil mapping of the area indicates that the site overlain by marine blanket, generally consisting of sand, clay, silt and minor gravel.

Geologic mapping of the proposed development area indicates that bedrock belongs to the Richibucto formation of the Pictou Group. This formation can generally be described as consisting of grey and minor greyish to brownish red sandstone, pebbly sandstone and intra-formational conglomerate, interstratified with red and minor grey very fine-grained sandstone, siltstone, mudstone and rare, lacustrine limestone.

2.2 TOPOGRAPHIC INFORMATION

Topography on the site can be characterized as relatively level along the road surface. Elevations ranged from 5.3 to 5.7 metres at the borehole locations.

3 INVESTIGATION PROCEDURE

3.1 BOREHOLE PROGRAM

The purpose of the geotechnical investigation was to develop an understanding of the subsurface soil, bedrock and groundwater conditions at the site and provide recommendations to assist in foundation design. The recommendations consider the field and laboratory test results discussed subsequently.

Subsurface investigation of the site was conducted on December 5 and 6, 2017 and included drilling four (4) boreholes (designated BH-01 – BH-04), at the locations shown on Figure 1. The boreholes were drilled using a track-mounted drill rig supplied by Lantech. All boreholes were terminated within bedrock.

During the borehole investigation soil samples were taken at 750-mm increments using a 50-mm outside diameter split-spoon sampler, driven in accordance with standard penetration resistance procedures (ASTM D1586). N-index values, described as the number of blows required to drive the sampler 305 mm (1 ft) into the soil were recorded for each sample location and are plotted on the borehole log. Diamond-bit core-drilling of bedrock was conducted using a 96 mm outside diameter HQ core barrel at select borehole locations.

Basic laboratory and visual examinations were carried out on select soil samples from the borehole investigation. Tests were performed in accordance with materials testing requirements and procedures outlined in ASTM testing manuals, as applicable. Laboratory testing was carried out by Stantec Inc.

An explanation of the symbols and terms used in this report are enclosed in Appendix A. Borehole logs and photo plate detailing the subsurface conditions are enclosed in Appendix B. Confirmatory laboratory index testing results are presented in Appendix C (laboratory testing services provided by Stantec Inc.).

3.2 LABORATORY TESTING

Basic laboratory testing and visual examinations were carried out on selected soil samples from the borehole investigation. Tests were performed in accordance with materials testing requirements and procedures outlined in the ASTM and CSA testing manuals, as applicable. All laboratory testing was carried out by Stantec Inc. at the request of WSP and laboratory results can be found in Appendix C.

4 SUBSURFACE CONDITIONS

In Summary, the subsurface conditions were found to be relatively similar in the subject boreholes. Generally, asphalt pavement overlying fill, glacial till and bedrock was encountered in the boreholes. The fill deposits extended to a depth of 3.5 to 3.7 metres below ground surface. Bedrock was encountered in all boreholes and generally consisted of weathered and fractured sandstone. Groundwater was observed in all the boreholes ranging in depth from 2.1 to 4.5 metres below ground surface. A summary of the subsurface conditions is provided in Table 4-1, below.

Table 4-1 – Summary of Subsurface Conditions

Borehole	Ground Surface Elevation* (metres)	Thickness of Asphalt (metres)	Thickness of Fill (metres)	Depth to Till (metres)	Depth to Bedrock (metres)	Depth to Groundwater (metres)	Bedrock Elevation* (metres)
BH-01	5.3	0.15	3.55	3.70	6.00	4.50	-0.7
BH-02	5.7	0.15	3.35	3.50	4.00	3.50	1.7
BH-03	5.3	0.15	3.35	3.50	5.30	2.10	0.0
BH-04	5.7	0.15	3.35	3.50	5.00	4.50	0.7

*Approximate ground surface elevations are referenced to WSP Topographic Survey Data (Collected: December, 2016).

4.1 ASPHALT

An asphalt layer was encountered at all borehole locations and extended to approximately 150 mm in total thickness.

4.2 SAND AND GRAVEL

A sand and gravel layer was encountered below asphalt layer in all boreholes locations, with a thickness ranging from 1,350 to 1,550 mm.

4.3 FILL

Fill deposits were encountered during the investigation beneath the sand and gravel layer. The fill material consisted of sand and clay, some silt, trace to some gravel. The material was generally in a dry to moist condition and red-brown in colour. Standard Penetration N-Values ranged from 5 to 20 blows per 305 mm, indicating a loose to compact relative density (note: higher N-Values may be the result of cobble sized particles.)

Laboratory grain size analysis of two (2) samples of the fill indicated a particle size distribution (gradation) of 1.1 to 10.5 percent gravel, 37.2 to 39.6 percent sand and a silt/clay content of 52.3 to 59.3 percent. Moisture contents for the fill samples ranged from 9.3 to 20.5 percent.

4.4 UNDISTURBED TILL

Till was encountered beneath the fill deposits in the subject boreholes. The till generally consisted of sand, some silt and clay, some gravel. This material was in a dry to saturated condition, red-brown in colour and generally compact to dense in relative density.

Laboratory grain size analysis of two (2) samples of the till indicated a particle size distribution (gradation) of 15.7 to 16.3 percent gravel, 61.7 to 62.0 percent sand and a silt/clay content of 21.7 to 22.5 percent. Moisture contents for the fill samples ranged from 13.4 to 16.7 percent.

4.5 BEDROCK

Geologic mapping of the proposed development area indicates that bedrock belongs to the Richibucto formation of the Pictou Group. This formation can generally be described as consisting of grey and minor greyish to brownish red sandstone, pebbly sandstone and intra-formational conglomerate, interstratified with red and minor grey very fine-grained sandstone, siltstone, mudstone and rare, lacustrine limestone.

Bedrock was encountered in all boreholes at depths ranging from 4.0 metres to 6.0 metres below ground surface. During the field investigation, bedrock was core-drilled at all boreholes. Generally, the bedrock has been observed to be highly fractured, weathered and of low-strength. The Rock Quality Designation (RQD) values of core samples ranged from 0 to 75%, indicating very poor to fair quality rock. Photographs of bedrock core samples are included in Appendix B.

Laboratory compressive strength testing of two (2) intact rock core samples indicated unconfined compressive strengths (UCS) ranging from 29 MPa to 41 MPa. Based on classification systems used in the Canadian Foundation Engineering Manual (4th Ed), Section 3.2.4.1, the sandstone bedrock is generally medium strong (Grade R3). Laboratory results are included in Appendix C.

4.6 GROUNDWATER

Groundwater was observed in all boreholes at depths ranging from 2.1 to 4.5 metres below the ground surface, during the investigation. Groundwater levels can be expected to fluctuate seasonally

5 DISCUSSION AND RECOMMENDATIONS

5.1 GENERAL

The site is located along Highway No.117 at the Kouchibouguac National Park, in New Brunswick. It is understood that Rankin Bridge has been identified by as being in relatively poor condition and in need of replacement. The Rankin Brook Bridge was constructed in 1963 and has received rehabilitations in 2003 and 2015. The bridge is of monolithic rigid frame design with concrete T-beams monolithic with the deck and abutments. The span length is 14.56m (face to face of abutments) and the bridge is on a 33 degree +/-skew. The bridge accommodates two traffic lanes and two shoulders with a curb-to-curb width of 9.14 m. There is a sidewalk supported off of the east side of the bridge intended for pedestrian and bicycle traffic. There is a 0.91m wide safety curb on each side with concrete panel railings. The overall structure width is 12.97m.

The following discussion and recommendations for the proposed new bridge are based on the observed subsurface conditions and assume that the proposed abutment locations are in general conformance with Figure 1. As previously noted, the subsurface conditions encountered at the site generally consist of an asphalt layer (100-mm in thickness) overlying fill deposits, glacial till and sandstone bedrock (at an elevation ranging from 1.7 to -0.7 metres, geodetic datum).

Due to the relatively shallow depths to bedrock (i.e. 4 to 6 metres below asphalt surface); the use of spread foundations and approach embankments will be most practical for this site. If piles are being considered for the site, drilled piles extending into and socketed in bedrock would be recommended. Design parameters can be provided for pile foundations if this method is chosen for design.

Some of the recommendations below are preliminary in nature and can be confirmed once specific design information is available.

5.2 GEOTECHNICAL DESIGN

5.2.1 OPTION 1: SHALLOW FOUNDATIONS

Subsurface conditions are satisfactory for use of concrete spread footing and approach embankments. Footings may be set directly on bedrock.

Bearing capacity estimates for Serviceability Limit State (SLS) and Ultimate Limit State (ULS) design are provided as follows, and are based on criteria in the Canadian Highway Bridge Design Code (CHBDC, 2014), Section 6.

For spread/strip footings founded on sandstone bedrock, as approved by the Geotechnical Engineer:

→ Ultimate Limit State Bearing Capacity (ULS): 750 kPa

The ULS includes a geotechnical resistance factor 0.5 in accordance with CHBDC.

Total and differential settlement at the allowable SLS design stresses are expected to be negligible for footings set on bedrock.

Assessment of the foundation bearing surface (footing subgrade) will be required to confirm the recommended bearing pressures noted above. The footing subgrade should be inspected by qualified

geotechnical personnel during bearing surface preparation; compaction and proof rolling of the bearing surface will likely be required prior to placing concrete.

Bearing capacity estimates generally assume that the foundation footing depth (D_f) is at least 1.2 metres, and that the confining soil weight is included in the estimates. Footings should be founded at a minimum depth of 1.2 metres below exterior grade elevation for frost protection.

If loosening/softening of the footing subgrade occurs due to water seepage, construction traffic, etc. removal and replacement with an approved granular material (i.e. NBDOT 75-mm minus, or equivalent) may be required

5.2.2 OPTION 2: DRIVEN STEEL H PILES

We understand that the proposed new bridge will be a 14.56 m single span bridge. If pile foundations are considered for the design, each abutment will be supported on steel 'H' piles, driven to practical refusal on bedrock. Practical refusal shall be defined by an accepted pile inspection method.

Rock points should be used for the expected site conditions, and care should be taken not to overdrive and damage the pile upon refusal. The Canadian Foundation Engineering Manual (4th Edition) recommends that hammer energy during installation be restricted to $6x10^6$ J multiplied by cross-sectional pile area.

Axial capacities of 'H' piles bearing on bedrock are governed by the pile's allowable capacity when considered as a fully supported structural column. The maximum capacity is estimated as one third of the yield strength of the pile material ($0.3f_y$), and capacity estimates for the preferred H-pile types are provided in the following Table 5.1.

Table 5-1 – Pile Capacities

Pile Size	Factored Pile Capacity, kPa (ULS)	Bearing Capacity, kPa (SLS)	Ultimate Geotechnical Resistance
HP310x79	1200 kN	900 kN	4800 kN
HP310x110	1600 kN	1200 kN	4800 kN

SLS capacity is based on a factor of safety of 3. Factors for ULS design were obtained from the Canadian Highway Bridge Design Code (CHBDC). Settlement of individual piles driven to refusal on bedrock is expected to be negligible.

For estimating purposes, it is assumed that 'H' piles will meet refusal near an elevation of -1.0 metres, geodetic datum. Actual pile lengths will be determined by driving resistance assessments and field testing during installation.

Where adjacent piles are driven parallel to one another, we recommend a minimum pile spacing of three (3) times the outside diameter of the piles to avoid group reduction effects and potential "following" during installation. This requirement can be reviewed if the need for smaller spacing arises during design or construction.

A protective driving shoe should be used to protect steel piles during hard driving in Stony Till soils with cobbles and/or boulders. The maximum cobble/boulder size was not determined during this investigation and shallow refusal of driven piles on cobbles or boulders is not anticipated. Where piles

are refused above design elevations, pile extraction and drilling to clear obstructions should be undertaken prior to re-driving.

5.2.3 LATERAL RESISTANACE OF PILES

A number of options are available for estimating the lateral resistance of piles. The simplest and usually conservative approach is to use passive pressure resistances as suggested in Section 18.4 of the Canadian Foundation Engineering Manual (4nd Edition). For vertical piles subjected to horizontal loads, an approximate and usually conservative approach is to assume that each pile can sustain an allowable horizontal load equal to the passive earth pressure acting on an equivalent wall with depth 6b and width 3b, where b is the pile diameter or face-to-face distance. A depth of 8b is recommended if piles are fixed at the top. The allowable resistance (SLS) is the maximum calculated resistance divided by 3. If the lateral resistance is not sufficient, the use of sand or concrete filled corrugated steel pipes or batter piles is recommended. Due to the similar soils encountered across the site, the soil parameters are consistent for both bridge abutments. Parameters for use are as follows:

Table 5-2 – Soil Parameters for Pile Lateral Resistance

ɣ	KP (ABUTMENTS)
20 kN/m^3	2.8

It is assumed that the top of the 'H' piles will be located within 3 m of the existing site grade. If not, we should be notified to revise the values of these parameters.

5.2.4 MATERIAL DESIGN PARAMTERS FOR RETAINING WALLS

Recommended material design parameters for retaining walls are provided below, in Table 5-1. If conditions are different at time of construction we should be contacted immediately to re-evaluate the below design parameters.

Table 5-3 – Summary of Recommended Material Design Parameters

PARAMETER	BEDROCK	IMPORTANT SAND AND GRAVEL (NBDOT 75-MM MINUS, OR EQUIVALENT)
Total Unit Weight (kN/m^3)	25	21
Submerged Unit Weight (kN/m^3)	15	11
Angle of Internal Friction	38°	36°
Coefficient of Active Earth Pressure, Ka		0.26
Coefficient of Passive Earth Pressure, Kp		3.85
Friction Factor (Soil-Concrete Interface)	0.70	0.60

Retaining walls should be designed for anticipated surcharges from structures, vehicle loads, sloping backfill, etc. The above parameters assume the backfill behind the wall is horizontal. If inclined backfill is being constructed behind the wall, the Geotechnical Engineer should be contacted for appropriate revision of design parameters.

Compaction of backfill behind the retaining wall should be performed using a walk-behind vibratory plate roller or plate tamper rather than a large vibratory drum roller to avoid damage to the wall.

5.2.5 EARTHQUAKE DESIGN PARAMETERS

The subsurface conditions at the proposed site consist of sandstone bedrock at foundation design grades. According to clause 4.4.3.2 of the Canadian Highway Bridge Design Code (CHBDC, 2014), the soil profile designation for seismic analysis is Class “C” for soft rock. The applicable site coefficients are found in Table 4.2 to 4.9 of the same code.

The structural engineer should confirm the applicable site coefficients.

5.3 EARTHWORKS CONSTRUCTION

5.3.1 EXCAVATIONS AND RE-USE OF ON-SITE SOILS

We expect that any excavations above the water table will be reasonably straightforward. A 1:1 excavation slope should be feasible in the existing materials. We expect that steel sheet pile enclosures will be required to excavate any significant depth below the groundwater and river water levels (if required).

All temporary excavations must be carried out in accordance with the current Occupational Health and Safety Act (OHSA) requirements. All side slopes of excavations must be maintained within OHSA criteria, or they must be supported.

Any groundwater or surface water encountered must be diverted to avoid softening/loosening of the exposed subgrade. Measures to divert groundwater/surface water may include excavating subgrade to sump locations where water will be disposed of by pumping.

The footing subgrade should be inspected by qualified geotechnical personnel during bearing surface preparation; compaction and proof rolling of the bearing surface will likely be required prior to placing concrete.

5.3.2 STRUCTURAL FILL

Imported structural fill for the abutments should consist of a well-graded sand and gravel material, free of organics and have less than 10 % fines. The structural fill should consist of a 31.5-mm minus or 75-mm minus (or equivalent), as specified in the NBDOT Specifications.

The on-site soils will not be suitable for re-use as structural fill against the abutments but may be used in common areas for general site grading; materials must be approved by a Geotechnical Engineer prior to use. Saturated material is not suitable for re-use in structural applications and removal of oversize material (particle size greater than 200mm) will be required prior to re-use for backfilling. Proper construction methods during excavation, handling and stockpiling of the on-site materials will be required to prevent addition and excessive water content in the soil.

5.3.3 ABUTMENT BACKFILL

The abutment backfill should consist of a non-frost susceptible 31.5-mm minus or 75-mm minus (or equivalent), as specified in the NBDOT Specifications.

During fill placement, lift thickness should be compatible with type of compaction equipment and material used (i.e. gradation, particle size, etc.). Compaction of fill adjacent to the structure should be completed with hand operated compactors to prevent the build-up of significant “wedging” pressures

that may develop if large compactors are used. Generally, abutment backfill should be placed in compacted lifts not to exceed 200-mm and compacted to 98 percent of the material's Standard Proctor Maximum Dry Density (SPMDD) for structural applications (ASTM D698 procedure). Water and loose/soft soils should be removed prior to fill placement. Fill material, compaction equipment, lift thicknesses, etc. are to be evaluated for approval by the Geotechnical Engineer prior to fill placement.

5.3.4 GROUNDWATER CONTROL

During construction, surface runoff, groundwater and/or flood water from the Rankin Brook may be encountered. Controlling water at the site will minimize softening and loosening of the exposed subgrade.

If construction and excavation is being considered below the river level, a more aggressive water control measure (i.e. steel sheet pile enclosure) will likely be required to work in dry conditions below the river level.

Typical de-watering techniques for groundwater seepage may include grading excavations to sump locations to dispose of water by pumping. If necessary, soft/wet soils can be over excavated and replaced by an imported rock fill. Proper erosion and sedimentation control measures should be provided to limit site disturbance, as in accordance with provincial and municipal regulations.

5.3.5 EROSION AND SEDIMENT CONTROL

Erosion and sedimentation control measures (e.g. silt booms, silt fences, check dams, settling ponds, etc.) should be provided, as required, for the site as part of the detailed design activity in accordance with New Brunswick Environment requirements. Application of these control measures should be utilized to minimize soil erosion.

5.4 ASPHALT PAVEMENT REINSTATEMENT

Prior to the field drilling operations, a visual reconnaissance program was conducted along the bridge and the approach roadways. In general, the pavement is in excellent condition, it's understood Highway No. 117 was repaved in the summer of 2015. No severe areas of alligator cracking were evident in the investigated areas. The road crown is also in fair condition, and crossfall drainage does not appear to be an issue along the approach roadways or the bridge.

The project roadway is considered to be a relatively moderate volume road subject to all types of traffic, in particular transport truck traffic due to the peat farm industry in the near-by location. It is recommended that pavement reconstruction allow for both automobile and loaded truck loadings. Based on routine design methods and our assessment of the existing pavement profile and performance, the following minimum pavement structure is recommended.

Table 5-4 – Flexible Asphalt Pavement Design

MATERIAL	PAVEMENT STRUCTURE THICKNESS
Type C-HF Asphalt Pavement	50-mm
Type B-HF Asphalt Pavement	100-mm
31.5mm minus Gravel	150-mm
75-mm minus Gravel	400-mm

If soft/wet areas are encountered in the subgrade, additional gravels may be required. Soft areas, if any, would be determined during evaluation of finished subgrade, prior to placement of the pavement structure. The exposed subgrade should be compacted to 100 percent of the Standard Proctor Maximum Dry Density (SPMDD).

All granular material is to be compacted to 100 percent of the Standard Proctor Maximum Dry Density (SPMDD). Asphalt concrete pavement should be compacted to a minimum 92 percent of the Maximum Theoretical Bulk Density, as per NBDOT specifications. The pavement materials should be provided and constructed in accordance with the Municipal Specifications or other equivalent specifications.

6 CLOSURE

This report has been prepared for the sole benefit of Parks Canada and is not intended for use by others. This report may not be reproduced without the prior written permission of WSP and Parks Canada. Contractors undertaking work must draw their own interpretations of the factual investigation results provided in this report as it affects construction costs, procedures and scheduling.

As boreholes provide a localized representation of the total study area, subsurface conditions may vary between and/or beyond the borehole locations. If conditions encountered at the site vary significantly from the reported herein, we should be notified immediately so that our interpretations and recommendations can be reviewed and revised if necessary. The boreholes were backfilled and lightly compacted upon completion.

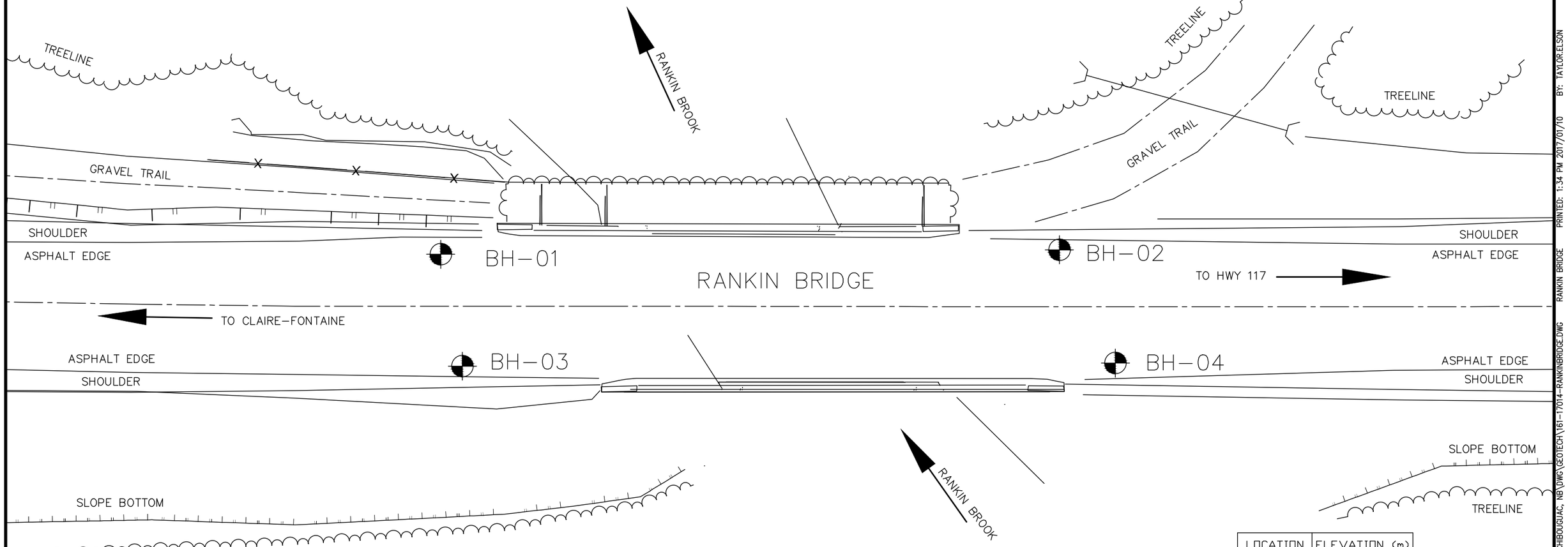
Since design details were not available at the time of preparing this report, the foundation and retaining wall design should be reviewed with us when more information is available. Inspections of testing of the subgrade conditions and pavement construction are recommended for QA/QC purposes.

We trust this report meets your present requirements. If you have any questions with the information contained in the report, please do not hesitate to contact us at your convenience.

Yours truly,

WSP Canada Inc.

Clayton J. Rogers. P.Eng
Manager, Geotechnical - Dartmouth



LOCATION	ELEVATION (m)
BH-01	5.3
BH-02	5.7
BH-03	5.3
BH-04	5.7

*APPROXIMATE ELEVATIONS FROM WSP TOPOGRAPHICAL SURVEY DATED DECEMBER, 2016

LEGEND:

BH-01 - BOREHOLE LOCATION

WSP Canada Inc.
1 Spectacle Lake Drive
Dartmouth, Nova Scotia, Canada B3B 1X7
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PROJECT:

KOUCHIBOUGUAC NATIONAL PARK DATA COLLECTION
GEOTECHINCAL INVESTIGATION

TITLE:

RANKIN BRIDGE
SITE PLAN SHOWING APPROXIMATE BOREHOLE LOCATIONS

PROJECT NO: 161-17014

SCALE: 1:250

DRAWN BY: T. ELSON

CHECKED BY: C. ROGERS

DATE: (YYYY/MM/DD) 2017/01/10

WSP REF. NO.: ---- N:\MONCTON\2016\161-17014- PARKS CAN, KOUCHIBOUGUAC, NB\DWG\GEOTECH\161-17014-RANKINBRIDGE.DWG PRINTED: 1:34 PM 2017/01/10 BY: TAYLOR.ELSON

Appendix A

BOREHOLE EXPLANATION FORM

BOREHOLE LOG EXPLANATION FORM

This explanatory section provides the background to assist in the use of the borehole logs. Each of the headings used on the borehole log, is briefly explained.

DEPTH

This column gives the depth of interpreted geologic contacts in metres below ground surface.

STRATIGRAPHIC DESCRIPTION

This column gives a description of the soil based on a tactile examination of the samples and/or laboratory test results. Each stratum is described according to the following classification and terminology.

Soil Classification*		Terminology	Proportion
Clay	<0.002 mm		
Silt	0.002 to 0.06 mm	"trace" (e.g. trace sand)	<10%
Sand	0.06 to 2 mm	"some" (e.g. some sand)	10% - 20%
Gravel	2 to 60 mm	adjective (e.g. sandy)	20% - 35%
Cobbles	60 to 200 mm	"and" (e.g. and sand)	35% - 50%
Boulders	>200 mm	noun (e.g. sand)	>50%

* Extension of MIT Classification system unless otherwise noted.

The use of the geologic term "till" implies that both disseminated coarser grained (sand, gravel, cobbles or boulders) particles and finer grained (silt and clay) particles may occur within the described matrix.

The compactness of cohesionless soils and the consistency of cohesive soils are defined by the following:

COHESIONLESS SOIL		COHESIVE SOIL	
Compactness	Standard Penetration Resistance "N", Blows / 0.3 m	Consistency	Standard Penetration Resistance "N", Blows / 0.3 m
Very Loose	0 to 4	Very Soft	0 to 2
Loose	4 to 10	Soft	2 to 4
Compact	10 to 30	Firm	4 to 8
Dense	30 to 50	Stiff	8 to 15
Very Dense	Over 50	Very Stiff	15 to 30
		Hard	Over 30

The moisture conditions of cohesionless and cohesive soils are defined as follows.

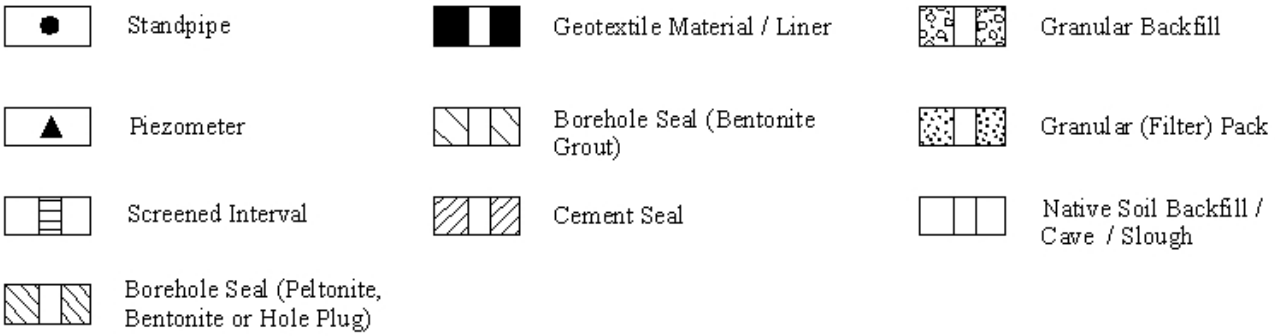
COHESIONLESS SOILS	COHESIVE SOILS		
Dry	DTPL	-	Drier Than Plastic Limit
Moist	APL	-	About Plastic Limit
Wet	WTPL	-	Wetter Than Plastic Limit
Saturated	MWTPL	-	Much Wetter Than Plastic Limit

STRATIGRAPHY

Symbols may be used to pictorially identify the interpreted stratigraphy of the soil and rock strata.

MONITOR DETAILS

This column shows the position and designation of standpipe and/or piezometer ground water monitors installed in the borehole. Also the water level may be shown for the date indicated.



Where monitors are placed in separate boreholes, these are shown individually in the "Monitor Details" column. Otherwise, monitors are in the same borehole. For further data regarding seals, screens, etc., the reader is referred to the summary of monitor details table.

SAMPLE

These columns describe the sample type and number, the "N" value, the water content, the percentage recovery, and Rock Quality Designation (RQD), of each sample obtained from the borehole where applicable. The information is recorded at the approximate depth at which the sample was obtained. The legend for sample type is explained below.

SS	=	Split Spoon	GS	=	Grab Sample
ST	=	Thin Walled Shelby Tube	CS	=	Channel Sample
AS	=	Auger Flight Sample	WS	=	Wash Sample
CC	=	Continuous Core	RC	=	Rock Core

$$\% \text{ Recovery} = \frac{\text{Length of Core Recovered Per Run}}{\text{Total Length of Run}} \times 100$$

Where rock drilling was carried out, the term RQD (Rock Quality Designation) is used. The RQD is an indirect measure of the number of fractures and soundness of the rock mass. It is obtained from the rock cores by summing the length of core recovered, counting only those pieces of sound core that are 100 mm or more in length. The RQD value is expressed as a percentage and is the ratio of the summed core lengths to the total length of core run. The classification based on the RQD value is given below.

RQD Classification	RQD (%)
Very poor quality	< 25
Poor quality	25 - 50
Fair quality	50 - 75
Good quality	75 - 90
Excellent quality	90 - 100

TEST DATA

The central section of the log provides graphs which are used to plot selected field and laboratory test results at the depth at which they were carried out. The plotting scales are shown at the head of the column.

Dynamic Penetration Resistance - The number of blows required to advance a 51 mm diameter, 60º steel cone fitted to the end of 45 mm OD drill rods, 0.3 m into the subsoil. The cone is driven with a 63.5 kg hammer over a fall of 750 mm.

Standard Penetration Resistance - Standard Penetration Test (SPT) "N" Value - The number of blows required to advance a 51 mm diameter standard split-spoon sampler 300 mm into the subsoil, driven by means of a 63.5 kg hammer falling freely a distance of 750 mm. In cases where the split spoon does not penetrate 300 mm, the number of blows over the distance of actual penetration in millimetres is shown as $\frac{xBlows}{mm}$

Water Content - The ratio of the mass of water to the mass of oven-dry solids in the soil expressed as a percentage.

W_P - Plastic Limit of a fine-grained soil expressed as a percentage as determined from the Atterberg Limit Test.

W_L - Liquid Limit of a fine-grained soil expressed as a percentage as determined from the Atterberg Limit Test.

REMARKS

The last column describes pertinent drilling details, field observations and/or provides an indication of other field or laboratory tests that were performed.

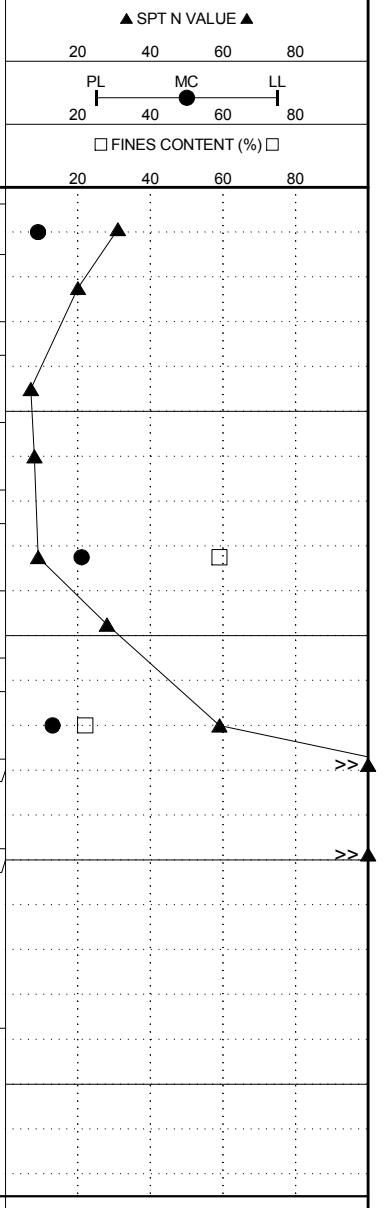
Appendix B

BOREHOLE LOGS AND PHOTOPLATE

BORING NUMBER BH-01

CLIENT Agence Parks Canada Agency
PROJECT NAME Kouchibouguac National Park - Data Collection
PROJECT NUMBER 161-17014
PROJECT LOCATION Kouchibouguac National Park, NB
DATE STARTED 5/12/16 **COMPLETED** 5/12/16
GROUND ELEVATION 5.3 m Geodetic **HOLE SIZE** 100mm
DRILLING CONTRACTOR Lantech Drilling Services Ltd.
GROUND WATER LEVELS:
DRILLING METHOD Track Mounted Drill Rig
AT TIME OF DRILLING 4.50 m / Elev 0.80 m
LOGGED BY T. Elson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES Rankin Bridge
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
		5.3	Asphalt (150mm in thickness)				
		5.15	FILL: sand and gravel, loose to compact, dry to moist, grey-brown.		SS 01	12-18-13 (31)	67
					SS 02	17-9-11-13 (20)	50
2		3.6	FILL: sand and clay, some silt, trace to some gravel, loose to compact, dry to moist, red-brown.		SS 03	16-4-3-4 (7)	67
					SS 04	6-4-4-4 (8)	17
					SS 05	2-3-6-9 (9)	75
4		1.6	TILL: sand, some silt and clay, some gravel, compact to dense, dry to saturated, red-brown.		SS 06	8-11-17-10 (28)	83
				▽	SS 07	31-40-19-37 (59)	100
					SS 08	50/0.10	100
6		-0.7	BEDROCK (Sandstone) - weathered and fractured, very poor to poor quality, medium strong to strong.		SS 09	50/0.10	100
					RC 01		100 (0)
8		-2.3	UCS = 41 MPa		RC 02		100 (59)
10		-3.8	End of borehole at 9.0 metres below ground surface in Bedrock (sandstone). Groundwater was encountered at 4.5 metres below ground surface at the time of the investigation. *Approximate elevations taken from available topographic information.				
12							

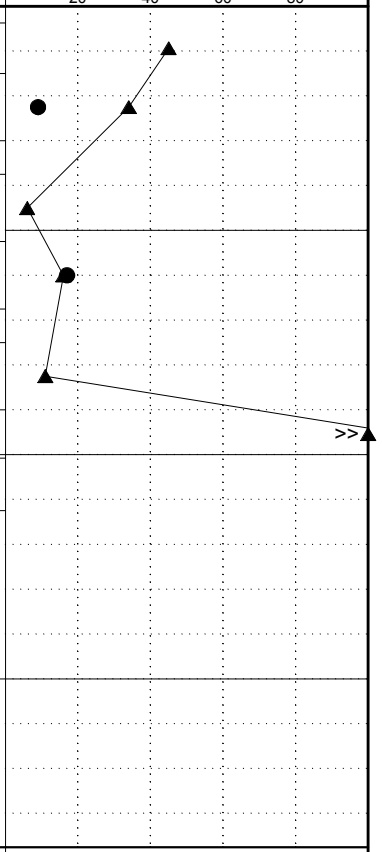


BORING NUMBER BH-02

CLIENT Agence Parks Canada Agency
PROJECT NAME Kouchibouguac National Park - Data Collection
PROJECT NUMBER 161-17014
PROJECT LOCATION Kouchibouguac National Park, NB
DATE STARTED 5/12/16 **COMPLETED** 5/12/16
GROUND ELEVATION 5.7 m Geodetic **HOLE SIZE** 100mm
DRILLING CONTRACTOR Lantech Drilling Services Ltd.
GROUND WATER LEVELS:
DRILLING METHOD Track Mounted Drill Rig
AT TIME OF DRILLING 3.50 m / Elev 2.20 m
LOGGED BY T. Elson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES Rankin Bridge
AFTER DRILLING ---

DEPTH (m)	ELEVATION (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
	5.7	Asphalt (150mm in thickness)			
	5.55	FILL: sand and gravel, loose to compact, dry to moist, grey-brown.	SS 01	37-24-21 (45)	67
			SS 02	18-18-16-14 (34)	58
2	4.2	FILL: sand and clay, some silt, trace to some gravel, loose to compact, dry to moist, red-brown.	SS 03	5-3-3-7 (6)	50
			SS 04	11-7-9-11 (16)	83
			SS 05	3-6-5-12 (11)	83
4	2.2	TILL: sand, some silt and clay, some gravel, compact to dense, dry to saturated, red-brown.	SS 06	13-14-50/0.13	70
	1.7	BEDROCK (Sandstone) - weathered and fractured, very poor to poor quality, medium strong to strong.	RC 01		100 (0)
6			RC 02		100 (50)
	-1.3	UCS = 29 MPa	RC 03		100 (50)
8	-1.9	End of borehole at 7.6 metres below ground surface in bedrock (sandstone). Groundwater was encountered at 3.5 metres below ground surface at the time of the investigation. *Approximate elevations taken from available topographic information.			
10					
12					

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

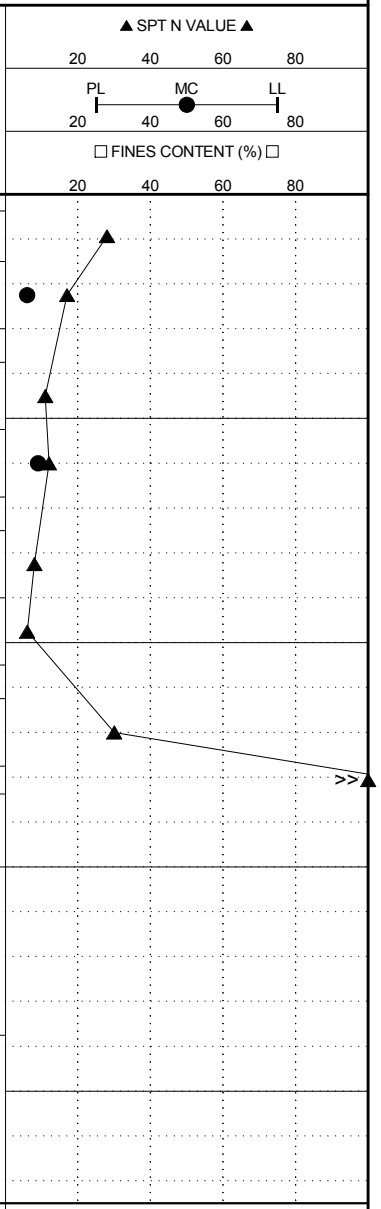


GEOTECH BH (N-VALUES) 161-17014 - PRELIM BH LOGS - RANKIN.GPJ GINT STD CANADA.GDT 1/10/17

BORING NUMBER BH-03

CLIENT Agence Parks Canada Agency
PROJECT NAME Kouchibouguac National Park - Data Collection
PROJECT NUMBER 161-17014
PROJECT LOCATION Kouchibouguac National Park, NB
DATE STARTED 6/12/16 **COMPLETED** 6/12/16
GROUND ELEVATION 5.3 m Geodetic **HOLE SIZE** 100mm
DRILLING CONTRACTOR Lantech Drilling Services Ltd.
GROUND WATER LEVELS:
DRILLING METHOD Track Mounted Drill Rig
▽ **AT TIME OF DRILLING** 2.10 m / Elev 3.20 m
LOGGED BY T. Elson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES Rankin Bridge
AFTER DRILLING ---

DEPTH (m)	ELEVATION (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
	5.3	Asphalt (150mm in thickness)			
	5.15	FILL: sand and gravel, loose to compact, dry to moist, grey-brown.	SS 01	13-16-12 (28)	67
			SS 02	13-10-7-7 (17)	50
	3.8	FILL: sand and clay, some silt, trace to some gravel, loose to compact, dry to moist, red-brown.	SS 03	6-6-5-6 (11)	50
2			SS 04	7-7-5-4 (12)	58
			SS 05	3-4-4-4 (8)	50
	1.8	TILL: sand, some silt and clay, some gravel, compact to dense, dry to saturated, red-brown.	SS 06	2-2-4-6 (6)	50
4			SS 07	8-8-22-29 (30)	100
			SS 08	38-50/0.10	100
	0	BEDROCK (Sandstone) - weathered and fractured, very poor to poor quality, medium strong to strong.	RC 01		100 (0)
6			RC 02		100 (30)
8			RC 03		100 (75)
	-3.8	End of borehole at 9.0 metres below ground surface in bedrock (sandstone).			
10		Groundwater was encountered at 2.1 metres below ground surface at the time of the investigation.			
		*Approximate elevations taken from available topographic information.			
12					

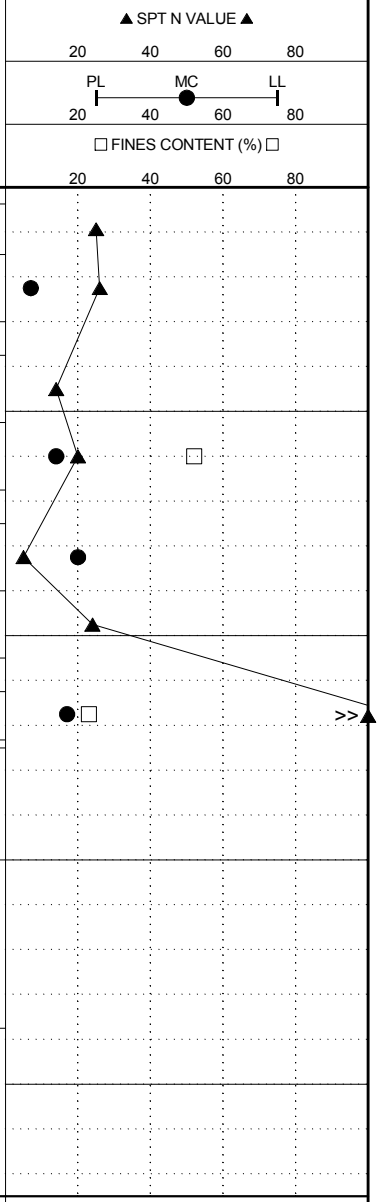


GEOTECH BH (N-VALUES) 161-17014 - PRELIM BH LOGS - RANKIN.GPJ GINT STD CANADA.GDT 1/10/17

BORING NUMBER BH-04

CLIENT Agence Parks Canada Agency
PROJECT NAME Kouchibouguac National Park - Data Collection
PROJECT NUMBER 161-17014
PROJECT LOCATION Kouchibouguac National Park, NB
DATE STARTED 6/12/16 **COMPLETED** 6/12/16
GROUND ELEVATION 5.7 m Geodetic **HOLE SIZE** 100mm
DRILLING CONTRACTOR Lantech Drilling Services Ltd.
GROUND WATER LEVELS:
DRILLING METHOD Track Mounted Drill Rig
▽ **AT TIME OF DRILLING** 4.50 m / Elev 1.20 m
LOGGED BY T. Elson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES Rankin Bridge
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
		5.7	Asphalt (150mm in thickness)				
		5.55	FILL: sand and gravel, loose to compact, dry to moist, grey-brown.		SS 01	16-12-13 (25)	67
					SS 02	9-10-16-16 (26)	75
		4.2	FILL: sand and clay, some silt, trace to some gravel, loose to compact, dry to moist, red-brown.		SS 03	8-6-8-12 (14)	83
2					SS 04	14-10-10-13 (20)	83
					SS 05	4-3-2-4 (5)	92
		2.2	TILL: sand, some silt and clay, some gravel, compact to dense, dry to saturated, red-brown.		SS 06	8-7-17-30 (24)	92
4				▽	SS 07	16-35-50/0.13	100
		0.7	BEDROCK (Sandstone) - weathered and fractured, very poor to poor quality, medium strong to strong.		RC 01		100 (0)
6					RC 02		100 (30)
8					RC 03		100 (67)
		-3.3	End of borehole at 9.0 metres below ground surface in bedrock (sandstone).				
10			Groundwater was encountered at 4.5 metres below ground surface at the time of the investigation.				
			*Approximate elevations taken from available topographic information.				
12							



GEOTECH BH (N-VALUES) 161-17014 - PRELIM BH LOGS - RANKIN.GPJ GINT STD CANADA.GDT 1/10/17

Photo 1: BH-01 / SS05

Photo 2: BH-01 / SS04

Photo 3: BH-03 / SS07

Photo 4: BH-04 / SS01

Photo 5: BH-01 / Rock Cores

Photo 6: BH-02 / Rock Cores

Photo 7: BH-03 / Rock Cores

Photo 8: BH-04 / Rock Cores

Appendix C

LABORATORY TEST RESULTS (STANTEC)

STANTEC MATERIALS TESTING REPORT

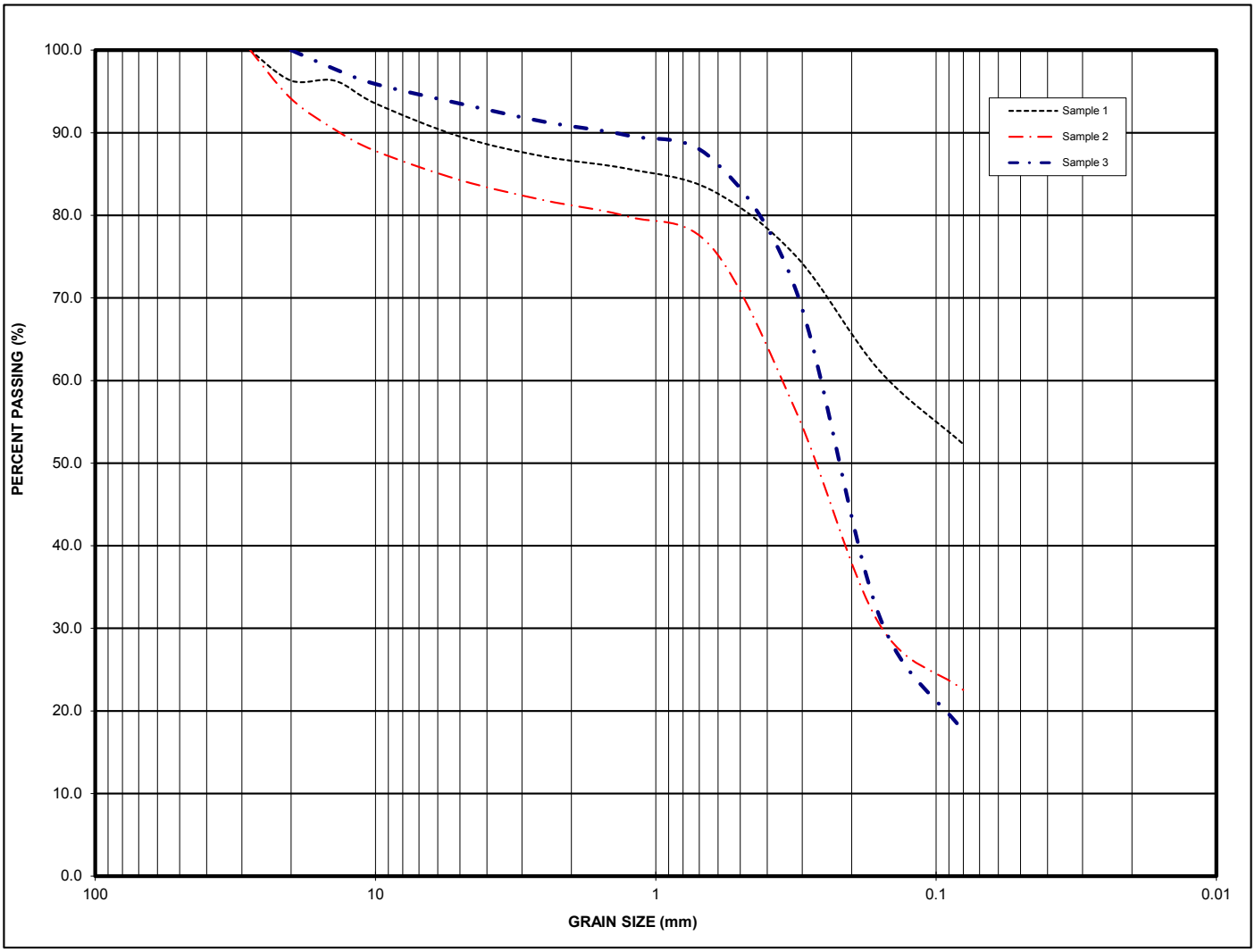
Project #: 121619399
Task#: 200.235

Client: WSP Canada Inc.
Project: WSP 161-17014, Kouchibouguac National Park
Source 1: BH04, SS04
Source 2: BH04, SS07
Source 3: BH06, SS08

Material Type: N/A
Date Received: 15-Dec-16
Date Tested: 19-Dec-16

GRADING				
SAMPLE #	1	2	3	
SIEVE (mm)	**% PASSING**	**% PASSING**	**% PASSING**	**SPEC**
80				-
56				-
40				-
28	100.0	100.0		-
20	96.3	94.1	100.0	-
14	96.3	90.4	97.7	-
10	93.5	87.8	95.9	-
5	89.5	84.3	93.5	-
2.5	87.1	81.8	91.3	-
1.25	85.6	79.8	89.6	-
0.630	83.0	76.1	86.8	-
0.315	75.0	56.1	70.8	-
0.160	61.3	30.6	31.6	-
0.080	52.3	22.5	17.5	-

PHYSICAL PROPERTY TESTS			
Sample Number	1	2	3
Gravel, %	10.5	15.7	6.5
Sand, %	37.2	61.7	76.0
Silt & Clay, %	52.3	22.5	17.5
Classification			
Natural Moisture Content, %			
Abrasion Loss, %			
Soundness Loss, %			
Micro Deval Loss, %			
Fine Absorption, %			
Flat & Elongated Particles,%			
Coarse Absorption, %			
Coarse Spec. Gravity, kg/m³			
Fractured Faces, %			
Liquid Limit, %			
Plastic Limit, %			
Plasticity Index, %		Non-Plastic	
Max. Dry Density: Standard			
Optimum Moisture Content %			



Technician R. Cameron

Reviewed By C.Mullins

STANTEC MATERIALS TESTING REPORT

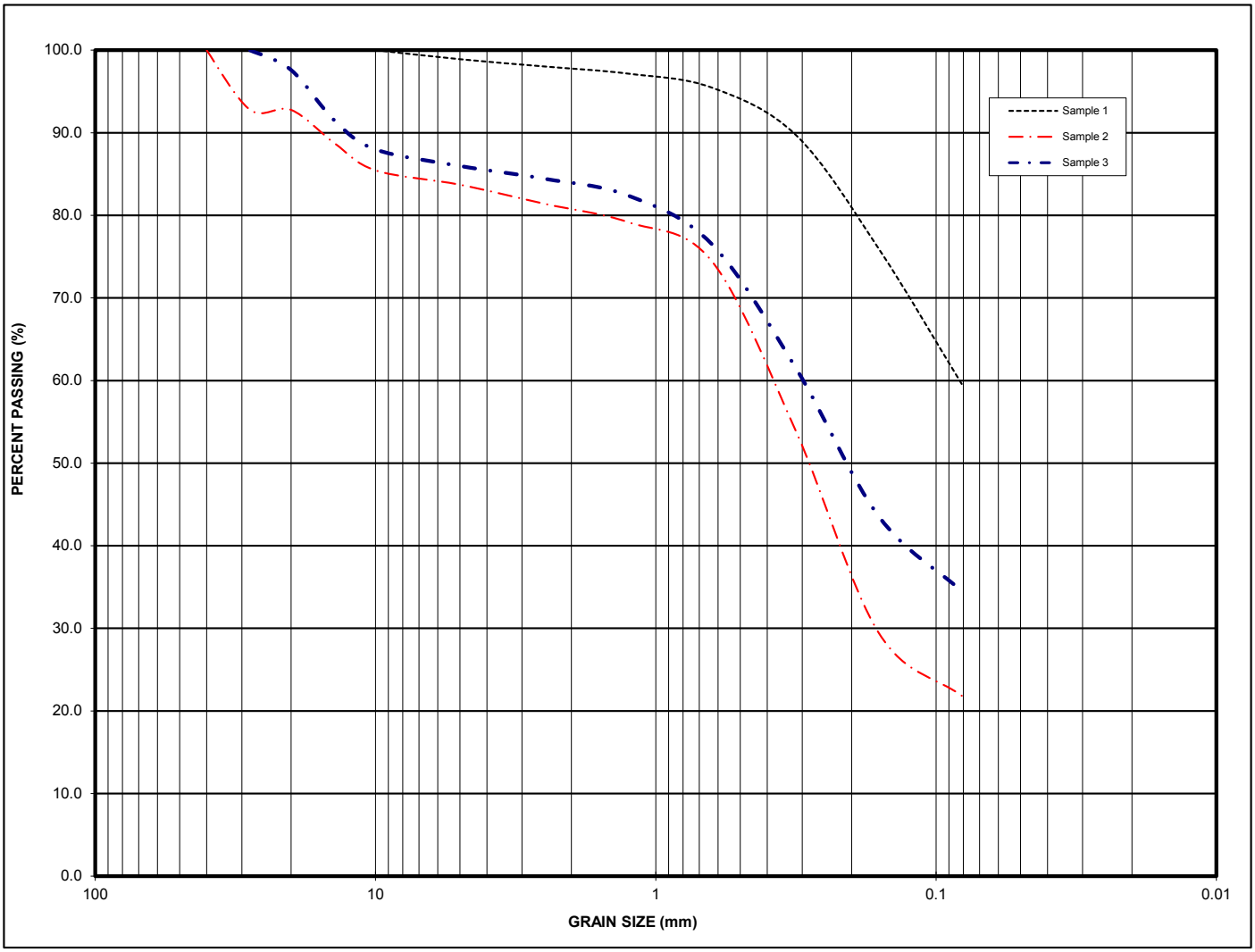
Project #: 121619399
Task#: 200.235

Client: WSP Canada Inc.
Project: WSP 161-17014, Kouchibouguac National Park
Source 1: BH01, SS05
Source 2: BH01, SS07
Source 3: BH09, SS04

Material Type: N/A
Date Received: 15-Dec-16
Date Tested: 19-Dec-16

GRADING				
SAMPLE #	1	2	3	
SIEVE (mm)	**% PASSING**	**% PASSING**	**% PASSING**	**SPEC**
80				-
56				-
40		100.0		-
28		92.8	100.0	-
20		92.8	97.6	-
14		88.7	91.5	-
10	100.0	85.4	88.0	-
5	98.9	83.7	86.0	-
2.5	98.0	81.4	84.4	-
1.25	97.1	79.2	82.4	-
0.630	95.5	74.4	76.5	-
0.315	89.7	53.7	61.4	-
0.160	75.9	29.4	43.5	-
0.080	59.3	21.7	34.4	-

PHYSICAL PROPERTY TESTS			
Sample Number	1	2	3
Gravel, %	1.1	16.3	14.0
Sand, %	39.6	62.0	51.6
Silt & Clay, %	59.3	21.7	34.4
Classification			
Natural Moisture Content, %			
Abrasion Loss, %			
Soundness Loss, %			
Micro Deval Loss, %			
Fine Absorption, %			
Flat & Elongated Particles,%			
Coarse Absorption, %			
Coarse Spec. Gravity, kg/m³			
Fractured Faces, %			
Liquid Limit, %			
Plastic Limit, %			
Plasticity Index, %			
Max. Dry Density: Standard			
Optimum Moisture Content %			



Technician J.Fiset

Reviewed By C.Mullins

Stantec

Project Name: WSP 161-17014, Kouchibouguac National Park **Project Number:** 121619399

Task: 200.235

Client: WSP Canada Inc.

Sample Identification	Moisture Content, %		Sample Identification	Moisture Content, %
BH01 SS02	8.7			
BH01 SS05	20.5			
BH01 SS07	13.4			
BH02 SS02	8.9			
BH02 SS04	17.1			
BH03 SS02	5.5			
BH03 SS04	9.3			
BH04 SS02	7.3			
BH04 SS04	14.0			
BH04 SS05	20.2			
BH04 SS07	16.7			
BH05 SS04	20.4			
BH06 SS04	8.6			
BH06 SS08	23.7			
BH09 SS02	12.4			
BH09 SS04	16.4			

Reviewed By: C.Mullins **Date:** 24-Dec-16

Stantec Ltd.

ROCK CORE DIMENSIONAL and SHAPE TOLERANCES ASTM D 4543

Project Name	WSP 161-17014			Project Location	Kouchibouguac National Park			Project Number	121619399 200.235
Block	1	**Sample**	25'	**Area (mm²)**	3117	**L (mm)**	146.25	**D (mm)**	63.00

Axial Tolerance	Axial		End Surface Flatness				Perpendicularity Tolerance		
	Min	Max	D_1	D_2	D_3	D_4			
L_1	0.000	0.013	0.000	0.002	0.008	0.003	D_1 Δ	0.008	
L_2	0.000	0.005	0.008	0.009	0.000	0.010	D_2 Δ	0.007	
L_3	-0.003	0.002					D_3 Δ	0.008	
							D_4 Δ	0.007	
L_1 Δ	0.013								
L_2 Δ	0.005						L/D Ratio	2.3	
L_3 Δ	0.005						L/D Meets Spec		
Maximum Axial Deviation (in) 0.013							Δ Max	0.008	
							Δ Max / D	0.003	
Axial Deviation Meets Spec							Perpendicularity Meets Spec		

COMPRESSIVE STRENGTH of INTACT ROCK CORE ASTM D 7012

Load, kN	128.0	Compressive Strength, MPa	41	Unit Weight, g/cm³	2.166
Bedrock Type	Sandstone				
Remarks					
Tested By	JF	Date 16-Dec-16	Reviewed By	M.Bochmann	

Stantec Ltd.

ROCK CORE DIMENSIONAL and SHAPE TOLERANCES ASTM D 4543

Project Name	WSP 161-17014			Project Location	Kouchibouguac National Park			Project Number	121619399 200.235
Block	4	**Sample**	19'	**Area (mm²)**	3117	**L (mm)**	130.00	**D (mm)**	63.00

Axial Tolerance	Axial		End Surface Flatness				Perpendicularity Tolerance		
	Min	Max	D_1	D_2	D_3	D_4			
L_1	0.000	0.018	0.000	0.006	0.006	0.006	D_1 Δ	0.007	
L_2	0.000	0.026	0.007	0.000	0.008	-0.002	D_2 Δ	0.006	
L_3	0.000	0.022					D_3 Δ	0.002	
							D_4 Δ	0.008	
L_1 Δ	0.018								
L_2 Δ	0.026						L/D Ratio	2.1	
L_3 Δ	0.022						L/D Meets Spec		
Maximum Axial Deviation (in) 0.026							Δ Max	0.008	
							Δ Max / D	0.003	
Axial Deviation Out of Spec							Perpendicularity Meets Spec		

COMPRESSIVE STRENGTH of INTACT ROCK CORE ASTM D 7012

Load, kN	117.8	Compressive Strength, MPa	38	Unit Weight, g/cm³	2.151
Bedrock Type	Sandstone				
Remarks	Axial deviation out of spec due to undulations along side of core due to drill process				
Tested By	JF	Date 16-Dec-16	Reviewed By	M.Bochmann	

Stantec Ltd.

ROCK CORE DIMENSIONAL and SHAPE TOLERANCES ASTM D 4543

Project Name	WSP 161-17014			Project Location	Kouchibouguac National Park			Project Number	121619399 200.235
Block	6	**Sample**	38'	**Area (mm²)**	3093	**L (mm)**	128.50	**D (mm)**	62.75

Axial Tolerance	Axial		End Surface Flatness				Perpendicularity Tolerance		
	Min	Max	D_1	D_2	D_3	D_4			
L_1	0.000	0.022	0.000	-0.005	0.002	-0.005	D_1 Δ	0.005	
L_2	0.000	0.020	-0.005	0.004	-0.007	0.001	D_2 Δ	0.009	
L_3	0.000	0.016					D_3 Δ	0.009	
							D_4 Δ	0.006	
L_1 Δ	0.022								
L_2 Δ	0.020						L/D Ratio	2.0	
L_3 Δ	0.016						L/D Meets Spec		
Maximum Axial Deviation (in) 0.022							Δ Max	0.009	
							Δ Max / D	0.004	
Axial Deviation Out of Spec							Perpendicularity Meets Spec		

COMPRESSIVE STRENGTH of INTACT ROCK CORE ASTM D 7012

Load, kN	137.2	Compressive Strength, MPa	44	Unit Weight, g/cm³	2.411
Bedrock Type	Sandstone				
Remarks	Axial deviation out of spec due to undulations along side of core due to drill process				
Tested By	JF	Date 20-Dec-16	Reviewed By	M.Bochmann	

Stantec Ltd.

ROCK CORE DIMENSIONAL and SHAPE TOLERANCES ASTM D 4543

Project Name	WSP 161-17014			Project Location	Kouchibouguac National Park			Project Number	121619399 200.235
Block	7	**Sample**	33'	**Area (mm²)**	3142	**L (mm)**	143.75	**D (mm)**	63.25

Axial Tolerance	Axial		End Surface Flatness				Perpendicularity Tolerance		
	Min	Max	D_1	D_2	D_3	D_4			
L_1	-0.012	0.000	0.000	0.001	0.005	0.005	D_1 Δ	0.007	
L_2	-0.010	0.002	0.007	0.007	0.000	-0.003	D_2 Δ	0.006	
L_3	-0.002	0.000					D_3 Δ	0.005	
							D_4 Δ	0.008	
L_1 Δ	0.012								
L_2 Δ	0.012						L/D Ratio	2.3	
L_3 Δ	0.002						L/D Meets Spec		
Maximum Axial Deviation (in) 0.012							Δ Max	0.008	
							Δ Max / D	0.003	
Axial Deviation Meets Spec							Perpendicularity Meets Spec		

COMPRESSIVE STRENGTH of INTACT ROCK CORE ASTM D 7012

Load, kN	127.4	Compressive Strength, MPa	41	Unit Weight, g/cm³	2.397
Bedrock Type					
Remarks					
Tested By	JF	Date 20-Dec-16	Reviewed By	M.Bochmann	

Stantec Ltd.

ROCK CORE DIMENSIONAL and SHAPE TOLERANCES ASTM D 4543

Project Name	WSP 161-17014			Project Location	Kouchibouguac National Park			Project Number	121619399 200.235
Block	9	**Sample**	25'	**Area (mm²)**	3043	**L (mm)**	107.75	**D (mm)**	62.25

Axial Tolerance	Axial		End Surface Flatness				Perpendicularity Tolerance		
	Min	Max	D_1	D_2	D_3	D_4			
L_1	-0.015	0.016	0.000	-0.010	0.008	-0.003	D_1 Δ	0.004	
L_2	-0.058	0.002	-0.004	0.010	-0.012	0.003	D_2 Δ	0.020	
L_3	-0.040	0.000					D_3 Δ	0.020	
							D_4 Δ	0.006	
L_1 Δ	0.031								
L_2 Δ	0.060						L/D Ratio	1.7	
L_3 Δ	0.040						L/D Out of Spec		
Maximum Axial Deviation (in)							Δ Max	0.020	
0.06							Δ Max / D	0.008	
							Perpendicularity Out of Spec		
Axial Deviation Out of Spec									

COMPRESSIVE STRENGTH of INTACT ROCK CORE ASTM D 7012

Load, kN	88.8	Compressive Strength, MPa	29	Unit Weight, g/cm³	2.403
Bedrock Type	Sandstone				
Remarks	Axial deviation out of spec due to undulations along side of core due to drill process				
Tested By	JF	Date 20-Dec-16	Reviewed By	M.Bochmann	

APPENDIX

B

PARKS CANADA NATIONAL BEST MANAGEMENT PRACTICES – ROADWAY, HIGHWAY, PARKWAY AND RELATED INFRASTRUCTURE

APPENDIX

C PARKS CANADA – BASIC IMPACT ANALYSIS