



Parks Canada Agency

# North Aspy River (South) Branch Bridge Replacement

## Technical Specifications

**ISSUED FOR TENDER**

July, 2017

PCA Project No: 666

Stantec Project No: 133346833

0	Issued for Tender	July 6, 2017	RMB	PJF/GL	
Rev	Issue or Revision	Date	Prepared By	Reviewed By	Issued by

Specifications  
Issued for Tender

Parks Canada Agency

Cabot Trail  
North Aspy River (South) Bridge Replacement  
Cape Breton Highlands National Park, NS

Project No. 666  
Stantec Consulting Limited



Peter Flower, P.Eng  
Senior Civil Engineer  
Stantec Consulting Limited



Gino Lefrancois, P.Eng  
Stantec Consulting Limited

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**Part 1            General**

**1.1                REFERENCES**

- .1        Public Act (Nova Scotia), Pit and Quarry Guidelines, Asphalt Paving Plant Regulations, Environmental Construction Practice Specifications, Forest Improvement Act, National Parks Act and Regulations and Canadian Environmental Protection Act.

**1.2                DESCRIPTION OF WORK AND LOCATION**

- .1        The work under this Contract covers the furnishing of all labour, materials and equipment required to provide construction services for the replacement of a bridge crossing on the Cabot Trail, North Aspy River South Branch located at the Big Intervale boundary, at KM 51.0 within Cape Breton Highlands National Park (CBHNP).

**1.3                WORK COVERED BY CONTRACT DOCUMENTS**

- .1        Parks Canada is preparing to replace the North Aspy River South Branch Bridge which includes realigning a section of the Cabot Trail, removal of existing accesses and construction of a new Day Use/Campground, parking area and accesses.
- .2        Carry out a preconstruction survey, this is considered incidental to the Contract. **The Contractor shall be required to layout and place wooden grade stakes at every construction stage of the roadway structure (top of backslope, toe of slope, subgrades, granulars, etc.) on both sides of the roadway. Establish and maintain 20 m stationing and placement of offset stakes of the 20 m stations on which is written with the chainage and centreline offset.**
  - .1        This includes stakes, marks and grades necessary for clearing, grubbing and stripping limits, cuts, fills, and culvert layouts.
  - .2        The preservation of stakes and marks, shall be the responsibility of the Contractor and are to be maintained throughout the Work.
  - .3        The Contractor shall ensure access for the Departmental Representative for checking control lines and grades.
  - .4        The Contractor shall meet the design lines and grades as provided in the contract Drawings.
  - .5        Remove all grade stakes and markings at the completion of Work.
- .3        Record the direction, start station, and end station of all pavement marking passing lanes within the project limits. Establish offset stake at each location and re-establish prior to new pavement marking.
- .4        Supply traffic control signs including portable electronic message boards, traffic control personnel and pilot vehicle including means of transporting cyclist and their bicycles thru the traffic control zone.
- .5        Supply and operation of traffic control for the duration of the project.

- .6 The Contractor shall develop an Environmental Protection Plan for submission and approval prior to starting work based on the Basic Impact Analysis and Parks Canada's Best Management Practices document as shown in **Appendix B**. (*Parks Canada National Best Management Practices – Roadway, Highway, Parkway and Related Infrastructure (May 2015)*).
- .7 Site erosion and sediment control measures, including cofferdams, check dams, silt fencing, silt curtain, hay/straw bales, vegetative stabilization and other measures as required, maintained for the duration of the Work.
- .8 Maintenance of traffic on existing bridge until new bridge is complete and open to traffic.
- .9 Removal and disposal of existing features within the limits of contract including; tree clearing and grubbing, soil stripping, asphalt pavement, guard rail, signage, concrete structures, foundations, buildings, retaining walls, fencing.
- .10 Removal of existing asphalt concrete and reuse/disposal as required.
- .11 Construction including; clearing, grubbing, stripping, ditching, and grading areas as shown on the Contract Drawings.
- .12 Removal and reinstatement of existing Big Intervale Camping area as shown on the Contract Drawings. This includes: access, signage, retaining wall, fencing and buildings.
- .13 Construction and development of a new Day Use Park/Campground area including; the construction of a new Privy Building as shown on the Contract Drawings.
- .14 Removal and reinstatement of existing Beulach Ban Falls Access as shown on the Contract Drawings.
- .15 Reconstruction and development of the new Beulach Ban Falls Access as shown on the Contract Drawings.
- .16 Construction and development of a new Parking area at Beulach Ban Falls as shown on the Contract Drawings.
- .17 All landscaping requirements, reclamation and trailways as shown and detailed on the Contract Drawings.
- .18 Dewatering of site and temporary water control.
- .19 Removal and disposal of existing culverts and replacement with new culverts as shown on the Drawings.
- .20 Excavation of the roadway structure.
- .21 Rock breaking and excavation, as required.
- .22 Supply and installation of new bridge, including driven H-pile foundation, cast-in-place concrete abutments, wingwalls, deck, curb, crash block, pre-stressed concrete beams, barrier, deck waterproofing membrane, asphalt, embankment slope and incidentals required to complete the work as shown on Contract Drawings and described in the Contract Documents.
- .23 Compact and proof roll new subgrade surfaces

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- .24 Replacement of the surface asphalt along the existing Cabot Trail which has been identified for the development of the new Day Use/Campground area.
  - .25 The supply, placement, compaction and grading of Type 1, Type 2 and Type 1S granular materials, rip-rap, and asphalt to the lines and grades shown on the Drawings and as specified in the specifications.
  - .26 Supply and install guide rail and posts.
  - .27 Supply and place base and surface course asphalt concrete. A material transfer vehicle (Roadtec SB 2500C or approved equal) is to be used to transfer all hot mix asphalt from haul units to asphalt spreader.
  - .28 Demolition of existing bridge, including removal and disposal of barrier, deck, abutments, wingwalls and other incidentals required to restore site to near undisturbed condition. This shall include the removal of piles, if any are present, to a depth of 1000 mm below underside of existing footing. Demolition of existing roadway approaches and restoration of site shall be considered incidental to the work.
  - .29 Supply, placement and compaction of bedding, surround and backfill/sub-grade materials around new bridge abutments.
  - .30 Supply, placement and compaction of sub-base and base gravels in roadway structure at bridge approaches.
  - .31 Power pole relocation efforts and coordination with NS Power.
  - .32 Supply and installation of finish surfacing, including rip rap and shoulder gravels.
  - .33 Removal of regulatory and warning signs and sign posts and replace with new signs and posts. The Contractor shall provide the new regulatory and warning signs.
  - .34 Remove Park signs and sign posts and deliver to a location within the Park as directed by the Departmental Representative. The Contractor shall replace sign posts and replace or reinstate Park signs as provided by the Park upon completion of the Work.
  - .35 Supply and placement of hydroseeding and dry mulch on designated slopes.
  - .36 Establish the layout of pavement markings, delineation and arrows etc. prior to line stripping. Provide for review and approval to the Departmental Representative drawings of new layout locations prior to pavement marking.
  - .37 Supply and installation of all temporary and permanent pavement markings.
- .2 All mitigation measures to protect downstream water quality impacts contained within these specifications require full adherence from the Contractor.
  - .3 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, as it applies to the Temporary Workplace Traffic Control Manual.

- .4 The Contractor must be aware that other construction work may be performed at several different locations within the Park during the time frame of this contract and that coordination with other Contracts may be required. The Contractor must plan their work accordingly. A list of other anticipated work areas along Cabot Trail includes:

- .1 French Mountain Culvert Replacement.
- .2 French Mountain Rock Slope Stabilization.
- .3 French to MacKenzie Rehabilitation.
- .4 MacKenzie River Bridge Replacement.
- .5 North Mountain Pavement Rehabilitation.
- .6 North Aspy North Branch Bridge Replacement.
- .7 South Mountain Pavement Rehabilitation.
- .8 Clyburn Brook Bridge Replacement.
- .9 Trout Brook Campground Reconstruction.
- .10 Little Smokey Rock Slope Stabilization.

This list is not considered accurate, instead is listed to convey the amount of work being performed in the Park and the Contractor must plan their work accordingly.

#### **1.4 CONTRACT METHOD**

- .1 Construct the Work under a combined lump sum and unit price items Contract.

#### **1.5 TERMS AND DEFINITIONS**

- .1 Project Limits: The clearing limits.
- .2 Roadway: Portion of right-of-way included within construction limits of grading, drainage, base course, shouldering and surface course improvements and appurtenant structures.

#### **1.6 MAINTENANCE OF WORK DURING CONSTRUCTION**

- .1 Maintain work during construction. Undertake continuous and effective maintenance work day by day, with adequate equipment and forces so that the roadway or structures are continuously kept in a condition satisfactory to Departmental Representative.
- .2 Co-operate with other Contractors in carrying out their respective works and carry out instructions from the Departmental Representative.
- .3 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Departmental Representative, in writing, any defects which may interfere with proper execution of Work.

## 1.7 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 (Nova Scotia Department of Transportation and 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 Highways Act (Nova Scotia).

## 1.8 WORK WITHIN PARK BOUNDARIES

- .1 The project is within a National Park and it is essential that 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, the Contractor is responsible to 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 The Contractor shall ensure 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 at least two weeks prior to the start of any work.
  - .5 The Contractor is responsible to follow the Provincial requirements regarding the following:
    - .1 Pit and Quarry Guidelines.
    - .2 Environmental Construction Practice Specifications.
  - .6 The Contractor will 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.
  - .7 Other documents as specified.

- .8 Construction schedule.
- .9 Environmental control plan.

## **1.9 WORK SEQUENCE**

- .1 Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.
- .2 Required stages:
  - .1 Construction of new bridge structure and segment of approaches that will not impede flow of traffic on existing bridge and approaches.
  - .2 Construction of roadway re-alignment to North of existing approach from Ingonish. Open new bridge to traffic.
  - .3 Demolition of existing bridge structure.
  - .4 Removal of old roadway no longer required and restoration of site including construction of new Day Use/Campground area landscaping of slopes, placement of guiderails and signs.

## **1.10 WORK BY OTHERS**

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from the Departmental Representative.
- .2 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Departmental Representative, in writing, any defects which may interfere with proper execution of Work.
- .3 There shall be no Work during the May, 2018 Cabot Trail Relay Race, the specific date TBD.

## **1.11 SITE CONDITIONS**

- .1 The Contractor will be responsible to visit the site and review existing site conditions.
- .2 Before submitting a bid, it is recommended that bidders visit the site to review and verify the form, nature and extent of the work, materials needed, the means of access and the temporary facilities required to perform the Work.
- .3 Obtain prior permission from the Parks Canada Asset Manager before carrying out such site inspection.
- .4 All persons visiting the site are to review specification Section 01 35 29.06 – Health and Safety Requirements before arrival on site. Take all appropriate safety measures for any visit to site, either before or after acceptance of bid.

- .5 For geotechnical and borehole information, refer to report prepared by Stantec Consulting Ltd. dated March, 2016, attached in **Appendix A**. Any interpretations of its findings will be made at the Contractor's own risk and the Departmental Representative will not be held responsible for the interpretation of this document.
- .6 Promptly notify the Departmental Representative if subsurface conditions differ materially for those indicated in the Contract Documents or a reasonable assumption of probable conditions based on thereon.

### **1.12 SITE SURVEY AND SETTING OUT OF WORK**

- .1 Existing topographic data used in the preparing these Contract Documents was provided by Leading Edge Geomatics using LIDAR supplied data. Topographic surveys by Attwood Surveys Ltd. was completed to supplement the Lidar data.
- .2 If required, georeferenced CAD files of the site can be provided to the Contractor for use in layout.
- .3 Contractor shall carry out all layouts.
- .4 Contractor shall assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.
- .5 Contractor shall supply such devices as straight edges and templates required to facilitate Departmental Representative's inspection of work.
- .6 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 toe of slope, rounding and centerline offsets, etc.
- .7 Provide coordinates, elevations and dimensions in the field, as required by the Departmental Representative.

### **1.13 WASTE DISPOSAL**

- .1 Waste material from common excavation and other waste generated from this project will be disposed of outside of Park boundaries. Disposal waiver forms are to be submitted to the Departmental Representative.

### **1.14 MAINTENANCE OF WORK DURING CONSTRUCTION**

- .1 Maintain work during construction. Undertake continuous and effective maintenance work day by day, with adequate equipment and forces so that the roadway or structures are continuously kept in a condition satisfactory to Departmental Representative.



## 1.15 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 listed in the description of work.
- .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 All in-stream work is to be carried out under low flow conditions as per the Basic Impact Analysis, and the Environmental Control Plan provided in the **Appendices B and D**.
- .4 The new replacement bridge shall be open to traffic prior to **August 31, 2018**, including paving of bridge deck and approaches and backfilling around structures. Demolition of the existing bridge shall be completed prior to **September 30, 2018**. Demolition of the existing structure shall not commence until the new bridge and roadway are ready for traffic to the approval of the Departmental Representative. The final completion date shall be **October 26, 2018** to allow for minor outstanding items, as approved by the Departmental Representative.
- .5 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.
- .6 No work will begin until the pre-construction meeting is held.
- .7 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.

## 1.16 CONTRACTOR'S USE OF SITE

- .1 Limit use of premises for Work, to allow:
  - .1 Work by other Contractors.
  - .2 Public usage.
- .2 Co-ordinate use of premises under direction of Departmental Representative.
- .3 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.

- .4 Contractor's use of site for trailers storage and preparatory work shall be limited to an approved area. Any additional areas required shall be approved by The Departmental Representative prior to use.
  - .1 The Contractor has been provided use of the existing Big Intervale Day Use area as an approved location for stockpiling of materials and construction materials. This site also contains stockpiled borrow material to be used for this project.
  - .2 All other areas from equipment storage, stockpiling of materials, field office, employee parking etc. shall be to the approval of the Departmental Representative.
  - .3 Material storage, stockpiles and all disposal sites are to be reinstated to pre-construction activities as directed by the Departmental Representative.
- .5 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .6 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 work.
- .7 Contractor shall provide any and all necessary traffic control services required for the project.
- .8 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .9 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by the Departmental Representative.
- .10 At completion of operations condition of existing work: equal to or better than that which existed before new work started.
- .11 Contractor to obtain all necessary permits and/or approvals to perform work and to comply with all permit requirements and conditions.

#### **1.17 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.

#### **1.18 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.

- .2 After receiving the Contractor's schedule, traffic control plan, health and safety hazard assessment, and environmental protection 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, health and safety, methods of construction, environment protection methods and traffic control.
- .3 Interim reviews of work progress based on work schedule will be conducted as decided by the Departmental Representative and schedule updated by the Contractor in conjunction with and approval of the Departmental Representative.
- .4 No work will begin until the pre-construction meeting is held, and all submittals have been approved.
- .5 Following the pre-construction meeting and approval of submittals, the work will be carried out to meet the time restraints and have the project completed on time.

#### **1.19 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy each of following:
  - .1 Contract drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed shop drawings.
  - .5 List of Outstanding Shop Drawings.
  - .6 Manufacturer's installation and application instructions.
  - .7 Change orders.
  - .8 Other modifications to contract.
  - .9 Field test reports.
  - .10 Copy of approved work schedule.
  - .11 Health and Safety Plan and other safety related documents.
  - .12 Other documents as stipulated elsewhere in the Contract Documents.

#### **1.20 DEPARTMENTAL REPRESENTATIVE**

- .1 Departmental Representative will be assigned after contract award.

#### **1.21 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 any violations. The Plan must indicate the progressive steps that will be followed should violations occur.
  - .2 Over Weight Loads: Departmental Representative will 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 NS 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 material. 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.

## **1.22 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.

## **1.23 MEASUREMENT FOR PAYMENT**

- .1 Notify Departmental Representative sufficiently in advance of operations to permit required measurements for payment.

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**1.24 CUTTING AND PATCHING**

- .1 Cut and patch as required to make work fit.
- .2 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work.

**1.25 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.

**1.26 NATIONAL PARKS ACT**

- .1 For projects within boundaries of National Park, perform work in accordance with the National Parks Act and Regulations for arrears.

**1.27 MEASUREMENT OF QUANTITIES**

- .1 Linear: Items which are measured by metre or kilometer are to be measured along centreline of installation unless otherwise shown on plans.
- .2 Area:
  - .1 Longitudinal and transverse measurements for areas to be measured horizontally.
- .3 Mass:
  - .1 Term "tonne" shall mean 1000 kg.
  - .2 Materials which are specified for measurement by mass shall be weighed on scales approved by and at locations designated by Departmental Representative. 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.
- .4 Time:
  - .1 Unless otherwise provided for elsewhere or by written authority of the 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.

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**1.28 PERMITS/AUTHORITIES**

- .1 The Contractor shall obtain, and pay for, permits from authorities as required for all operations and construction. The Contractor shall also comply with all pertinent regulations of all authorities having jurisdiction over the work. The Contractor shall provide copies of all permits and approvals to the Owner 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.

**1.29 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 Nova Scotia Road Builders Association.

**1.30 PROTECTION**

- .1 Store all materials and equipment to be incorporated into work to prevent damage by any means.
- .2 Repair and replace all materials or equipment damaged in transit or storage to the satisfaction of the Departmental Representative and at no cost to Crown.
- .3 Contractor will take adequate precautions to protect existing structures when operating tracked equipment.
- .4 Exercise care so as not to obstruct or damage public or private property in the area.
- .5 At completion of work, restore area to its original condition. Damage to ground and property will be repaired by Contractor. Remove all construction materials, residue, excess, etc., and leave site in a condition acceptable to Departmental Representative.

**1.31 EXISTING SERVICES**

- .1 Notify the Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give the Departmental Representative 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to vehicular traffic.
- .3 Establish location and extent of service lines in area of work before starting Work. Notify the Departmental Representative of findings.

- .4 Submit schedule to and obtain approval from the Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .5 Where unknown services are encountered, immediately advise the Departmental Representative and confirm findings in writing.
- .6 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .7 Record locations of maintained, re-routed and abandoned service lines.
- .8 Cut and patch as required to make work fit.
- .9 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work.
- .10 Carry out work at times directed by authorities having jurisdiction, with minimum of disturbance to pedestrian and vehicular traffic.
- .11 Ensure that two lanes of traffic are maintained at construction sites at all times, except during tie-ins of the new roadway, where traffic will be reduced to one lane with the provision of traffic signals, subject to the approval of the Departmental Representative.
- .12 Ensure pedestrian and other traffic is not unduly impeded, interrupted or endangered by execution or existence of work or plant.
- .13 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
- .14 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.
- .15 There are existing signs, power and utility poles located within the project area that are impacted by the new work and will require relocation. This includes the existing "Road Closed When Lights Flashing" sign located on the east approach. The Contractor will be required to coordinate their work with utility companies and schedule the works accordingly.

**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 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.
- .2        Section 01 35 00.06 - Special Procedures for Traffic Control.

**1.2            ACCESS AND EGRESS**

- .1        Design, construct and maintain temporary "access to" and "egress from" work areas, in accordance with relevant municipal, provincial and other regulations.

**1.3            USE OF SITE AND FACILITIES**

- .1        Provide for personnel and vehicle access.
- .2        The Contractor shall not park equipment on the shoulder of the roadway at the end of each work day.
- .3        The Contractor shall coordinate and submit a plan to the Departmental Representative of proposed locations for laydown, equipment storage and Contractor staff parking for review and approval.
- .4        Contractor has full use of existing Big Intervale Day Use area during construction activities. The Contractor shall install appropriate signage and barricades to delineate the work area.
- .5        Contractor shall maintain access to the Warden's office and the trailhead at Beulach Ban Falls at all times. Access shall be appropriately delineated and signed during the Work.
- .6        Maintenance work on Contractor/Sub-Contractor equipment is prohibited with the Park boundary.
- .7        The Contractor to provide survey layout with stakes on both sides of the road/alignment at 20 m Stations (top of back slope, toe of slope, subgrade, granulars, shoulders, etc.) with C/L offset.
- .8        Special Move Permit (over weight & over dimension) from the province shall be submitted to the Departmental Representative for review and approval prior to activity.
- .9        Maintain Road & Site Signage at all times during Contract (ie. Dust control, no potholes, bumps, PVMS, etc.)
- .10        Water extraction within the Park is not permitted.
- .11        Blasting is prohibited.
- .12        Relics, Antiques, Artifacts, Wildlife Habitat encountered and all spills must be reported to Parks Canada and the Departmental Representative as per Contract.
- .13        The Work shall be conducted in accordance with Parks Canada Best Management Practices – Roadway, Highway, Parkway and Related Infrastructure (May, 2015), Environmental Construction Practice Specifications, National Parks Act and Regulations,

Canadian Environmental Protection Act and the Basic Impact Analysis Document  
(Appendix B).

- .14 If native topsoil is encountered, the Contractor shall maintain so embankments and designated areas can be dressed at the end of the project prior to hydroseeding and dry mulch.
- .15 Any materials deemed salvageable such as Guide Rail, Signage etc. The Contractor shall deliver these materials to the Park Compounds. Guide Rail shall be unbolted and neatly stored with hardware provided.
  - .1 The Contractor shall coordinate with Park staff:
    - .1 Cheticamp Compound: Jerry LeBlanc (902-224-2041)
    - .2 Ingonish Compound: Hank Etheridge (902-776-0397)
- .16 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .17 Where security is reduced by work provide temporary means to maintain security.
- .18 The Contractor is advised that there is other Work ongoing in other areas of the Park outside the limits of the Work for this Contract.
- .19 The Contractor is required to record As-Built information and provide at the end of the project as per the Contract.

#### **1.4 ALTERATIONS, ADDITIONS OR REPAIRS**

- .1 Execute work with least possible interference or disturbance to public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

#### **1.5 EXISTING SERVICES**

- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission:
  - .1 The Contractor shall obtain clearance reports from all utilities and ensure temporary lines are not disturbed during the duration of this project. The Contractor will be required to coordinate their work with utility companies and schedule the works accordingly.
- .2 Provide for personnel, pedestrian and vehicular traffic. Provide for two lanes of traffic for the duration of the project.

#### **1.6 SPECIAL REQUIREMENTS**

- .1 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. It should be noted that there will be no Work during the Cabot Trail Relay Race, typically the last weekend in May. The Contractor is responsible for confirming this date with the Departmental Representative.
- .2 The maximum cumulative traffic delay within the project limits during the peak season (July 1 - August 31) between the hours of 9am and 4pm shall be 10 minutes. The

maximum cumulative traffic delay within the project limits shall be 15 minutes during the off peak season. The Contractor shall be aware of the Road Rental clause associated with Traffic Delays as specified in Section 01 35 00.06 – Special Procedures for Traffic Control, subsection 3.1.5.1.

- .3 Deliver materials outside of peak traffic hours unless otherwise approved by Departmental Representative.
- .4 Road closure for erection of girders is restricted to the hours of 12am to 6am between the months of June to August, and 9pm to 7am for all other months. The Contractor shall provide an erection plan to the Departmental Representative 2 weeks prior to erection for review and approval.
- .5 The Contractor shall provide a demolition plan of the existing bridge to the Departmental Representative 2 weeks prior to demolition for review and approval.
- .6 During the school year, minimize delays for school buses.
- .7 Water extraction from within the Park boundaries is strictly forbidden. Water extraction may be permitted following a detailed proposal submitted by the Contractor and subject to approval by the Departmental Representative.
- .8 All In-stream work shall only be permitted as per the Basic Impact Analysis, provided in the Appendices.
- .9 Temporary lanes to have minimum 50 mm of Aggregate Base Course at the end of each working day as riding surface open to the public.
- .10 The Contractor is advised that all materials shall come from outside the Park limits.
- .11 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .12 Keep within limits of Work and avenues of ingress and egress.
- .13 Submit schedule in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

**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        General Conditions.

**1.2                MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 – Payment Procedures.

**1.3                PRIME COST SUM**

- .1        Include in Contract Price a total Prime Cost Sum of \$80,000.
- .2        The Contract Price, and not Prime Cost Sum, includes Contractor's overhead and profit in connection with such prime cost sum.
- .3        Prime Cost Sum provided for in the unit price table is not a sum due the Contractor. Rather, payment will be made against it for miscellaneous work not included in the unit price table ordered under GC 6.1 of the General Conditions.
- .4        Such work may include, but not be limited to:
  - .1        Coordination efforts with Nova Scotia Power for removal and relocation of hydro poles and associated infrastructure, within the limits of Work.
    - .1        The Contractor shall schedule and coordinate the Work with NS Power.  
Shoaib Badshah  
T&D Capital Engineer  
Nova Scotia Power  
O: 1 (902) 496-4879  
C: 1 (902) 789-9687  
[shoaib.qabilbadshah@nspower.ca](mailto:shoaib.qabilbadshah@nspower.ca)
- .5        Once a Prime Cost Sum has been agreed upon with Parks Canada, it shall be included as an item on the Project Schedule. This shall occur on the next update of the Project Schedule.

**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 01 11 00 - Summary of Work.

**1.2                MEASUREMENT FOR PAYMENT**

- .1            See Section 01 29 00 – Payment Procedures.

**1.3                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.

**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 price bids 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 items in the Bid and Acceptance Form.
- .6        There will be no measurement of payment for Work carried out beyond the limits defined on the Drawings.
- .7        There will be no payment for work carried out on weighed material in the absence of weight tickets.

**1.2                MEASUREMENT AND PAYMENT**

- .1        All items in this Contract will be paid for as indicated in the bid items below:
- .2        Lump Sum Item 1 – Section 01 21 00 – Prime Cost Sum
  - .1        Terms of Payment: Lump Sum.
  - .2        This Item includes:
    - .1        Coordination efforts with Nova Scotia Power for the removal and relocation of hydro poles and associated infrastructure, within the limits of Work to the satisfaction of the Departmental Representative.
  - .3        All incidentals to this work not covered in other contract items shall be included.
- .3        Lump Sum Item 2 - Section 01 25 20 - Mobilization / Demobilization
  - .1        Terms of Payment: Lump Sum.
  - .2        This Item includes: For 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.

- .4 Lump Sum Item 3 - Section 01 35 00.06 - Special Procedures for Traffic Control
  - .1 Terms of Payment: Lump Sum.
  - .2 This Item includes:
    - .1 Traffic control persons and traffic accommodation person(s).
    - .2 Provision, installation, and maintenance of temporary traffic control devices, including detour signs, construction signage, trail closure, rest areas and picnic area closure signage and barricades, portable variable message signs, and temporary pad sites.
    - .3 Provision, maintenance and removal of all detours and temporary accesses. Reinstatement of all detours to pre-construction conditions.
    - .4 Traffic control devices and measures required to comply with NSTIR's Temporary Workplace Traffic Control Manual (TWTCM) including but not limited to all labour, materials, and equipment, related to traffic control, accredited Sign Supervisor, traffic control signage, flashing light units, reflectors, jersey barriers, traffic barrels, etc.
    - .5 Dedicated 24/7 traffic control representative / contact during the project.
- .5 Lump Sum Item 4 - Section 01 35 43 - Environmental Procedures
  - .1 Terms of Payment: Lump Sum.
  - .2 This item includes:
    - .1 Periodic and general maintenance of all erosion and sediment control measures or as directed by Departmental Representative.
    - .2 All environmental protection, sedimentation and erosion control measures required to complete the project, such as (but not limited to) diversion ditching and channels, temporary culverts, temporary ground covering, dry mulch, dewatering of the site and temporary water control, and rock flow checks in accordance with Parks Canada National Best Management Practices (BMP) - Roadway, Highway, Parkway and Related Infrastructure (May 2015) and the Basic Impact Analysis (BIA) included in **Appendix B**. In addition to the Environmental Control Plan included in **Appendix D**.
    - .3 Submission of the Environmental Protection Plan (EPP) as per **Appendix B** and **Appendix D**. Development of the EPP shall reference the EPP checklist as provided in **Appendix E** and is to be submitted to the Departmental Representative for review and approval.
    - .4 Dedicated 24/7 environmental control representative / contact during the project.
- .6 Lump Sum Item 5 - Section 01 52 00 – Construction Facilities
  - .1 Terms of Payment: Lump Sum.
  - .2 This item includes:



- .1 Provide and maintain adequate access to project site.
- .2 Build and maintain temporary roads during period of the Work.
- .3 Upon completion of the Work, rehabilitate, remove, or reinstate any temporary roads to pre-construction conditions to the satisfaction of the Departmental Representative.
- .4 Clean roads and parking areas where used by the Contractor or employees.
- .5 Provide, erect and maintain project identification site signs, safety and instruction signs, trail closure signs and notices.
- .6 Provide sanitary facilities for Departmental Representative.
- .7 Provide Construction Site Trailer for Departmental Representative.
- .8 Provide Asphalt and Aggregate Lab facilities for Departmental Representative.
- .9 Removal of temporary facilities from site as directed by the Departmental Representative.

.7 Lump Sum Item 6 - Section 02 41 13 - Selective Site Demolition

- .1 Terms of Payment: Lump Sum.
- .2 This item includes:
  - .1 The removal, transporting and disposal of existing culverts.
  - .2 Dismantling, transporting and disposal of existing bridge structure and associated foundations to 1 m below the finished grade lines. This includes super structures, substructure, approach slabs, deck, bridge railing, etc.
  - .3 Dismantling, transporting and disposal of existing buildings at Big Intervale Camping.
  - .4 Dismantling, removal, transporting and disposal of crib type retaining wall and rail fencing along the northeast bank of North Aspy River South Branch as indicated in the Contract Drawings.
  - .5 Dismantling, transporting and disposal of guard rail, hardware, wooden guide posts and offset blocks as indicated in the Contract Documents and to the approval of the Departmental Representative.
  - .6 Dismantling, salvaging and transporting of information signs and hardware to a location within Cape Breton Highlands National Park, along with disposal of associated posts. Work also includes dismantling, disposal of regulatory and warning signs and associated hardware, along with disposal of associated posts.
  - .7 Posts that are deemed salvageable by the Departmental Representative shall be delivered to the Park Compound (Cheticamp or Ingonish). Posts that are non-salvageable shall be disposed of by the Contractor.
  - .8 Removal of existing roadway and accesses along existing alignments after new bridge is open to traffic. Reshaping and grading to match surrounding landscape.

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- .9 There shall be no payment for transporting, stockpiling and disposal of materials.
- .10 For all other items to be removed such as (but not limited to) fencing, driveway markers, Park information boards etc. including location and protection (in operating condition) of utilities traversing the site there shall be no measurement for payment and the work is considered incidental to the overall work of the project.
- .8 Lump Sum Item 7 - Section 03 49 00 – Glass Fibre Reinforced Polymer Reinforcing (GFRP)
- .1 Terms of Payment: Lump Sum.
- .2 This item includes:
- .1 Fabrication, supply, transportation, placing of GFRP reinforcing as indicated on Contract Drawings. No allowance shall be made for clips, wire or other mechanical means required for fastening.
- .9 Lump Sum Item 8 - Section 10 14 53 - Traffic Signage
- .1 Terms of Payment: Lump Sum.
- .2 This item includes:
- .1 Supply and installation of new regulatory and warning signs and timber posts; including all hardware, common excavation and backfill as indicated on the Plans. Regulatory and warning signs to be supplied by the Contractor.
- .2 Supply and installation of new timber posts or concrete posts and reinstatement of salvaged or replacement of new Parks Canada signs; including all hardware, common excavation, backfill as indicated on the Plans. Parks Canada signs to be supplied by the Departmental Representative.
- .10 Lump Sum Item 9 - Section 32 17 23 - Pavement Marking
- .1 Terms of Payment: Lump Sum.
- .2 This item includes: The supply and application of paint in the colours, sizes, and configurations shown on the drawings and as specified by the Departmental Representative. Also, includes layout and pre-markings. All intersection markings, arrows, delineation, parking lot markings and other special markings in the sections will be considered incidental to this item. No additional payment for traffic control associated with the application of pavement markings shall be made.
- .11 Lump Sum Item 10 - Other Items Not Included in the Unit Price Table
- .1 Terms of Payment: 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, permits, water control, fish rescue, cold weather protection and curing of materials and approvals required to complete the Work.
- .3 Supply of all materials and construction of a new Privy Kiosk Building within the development area of the new Day Use/Campground area as indicated in the Contract Documents (**Appendix G**). This includes geotechnical investigations to confirm subsurface conditions for foundation work.
  - .4 All landscaping features and landscape reclamation requirements, berm construction, trail connections and pathways, timber railings, and drainage within the Work area and designated areas as shown on the Drawings to the satisfaction of the Departmental Representative.
  - .5 For all other items required to complete construction of the new Day Use/Campground Area and Beulach Ban Falls Parking Area such as, removals, asphalt removal, clearing, grubbing, excavating, trenching and backfilling, roadway granulars, asphalt, geotextiles, rip-rap, culverts, hydroseeding, and mulch: are deemed to be included in those respective items.
- .12 Unit Price Item 1 - Section 02 41 13.14 - Asphalt Pavement Removal
- .1 Unit of Measurement: Square Metres (m<sup>2</sup>).
  - .2 Method of Measurement: Horizontal measurement of surface area.
  - .3 This item includes: the supply of all necessary materials, labour and equipment required for the **full depth removal**. The bottom 40 mm of existing asphalt is to be removed incrementally prior to any paving or earthworks, regardless of depth removed or number operations required. Payment for this remaining depth is included with this item.
  - .4 Payment includes all milling cutting, removal, hauling, stockpiling, and disposal of asphalt. This item also includes removal of asphalt swales and drainage gutters. The Contractor shall replace, at no extra cost to the Departmental Representative, the asphalt driving surface in any areas where milling operations break through to underlying granulars. This item also includes construction and removal of temporary tapers and milling for keyed joints as directed by the Departmental Representative.
  - .5 Asphalt concrete used to construct tapers shall not be measured and shall be considered incidental to the overall work of the project.
- .13 Unit Price Item 2 - Section 03 20 00 – Concrete Reinforcing – Reinforcing Steel (Hot Dip Galvanized) Placed
- .1 Unit of Measurement: Kilogram.
  - .2 This item includes: Fabrication, supply, transportation, placing of steel reinforcing as indicated on Contract Drawings. No allowance shall be made for chairs, clips, wire or other mechanical means required for fastening.
- .14 Unit Price Item 3 - Section 03 30 00 - Cast-in-Place Concrete
- .1 Unit of Measurement: Cubic Metre (m<sup>3</sup>).

- .2 Method of Measurement: Volume measured from plan and cross-sectional dimensions as indicated on Contract Drawings.
  - .3 This item includes: Supply, transportation, placement of all cast-in-place concrete in wingwalls, abutments, deck, approach slab, road drains on approach embankments and crash block. The price shall include all materials, aggregates, cement, supplementary cementing materials, water, admixtures, other materials, transportation, equipment, plant, tools, labour, formwork and falsework, form liners, curing, incidentals, and all other work necessary to complete the job as indicated on the Contract Drawings and finishing of concrete as described under Section 03 35 00.
  - .4 There shall be no payment for extra thickness of concrete placed outside of limits. Whenever, in the opinion of the Departmental Representative, there is extra thickness, or quantity the appropriate volume will be deducted.
  - .5 The volume of concrete required for sampling and testing is also considered incremental to this item.
- .15 Unit Price Item 4 - Section 03 41 00 – Precast Structural Concrete – Beams NEBT1400
- .1 Unit of Measurement: Each.
  - .2 This item includes: Shop drawings, erection drawings, fabrication, supply, delivery, storage and placement of beams. The price shall include all materials, aggregates, cement, supplementary cementing materials, water, admixtures, prestressing stands, reinforcing steel, dowel inserts, plain bearings, other materials, transportation, equipment, plant, tools, labour, formwork and falsework, form liners, curing, incidentals, and all other work necessary to complete the job as indicated on the Contract Drawings.
- .16 Unit Price Item 5 - Section 05 12 33 – Structural Steel for Bridges – Metal Traffic Barriers and Metal Railings for Structures
- .1 Unit of Measurement: Lineal Metre.
  - .2 Method of Measurement: Lineal metres of railings installed as indicated on the drawings. The measurement shall be taken along the centre of the railings from end to end of rails.
  - .3 This item includes: Shop drawings, erection drawings, fabrication, supply, delivery, storage and installation of complete railing system as indicated and necessary for this work as measured from Contract Drawings.
- .17 Unit Price Item 6 - Section 05 50 00 – Metal Fabrications – Galvanized Armour Angles
- .1 Unit of Measurement: Lineal Metre.
  - .2 This item includes: Supply and installation of the galvanized armour angles located on the approach end of each approach slab as detailed on the Contract Drawings. This shall include supply and installation, including all tools, labour, materials, equipment and services necessary to complete the work.
- .18 Unit Price Item 7 - Section 07 11 00 – Bridge Deck Waterproofing

- .1 Unit of Measurement: Square Metres (m<sup>2</sup>).
  - .2 Method of Measurement: Plan area of bridge deck and approach slab concrete horizontal top surface as indicated on the drawings.
  - .3 This item includes: Preparation of surfaces, supply and installation of waterproofing membrane on bridge decks and approach slabs and PVC membrane drains in bridge deck as measured from Contract Drawings.
- .19 Unit Price Item 8 - Section 07 95 00 – Expansion Joint System
- .1 Unit of Measurement: Metres (m).
  - .2 Method of Measurement: Length of routered joint at end of the approach slab at asphalt transitions.
  - .3 This item includes: Preparation of surfaces, supply and installation of expandable material as per this specification and as measured from Contract Drawings.
- .20 Unit Price Item 9 - Section 31 11 00 - Clearing
- .1 Unit of Measurement: Hectare (ha):
    - .1 Clearing will be measured in hectares by plan area within limits indicated or as directed by the Departmental Representative.
    - .2 This Section includes: The cutting and disposal of all trees and brush from areas indicated.
    - .3 Any Work at materials stockpiles and disposal sites are incidental to the Contract.
    - .4 There will be no payment for areas cleared outside the Work area unless approved by the Departmental Representative.
- .21 Unit Price Item 10 - Section 31 11 00 - Grubbing
- .1 Unit of Measurement: Hectare (ha):
    - .1 Grubbing will be measured in hectares by plan area within the limits indicated or as directed by the Departmental Representative.
    - .2 This Section includes: The removal and disposal of all stumps, roots, downed timber, slash embedded logs, rootmat, humus, and topsoil from areas indicated.
    - .3 Any Work at materials stockpiles and disposal sites are incidental to the Contract.
    - .4 There will be no payment for areas grubbed outside the Work area unless approved by the Departmental Representative.
- .22 Unit Price Item 11 - Section 31 23 16.26 – Rock Removal
- .1 Unit of Measurement: Cubic Metre (m<sup>3</sup>)
  - .2 Method of Measurement: Average end area method between cross sections taken after rock is exposed to lines and elevations indicated. Boulders one cubic metre or

larger will be classified as rock. Boulders removed from the excavation shall be measured along the three maximum perpendicular axes.

- .3 For rock in trench, dimensions used to calculate end areas shall be theoretical trench width as indicated on the drawings, and depth from surface of rock as exposed on sides of trench after excavation to bottom of specified bedding for each pipe in trench. Boulders larger than one cubic metre, any portion of which is within theoretical trench, will be classified as rock. Boulders removed from trench shall be measured along the three maximum perpendicular axes. Blasting will not be permitted in this contract.
- .4 This item includes: Excavation, loading, hauling, placement and compaction to lines and elevations indicated, and disposal of surplus or unsuitable material. This item includes shoring, bracing, cofferdams, underpinning and de-watering of excavation if required.

.23 Unit Price Item 12 - Section 31 23 33.01 - Excavating, Trenching and Backfilling

- .1 Unit of Measurement: Cubic Metre (m<sup>3</sup>).
- .2 Method of Measurement: To the theoretical lines and grades as indicated on the Drawings, along with final cross sections to the finished lines and grades.
- .3 This item includes: Excavation, loading, hauling, disposal of surplus or unsuitable material, placement and compaction of excavated material as indicated on the Drawings, including areas where culverts are being removed and not replaced. Surplus material not incorporated into the roadway cross section shall become the property of the Contractor and disposed of outside the Park.
- .4 This item also includes for all soil stripping and stockpiling for the Work. Excavation, loading, hauling, stockpiling and placement of salvaged topsoil at the direction of the Departmental Representative along with the disposal of surplus or unsuitable soil stripping materials. Surplus material not incorporated into the Work shall become the property of the Contractor and disposed of outside the Park.
- .5 This item does **not** include excavation for the new bridge foundations Work, as this has been identified in Section 31 23 33.01 - Excavating, Trenching and Backfilling – Fill Against Structure and Free Draining Backfill
- .6 This item does **not** include excavation at culvert replacement locations, grubbing, asphalt removal, guard rail removals and installations, signage removals and installations which are deemed to be included in those respective items.
- .7 This item includes shoring, bracing, cofferdams, underpinning and de-watering of excavation, if required.
- .8 Any additional backfill material required to complete the Work is to be sourced from the stockpiled storage area at the Big Intervale Day Use to the approval of the Departmental Representative and will not be measured separately for payment and shall be considered as incidental to the Work.
- .9 Excavation and Disposal of unsuitable materials due to Contractor activities will not be measured separately for payment.

- .10 Re-ditching of the existing roadway embankments in distress areas at locations as indicated on the Drawings will not be measured separately for payment and shall be considered as incidental to the Work.
- .11 There shall be no payment for excavation beyond the limits indicated on the Drawings.
- .24 Unit Price Item 13 - Section 31 23 33.01 - Excavating, Trenching and Backfilling – Fill Against Structure and Free Draining Backfill
- .1 Unit of Measurement: Metric Tonne (1000 kg).
- .2 Method of Measurement: To the theoretical lines and grades as indicated on the drawings, along with scale tickets signed by the Departmental Representative.
- .3 This item includes: Excavation, loading, hauling, disposal of surplus or unsuitable material, placement and compaction of backfill material as indicated on the Drawings for bridge foundations. Surplus material not used shall become the property of the Contractor and disposed of outside the Park.
- .4 This item includes shoring, bracing, cofferdams, underpinning and de-watering of excavation, if required.
- .5 There shall be no payment for excavation beyond the limits indicated on the Drawings.
- .25 Unit Price Item 14 – Section 31 32 19.01 – Geotextiles
- .1 Unit of Measurement: Square Metres (m<sup>2</sup>)
- .2 This item includes: All labour, equipment and incidentals required for the supply and placement of geotextiles along roadways, embankments, and areas as directed by the Departmental Representative.
- .3 No additional payment will be made for any required overlapping.
- .4 This item does **not** include geotextile requirements for culvert replacements which are deemed to be included in those respective items.
- .26 Unit Price Items 15, 16 and 17 - Section 31 37 00 - Rip-Rap – R-A, R-50 and R-250
- .1 Unit of Measurement: Metric Tonne (1000 kg).
- .2 Method of Measurement: Scale tickets signed by the Departmental Representative.
- .3 This item includes: Supply, placement and compaction of Rip-Rap, Clear Stone and Armour Rock materials as indicated on the Contract Drawings including; in front of footings, wing walls and abutments, along the riverbank, steep ditch slopes, and areas as indicated on the contract Drawings at the direction of the Departmental Representative.
- .4 This item does **not** include rip-rap requirements for culvert replacements which are deemed to be included in that respective item.
- .27 Unit Price Item 18 - Section 31 62 16.16 – Steel H-Piles
- .1 Unit of Measurement: Lineal Metre.

- .2 Method of Measurement: Lineal metres of pile length.
  - .3 This item includes: Shop drawings, erection drawings, welding procedures, supply, delivery and installation including all handling and storing, supply fabrication, fastening of pile caps and driving shoes, falsework, placing, erecting, driving, retapping, and cutting.
- .28 Unit Price Item 19 – Section 31 62 16.16 – Steel H-Piles - Splicing (Provisional Item)
- .1 Unit of Measurement: Each.
  - .2 This item includes: If driven pile length exceeds length of supplied H-pile, welding of steel H-piles sections to one another, including alignment, preparation of sections, coping, guide plates, run off blocks, tools, equipment, material, testing and weld repair if required. H-piles sections should be supplied in maximum length possible to minimize pile splices.
- .29 Unit Price Item 20 - Section 32 11 16.01 - Granular Sub-Base - Type 2 Gravel
- .1 Unit of Measurement: Metric Tonne (1000 kg).
  - .2 Method of Measurement: Scale tickets signed by the Departmental Representative.
  - .3 This item includes: Supply, handling, loading, hauling, placing, fine grading, supply and application of water for compaction of granular sub-base materials, as well as any incidentals, to the limits and at the locations indicated on the Drawings.
  - .4 There shall be no payment for extra thickness or width of sub-base materials 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 width, the appropriate weight will be deducted.
  - .5 There shall be no payment for no tickets received at the time of delivery or rejection of materials.
- .30 Unit Price Item 21 - Section 32 11 23 - Aggregate Base Courses - Type 1 Gravel
- .1 Unit of Measurement: Metric Tonne (1000 kg).
  - .2 Method of Measurement: Scale tickets signed by the Departmental Representative.
  - .3 This item includes: Supply, handling, loading, hauling, placing, fine grading, supply and application of water for compaction of granular base materials, as well as any incidentals, to the limits and at the locations indicated on the Drawings.
  - .4 There shall be no payment for extra thickness or width of base materials 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 width, the appropriate weight will be deducted.
  - .5 There shall be no payment for no tickets received at the time of delivery or rejection of materials.
- .31 Unit Price Item 22 - Section 32 11 23 – Aggregate Base Courses – Type 1S Gravel
- .1 Unit of Measurement: Metric Tonne (1000 kg).



- .2 Method of Measurement: To the theoretical lines and grades as indicated on the drawings, along with scale tickets signed by the Departmental Representative.
  - .3 This item includes: Supply, handling, loading, hauling, placing, fine grading, supply and application of water for compaction of granular base materials, as well as any incidentals, to the limits and at the locations indicated on the Drawings.
  - .4 There shall be no payment for extra thickness or width of base materials 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 width, the appropriate weight will be deducted.
  - .5 There shall be no payment for no tickets received at the time of delivery or rejection of materials.
- .32 Unit Price Item 23 - Section 32 12 16 - Asphalt Paving - Type "D-HF"
- .1 Unit of Measurement: Type "D-HF" - Metric Tonne (1000 kg).
  - .2 Method of Measurement: Scale tickets signed by the Departmental Representative.
  - .3 Payment adjustment will be made for escalation/de-escalation in the price of liquid asphalt in accordance per the supplementary conditions of the contract documents.
  - .4 This item includes: Supply, transportation of all materials including asphalt tack coat and asphalt binder; production, blending sand, handling, preparation of surface, placing (**including material transfer vehicle**), rolling and compaction of asphalt concrete Type "D-HF". 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.
  - .5 There shall be no payment for extra thickness or extra width of asphalt placed outside of the theoretical lines and grades as indicated on the drawings. Wherever in the opinion of the Departmental Representative there is extra thickness, the appropriate weight will be deducted.
  - .6 There shall be no payment for no tickets received at the time of delivery or rejection of materials.
- .33 Unit Price Item 24 – Section 32 12 16 – Asphalt Paving – Asphalt Swale / Gutter
- .1 Unit of Measurement: Lineal Metre (m)
  - .2 Method of Measurement: Slope measure along centreline of swale/gutter.
  - .3 Payment adjustment will be made for escalation/de-escalation in the price of liquid asphalt in accordance per the supplementary conditions of the contract documents.
  - .4 This item includes: Preparation, supply, loading, hauling, placement and construction of new asphalt gutters including paved takeoffs as directed by the Departmental Representative.
  - .5 There shall be no payment for no tickets received at the time of delivery or rejection of materials.
- .34 Unit Price Item 25 - Section 32 15 60 - Roadway Dust Control - Water
- .1 Unit of Measurement: Kilolitres.

- .2 Method of Measurement: Water shall be measured in kilolitres. This item includes: Supply of and placement of water and at times as directed by the Departmental Representative.
- .3 This item does **not** include water for compaction of granulars as compaction is deemed to be included in those respective items.
- .35 Unit Price Item 26 - Section 32 92 19.16 - Hydraulic Seeding - Hydroseeding
  - .1 Unit of Measurement: Square Metre (m<sup>2</sup>).
  - .2 Method of Measurement: Slope measure.
  - .3 This item includes: Supply, haulage and placement of hydroseed mix, erosion control agent, water and fertilizer as specified and maintenance.
- .36 Unit Price Item 27 - Section 32 92 19.16 - Hydraulic Seeding - Dry Mulch
  - .1 Unit of Measurement: Square Metre (m<sup>2</sup>).
  - .2 Method of Measurement: Slope measure.
  - .3 This item includes: Supply, haulage and placement of dry mulch, erosion control agent, water and fertilizer as specified and maintenance.
  - .4 Mulch shall be blown.
- .37 Unit Price Items 28 - Section 33 42 13 – Pipe Culverts – 600 mm dia.
  - .1 Unit of Measurement: Lineal Metre (m) for each size and type of culvert.
  - .2 Method of Measurement: Along centreline of new culvert pipe, from end to end of culvert, as laid and as accepted by the Departmental Representative.
  - .3 Payment for this item includes:
    - .1 Dewatering of site and temporary water control.
    - .2 The removal of existing culverts shall be incidental to the Work.
    - .3 Excavation of trench, supply and placement of bedding and backfill material, and disposal of all old fill and culvert material, as well as any extra excavated material required to install new culvert. If existing fill material to top of subgrade is deemed suitable by the Departmental Representative, it shall be used for backfilling. Unsuitable fill material shall be disposed of outside of the Park at the expense of the Contractor, as directed by the Departmental Representative.
    - .4 Supply and placement of new culverts.
    - .5 Supply and placement of Geotextiles, offtake channels and inlet and outlet treatments as specified on Contract Drawings.
    - .6 Supply and placement of Rip-Rap as provided on Contract Drawings.
- .38 Unit Price Item 29 - Section 34 71 13. 25 - Vehicle W-Beam Guide Rail
  - .1 Unit of Measurement: Lineal Metre.
  - .2 Method of Measurement: Lineal metres of guide rail installed as indicated on the drawings. The measurement shall be taken along the centre of the guide rail from

end to end of each section of guide rail including buried ends, not including overlaps.

- .3 This item includes: Common excavation and backfill, supply and placing posts and surface reinstatement. Supply and installation of new guide rail, hardware, delineators, accessories, offset blocks, Michigan shoes, channels and hardware of guide rail for bridge approach system and weak post system. There shall be no payment for guide rail overlaps.

### **1.3 ITEMS CONSIDERED INCIDENTAL TO THE WORK**

- .1 Incidentals to the Work shall include but are not limited to the following. There shall be no measurement and payment for these items:

- .1 Access.
- .2 Barricades.
- .3 Clean-up.
- .4 Cold weather protection and curing of materials.
- .5 Consumables.
- .6 Design, supply, fabrication, use and removal from site of all temporary works and erection equipment.
- .7 Environmental protection and disposal of hazardous materials.
- .8 Field measurements and sketches.
- .9 Lost time due to weather.
- .10 Obtaining any permits or approvals required.
- .11 Protection of existing structures.
- .12 Protection, relocation, moving, storage and final location of stored equipment.
- .13 Provision of services.
- .14 Reinstatement of damaged surfaces.
- .15 Rental of equipment; products.
- .16 Safety measures, equipment, and training.
- .17 Scaffolding / staging.
- .18 Security.
- .19 Shoring and bracing.
- .20 Any access equipment and time necessary for inspections and testing.
- .21 Snow removal.
- .22 Submissions.
- .23 Surfacing.
- .24 Scale person.
- .25 Survey and measurement assistance for Departmental Representative.
- .26 Transportation of equipment.

- .27 Working Drawings.
- .28 All ancillaries required to complete the Work to the full satisfaction of the Departmental Representative.
- .2 The Contractor shall be responsible for all costs should remediation be necessary to return the environment to its original condition.
- .3 The Contractor shall be responsible for the costs of repair. The cost of Quality Assurance will be paid by PCA, with the exception of additional testing required for re-inspection of non-conforming areas; PCA reserves the right to pass this additional cost along to the Contractor.

**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 31 32 19.01 - Geotextiles.
- .5        Section 31 37 00 - Rip-Rap.
- .6        Section 32 11 16.01 - Granular Sub-Base.
- .7        Section 32 11 23 - Aggregate Base Courses.
- .8        Section 32 12 13.16 -Asphalt Tack Coat.
- .9        Section 32 12 16 - Asphalt Paving.
- .10      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.

**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 01 33 00 - Submittal Procedures.
- .2      Section 01 52 00 - Construction Facilities.
- .3      Section 01 78 00 - Closeout Submittals.

**1.2                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 four 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, affected parties not in attendance and the Departmental Representative.
- .8      Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

**1.3                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      Senior representatives of 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.
- .5      Agenda to include:
  - .1      Appointment of official representative of participants in the Work.
  - .2      Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.

- .3 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
- .4 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .5 Owner provided products.
- .6 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .7 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .8 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
- .9 Monthly progress claims, administrative procedures, photographs, hold backs.
- .10 Appointment of inspection and testing agencies or firms.
- .11 Insurances, transcript of policies.

#### **1.4 PROGRESS MEETINGS**

- .1 During course of Work and two weeks prior to project completion, schedule progress meetings bi-weekly.
- .2 Contractor and Departmental Representative are to be in attendance. Major sub-contractors to be in attendance by invitation only.
- .3 Notify parties minimum 7 days prior to meetings.
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 4 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 Review of off-site fabrication delivery schedules.
  - .6 Corrective measures and procedures to regain projected schedule.
  - .7 Revision to construction schedule.
  - .8 Progress schedule, during succeeding work period.
  - .9 Review submittal schedules: expedite as required.
  - .10 Maintenance of quality standards.
  - .11 Review proposed changes for effect on construction schedule and on completion date.
  - .12 Other business.



**Part 2            Products**

**2.1                NOT USED**

.1                Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1                Not Used.

**END OF SECTION**

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**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 01 33 00 - Submittal Procedures.

**1.2                DEFINITIONS**

- .1            Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2            Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
- .3            Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4            Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5            Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or work weeks.
- .6            Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7            Milestone: significant event in project, usually completion of major deliverable.
- .8            Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9            Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

**1.3                REQUIREMENTS**

- .1            Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2            Plan to complete Work in accordance with prescribed milestones and time frame.
- .3            Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.

- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative within 5 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

#### **1.5 MASTER PLAN**

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Departmental Representative will review and return revised schedules within 5 working days.
- .3 Revise impractical schedule and resubmit within 5 working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

#### **1.6 PROJECT SCHEDULE**

- .1 Develop detailed Project Schedule derived from Master Plan.

#### **1.7 PROJECT SCHEDULE REPORTING**

- .1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

#### **1.8 PROJECT MEETINGS**

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

### **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 01 35 29.06 - Health and Safety Requirements.
- .2        Section 01 35 43 - Environmental Procedures.

**1.2                ADMINISTRATIVE**

- .1        Submit to the Departmental Representative submittals listed for review in each specification section. 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 the 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 the 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 the Departmental Representative's review of submittals.
- .9        Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by the Departmental Representative's review.
- .10      Keep one reviewed copy of each submission on site.

**1.3                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 shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in the Province of Nova Scotia.
- .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 the Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by the Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to the Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as the Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify the Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in duplicate, 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 the Departmental Representative's review, distribute copies.
- .10 Submit 6 prints of shop drawings for each requirement requested in specification sections and as the Departmental Representative may reasonably request.
- .11 Submit 6 copies of product data sheets or brochures for requirements requested in specification sections and as requested by the Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit 6 copies of test reports for requirements requested in specification sections and as requested by the 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 3 years of date of contract award for project.
- .13 Submit 6 copies of certificates for requirements requested in specification sections and as requested by the 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 6 copies of Manufacturer's instructions for requirements requested in specification sections and as requested by the 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.
- .15 Submit 6 copies of manufacturer's 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.

- .16 Submit 6 copies of Manufacturer's Field Reports for requirements requested in specification sections and as requested by Departmental Representative:
  - .1 Documentation of the testing and verification of actions taken by manufacturer's representative to confirm compliance with Manufacturer's standards or instructions.
- .17 Submit 6 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 the 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.
- .21 The review of shop drawings by Parks Canada is for sole purpose of ascertaining conformance with general concept:
  - .1 This review shall not mean that Parks Canada approve detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
  - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

#### **1.4 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 the Departmental Representative's business address.
- .3 Notify the 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 the Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to the Departmental Representative prior to proceeding with Work.



- .6 Make changes in samples which the 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.

**1.5 CERTIFICATES AND TRANSCRIPTS**

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

**1.6 MEASUREMENT PROCEDURES**

- .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 01 11 00 - Summary of Work.
- .2    Section 01 14 00 - Work Restrictions.

**1.2                MEASUREMENT FOR PAYMENT**

- .1    See Section 01 29 00 - Payment Procedures.
- .2    Payment for traffic control persons and traffic accommodation person(s) shall be considered incidental to the work, and will not be measured separately for payment.
- .3    Provision, installation, and maintenance of temporary traffic control devices, including detour signs, are considered incidental to the work, and will not be measured for payment.
- .4    Provision and maintenance of detours are considered incidental to work and will not be measured for payment.
- .5    No payment to be made for vehicles, equipment, supplies, and additional manpower required by traffic accommodations persons.

**1.3                REFERENCES**

- .1    Nova Scotia Department of Transportation and Infrastructure Renewal:
  - .1    Temporary Workplace Traffic Control Manual (Latest Edition).
  - .2    Standard Specification - Highway Construction and Maintenance (Latest Edition).
- .2    Manual of Uniform Traffic Control Devices for Canada (MUTCD-C) - (Latest Edition).

**1.4                DESCRIPTION**

- .1    This section specifies requirements and procedures for traffic regulation to ensure protection of work and safety of public to satisfaction of Departmental Representative.

**1.5                REFERENCE STANDARD**

- .1    Regulate traffic in accordance with the Department of Transportation and Infrastructure Renewal Traffic Control Manual (TCM), no exceptions.
- .2    Given the nature of the highway, its critical transportation link, effect on motorists, etc. it is imperative that Park personnel be kept notified as to the number of construction areas, their locations, duration of work, etc. This information must be provided by the contractor to the Park Communications staff on an ongoing basis.
- .3    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.

## **1.6 TRAFFIC CONTROL PERSONS TO BE INSTRUCTED**

- .1 Contractor shall ensure that only employees who are in possession of "Traffic Control Persons Certificate" as per the Nova Scotia Department of Transportation and Infrastructure Renewal Temporary Workplace Traffic Control Manual (Latest Edition).

## **1.7 PROTECTION OF THE PUBLIC**

- .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 present minimum of 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 Do not close any lanes of road without approval of Departmental Representative. Before rerouting traffic, erect suitable signs and devices in accordance with instructions contained in Part D of MUTCD and TCM. Provide sufficient crushed gravel and wearing course to ensure a smooth riding surface during work.
- .4 Keep travelled way graded, free of pot holes and of sufficient width for required number of lanes of traffic.
- .5 Provide and maintain reasonable road access and egress to property fronting along Work under Contract and in other areas as indicated, unless other means of road access exist that meet approval of Departmental Representative.

## **1.8 INFORMATIONAL AND WARNING DEVICES**

- .1 Provide and maintain fully actuated traffic signals; signs, flashing warning lights and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project Work which requires road user response.
- .2 All traffic signs are to be bilingual or symbolic and shall be Level 1 reflectivity.
- .3 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified in Part D, Temporary Conditions Signs and Devices, of MUTCD manual and TCM.
- .4 Place signs and other devices in locations as recommended by TCM.
- .5 All flag persons and traffic control personnel shall have successfully completed a traffic control training course approved by the Workers' Compensation Board of Nova Scotia. Proof of training for all persons shall be available on site at all times.
- .6 Continually maintain traffic control devices in use by:
  - .1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.

- .2 Removing or covering signs which do not apply to conditions existing from day to day.

## **1.9 CONTROL OF PUBLIC TRAFFIC**

- .1 Provide traffic control personnel who have a valid provincial license and trained in accordance with, and properly equipped as specified in TCM manuals in following situations:
  - .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 traffic signal system is not in use.
  - .3 When workmen or equipment are employed at 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 vehicles 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.
- .4 Flagpersons are to be equipped with portable radios only, not cellular devices. Any flagperson using cellular devices, except for emergency use only, shall be deemed incompetent and shall be removed from the site immediately. PCA shall not be held responsible for any lost time incurred due to the removal of such an individual.

## **1.10 OPERATIONAL REQUIREMENTS**

- .1 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 herein and approved by Departmental Representative to protect and control public traffic, existing conditions for traffic may be restricted as follows:
  - .1 In accordance with TCM.
  - .2 Maintain two-lane, two way traffic for the duration of the Contract unless otherwise approved by the Departmental Representative following submission of a traffic control plan.
  - .3 As directed by Departmental Representative, temporarily relocate traffic control informational devices, warning devices and barriers as required to accommodate 'wide load' traffic. Minimum 24 hours notice will be provided by Departmental Representative for passage of such traffic.

- .2 A traffic control plan and emergency response plan which accounts for the operational requirements above, must be approved by the Departmental Representative prior to commencing any work.

## **Part 2 Products**

### **2.1 TRAFFIC CONTROL DEVICES**

- .1 Barricades, signs, delineators, warning lights, traffic control person's paddles and other devices shall be in strict accordance with the Nova Scotia Department of Transportation and Infrastructure Renewal Temporary Workplace Traffic Control Manual.
- .2 Signs, barricades, delineators and traffic control persons paddles shall be as new and reflectorized to show same shape and colour by night as by day.
- .3 Signs to be bilingual and symbolic.

## **Part 3 Execution**

### **3.1 GENERAL**

- .1 Conduct operations as to create a minimum of inconvenience to traffic.
- .2 Provide and maintain access to and from properties adjacent to work area.
- .3 Provide traffic control through use of either an approved traffic signal system or traffic control persons.
- .4 At least one week prior to commencing work; submit to Departmental Representative a traffic control signing plan. This layout shall indicate the quantity, spacing and detail of signs, to be used during construction for each work area site (including adjustments for various stages of work). Work shall not commence until Departmental Representative has approved layout.
- .5 Accommodating traffic and hours of work:
  - .1 **Road Rental for Traffic Delays:** Parks Canada Agency (PCA) and the Contractor agree that the **maximum cumulative time delay to traffic through the Contract limits shall be ten (10) minutes from nine (9) am to four (4) pm during July and August and twenty (20) minutes during remaining time periods.** In the event that this time limit is not met by the Contractor, PCA will suffer damages which are very difficult to identify with precision because of the nature of the project. PCA and the Contractor agree that a fair pre-estimate of the amount of set damages is **One Thousand Dollars (\$1,000.00)** per 15 minute interval or part thereof for which the traffic delay extends beyond maximums identified. Therefore, the parties agree that the Contractor shall pay to PCA for each and every 15 minute increment the traffic delay extends after maximum time limit identified, the sum of **One Thousand Dollars (\$1,000.00)** determined by the parties hereto to be liquidated damages, not a penalty.
  - .2 During the school year, minimize delays for school buses.

- .6 Take into account the effect of steep grades and curved alignment present in the work area when planning and executing traffic control measures.

### **3.2 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 Two lanes are to be open and maintained throughout the work, except as required to existing road tie-in or as approved by Departmental representative .
- .4 Keep travelled way graded, free from pot holes and of sufficient width for required number of lanes of traffic.

### **3.3 TRAFFIC INTERRUPTIONS**

- .1 Period and timing of any traffic interruptions greater than those stated in Section 01 14 00 – Work Restrictions, subsection 1.6.3 must have prior approval of the Departmental Representative.

### **3.4 SIGNS AND BARRICADES**

- .1 Provide, erect and maintain necessary barricades, suitable and sufficient flashing warning lights, danger signals and other signs.
- .2 Placement and erection of signs, barricades, delineators and warning lights and other devices to be in strict accordance with the Nova Scotia Department of Transportation and Infrastructure Renewal Temporary Workplace Traffic Control Manual.
- .3 Remove or cover signs which do not apply to existing conditions.
- .4 Check devices daily for damage, legibility and correct positioning. Repair, replace or reposition as required or as directed by Departmental Representative.

### **3.5 SPEED ZONES**

- .1 Speed zone signing within a construction zone shall be established following authorization by Parks Canada and the Departmental Representative.
- .2 There will be strict enforcement of the Speed limits by the RCMP, Environmental Protection Officer and Parks Canada Warden Service.

### **3.6 TRAFFIC ACCOMODATION PERSON**

- .1 The Contractor shall provide for services 24 hrs per day.

- .2 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.
  - .3 During winter shutdown, the Contractor shall provide daily inspection of the site to ensure traffic control devices such as traffic control signage, barricades, reflectors, flashing light units, traffic barrels, etc. are in good working order and comply with the requirements. A weekly report stating that site and traffic control complies with the requirements shall be submitted to the Departmental Representative.
- .3 Assist the travelling public the event of an emergency.  
Contact proper authorities in the event of an emergency, i.e., Contractor's Supervisor, Park Warden, and Departmental Representative.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 01 33 00 - Submittal Procedures.

**1.2                REFERENCES**

- .1            Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .2            Province of Nova Scotia:
  - .1            Occupational Health and Safety Act, S.N.S.

**1.3                DEFINITIONS**

- .1            COSH: Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.
- .2            Competent Person means a person to who is:
  - .1            Qualified by virtue of personal knowledge, training and experience to perform assigned work in a manner that will ensure the health and safety of persons in the workplace.
  - .2            Knowledgeable about the provisions of occupational health and safety statutes and regulations that apply to the Work.
  - .3            Knowledgeable about potential or actual danger to health or safety associated with the Work.
- .3            Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.
- .4            PPE: personal protective equipment.
- .5            Work Site: where used in this section shall mean areas, located at the premises where Work is undertaken, used by Contractor to perform all of the activities associated with the performance of the Work.

**1.4                SUBMITTALS**

- .1            Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Submit site-specific Health and Safety Plan prior to commencement of Work:



- .1 Submit within ten (10) work days of notification of Bid Acceptance. Provide three (3) hard copies and one (1) electronic PDF file.
- .2 Departmental Representative will review Health and Safety Plan and provide comments.
- .3 Revise the Plan as appropriate and resubmit within five (5) work days after receipt of comments.
- .4 Departmental Representative's review and comments made of the Plan shall not be construed as an endorsement, approval or implied warranty of any kind by Canada and does not reduce Contractor's overall responsibility for Occupational Health and Safety of the Work.
- .5 Submit revision and updates made to the Plan during the course of Work.
- .3 Submit name of designated Health & Safety Site Representative and support documentation specified in the Safety Plan.
- .4 Submit building permit, compliance certificates and other permits obtained.
- .5 Submit copy of Letter in Good Standing from Provincial Workers Compensation or other department of labour organization:
  - .1 Submit update of Letter of Good Standing whenever expiration date occurs during the period of Work.
- .6 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .7 Submit copies of incident reports.
- .8 Submit WHMIS MSDS - Material Safety Data Sheets.

## **1.5 COMPLIANCE REQUIREMENTS**

- .1 Comply with the Occupational Health and Safety Act for the Province of Nova Scotia, and the Regulations made pursuant to the Act.
- .2 Comply with Canada Labour Code Part II, and the Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code.
- .3 Observe and enforce construction safety measures required by:
  - .1 1995 National Building Code of Canada, Part 8.
  - .2 Provincial Worker's Compensation Board.
  - .3 Municipal statutes and ordinances.
  - .4 Comply with Occupational R.S.Q., c. S-2.1, an Act respecting Health and Safety Code for the Construction Industry.

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- .4 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.
  - .5 A copy of the Canada Labour Code Part II may be obtained by contacting:  
  
Canadian Government Publishing  
Public Works & Government Services Canada  
Ottawa, Ontario K1A 0S9  
Tel: (819) 956-5800 (1-800-635-7943)  
Publication No. L31-85/2000 E or F
  - .6 Observe construction safety measures of:
    - .1 Part 8 of National Building Code.
    - .2 Municipal by-laws and ordinances.
  - .7 In case of conflict or discrepancy between above specified requirements, the more stringent shall apply.
  - .8 Maintain Workers Compensation Coverage in good standing for duration of Contract. Provide proof of clearance through submission of Letter in Good Standing.
  - .9 Medical Surveillance: Where prescribed by legislation or regulation, obtain and maintain worker medical surveillance documentation.

## **1.6 SITE CONTROL AND ACCESS**

- .1 Control the Work and entry points to Work Site. Approve and grant access only to workers and authorized persons. Immediately stop and remove non-authorized persons:
  - .1 Departmental Representative will provide names of those persons authorized by Departmental Representative to enter onto Work Site and will ensure that such authorized persons have the required knowledge and training on Health and Safety pertinent to their reason for being at the site, however, Contractor remains responsible for the health and safety of authorized persons while at the Work Site.
- .2 Isolate Work Site from other areas of the premises by use of appropriate means:
  - .1 Erect fences, hoarding, barricades and temporary lighting as required to effectively delineate the Work Site, stop non-authorized entry, and to protect pedestrians and vehicular traffic around and adjacent to the Work and create a safe environment.
  - .2 Post signage at entry points and other strategic locations indicating restricted access and conditions for access.
  - .3 Use professionally made signs with bilingual message in the two (2) official languages or international known graphic symbols.

- .3 Provide safety orientation session to persons granted access to Work Site. Advise of hazards and safety rules to be observed while on site.
- .4 Ensure persons granted site access wear appropriate PPE. Supply PPE to inspection authorities who require access to conduct tests or perform inspections.
- .5 Secure Work Site against entry when inactive or unoccupied and to protect persons against harm.

## **1.7 PROTECTION**

- .1 Give precedence to safety and health of persons and protection of environment over cost and schedule considerations for Work.
- .2 Should unforeseen or peculiar safety related hazard or condition become evident during performance of Work, immediately take measures to rectify situation and prevent damage or harm. Advise Departmental Representative verbally and in writing.

## **1.8 RESPONSIBILITY**

- .1 Be responsible for safety of persons and property on work site and for protection of building employees and general public circulating adjacent to work operations to extent that they may be affected by conduct of work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

## **1.9 FILING OF NOTICE**

- .1 File Notice of Project and other Notices with Provincial authorities prior to commencement of Work.
- .2 Upon request, Departmental Representative will provide name and mailing address of provincial department to whom the Notice of Project must be sent.
- .3 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

## **1.10 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 work.
- .3 Post all permits on site. Submit copies to Departmental Representative.

#### **1.11 SAFETY ASSESSMENTS**

- .1 Implement and carry out a health and safety hazard assessment program as part of the work. Program to include:
  - .1 Initial hazard assessment carried out immediately upon notification of contract award and prior to commencement of work.
  - .2 On-going hazard assessments performed during the progress of work identifying new or potential health risks and safety hazards not previously known. As a minimum hazard assessments shall be carried out when:
    - .1 New subtrade work, new subcontractor(s) or new workers arrive at the site to commence another portion of the work.
    - .2 The scope of work has been changed by Change Order.
    - .3 Potential hazard or weakness in current health and safety practices are identified by Departmental Representative or by an authorized safety representative.
  - .3 Hazard assessments to be project and site specific, based on review of contract documents, site and weather conditions.
  - .4 Each hazard assessment to be made in writing. Keep copies of all assessments on site for duration of work. Upon request, make available to Departmental Representative for inspection.

#### **1.12 PROJECT/SITE CONDITIONS**

- .1 The following are known or potential project related safety hazards at site:
  - .1 Work immediately adjacent/atop high steep embankments and cliffs with heavy equipment and construction personnel.
  - .2 Highway traffic.
  - .3 Working adjacent highway rockcuts which have potential to release rock into ditches and onto roadway below.
  - .4 Other construction contractors work on site.
- .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.

### **1.13 SAFETY MEETINGS**

- .1 Prior to commencement of work attend health and safety meeting conducted by Departmental Representative. Have Contractor's Site Superintendent in attendance. Departmental Representative will advise of time and location.
- .2 Provide site safety orientation session to all workers and other authorized persons prior to granting them access to work site. Brief persons on site conditions and on the minimum site safety rules in force at site.
- .3 Conduct site specific occupational health and safety meetings during the entire work as follows:
  - .1 Formal meetings on a minimum monthly basis.
  - .2 Informal tool box meetings on a regular basis from a predetermined schedule.
- .4 Keep workers informed of anticipated hazards, on safety practices and procedures to be followed and of other pertinent safety information related to:
  - .1 Progress of Work.
  - .2 New sub-trades arriving on site.
  - .3 Changes in site and project conditions.
- .5 Record and post minutes of meetings. Make copies available to Departmental Representative upon request.

### **1.14 HEALTH AND SAFETY PLAN**

- .1 Develop written site-specific Project Health and Safety Plan, based on hazard assessments, prior to commencement of work. Submit plan to Departmental Representative within 7 calendar days of Contract Award date.
- .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 practises 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:

- .1 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.
  - .3 Prepare Health and Safety Plan in a three column format, addressing the three parts specified above, as follows:

<u>Column 1</u>	<u>Column 2</u>	<u>Column 3</u>
Identified	Control	Emergency Measures & Communications
Hazard	Measures	Implemented Procedures

- .4 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.
- .5 Implement, maintain and enforce compliance with requirements of the Health and Safety Plan until final completion of work and demobilization from site.
- .6 As work progresses, review and update Plan addressing additional health risks and safety hazards identified by on-going hazard assessments.
- .7 Submit revised versions of Plan to Departmental Representative.

- .8 Post a typed written copy, including all updates, of the Health and Safety Plan in a common visible location at work site.
- .9 Submission of the Health and Safety Plan, and updates, to the Departmental Representative is for review and information purposes only. It's submission shall not be construed to imply approval by Departmental Representative, be interpreted as a warranty of being complete, accurate and legislative compliant and shall not relieve Contractor of his legal obligations for the provision Health and Safety on the construction project.

### **1.15 SAFETY SUPERVISION AND INSPECTIONS**

- .1 Employ Health & Safety Site Representative responsible for daily supervision of health and safety of the Work.
- .2 Health & Safety Site Representative may be the Superintendent of the Work or other person designated by Contractor and will be assigned the responsibility and authority to:
  - .1 Implement, monitor and enforce daily compliance with health and safety requirements of the Work.
  - .2 Monitor and enforce Contractor's site-specific Health and Safety Plan.
  - .3 Conduct site safety orientation session to persons granted access to Work Site.
  - .4 Ensure that persons allowed site access are knowledgeable and trained in health and safety pertinent to their activities at the site or are escorted by a competent person while on the Work Site.
  - .5 Stop the Work as deemed necessary for reasons of health and safety.
- .3 Health & Safety Site Representative must:
  - .1 Be qualified and competent person in occupational health and safety.
  - .2 Have site-related working experience specific to activities of the Work.
  - .3 Be on Work Site at all times during execution of the Work.
- .4 All supervisory personnel assigned to the Work must also be competent persons.
- .5 Inspections:
  - .1 Conduct regularly scheduled safety inspections of the Work on a minimum weekly basis. Record deficiencies and remedial action taken.
  - .2 Conduct Formal Inspections on a minimum monthly basis. Use standardized safety inspection forms. Distribute to subcontractors.
  - .3 Follow-up and ensure corrective measures are taken.
- .6 Cooperate with Facility's Occupational Health and Safety representative should one be designated by Departmental Representative.

- .7 Keep inspection reports and supervision related documentation on site.

#### **1.16 TRAINING**

- .1 Use only skilled workers on Work Site who are effectively trained in occupational health and safety procedures and practices pertinent to their assigned task.
- .2 Maintain employee records and evidence of training received. Make data available to Departmental Representative upon request.
- .3 When unforeseen or peculiar safety-related hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

#### **1.17 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 personnel protective equipment (PPE) appropriate to function and task on site; the minimum requirements being hard hat, safety footwear (and 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.
- .2 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.

#### **1.18 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 will stop Work if non-compliance of health and safety regulations is not corrected in a timely manner.

#### **1.19 INCIDENT 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 \$10,000.00.
  - .3 Required notification to Workers Compensation Board or other regulatory agencies as stipulated by applicable regulations.
  - .4 Interruptions to Facility operations resulting in an operational lost to a Federal department in excess of \$5000.00.
- .3 Medical aid in above clause shall have the same meaning as the term "medical aid injury" as defined in the Canadian Dictionary of Safety Terms - 1987 issue, from the Canadian Society of Safety Engineers (C.S.S.E) as follows:
  - .1 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.
- .4 Submit report in writing.

#### **1.20 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.

#### **1.21 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 Post all MSDS data sheets on site, in a common area, visible to workers.
- .4 On building renovation projects where work is adjacent to occupied areas, locate data sheets in a public location accessible to tenant employees.

**1.22 BLASTING**

- .1 Blasting or other use of explosives is not permitted without prior written instructions from Departmental Representative.

**1.23 POWDER ACTUATED DEVICES**

- .1 Use powder actuated fastening devices only after receipt of written permission from Departmental Representative.

**1.24 POSTING OF DOCUMENTS**

- .1 Post documents indicated herein and as required by Authority having jurisdiction.
- .2 Post other documents as specified herein, including:
  - .1 Site specific Health and Safety Plan.
  - .2 WHMIS data sheets.

**1.25 RECORDS ON SITE**

- .1 Maintain on site copy of safety documentation as specified in this section and other safety related reports and documents issued to or received from authorities having jurisdiction.
- .2 Make available to Departmental Representative, or authorized safety representative, for inspection upon request.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 01 33 00 - Submittal Procedures.

**1.1                MEASUREMENT FOR PAYMENT**

- .1            See Section 01 29 00 – Payment Procedures.

**1.2                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            Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.
- .2            Reference Standards:
  - .1            Basic Impact Analysis, Parks Canada National Best Management Practices - Roadway, Highway, Parkway and Related Infrastructure (May 2015) provided in **Appendix B**, Environmental Construction Practice Specifications, National Parks Act and Regulations, Canadian Environmental Protection Act.
  - .2            U.S. Environmental Protection Agency (EPA)/Office of Water:
    - .1            EPA 832/R-92-005-92, Storm Water Management for Construction Activities, Chapter 3.
    - .2            EPA General Construction Permit (GCP) 2012.
  - .3            Environmental Protection Plan Checklist, **Appendix E**.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan as per **Appendix B and D** and as per this section for review and approval by the Departmental Representative.
- .3            Ensure 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 and regulations and EPA 832/R-92-005, Chapter 3 requirements.
    - .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 mud 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 Plans 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 includes 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, dewatering

of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

- .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.
- .15 Pesticide treatment plan to be included and updated, as required.

#### **1.4 FIRES**

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

#### **1.5 DRAINAGE**

- .1 Develop and submit erosion and sediment control plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations, EPA 832/R-92-005, Chapter 3 and US EPA General Construction Permit.
- .2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.
- .3 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .4 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

#### **1.6 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. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.
- .5 Restrict tree removal to areas indicated or designated by the Departmental Representative.
- .6 Dispose of all harvested trees off-site or as directed by the Departmental Representative.

**1.7 WORK ADJACENT TO WATERWAYS**

- .1 Construction equipment to be operated on land only.
- .2 Waterways to be kept free of excavated fill, waste material and debris.
- .3 Design and construct temporary crossings to minimize erosion to waterways.
- .4 Do not skid logs or construction materials across waterways.
- .5 Avoid indicated spawning beds when constructing temporary crossings of waterways.

**1.8 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 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area:
  - .1 Provide temporary enclosures where directed by the Departmental Representative.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

**1.9 PARK REQUIREMENTS**

- .1 Work under this contract is to be carried out in a National Park, and environmental protection must be given a high priority by all staff involved with the work.
- .2 An Environmental Briefing will be held prior to work commencing at the site, which will outline environmental factors to be considered during the work. It is mandatory that all current staff of the Contractor attend this meeting with the Departmental Representative and Environmental Protection Officer (EPO).
- .3 Mitigation requirements are outlined in the Basic Impact Analysis Document appended to the Specifications. This document is not all-inclusive, and site adjustment of the mitigation methods for the work may be required. The Departmental Representative will advise the Contractor of any additional requirements as they arise.

**1.10 SITE SET-UP AND USE**

- .1 Confine all site activities related to construction within the defined project boundaries. Confine construction activities to as small an area as necessary to safely complete the project.

- .2 Garbage must be collected and removed daily from the work site. All material must be removed, transported and disposed of in accordance with existing provincial - municipal and Park solid waste disposal guidelines and/or regulations.
- .3 Littering is prohibited.
- .4 Temporary storage, parking areas, and turn around facilities for Contractor-related equipment and vehicles will be limited to those areas agreed to and designated by the Departmental Representative.

#### **1.11 ENVIRONMENTAL PROTECTION PLAN**

- .1 Submit a plan showing all pollution control measures that will be used to fulfill the requirements of the Environmental Protection Section and Basic Impact Analysis attached to this document. This plan will be reviewed by the Departmental Representative and the Environmental Protection Officer prior to commencement of any work. Any deviation from this plan will require further approval by the Departmental Representative. Submit the protection plan prior to the pre-construction meeting.
- .2 The Environmental Plan will outline how the Contractor will address the environmental protection requirements, including removal and installation of culverts, and ensure pollution created by the construction is controlled. It must show sufficient detail on products to be used and physical placement on site to determine effectiveness of these items.

#### **1.12 ENVIRONMENTAL PERFORMANCE**

- .1 Follow the Canadian Environmental Protection Act.
- .2 Confirm all necessary permits related to Environmental Protection have been obtained and that necessary documentation is available on-site.

#### **1.13 EROSION CONTROL**

- .1 Construct sediment fences and erosion control structures in roadside ditches or at culvert inlets prior to any excavation as directed by Departmental Representative.
- .2 To minimize run-off, curtain work on slopes which may affect water body during periods of heavy rainfall, as directed by the Departmental Representative.

#### **1.14 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 the Departmental Representative.

### **1.15 ENVIRONMENTAL INCIDENT OR EMERGENCY**

- .1 In the event of an environmental incident or emergency such as:
  - .1 Chemical spill or petroleum spill.
  - .2 Poisonous or caustic gas emission.
  - .3 Hazardous material spill.
  - .4 Sewage spill.
  - .5 Contaminated water into waterways.
- .2 The Contractor or his employees must:
  - .1 Notify the Contractor's job superintendent.
  - .2 Call the local emergency services and give type of emergency.
  - .3 Submit to Departmental Representative a copy of its Environmental/Spill Response Plan for approval.

### **1.16 NOTIFICATION**

- .1 The 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 the Departmental Representative of proposed corrective action and take such action for approval by the Departmental Representative:
  - .1 Take action only after receipt of written approval by the Departmental Representative.
- .3 The 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.



**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 01 33 00 - Submittal Procedures.

**1.2                INSPECTION**

- .1            Allow the 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 the 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            The 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.

**1.3                INDEPENDENT INSPECTION AGENCIES**

- .1            Independent Inspection/Testing Agencies will be engaged by the Departmental Representative for purpose of inspecting and/or testing portions of Work.
- .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 the Departmental Representative at no cost to the 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 the 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 the 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 the 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 the Departmental Representative.

## **1.7 REPORTS**

- .1 Submit 4 copies of inspection and test reports to the 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.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by the Departmental Representative and may be authorized as recoverable.

## **1.9 MOCK-UPS**

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable to the Departmental Representative as specified in specific section.

- .3 Prepare mock-ups for the Departmental Representative's review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups 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.
- .5 If requested, the Departmental Representative will assist in preparing schedule fixing dates for preparation.
- .6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

**1.10 MEASUREMENT PROCEDURES**

- .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                MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 – Payment Procedures.

**1.2                ACCESS**

- .1        Provide and maintain adequate access to project site.
- .2        Build and maintain temporary roads during period of work. Parks Canada must approve prior to their use, any proposed temporary roads within the Park.
- .3        Upon completion of contract work, rehabilitate any temporary roads to the satisfaction of the Departmental Representative.
- .4        If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractor's use of roads.
- .5        Clean roads and parking areas where used by Contractor's equipment or employees' vehicles.

**1.3                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 fax machine, internet connection and photocopier in Departmental Representative's office for its exclusive use. Capacity of internet connection 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.

#### **1.4 SANITARY FACILITIES**

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances:
  - .1 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.

#### **1.5 PARKING**

- .1 Parking space for work force will be limited to the construction limits for each area under construction at the approval of the Departmental Representative.

**1.6 REMOVAL OF TEMPORARY FACILITIES**

- .1 Remove temporary facilities from site when directed by Departmental Representative.

**1.7 CONTRACTOR'S CAMP**

- .1 The Contractor will not be permitted to set up a camp within Cape Breton Highlands National Park.

**Part 2 Materials**

**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 01 35 00.06 - Special Procedures for Traffic Control.
- .2    Section 01 35 29.06 - Health and Safety Requirements.
- .3    Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .4    Section 02 41 16 – Structure Demolition.

**1.2                REFERENCES**

- .1    Canadian General Standards Board (CGSB)
  - .1    CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
  - .2    CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
- .2    Canadian Standards Association (CSA International)
  - .1    CSA-O121-M1978(R2003), Douglas Fir Plywood.
- .3    Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR)
  - .1    Nova Scotia Temporary Workplace Traffic Control Manual (TWTCM)

**1.3                INSTALLATION AND REMOVAL**

- .1    Provide temporary controls in order to execute Work expeditiously.
- .2    Remove from site all such work after use.

**1.4                HOARDING**

- .1    Erect temporary site enclosures when and where required using 38 x 89mm construction grade lumber framing at 600mm centres and 1200 x 2400 x 13mm exterior grade fir plywood to CSA O121.
- .2    Apply plywood panels vertically as indicated flush and butt jointed.
- .3    Provide one or two lockable truck entrance gates and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.
- .4    Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law.
- .5    Paint public side of site enclosure in selected colours with one coat primer to CAN/CGSB 1.189 and one coat exterior paint to CGSB 1.59. Maintain public side of enclosure in clean condition.
- .6    Erect temporary site enclosure where and when required using new 1.2m high snow fence wired to rolled steel "T" bar fence posts spaced at 2.4 m on centre. Provide one lockable truck gate. Maintain fence in good repair.



- .7 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

#### **1.5 GUARD RAILS AND BARRICADES**

- .1 Provide secure, rigid guard rails and barricades around deep excavations, open edges of structures, or as indicated by Contract Documents. Provide as required by governing authorities and as indicated.

#### **1.6 WEATHER ENCLOSURES**

- .1 Provide weather tight closures where and when required to facilitate construction operations.
- .2 Design enclosures to withstand wind pressure and snow loading.

#### **1.7 DUST TIGHT SCREENS**

- .1 Provide dust tight screens to localize and control dust generating activities, and for protection of workers and the environment.
- .2 Maintain and relocated protection until such work is complete.

#### **1.8 ACCESS TO SITE**

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

#### **1.9 PUBLIC TRAFFIC FLOW**

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

#### **1.10 FIRE ROUTES**

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

#### **1.11 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.

#### **1.12 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**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 01 78 00 - Closeout Submittals.

**1.2            REFERENCES**

- .1            Control reference from the LiDAR survey data collected by Leading Edge Geomatics in June, 2015 shall be the only approved source for the project. Survey control based on the CAN-NET ([www.can-netgps.ca](http://www.can-netgps.ca)), Nova Scotia active control network at CAN-NET stations NHBR (Neils Harbour) and CHET (Cheticamp).

**1.3            QUALIFICATIONS OF SURVEYOR**

- .1            Qualified registered land surveyor, licensed to practice in Nova Scotia and acceptable to the Departmental Representative.

**1.4            SURVEY REFERENCE POINTS**

- .1            Survey control is based on the CAN-NET ([www.can-netgps.ca](http://www.can-netgps.ca)), Nova Scotia active control network at CAN-NET stations NHBR (Neils Harbour) and CHET (Cheticamp).
- .2            Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.
- .3            Make no changes or relocations without prior written notice to the Departmental Representative.
- .4            Report to the Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .5            Require surveyor to replace control points in accordance with original survey control.

**1.5            SURVEY REQUIREMENTS**

- .1            Establish two permanent bench marks on site, referenced to established the survey control network at CAN-NET stations NHBR (Neils Harbour) and CHET (Cheticamp). Record locations, with horizontal and vertical data in Project Record Documents.
- .2            Establish lines and levels, locate and lay out, by instrumentation.
- .3            Stake for grading, fill placement, granular material, and culvert placements.
- .4            Stake slopes and berms.

- .5 Establish pipe invert elevations and location of any exposed pipe not being removed under this contract.
- .6 Record elevation and location of all existing and installed end caps of abandoned underground services.

#### **1.6 EXISTING SERVICES**

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify the Departmental Representative of findings.
- .2 Remove abandoned service lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by the Departmental Representative.

#### **1.7 LOCATION OF EQUIPMENT AND FIXTURES**

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform the Departmental Representative of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by the Departmental Representative.

#### **1.8 RECORDS**

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.
- .3 Record locations of maintained, re-routed and abandoned service lines.

#### **1.9 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit name and address of Surveyor to the Departmental Representative.
- .2 On request of the Departmental Representative, submit documentation to verify accuracy of field engineering work.
- .3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

**1.10 SUBSURFACE CONDITIONS**

- .1 Promptly notify the Departmental Representative if subsurface conditions within project area differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.
- .2 After prompt investigation, should the Departmental Representative determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

**1.11 MEASUREMENT PROCEDURES**

- .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        Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC) - ID: R0202D, Title: General Conditions "C", In Effect as Of: May 14, 2004.

**1.2            PROJECT CLEANLINESS**

- .1        Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
- .2        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, unless approved by Departmental Representative.
- .3        Clear snow and ice from access to site or facilities of the work, bank/pile snow in designated areas only.
- .4        Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5        Provide suitable on-site containers for collection of waste materials and debris.
- .6        Provide and use marked separate bins for recycling.
- .7        Dispose of waste materials and debris outside the limits of the National Park at a location/facility approved by the Authority having jurisdiction.
- .8        Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .9        Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

**1.3            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, unless approved by Departmental Representative.

- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .8 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .9 Remove dirt and other disfiguration from exterior surfaces.

**1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling.

**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           WASTE MANAGEMENT GOALS**

- .1   Prior to start of Work conduct meeting with Departmental Representative to review and discuss PCA's Waste Management Plan and Goals.
- .2   Accomplish maximum control of solid construction waste.
- .3   Preserve environment and prevent pollution and environmental damage.

**1.2           RELATED REQUIREMENTS**

- .1   Section 01 33 00 - Submittal Procedures.
- .2   Section 01 74 11 - Cleaning.
- .3   Section 02 41 16 – Structure Demolition

**1.3           REFERENCES**

- .1   Nova Scotia Solid Waste Resource Strategy.
- .2   Nova Scotia's Environmental Act, Section 84, Used Oil Regulations.
- .3   Municipality of the County of Victoria, Noise Control Bylaw.

**1.4           DEFINITIONS**

- .1   Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority or other users of material for recycling approved by the Departmental Representative.
- .2   Class III: non-hazardous waste - construction renovation and demolition waste.
- .3   Inert Fill: inert waste - exclusively asphalt and concrete.
- .4   Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .5   Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .6   Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .7   Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
  - .1   Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
  - .2   Returning reusable items including pallets or unused products to vendors.



- .8 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .9 Separate Condition: refers to waste sorted into individual types.
- .10 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.

## **1.5 ACTION AND INFORMATIONAL SUBMITTALS**

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

## **1.6 USE OF SITE AND FACILITIES**

- .1 Execute Work with minimal interference and disturbance to normal use of premises.
- .2 Maintain security measures established by facility provide temporary security measures approved by Departmental Representative.

## **1.7 WASTE PROCESSING SITES**

- .1 Contractor is responsible to research and locate waste diversion resources and service providers. Salvaged materials are to be transported off site to approved and/or authorized recycling facilities or to users of material for recycling.

## **1.8 STORAGE, HANDLING AND PROTECTION**

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Separate and store materials produced during project in designated areas.
- .6 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities:
  - .1 On-site source separation is recommended.
  - .2 Remove co-mingled materials to offsite processing facility for separation.
  - .3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.

## **1.9 DISPOSAL OF WASTES**

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil or paint thinner into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:

- .1 Number and size of bins.
  - .2 Waste type of each bin.
  - .3 Total tonnage generated.
  - .4 Tonnage reused or recycled.
  - .5 Reused or recycled waste destination.
- .4 Remove materials on-site as Work progresses.
  - .5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in the waste audit.

**1.10 USE OF SITE FACILITIES**

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Maintain security measures established by PCA.

**1.11 SCHEDULING**

- .1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 APPLICATION**

- .1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

**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 RELATED REQUIREMENTS**

- .1 Section 01 74 11 - Cleaning.
- .2 Canadian Environmental Protection Act (CEPA):
  - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- .1 Acceptance of Work Procedures:
  - .1 Contractor's Inspection: Contractor: 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 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 that tasks have been performed as follows:
    - .1 Work: completed and inspected for compliance with Contract Documents.
    - .2 Defects: corrected and deficiencies completed.
    - .3 Equipment and systems: tested, adjusted and balanced and fully operational.
    - .4 Operation of systems: demonstrated to Owner's personnel.
    - .5 Work: complete and ready for final inspection.
  - .4 Final Inspection:
    - .1 When completion tasks are done, request final inspection of Work by Departmental Representative, and Contractor.
    - .2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.

**1.3 FINAL CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning:
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling.

**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 01 33 00 - Submittal Procedures.
- .2        Section 01 45 00 - Quality Control.
- .3        Section 01 71 00 - Examination and Preparation.

**1.2                REFERENCES**

- .1        Canadian Environmental Protection Act (CEPA).

**1.3                ADMINISTRATIVE REQUIREMENTS**

- .1        Pre-warranty Meeting:
  - .1        Convene meeting one week prior to contract completion with contractor's representative and the Departmental Representative to:
    - .1        Verify Project requirements.
    - .2        Review manufacturer's installation instructions and warranty requirements.
  - .2        The 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.

**1.4                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Provide evidence, if requested, for type, source and quality of products supplied.

**1.5                FORMAT**

- .1        Organize data as instructional manual.
- .2        Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

- .3 When multiple binders are used correlate data into related consistent groupings:
  - .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems under Section Numbers and Sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab:
  - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dwg format on CD.

## **1.6 CONTENTS - PROJECT RECORD DOCUMENTS**

- .1 Table of Contents for Each Volume: provide title of project:
  - .1 Date of submission, names.
  - .2 Addresses and telephone numbers of Consultant and Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data:
  - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

## **1.7 AS -BUILT DOCUMENTS AND SAMPLES**

- .1 Maintain, in addition to requirements in General Conditions, at site for the 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 the Departmental Representative.

## **1.8 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS**

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by the Departmental Representative.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress:
  - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .2 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .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.

- .5 Specifications: mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specification sections.
- .7 Provide digital photos, if requested, for site records.

## **1.9 FINAL SURVEY**

- .1 Submit final site survey certificate in accordance with Section 01 71 00 - Examination and Preparation, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

## **1.10 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to the Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that the Departmental Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to the Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
  - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
  - .4 Verify that documents are in proper form, contain full information, and are notarized.
  - .5 Co-execute submittals when required.
  - .6 Retain warranties and bonds until time specified for submittal.



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- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
  - .8 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by the Departmental Representative.
  - .9 Include information contained in warranty management plan as follows:
    - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
    - .2 Provide list for each warranted equipment, item, feature of construction or system indicating:
      - .1 Name of item.
      - .2 Model and serial numbers.
      - .3 Location where installed.
      - .4 Name and phone numbers of manufacturers or suppliers.
      - .5 Names, addresses and telephone numbers of sources of spare parts.
      - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
      - .7 Cross-reference to warranty certificates as applicable.
      - .8 Starting point and duration of warranty period.
      - .9 Summary of maintenance procedures required to continue warranty in force.
      - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
      - .11 Organization, names and phone numbers of persons to call for warranty service.
      - .12 Typical response time and repair time expected for various warranted equipment.
    - .3 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.
    - .4 Procedure and status of tagging of equipment covered by extended warranties.
    - .5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
  - .10 Respond in timely manner to oral or written notification of required construction warranty repair work.

.11 Written verification to follow oral instructions:

.1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

**1.11 MEASUREMENT PROCEDURES**

.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                SUMMARY**

.1            Section includes:

- .1            Methods and procedures for demolishing, salvaging, recycling and removing sitework items designated to be removed in whole or in part, and for backfilling resulting trenches and excavations.

**1.2                RELATED REQUIREMENTS**

- .1            Section 01 33 00 - Submittal Procedures.
- .2            Section 01 35 29.06 - Health and Safety Requirements.
- .3            Section 01 35 43 - Environmental Procedures.
- .4            Section 01 45 00 - Quality Control.
- .5            Section 01 74 11 - Cleaning.
- .6            Section 31 23 33.01 - Excavating, Trenching and Backfilling.

**1.1                MEASUREMENT FOR PAYMENT**

- .1            See Section 01 29 00 – Payment Procedures.

**1.2                REFERENCES**

- .1            Health Canada/Workplace Hazardous Materials Information System (WHMIS):
  - .1            Material Safety Data Sheets (MSDS).

**1.3                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 wellbeing or environment if handled improperly.

**1.4                ACTION AND INFORMATIONAL SUBMITTALS**

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

## **1.5 QUALITY ASSURANCE**

- .1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial/Territorial 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 of 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 as directed by Departmental Representative from site, prior to start of demolition Work, and dispose of at designated disposal facilities in safe manner in accordance with TDGA and other applicable regulatory requirements.

**Part 2            Products**

**2.1                EQUIPMENT**

- .1            Contractor shall supply all equipment necessary to complete the Work.
- .2            Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

**Part 3            Execution**

**3.1                PREPARATION**

- .1            Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2            Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3            Notify and obtain approval of utility companies before starting demolition.

**3.2                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.

**3.3                REMOVAL OPERATIONS**

- .1            Remove items as indicated.
- .2            Do not disturb items designated to remain in place.
- .3            During removal operations, ensure that materials are not dropped into the watercourse.
- .4            Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving.
- .5            Excavate 300 mm below pipe invert, when removing pipes under existing or future pavement area.
- .6            Decommission water wells and monitoring wells in accordance with Municipal regulations.
- .7            Remove designated trees during demolition:
  - .1            Obtain written approval of Departmental Representative prior to removal of trees not designated.

- .8 Sell trees designated for removal and identified by Departmental Representative to be marketable:
  - .1 Grind, chip, or shred other vegetation for mulching and composting.
- .9 Provide erosion control and hydroseeding if not immediately used.
- .10 Disposal of Material:
  - .1 Dispose of materials not designated for salvage or reuse on site as instructed by Departmental Representative at authorized facilities approved in Waste Reduction Workplan.
- .11 Backfill:
  - .1 Backfill in areas as indicated and in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .12 Parks Canada signs will be removed, salvaged and delivered for reinstallation.

### **3.4 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.

### **3.5 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 Transport material designated for alternate disposal using approved facilities listed in Waste Reduction Workplan and in accordance with applicable regulations:
  - .1 Written authorization from Departmental Representative is required to deviate from facilities listed in Waste Reduction Workplan.

.4 Dispose of materials not designated for alternate disposal in accordance with applicable regulations:

- .1 Disposal Facilities: approved and listed in Waste Reduction Workplan.
- .2 Written authorization from Departmental Representative is required to deviate from disposal facilities listed in Waste Reduction Workplan.

### **3.6 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.

### **3.7 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning:
  - .1 Leave Work area clean at end of each day.
  - .2 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.

### **3.8 PROTECTION**

- .1 Repair damage to adjacent materials or property caused by selective site demolition.

**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.
- .3            Section 32 12 16 - Asphalt Paving.

**1.2                MEASUREMENT FOR PAYMENT**

- .1            See Section 01 29 00 – Payment Procedures.

**1.3                REFERENCES**

- .1            Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) – Standard Specification – (Latest Edition) – Division 4 Pavements – Section 6 – Removal of Asphalt Concrete.

**1.4                WASTE MANAGEMENT AND DISPOSAL**

- .1            Asphalt Pavement Removal shall be handled in the following manners:
  - .1            To be disposed of by the contractor outside of Park limits. All costs related to disposing of the surplus material to be borne by the Contractor.

**Part 2            Products**

- .1            Not Used

**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                EQUIPMENT**

- .1            The cold planning shall be accomplished using a cold-milling machine. The cold-milling machine shall be a self-driven rotating drum type, capable of removing asphalt 100 mm thick and at least 1200 mm wide in a single pass. Cutting depth shall be adjustable from 0 mm to 100 mm over the length of the drum. The machine shall have automatic grade



control and be able to load milled material directly into trucks, or be able to window the material for subsequent pick-up by other equipment.

### **3.3 PROTECTION**

- .1 Protect existing pavement not designated for removal from damage. In event of damage, immediately replace or make repairs to approval of Departmental Representative at no additional cost.

### **3.4 REMOVAL**

- .1 Remove existing asphalt to lines and grades as indicated.
- .2 Prior to paving operations commencing, a traverse butt joint must be constructed. If a transverse vertical cut is milled in the existing pavement at the limit of the work area the Contractor shall immediately construct with hot mix asphalt concrete a temporary smooth 1.5 m long taper. The temporary taper must be removed prior to paving of the milled area.
- .3 Lanes shall be completed to the same location and elevation at the end of day's cold milling operations where it is intended to have both lanes milled.
- .4 The surface remaining after cold planing shall have a constant and continuous cross fall matching the intended surface course cross fall and shall have an even texture free of grooves and/or ridges in all directions.
- .5 All residue left by the cold planing process shall be removed immediately from the road.
- .6 Mechanical sweeping shall be performed at the end of each day's operations. Low points in the asphalt as a result of cold planing operations, where water ponding may occur, shall have the shoulder milled for draining rainfall. Any guide rail contaminated as a result of cold planing or sweeping operations shall be cleaned to the satisfaction of the Departmental Representative. Any milled material that is lost over the shoulder shall be immediately retrieved and disposed of in an approved manner.
- .7 The Contractor shall dispose of residue at an approved waste disposal area provided by the Contractor at his own expense.
- .8 The Contractor shall continuously maintain the work site free of pot holes and standing water and in a condition providing for a safe and efficient flow of traffic, from the time of removal, until such time as the new asphalt concrete is placed. Hot mix asphalt concrete shall be placed in the pot holes; cold mix or RAP are acceptable only as a temporary repair. Areas cold milled must be paved within 7 days of the cold milling operation. Signage indicating the driving condition of the milled surface shall be posted. Milled and aged asphalt concrete surfaces shall be treated with bituminous tack coat in accordance with Section 32 12 13.16 – Asphalt Tack Coat prior to the placing of asphalt concrete.

- .9 Use equipment and methods of removal and hauling which do not tear, gouge, break or otherwise damage or disturb underlying pavement.
- .10 Prevent contamination of removed asphalt concrete pavement and granular base by topsoil, underlying gravel or other materials.
- .11 Provide for suppression of dust generated by removal process.
- .12 Compact underlying material in areas of complete removal of asphalt concrete.
- .13 In areas where localized pavement removal is carried out within the traffic lane ensure traffic is restricted from area until the surface is restored.
- .14 The contractor shall ensure that traffic does not travel on subgrade or sub-base at any time during construction unless directed by Departmental Representative.

**3.5 TRAFFIC CONTROL**

- .1 Maintain at least one lane of alternating two-way traffic at construction site at all times as specified in Section 01 35 00.06 – Special Procedures for Traffic Control.

**3.6 CLEANING**

- .1 Leave Work area clean at end of each day.
- .2 Sweep remaining asphalt pavement surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.

**END OF SECTION**

**Part 1        General**

**1.1        SUMMARY**

- .1        The Work under this section will include the supply of labour, supervision, materials, equipment, and transportation necessary to complete demolition work as shown on the Drawings, per the Specifications, and as directed by the Departmental Representative, complete in every respect.
- .2        Generally, the work in Demolition is the responsibility of the Contractor and includes but is not necessarily limited to the following:
  - .1        Full removal of existing North Aspy South Branch River Bridge.
  - .2        Full removal of existing concrete abutments and any existing piles to 1000mm below riverbed.
  - .3        Removal and disposal of debris.

**1.2        RELATED REQUIREMENTS**

- .1        Section 01 33 00 - Submittal Procedures.
- .2        Section 01 35 29.06 - Health and Safety Requirements.
- .3        Section 01 35 43 - Environmental Procedures.
- .4        Section 01 45 00 - Quality Control.
- .5        Section 01 56 00 - Temporary Barriers and Enclosures.
- .6        Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .7        Section 31 23 33.01 - Excavating, Trenching and Backfilling.

**1.3        MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 – Payment Procedures.

**1.4        REFERENCES**

- .1        Definitions:
  - .1        Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, include but not limited to: poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or materials that endanger human health or environment if handled improperly.
  - .2        Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating related, required submittal and reporting requirements.
- .2        Reference Standards:
  - .1        CSA International:

- .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .2 Department of Justice Canada (Jus):
  - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
  - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33:
    - .1 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
    - .2 SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations.
    - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

## **1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 WMC is responsible for fulfilment of reporting requirements.
- .3 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 and indicate:
  - .1 Descriptions of and anticipated quantities in percentages of materials to be salvaged reused, recycled and landfilled.
  - .2 Schedule of selective demolition.
  - .3 Number and location of dumpsters.
  - .4 Anticipated frequency of tipping.
  - .5 Name and address of haulers and waste receiving organizations.
- .4 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 receiving organizations listed in Waste Reduction Workplan.
- .5 Shop Drawings:
  - .1 Submit for review and approval demolition drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.
  - .2 Submit demolition drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.

## **1.6 QUALITY ASSURANCE**

- .1 Regulatory Requirements: Ensure Work is performed in compliance with Section 01 45 00 - Quality Control.

## **1.7 SITE CONDITIONS**

- .1 Environmental protection:
  - .1 Ensure Work is done in accordance with Section 01 35 43 - Environmental Procedures.
  - .2 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
    - .1 No machinery shall be allowed in the water at any time.
  - .3 Fires and burning of waste or materials is not permitted on site.
  - .4 Do not bury rubbish waste materials.
  - .5 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 project.
  - .6 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.
  - .7 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with as directed by Departmental Representative.
  - .8 Protect trees, plants and foliage on site and adjacent properties where indicated.
  - .9 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.
  - .10 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.

## **1.8 EXISTING CONDITIONS**

- .1 Refer to Drawings indicating existing and temporary conditions.

## **1.9 SCHEDULING AND STAGING**

- .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
  - .1 In event of unforeseen delay notify Departmental Representative in writing.
  - .2 The Contractor is to respect all restrictions on in water work as outlined in the Contract Documents.
- .2 Stage bridge demolition as follows:
  - .1 Demolition of the existing bridge shall not commence until traffic is permanently diverted onto the realigned highway and new bridge structure.

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**Part 2 Products**

**2.1 EQUIPMENT**

- .1 Equipment and heavy machinery:
  - .1 On-road vehicles to: CEPA-SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
  - .2 Off-road vehicles to: EPA CFR 86.098-10 and EPA CFR 86.098-11.
- .2 Contractor to implement an anti-idling policy. Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

**Part 3 Execution**

**3.1 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: sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
  - .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.
- .2 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.
    - .1 Provide bracing, shoring and underpinning as required.
    - .2 Repair damage caused by demolition as directed by Departmental Representative.
  - .3 Support affected structures and, if safety of structure being demolished adjacent structures or services appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.
  - .4 Prevent debris from blocking surface drainage system, elevators, mechanical and electrical systems which must remain in operation.
- .3 Preparation:
  - .1 Contact utilities prior to commencing work. Coordinate removals and relocations with respective utilities.
  - .2 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.

- .3 Disconnect and cap any utility to remain.
- .4 Do not disrupt active or energized utilities designated to remain undisturbed.
- .5 Remove rodent and vermin as required by Departmental Representative.

### 3.2 DEMOLITION

- .1 Do demolition work in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
- .2 Blasting operations not permitted during demolition.
- .3 Ensure that existing structure components including the bridge deck are not dropped into the watercourse during demolition.**
- .4 Remove contaminated or dangerous materials as 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.
- .5 Demolish parts of structure as indicated on the drawings and as described herein.
- .6 Crush concrete generated due to demolition of foundations to size suitable for recycling as directed.
  - .1 Where possible identify markets which will accept crushed material as aggregate.
  - .2 For further information regarding acceptable uses contact Provincial aggregate producers associations and Ministries of Transportation.
- .7 Concrete foundations to be demolished will be completely removed.
- .8 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as work progresses.
- .9 At end of each day's work, leave Work in safe and stable condition.
- .10 Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative.
- .11 Remove structural components and asphaltic material.
- .12 Only dispose of material specified by selected alternative disposal option as directed by Departmental Representative.
- .13 Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.
- .14 Dispose of materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### 3.3 CLEANING

- .1 Divert excess materials from landfill to site approved Departmental Representative.
- .2 Designate appropriate security resources / measures to prevent vandalism, damage and theft.

- .3 Locate stockpiled materials convenient for use in new construction. 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:
  - .1 Label stockpiles, indicating material type and quantity.
- .5 Remove stockpiled material as directed by Departmental Representative, when it interferes with operations of project construction.
- .6 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.
- .7 Transport material designated for alternate disposal using approved haulers listed in Waste Reduction Workplan and in accordance with applicable regulations:
  - .1 Written authorization from Departmental Representative is required to deviate from haulers listed in Waste Reduction Workplan.
- .8 Dispose of materials not designated for alternate disposal in accordance with applicable regulations:
  - .1 Disposal facilities must be those approved of and listed in Waste Reduction Workplan.
  - .2 Written authorization from Departmental Representative is required to deviate from disposal facilities listed in Waste Reduction Workplan.

**END OF SECTION**



**Part 1 General**

**1.1 SUMMARY**

- .1 The Work under this Section includes the supply of all labour, supervision, materials, plant, equipment, and transportation necessary for the supply, erection and stripping of all formwork for concrete work shown on the Drawings, per the Specifications, and as directed by the PCA Representative, complete in every respect.

**1.2 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.
- .5 Section 03 30 51 - Concrete Bridge Decks.
- .6 Section 07 92 00 - Concrete Joint Sealer.

**1.3 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.
  - .2 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
  - .3 CSA O121-M1978(R2003), Douglas Fir Plywood.
  - .4 CSA O151-04, Canadian Softwood Plywood.
  - .5 CSA O153-M1980(R2003), Poplar Plywood.
  - .6 CAN/CSA-O325.0-92(R2003), Construction Sheathing.
  - .7 CSA O437 Series-93(R2006), Standards for OSB and Waferboard.
  - .8 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
  - .9 CAN/CSA-S269.3-M92(R2003), Concrete Formwork, National Standard of Canada.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings for formwork and falsework:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.
- .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 CSA S269.1, for falsework drawings. 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 Departmental Representative.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Store and manage hazardous materials in accordance with jurisdictional requirements.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Formwork materials:
  - .1 Use wood and wood product formwork materials to CSA-A23.1/A23.2 and CSA 0121.
  - .2 Plywood and wood formwork materials to CSA-0121, CAN3-086.1S1, CSA 0153.
  - .3 Rigid insulation board between approach slab and wingwalls.
  - .4 Formwork shall be constructed from lumber devoid of warped defects in order to achieve face alignment free of distortion. This shall apply to all panel forms including prefabricated boards, plywood and steel panels.
- .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 25 mm 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 coatings are applied).
- .3 Form liner:
  - .1 Plywood: to be determined by the Departmental Representative based on the condition of the forms.
- .4 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.
- .5 Falsework materials: to CSA-S269.1.
- .6 Sealant: to Section 07 92 00 - Concrete Joint Sealer.

**Part 3 Execution**

**3.1 FABRICATION AND ERECTION**

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Assemble forms so that concrete is not damaged during its removal.
- .5 Fabricate and erect falsework in accordance with CSA S269.1.
- .6 Do not place shores and mud sills on frozen ground.
- .7 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .8 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.
- .9 Align form joints and make watertight:
  - .1 Keep form joints to minimum.
- .10 Use 19 mm chamfer strips on external corners and/or 19 mm fillets at interior corners, joints, unless specified otherwise.
- .11 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .12 Construct forms for architectural concrete, and place ties as indicated:
  - .1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.
- .13 Build 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.
- .14 Line forms for following surfaces:
  - .1 Outer face of bridge deck and curbs.
  - .2 Soffit of girders and underside of bridge decks if exposed.
  - .3 Exposed faces of abutments, wingwalls: do not stagger joints of form lining material and align joints to obtain uniform pattern.
  - .4 Secure lining taut to formwork to prevent folds.
  - .5 Pull down lining over edges of formwork panels.
  - .6 Ensure lining is new and not reused material.
  - .7 Ensure lining is dry and free of oil when concrete is poured.

- .8 Application of form release agents on formwork surface is prohibited where drainage lining is used.
- .9 If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.
- .10 Cost of textile lining is included in price of concrete for corresponding portion of Work.
- .15 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

### **3.2 REMOVAL AND RESHORING**

- .1 Leave formwork in place for following minimum periods of time after placing concrete:
  - .1 7 days (168 hours) for deck, curbs, crash blocks, and wingwalls.
  - .2 3 days (72 hours) for footings and abutments.
- .2 Remove formwork when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .4 Space reshoring in each principal direction at not more than 3 meters apart.
- .5 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.
- .6 When formwork is removed during the curing period the exposed concrete will be cured as specified.

**END OF SECTION**

**Part 1            General**

**1.1                SUMMARY**

- .1        The Work under this Section will include supply of all labour, supervision, materials, plant, equipment, and transportation necessary for supply and placing reinforcing steel bars shown on the Drawings, per the Specifications, and as directed by the PCA Representative, complete in every respect.

**1.2                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 10 00 - Concrete Forming and Accessories.
- .6        Section 03 30 00 - Cast-In-Place Concrete.
- .7        Section 03 30 51- Concrete Bridge Decks.
- .8        Section 03 49 00 - Glass Fibre Reinforced Polymer Reinforcing.

**1.3                MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 – Payment Procedures.

**1.4                REFERENCES**

- .1        American Concrete Institute (ACI):
  - .1        SP-66-04, ACI Detailing Manual 2004.
- .2        CSA International:
  - .1        CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2        CAN/CSA-A23.3-04(R2010), Design of Concrete Structures.
  - .3        CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
- .3        Reinforcing Steel Institute of Canada (RSIC):
  - .1        RSIC-2004, Reinforcing Steel Manual of Standard Practice.

**1.5                SUBMITTALS**

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

- .2 The Contractor shall submit proof of certification for the welders conducting the Work prior to commencing the Work:
  - .1 All welders shall be certified by the CWB in accordance with CSA W186, and/or to a certification level of Qualified Welder as issued by the Province of Nova Scotia, Canada.
- .3 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice SP-66.
- .5 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.
    - .1 Indicate placing of reinforcement and:
      - .1 Bar bending details.
      - .2 Lists.
      - .3 Quantities of reinforcement.
      - .4 Sizes, spacings, locations of reinforcement and mechanical splices 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.
    - .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated:
      - .1 Provide Class B tension splices unless otherwise indicated.

## **1.6 QUALITY ASSURANCE**

- .1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL:
  - .1 Mill Test Report: provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
  - .2 Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

## **1.7 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 off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

## **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 CSA-G30.18, unless indicated otherwise, with the following additional requirements:
  - .1 Reinforcing steel shall be in the form of deformed round bars unless otherwise noted in the Contract Documents.
  - .2 Reinforcing steel shall be free of physical defects.
  - .3 Reinforcing steel shall be bent to proper shape in a plant having suitable devices for bending reinforcing steel as recommended in The Reinforcing Steel Institute of Canada, (RSIC), Manual of Standard Practice, unless otherwise noted in the Contract Documents.
  - .4 Heating shall not be used as an aid in bending steel, unless specifically authorized by the Departmental Representative.
  - .5 Welding or splicing shorter bars as a substitute for supplying bars of the specified lengths shall not be permitted.
  - .6 Bars are subject to rejection if their actual weight varies from their theoretical weight, as specified in CAN/CSA G30.18, Grade 400W, by more than 5%.
  - .7 All structures are designed using Metric (SI) reinforcing steel bar sizes and the Contractor shall supply accordingly.
  - .8 Bar splice couplers approved by Departmental Representative develop 125% of the ultimate capacity of the bars.
  - .9 Steel reinforcing bars at the time the concrete is placed shall be free of mud, oil, and other contaminants that adversely affect bonding strength and deposits or iron and non-stainless steels as well as other physical defects. If mill scale is present, it shall be removed by pickling or abrasive blasting.
  - .10 Cutting of steel reinforcing bars to be carried out by saw cut and not torch cut. Obtain approval from Departmental Representative prior to carrying out any reinforcing steel modifications.

- .3 Stainless steel reinforcing: dowels at end of deck and in approach slab, as shown in Contract Documents, shall be Solid Stainless Steel Reinforcing Bars conforming to the requirements of A955/A955M “Deformed and Plain Stainless Steel Bars for Concrete Reinforcement” and shall be Type 316LN. The minimum yield strength shall be 400 MPa. Additional requirements of item 3.3.2.1.2 shall apply including the following:
  - .1 Tie wire used to tie stainless steel reinforcing bars to stainless steel reinforcing bars and standard reinforcing steel bars shall be Type 316LN, or Type 316L, stainless steel wire, 1.2 or 1.6 mm in diameter.
  - .2 Bar chairs for supporting stainless steel reinforcing bars shall be non-metallic. Concrete chairs shall not be used to support stainless steel reinforcing bars.
- .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.

## **2.2 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2, ACI315 and reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .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 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 being placed in position. Bending shall be accurately done, in a bending machine and no welding or heating of 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, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

### **3.3 PLACING REINFORCEMENT**

- .1 General:
  - .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Departmental Representative:
    - .1 Glass Fibre Reinforced Polymer (GFRP) rebar shall be used in the bridge deck and curb reinforcing, and in approach slab reinforcing as shown on the Contract Drawings. Refer to Section 03 49 00 - Glass Fibre Reinforced Polymer Reinforcing.
    - .2 The Work shall be in accordance with CSA A23.1, and Concrete Reinforcing Steel Institute (CRSI) Placing Reinforcing Steel Recommended Practices.
  - .2 Placing and Fastening:
    - .1 Immediately before placing, reinforcing steel shall be free of oil, dirt, mill scale, loose or excessive rust or other coatings that would reduce bond to concrete:
      - .1 Reinforcing steel shall be maintained in this clean condition until embedded in concrete and reinforcing steel about to be embedded in concrete shall be free of loose hardened concrete.
      - .2 Bar supports shall be made of plastic or stainless steel for non-coated bars and shall be non-metallic for supporting stainless steel and GFRP bars. Concrete bar supports shall not be used to support stainless steel bars.
    - .2 Reinforcement shall be accurately positioned, secured and supported, using bar supports and side form spacers, to ensure proper concrete cover and spacing within allowable tolerances before and during placement of concrete.
    - .3 Bars shall be fastened together at all intersections, except where the spacing is less than 300 mm in each direction in which case fastening at alternate intersections of each bar with other bars shall be permitted provided the Contractor can demonstrate to the Departmental Representative that this shall hold all the bars securely in position.
    - .4 In deck slabs, the top bar on the top mat shall be tied securely to the shear stirrups in the concrete beam:
      - .1 Spacing of the ties shall not exceed 900 mm centre along the entire length of the beams.

- .5 The Contractor shall ensure flexing of the reinforcing steel partially embedded in the Work shall not occur until the concrete has attained a minimum compressive strength of 20 MPa.
  - .6 Work on partially embedded reinforcing steel shall continue only when the previously placed concrete has attained a minimum compressive strength of 20 MPa.
  - .7 Prior to the deposition of concrete the positioning and securing of the reinforcing steel shall be inspected and approved by the Departmental Representative.
- .3 Bar Supports:
- .1 Bar supports shall have sufficient strength and stiffness to carry the loads from the reinforcement, construction crew and concrete pressures without failure, displacement or significant deformation.
  - .2 Bar supports shall be spaced such that any sagging between supports shall not reduce the specified concrete cover.
  - .3 Bar supports shall be made of plastic:
    - .1 Commercially available precast concrete bar supports, or Engineer approved equivalent, shall be used for bar supports that are in contact with soil:
      - .1 Precast concrete bar supports shall be made of concrete with a quality at least equal to that specified for the member into which the bar supports are integrated:
        - .1 Geometry of bar support or embedded tie wires shall keep rebar securely fastened.
        - .2 Stacking of bar supports shall not be permitted.
  - .4 Bar supports shall be nonconductive and have a geometry and bond characteristics that deter the movement of moisture from the surface to the reinforcement.
  - .5 Bar supports in contact with the soil shall have a base area of less than 100 mm x 100 mm.
- .4 Side Form Spacers:
- .1 Side form spacers shall have provisions to enable them to be firmly secured to the reinforcement.
  - .2 Side form spacers shall meet requirements of Bar Supports.
- .5 Internal Spacers:
- .1 Spacers for maintaining the specified distance between layers of reinforcement shall be made from reinforcing bars or steel rods.
  - .2 Spacers shall be positioned and securely fixed between the layers of reinforcement and shall not protrude in the cover concrete.
- .6 Welding:
- .1 When specified, weld rebar using E49 Series low hydrogen electrodes and in accordance with the requirements of CSA W186.

- .2 The welding of reinforcement, including tack welding, is prohibited unless otherwise indicated in the Contract Documents.
- .7 Testing:
  - .1 Additional reinforcing steel, required to replace that altered by testing, shall be provided by the Owner under the terms of this Item, unless the reinforcing steel is shown, by testing, to be in non-conformance with the Specifications, then the reinforcing steel shall be provided by the Contractor.
- .8 Notify the Departmental Representative 48 hours prior to placing of concrete.
- .9 Prior to placing concrete, obtain the Departmental Representative's approval of reinforcing material and placement.
- .10 Ensure cover to reinforcement is maintained during concrete pour.

### **3.4 CLEANING**

- .1 All materials will be free of all form oil or deleterious materials.
- .2 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning:
  - .1 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 for in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 The Work in this section includes the supply of all labour, supervision, materials, plant, equipment, and transportation necessary for the placing and finishing of reinforced concrete work as shown on the Drawings, per the Specifications, and as directed by the Departmental Representative, complete in every respect.

**1.2 RELATED REQUIREMENTS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 29.06 - Health and Safety Requirements.
- .3 Section 01 45 00 - Quality Control.
- .4 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .5 Section 03 10 00 - Concrete Forming and Accessories.
- .6 Section 03 20 00 - Concrete Reinforcing.
- .7 Section 07 92 00 - Concrete Joint Sealer.

**1.1 MEASUREMENT FOR PAYMENT**

- .1 See Section 01 29 00 – Payment Procedures.

**1.2 REFERENCES**

- .1 Abbreviations and acronyms:
  - .1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement:
    - .1 Type GU, GUb and GUL - General use cement.
    - .2 Type MS and MSb - Moderate sulphate-resistant cement.
    - .3 Type MH, MHb and MHL - Moderate heat of hydration cement.
    - .4 Type HE, HEb and HEL - High early-strength cement.
    - .5 Type LH, LHb and LHL - Low heat of hydration cement.
    - .6 Type HS and HSb - High sulphate-resistant cement.
  - .2 Fly ash:
    - .1 Type F - with CaO content less than 15%.
    - .2 Type CI - with CaO content ranging from 15 to 20%.
    - .3 Type CH - with CaO greater than 20%.
  - .3 GGBFS - Ground, granulated blast-furnace slag.
- .2 Reference Standards:
  - .1 ASTM International:

- .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
- .2 ASTM C309-07, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- .3 ASTM C494/C494M-10a, Standard Specification for Chemical Admixtures for Concrete.
- .4 ASTM C1017/C1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- .5 ASTM A153/A153M-09 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .6 ASTM A563-07a, Standard Specification for Carbon and Alloy Steel Nuts.
- .7 ASTM F436-11, Standard Specification for Hardened Steel Washers.
- .8 ASTM F1554-07a, Standard Specification for Anchor Bolts, Steel, 36, 55 and 105 ksi Yield Strength.
- .2 Canadian General Standards Board (CGSB):
  - .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
  - .2 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .3 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 A283-06, Qualification Code for Concrete Testing Laboratories.
  - .3 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

### 1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide testing results for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .3 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
- .4 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.
- .5 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

#### **1.4 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Site Meetings: one week prior to beginning concrete works:
  - .1 Ensure key personnel such as site supervisor, Departmental Representative, specialty contractor - finishing, forming, concrete producer, testing laboratories attend.
  - .2 Verify project requirements.
- .3 Submit to Departmental Representative, minimum 4 weeks prior to starting concrete work, 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 used in concrete mixture will meet specified requirements.
- .4 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
  - .1 Falsework erection.
  - .2 Hot weather concrete.
  - .3 Cold weather concrete.
  - .4 Curing.
  - .5 Finishes.
  - .6 Formwork removal.
  - .7 Joints.
- .5 Quality Control Plan: provide written report, as described in PART 3 - VERIFICATION to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.
- .6 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching:
  - .1 Modifications to maximum time limit must be agreed to 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.
- .3 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21.

- .2 Divert unused concrete materials from landfill to local facility approved by Departmental Representative.
- .3 Provide an appropriate area on the job site where concrete trucks can be safely washed.
- .4 Divert unused admixtures and additive materials from landfill to official hazardous material collections site as approved by the Departmental Representative.
- .5 Unused admixtures and additive 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.
- .6 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable jurisdictional regulations.

## **Part 2 Products**

### **2.1 DESIGN CRITERIA**

- .1 CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

### **2.2 PERFORMANCE CRITERIA**

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

### **2.3 MATERIALS**

- .1 Portland Cement: to CSA A3001.
- .2 Cementing material to be a blended Portland cement, fly ash, silica fume cement, Type GUb F/SF. The minimum proportion by mass of the total cementing materials for silica fume shall be 6% and a maximum of 8%. The maximum proportion by mass of the total cementing material for fly ash is 25%.
- .3 Supplementary cementing materials: to CAN/CSA-A3000.
- .4 Water: to CSA-A23.1 and to be free from injurious amounts of oil, acid, alkali soluble chloride, organic matter, sedimentation and other deleterious substances.
- .5 Admixtures:
  - .1 Air entraining admixture: to ASTM C260.
  - .2 Chemical admixture: to CSA A23.1/A12.2. The Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
  - .3 Corrosion-inhibiting admixture: to CSA A23.1/A23.2.
  - .4 Lithium-based admixture: to CSA A23.1/A23.2.

- .5 Shrinkage-reducing admixture (SRA): to CSA A23.1/A23.2.
- .6 Viscosity-modifying agent (VMA): to CSA A23.1/A23.2.
- .6 Aggregates: to CAN/CSA-A23.1/A23.2. The maximum Petrographic Number of course aggregate shall not exceed 140. The maximum absorption of course aggregate shall not exceed 2%.
- .7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2:
  - .1 Compressive strength: 45 MPa at 28 days.
  - .2 Consistency:
    - .1 Fluid: to ASTM C827. Time of efflux through flow cone (ASTM C939), under 30 seconds.
    - .2 Flowable: to ASTM C827. Flow tables, 5 drops in 35 (ASTM C109, applicable portion) as to 145%.
    - .3 Plastic: to ASTM C827. Flow table, 5 drops in 35 (ASTM C109, applicable portions) 100 to 125%.
- .8 Curing compound: to ASTM C309, Type 2.
- .9 Dampproofing:
  - .1 Emulsified asphalt, mineral colloid type, unfilled: to CAN/CGSB-37.2.
- .10 Polyethylene film under approach slabs: 2 sheets each 6 mils thick, to CAN/CGSB-51.34.
- .11 Bonding agent under bearing plinths: modified latex bonding agent.
- .12 Waterstop: preformed rectangle 25 mm x 8 mm hydrophilic waterstop for joints with up to 670% expansion in water, 1000 psi tensile strength, 600% elongation, and >100 ft. head pressure.

## 2.4 MIXES

- .1 Performance Method for specifying concrete: to meet Departmental Representative performance criteria in accordance with to CAN/CSA A23.1/A23.2:
  - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 - VERIFICATION.
  - .2 Proportion normal density concrete in accordance with CAN/CSA-A23.1, to give the properties for concrete in bridge deck, curbs, pile caps abutments, wingwalls, and approach slabs. Concrete 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 Class of exposure: C1.
    - .3 Chemical admixtures: type as approved and in accordance with ASTM C494.
    - .4 Normal size of aggregate: 20mm.



- .5 Maximum water to cement ratio: 0.35.
- .6 Minimum cementitious content: 420 kg/m<sup>3</sup>.
- .7 Air content: 6 ± 1%.
- .8 Maximum slump before superplasticization: 60mm.
- .9 Slump after superplasticization: 180 ± 30mm.
- .10 Maximum spacing factor of hardened concrete not to exceed 300mm.
- .11 Average spacing factor of hardened concrete not to exceed 250 mm.
- .12 Rapid concrete permeability @ 56 days: <1000 coulombs.
- .13 Maximum concrete temperature (from delivery equipment):
  - .1 Thickness >2 metres: 18°C.
  - .2 Thickness <2 metres: 25°C.
- .14 Maximum concrete temperature (in situ): 70°C.
- .15 Maximum temperature gradient: 20°C/metre.
- .16 Superplasticizer shall be used in all concrete.

### **Part 3 Execution**

#### **3.1 PREPARATION**

- .1 Obtain Departmental Representative's written approval before placing concrete:
  - .1 Provide 24 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 facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after review of equipment and mix by Departmental Representative.
- .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.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application of concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .10 Remove all debris including sawdust, chips and any other deleterious materials from the interior of the forms.
- .11 Do not place load upon new concrete until authorized by Departmental Representative.

### 3.2 INSTALLATION/APPLICATION

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Sleeves and inserts:
  - .1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.
  - .2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
  - .3 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Departmental Representative.
  - .4 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.
  - .5 Confirm locations and sizes of sleeves and openings shown on drawings.
  - .6 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 under supervision of appropriate trade prior to placing concrete.
  - .2 With approval of Departmental Representative, grout anchor bolts in preformed holes as indicated on the drawings.
  - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
  - .4 Set bolts and fill holes with shrinkage compensating 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 Drainage holes and weep holes:
  - .1 Form weep holes and drainage holes in accordance with Section 03 10 00 – Concrete Forming and Accessories.
  - .2 Install weep hole tubes and drains as indicated.
- .5 Placing of concrete:
  - .1 Consolidation:
    - .1 All methods of consolidation shall be subject to the approval of the Departmental Representative.
    - .2 Concrete shall be consolidated thoroughly and uniformly by means of hand tamping vibrators or finishing machines to obtain a dense, homogeneous structure, free from cold joints, voids and honeycomb.
    - .3 A sufficient number of vibrators shall be employed to adequately handle the anticipated rate of placement. The size and frequency of vibrators shall be as specified in CSA A23.1. A stand-by vibrator shall be available on the site at all times.

- .4 Internal vibrators shall be used wherever practicable. External type vibrators may be used where surfaces cannot be properly consolidated with the internal type alone.
  - .5 Insertion of internal vibrators shall be made systematically at intervals such that the zones of influence of the vibrator overlap.
  - .6 Extreme care shall be taken to ensure that the internal type vibrators do not displace the reinforcing steel or the forms. Vibrators shall have rubber or non-metallic vibrating heads if epoxy coated reinforcing steel is used.
- .2 Curing concrete:
- .1 Concrete shall be protected from freezing, premature drying, high temperature and moisture loss for a period of time necessary to develop the desired properties of the concrete.
  - .2 Curing shall be applied to concrete as soon as possible without damaging or marring the surface.
  - .3 The curing time shall be as indicated in CSA A23.1 or this specification. Curing shall be achieved by one or more of the following:
    - .1 Burlap. Two layers of pre-soaked burlap shall be carefully laid on the surface as soon as the concrete has set sufficiently to support the mass of the burlap without marking the surface. Strips shall be overlapped 150 mm, secured to the surface and kept wet throughout the curing period.
    - .2 Moisture Vapour Barrier. The Contractor shall provide an effective vapour barrier and prevent any flow of air between it and the concrete surface. Where polyethylene sheet is used, it shall be white opaque pigmented with a minimum thickness of 100 µm. The vapour barrier shall be secured to the surface and overlapped 150 mm.
    - .3 White Pigment Liquid Membrane. Curing compounds shall not be used on a surface where a bond is required for additional concrete. A curing compound may be approved by the Department Representative under certain circumstances where the application of moisture is impracticable and where such compounds will not jeopardize the appearance of the concrete. Curing compounds shall be applied at the Manufacturer's recommended application rate. Curing compounds are not permitted on construction joints, surfaces requiring weatherproofing sealants or deck sections.
    - .4 Water. All cast-in-place concrete bridge decks shall be cured with water unless otherwise directed by the Departmental Representative. Concrete exposed surfaces shall be kept continuously moist for a minimum of seven consecutive days after placing. The water for curing shall be clean and free from any material which could cause staining or discoloration of the

concrete. All freshly placed and consolidated concrete shall be suitably protected from the elements.

- .3 Hot Weather Concreting: When the air temperature is at or above 27°C, or is likely to rise above 27°C within 24 hours, special measures, as detailed in CSA A23.1 shall be taken by the Contractor to protect the concrete from the effects of hot and/or drying weather conditions. The temperature of the formwork, reinforcing steel or the material on which the concrete is to be placed, shall not exceed 27°C. Concrete temperatures shall not exceed those specified in CSA A23.1, Table 16.
- .4 Cold weather concreting:
  - .1 When the mean air temperature is at or below 5°C or when the temperature is likely to fall below 5°C within 24 hours, the Contractor shall place, cure and protect concrete in accordance with CSA A23.1 and this specification.
  - .2 Concrete shall not be placed on or against any surface which is at a temperature less than 5°C. Snow and ice shall be removed before concrete is deposited on any surface.
  - .3 Calcium chloride or other de-icing chemicals shall not be used as a deicing agent in the forms.
  - .4 If heating of the mix water and/or aggregates is used, the charging cycle shall be altered to prevent flash setting of the concrete.
  - .5 Aggregates and water shall not be heated above 80°C. Water and/or aggregates heated to a temperature in excess of 40°C, shall be batched in the mixer first to reduce the temperature of the combination below 40°C, prior to the addition of the cementing materials.
  - .6 All frozen lumps of aggregate shall be excluded from the mix.
- .5 Protection classes:
  - .1 Protection and curing depends upon the outside temperature, the wind velocity, and the size of the concrete section.
  - .2 Under normal circumstances the following methods of protection may be required to maintain the protection necessary for the conditions described.
  - .3 Heating of the mixing water and/or aggregates shall be required for all classes of protection.
  - .4 When the outside temperature during placing or during the protection period may fall below 5°C, adequate covering of all surfaces with tarpaulins or polyethylene sheets shall be provided.
  - .5 When the outside temperature during placing or during the protection period may fall below 0°C, all surfaces shall be covered with an approved insulating material, over which tarpaulins or polyethylene sheets are placed.
  - .6 When the outside temperature during placing or during the protection period may fall below -5°C, a complete housing of the concrete, together

- with supplementary heat, shall be provided. The Contractor shall ensure that heat is supplied uniformly around the concrete.
- .7 For mass concrete, defined as minimum section dimension in excess of 2 m, the temperature gradient shall not exceed 20°C/m from the interior of the element to the exterior face.
  - .8 In thin sections, less than 2 m, the temperature differential from the interior to the exterior shall not exceed 20°C.
  - .9 Steam or hot air blowers may be used, but a means of maintaining relative humidity of not less than 95% shall be provided. The use of salamanders, coke stoves, oil/gas burners and spot heaters availing of open flame shall be prohibited.
  - .10 When dry heat is used, hot air shall not be permitted to flow directly onto the concrete surface. Exhaust fumes shall be vented.
  - .11 The protection and curing shall continue to maintain the temperature of the concrete at not less than 10°C for five days after placing. The concrete shall be kept above 0°C for a total period of fourteen days.
  - .12 At the end of the curing and protection period, protection and heating shall be withdrawn in such a manner as not to induce thermal shock stresses in the concrete.
  - .13 The temperature of the concrete shall be gradually reduced to avoid cracking due to sudden temperature changes near the end of the curing period. The protection shall not be completely removed until the concrete has cooled to the temperature differential stated in Table 18 of CSA A23.1.
- .6 Finishing and curing:
- .1 Basic treatment:
    - .1 Upon removal of the forms, all cavities, honeycomb, and other deficiencies shall be patched with a sand cement mortar of the same composition as that used in the concrete.
    - .2 Mortar shall be composed of cement, fine aggregate and water, proportioned and mixed as specified.
    - .3 When the proportioning of cement and fine aggregate is not specified, the mortar shall consist of one (1) part by volume of cement and two (2) parts of fine aggregate.
    - .4 The quantity of water used in mixing the mortar shall be sufficient to make it capable of being freely spread with the trowel.
    - .5 Mortar shall be mixed in quantities which can be utilized within 60 minutes.
    - .6 Mortar shall not be re-tempered or re-mixed with water after initial set.
    - .7 All bolts, ties, nails, or other metal not specifically required for construction purposes, shall be removed or cut back to a depth of 25 mm from the surface of the concrete unless otherwise directed by the Departmental Representative.

- .8 The cavity shall be kept saturated for 60 minutes prior to the application of a latex bonding agent or neat cement paste.
  - .9 The mortar shall be pressed or packed into the depressions so as to completely fill the cavity and then finished to match the adjacent surface.
  - .10 Fins, unsightly ridges, or other imperfections shall be chipped or rubbed off flush with the surface.
  - .11 Mortar patches in excess of 25 mm shall be applied in layers not exceeding 25 mm with a 30 minute interval between the placing of layers.
  - .12 The surface of the patch shall be textured equivalent to the adjacent concrete.
  - .13 Honeycomb areas or cavities over 25 mm in diameter shall not be repaired until inspected by the Departmental Representative.
  - .14 Where honeycombing has occurred in non-structural elements, the affected area shall be removed and filled with mortar as previously described.
  - .15 Where honeycombing has occurred in structural elements, the corrective method of treatment shall be carried out as directed by the Departmental Representative.
  - .16 All concrete and mortar shall be cured and protected in accordance with CSA A23.1.
- .2 Smooth form finish:
- .1 A Smooth Form Finish shall be a uniform, high quality concrete which has been homogeneously placed and thoroughly compacted.
  - .2 A Smooth Form Finish shall be uniform in colour, pattern and texture.
  - .3 All exposed bridge components and curbs, sidewalks shall have a Smooth Form Finish. Top of wide curb on bridge structures to have a transverse light broom finish to produce a textured, non-slip surface with a smooth edge at each side of each joint. The width of the smooth edge shall match that of the CIP sidewalks on the approach and the joint shall be pro-fitted with a 6mm radius using a concrete edger.
  - .4 If the concrete, after form stripping and the basic treatment, does not exhibit such finish, the Contractor shall perform any or all of the following operations, in order to obtain a Smooth Form Finish:
    - .1 Cut out all corrodible metal within 25 mm of the surface and repair the cavities as indicated in basic treatment.
    - .2 Remove fins and other projections to leave a smooth, plane surface.
    - .3 Remove stains, rust marks or other blemishes which detract from the specified uniformity of appearance.

- .3 Open surfaces:
  - .1 The finished surface of concrete placed for such items as bridge decks, approach slabs, and curbs shall conform to the lines, grades and elevations shown on the contract drawings.
  - .2 Joints shall be rounded using a 6 mm radius edging tool.
  - .3 The finished surface shall not vary more than 3 mm under a 3 m straight edge and shall be lightly broomed transversely to produce a textured, non-slip surface.
- .7 Dampproof membrane:
  - .1 All dampproofing material shall conform to CAN/CGSB-37.2-M88.
- .8 Concrete sealer and coatings:
  - .1 Apply concrete sealers/coatings as described in Section 07 92 00 – Concrete Joint Sealer.
- .9 Placing and finishing concrete bridge deck:
  - .1 The finished surface of the deck concrete shall conform to grades and elevations shown on the Contract Drawings. Prior to placing deck concrete, the Contractor shall submit to the Departmental Representative detailed information on the method and equipment proposed for handling, placing and finishing of the concrete. The Contractor shall also demonstrate to the satisfaction of the Departmental Representative that all necessary adjustments have been made to provide the required camber, crown, slab thickness and concrete cover over reinforcement, prior to placement.
  - .2 Immediately prior to placement of deck concrete, the formwork shall be cleaned and thoroughly moistened. The Contractor shall also moisten the reinforcing steel with water at the request of the Departmental Representative.
  - .3 The concrete surface shall be floated with a wooden or magnesium float.
  - .4 The concrete shall be textured by means of a burlap drag, broom or approved alternative.
  - .5 There shall be no application of water or cement to the concrete surface for finishing purposes.
  - .6 Deck concrete shall be water cured as indicated in Item 03.30.3.2.5.3 of this specification. During freezing temperatures, water curing shall be terminated 12 hours prior to the end of the protection period.

### **3.3 SURFACE TOLERANCE**

- .1 Concrete tolerance to CSA A23.1 and per the table below.

Position in Structure	Tolerance
Finished Bridge Deck Grades Surface variation	±8 mm 8 mm over 3 m
Approach Slab directly overlaid with asphalt concrete Grades Surface variation	±8 mm 8 mm over 3 m
Approach Slab buried below grade Grades Surface variation	±8 mm 12 mm over 3 m
Concrete Bridge Bearing Block or Seat Grades Surface variation from level or specified slope	+1 to -5 mm ± 0.1°
Footing Grades	-10 mm/+50 mm
Columns, Walls, Cap Beams and High Quality Surface Areas and exposed Wingwalls Surface variation from true line	±5 mm
Misplacement or eccentricity in Pier, Cap Beam & Bridge Seat	± 10 mm
Columns, Piers, Walls, Beams and High Quality Surface Areas and exposed Wingwalls Cross sectional dimensions	- 5 mm/+ 10 mm
Footings Plan dimensions width/length Misplacement or eccentricity	- 10 mm ± 1% of footing dimension in direction of misplacement but < 50 mm
Variation in sizes and location of Slab and Wall openings	± 10 mm

### 3.4 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 - SUBMITTALS:
  - .1 Concrete pours.
  - .2 Slump tests.
  - .3 Air content.
  - .4 Compressive strength at 7 and 28 days.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative in accordance with CSA-A23.1/A23.2. Testing of concrete shall be paid by Departmental Representative:
  - .1 Ensure testing laboratory is certified to CSA A283.
  - .3 Ensure test results are distributed to all parties.
  - .4 Departmental Representative will take additional test cylinders as required. Cure cylinders on job site under same conditions as concrete which they represent.
  - .5 Non-Destructive Methods for Testing Concrete: in accordance with to CSA A23.1/A23.2.
  - .6 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.



**3.5 VERIFICATION**

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in PART 2 - Products, and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

**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 substrates 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 centreline, 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.

**1.1            MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 – Payment Procedures.

**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-A23.3-04(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-S6-06, 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 and CSA-A23.4 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 Nova Scotia, Canada.

### **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 elements 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 elements 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 unit 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. Inserts shall be made of wire conforming to ASTM A-510.
- .5 The elastomer used in the bearings shall be 100% virgin natural polyisoprene of nominal  $55 \pm 5$  durometer 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	$55 \pm 5$
Tensile Strength, MPa	ASTM D412	min. 17.0
Ultimate Elongation, %	ASTM D412	min. 400



Property	Test	Requirements
Heat Resistance	ASTM D573	70h at 70°C
Change in hardness, Shore A		max. +10
Change in tensile strength, %		max. -25
Change in ultimate elongation, %		max. -25
Compression Set, %	ASTM D395 Method B	22h at 70°C max. 25
Ozone	ASTM D518 Mounting Procedure A 20% strain 40 ± 2°C	25 pphm, 48 h no cracks
Bond between steel and Elastomer laminates, N. mm <sup>-1</sup>	ASTM D429 Method B	min. 7.0
Brittleness at - 40°C	ASTM D746 Procedure B	no failure
Low temperature crystallization increase in hardness, Shore A	ASTM D2240	168 h at -25°C max. +15

## 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 units to within allowable tolerances before connecting units.

### **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    Canadian 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 Alkali 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 contain 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 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 drawings. These drawings shall include quantity, bar size, location and spacing for all GFRP bars. All submissions 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 wire 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 thermoset 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 - Bent 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 of FRP Rods	125 MPa
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

Property	Requirement				Test Standard	Specified Limits
	1	2	3	4		
						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°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 Test 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 T <sub>g</sub> ; 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 <sup>-6</sup> °C <sup>-1</sup>
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 T <sub>g</sub> ; 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 <sup>-6</sup> °C <sup>-1</sup>
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	1%

Property	Requirement				Test Standard	Specified Limits
	1	2	3	4		
					ASTM D5117 Standard Test Method for Dye Penetration of Solid Fiberglass Reinforced Pultruded Stock	
Water absorption (long-term immersion at 50°C) for both straight and bent bars and grids	Yes	Yes	Yes		ASTM D570 Water Absorption of Plastics	1.0%
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

Property	Requirement				Test Standard	Specified Limits
	1	2	3	4		
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.
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 900mm. Bar support chairs shall not exceed 900mm 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 RELATED REQUIREMENTS**

- .1 Section 01 31 19 - Project Meetings.
- .2 Section 01 33 00 - Submittal Procedures.
- .3 Section 01 35 29.06 - Health and Safety Requirements.
- .4 Section 01 35 43 - Environmental Procedures.
- .5 Section 01 74 11 - Cleaning.
- .6 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**1.1 MEASUREMENT FOR PAYMENT**

- .1 See Section 01 29 00 – Payment Procedures.

**1.2 REFERENCES**

- .1 American Association for State Highway and Transportation Officials (AASHTO):
  - .1 AASHTO Standard Specifications for Highway Bridges-17th Edition 2002.
- .2 ASTM International:
  - .1 ASTM A325M-09, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength Metric.
  - .2 ASTM A490M-09, Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints.
- .3 CSA International:
  - .1 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3 CAN/CSA S6-14, Canadian Highway Bridge Design Code.
  - .4 CSA S16-09, Design of Steel Structures.
  - .5 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
  - .6 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
  - .7 CSA W59-03(R2008), Welded Steel Construction, (Metal Arc Welding).

**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 structural steel and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.
  - .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.
  - .4 Submit description of methods, temporary bracing and strengthening, sequence of erection and type of equipment proposed for use in erecting structural steel.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store and handle in accordance with manufacturer's instructions.
- .2 Provide protective blocking for lifting, transportation and storing:
  - .1 Exercise care during fabrication, transportation and erection so as not to damage members.
  - .2 Do not notch edges of members.
  - .3 Do not cause excessive stresses.
- .3 Mark mass on members weighing more than 3 tonnes.
- .4 Ensure that no portion of steel comes into contact with ground.
- .5 Provide Departmental Representative with delivery schedules minimum 7 days prior to shipping.

#### **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:
  - .1 Ensure Departmental Representative has delivery schedules 7 days minimum prior to shipping.



**Part 2 Products**

**2.1 MATERIALS**

- .1 Structural steel, excluding HSS members and sole plates: to CSA G40.20/G40.21, grade and types 350W.
- .2 All plates: to CSA G40.21M Grade 300W.
- .3 All HSS members to CSA G40.20 Class C (cold-formed, non-stress-relieved) or ASTM A500 Grade C.
- .4 High strength bolts, nuts and washers: to ASTM A325M. Bolts to ASTM A490M approved by Departmental Representative.
- .5 Anchor bolts, washers and nuts: to ASTM F1554 or approved alternative.
- .6 Welding electrodes: to CSA W48 series.
- .7 Hot dip galvanizing: to CAN/CSA G164, minimum zinc coating of 762 g/m<sup>2</sup>.
- .8 Bearings: elastomer bearing pads of neoprene, grade 50 to CAN/CSA S6-14.

**2.2 SOURCE QUALITY CONTROL**

- .1 Steel producer qualifications: certified in accordance with CSA G40.20/G40.21.
- .2 Provide suitable facilities and co-operate with Departmental Representative in carrying out inspection and tests required.

**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 Verify elevations of curbs and location of anchor bolts before erection of structural steel; report discrepancies to Departmental Representative.
- .3 Work near river banks or embankments in accordance with written instructions from Departmental Representative.

- .4 Restrict drifting during assembly to minimum required to bring parts into position without enlarging or distorting holes, and without distorting, kinking or sharply bending metal of any unit:
  - .1 Enlarge holes if necessary by reaming only after receipt of written approval from Departmental Representative.
  - .2 Ensure reamed holes are 2 mm maximum larger than bolt size used.
- .5 Fabricate and install bearings as indicated.
- .6 Place anchor bolts at elevations and locations indicated:
  - .1 Protect holes against entry of water and foreign material.

### 3.3 INSTALLATION

- .1 Do falsework in accordance to CSA S269.1.
- .2 Do fabrication and erection of structural steel in accordance with CAN/CSA S6, Design of Highway Bridges.
- .3 Do welding in accordance with CSA W59, except where specified otherwise:
  - .1 Do welding in shop unless otherwise permitted by Departmental Representative.
  - .2 Weld only at locations indicated.
- .4 High strength bolting: in accordance with CAN/CSA S6. Use 'turn-of-nut' tightening method.
- .5 Finish: members true to line, free from twists, bends, open joints, sharp corners and sharp edges.
- .6 Allowable tolerance for bolt holes:
  - .1 Matching holes for bolts to line up so that dowel 2 mm less in diameter than hole passes freely through assembled members at right angles to such members.
  - .2 Finish holes not more than 2 mm in diameter larger than diameter of rivet or bolt unless otherwise specified by Departmental Representative.
  - .3 Centre-to-centre distance between any two holes of group to vary by not more than 1 mm from dimensioned distance between such holes.
  - .4 Centre-to-centre distance between any two groups of holes to vary not more than maximum of the following:

Centre-to-Centre distance in metres	Tolerance in plus or minus mm
less than 10	1
10 to 20	2
20 to 30	3

- .5 Correct mispunched or misdrilled members only as directed by Departmental Representative.
- .7 Shop splices:
  - .1 Use complete joint penetration groove welds finished flush.
  - .2 Details of butt joints to CSA W59.

- .3 Use only as approved by Departmental Representative.
- .8 Field splices: to approval of Departmental Representative.
- .9 Mark members in accordance with CSA G40.20/G40.21:
  - .1 Do not use die stamping.
  - .2 Place marking at locations hidden when viewed from exterior after erection when steel is to be left in unpainted condition.
- .10 Match marking: shop mark splices.
- .11 Protect exposed concrete surfaces of substructures from staining due to weathering of unpainted steel as follows:
  - .1 Protect top surfaces of concrete with waterproof cover and drain away from vertical faces.
  - .2 Use galvanized anchors for anchorage to concrete.
  - .3 Submit details of installation and methods of support to Departmental Representative for review prior to commencing protection work.
- .12 All bolts to be detailed and installed with threads excluded from shear planes.

### **3.4 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 RELATED REQUIREMENTS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 29.06 - Health and Safety Requirements.
- .3 Section 01 74 11 - Cleaning.
- .4 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

**1.1 MEASUREMENT FOR PAYMENT**

- .1 See Section 01 29 00 – Payment Procedures.

**1.2 REFERENCES**

- .1 ASTM International:
  - .1 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2 ASTM A269-08, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .3 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 CSA International:
  - .1 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3 CSA S16-09, Design of Steel Structures.
  - .4 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
  - .5 CSA W59-13, Welded Steel Construction (Metal Arc Welding).
- .3 Environmental Choice Program:
  - .1 CCD-047-98(R2005), Architectural Surface Coatings.
  - .2 CCD-048-98(R2006), Surface Coatings - Recycled Water-borne.
- .4 Health Canada / Workplace Hazardous Materials Information System (WHMIS):
  - .1 Material Safety Data Sheets (MSDS).

**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 sections and stud shear connectors and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
  - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Nova Scotia.
  - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

#### **1.4 QUALITY ASSURANCE**

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in 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 off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding and packaging materials.

#### **1.6 WASTE MANAGEMENT DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

### **Part 2 Products**

#### **2.1 MATERIALS**

- .1 Armour angles: to CSA G40.20/G40.21, Grade 300W.
- .2 Welding materials: to CSA W59.

- .3 Welding electrodes: to CSA W48 Series.
- .4 Stud shear connectors: to CSA W59, Clause 5.5.6 and Appendix H.
- .5 Hot dip galvanizing: to CAN/CSA G164, minimum zinc coating of 762 g/m<sup>2</sup>.

## **2.2 FABRICATION**

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Where possible, fit and shop assemble work, ready for erection.
- .3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

## **2.3 FINISHES**

- .1 Galvanizing: hot dipped galvanizing with zinc coating 762 g/m<sup>2</sup> to CAN/CSA-G164.

## **Part 3 Execution**

### **3.1 ERECTION**

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CSA S6-14 or welded field connection.
- .7 Deliver items over for casting into concrete with setting templates to appropriate location and construction personnel.
- .8 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

### **3.2 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**3.3 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by metal fabrications installation.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 03 30 00 - Cast-In-Place Concrete.
- .2    Section 07 92 00 - Concrete Joint Sealer.
- .3    Section 32 12 13.16 – Asphalt Tack Coat
- .4    Section 32 12 16 - Asphalt Paving.

**1.1                MEASUREMENT FOR PAYMENT**

- .1    See Section 01 29 00 – Payment Procedures.

**1.2                REFERENCES**

- .1    CGSB 37-GP-50M, Hot Applied Rubberized Asphalt for Roofing and Waterproofing.

**1.3                SUBMITTALS**

- .1    Submit as per Section 01 33 00 – Submittal Procedures.
- .2    Latest edition of Manufacturer’s literature including performance data and installation procedures.
- .3    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.
- .4    Manufacturer to provide the Departmental Representative with contact information for each of the five (5) bridges referenced.
- .5    Submit test results for water absorption test of the protection board one (1) week prior to installation.
- .6    A sample of the waterproofing membrane shall be tested and approved prior to incorporation into the Work. Samples shall also be taken randomly from the heating and mixing kettle throughout the duration of the contract.
- .7    Copy of Applicator’s certification issued by the manufacturer stating that the Applicator is a qualified installer of the manufacturer’s system.
- .8    The Contractor shall give a minimum of 48 hours’ notice, in writing, prior to commencement of any waterproofing operations.
- .9    When the asphalt riding surface is stripped from the existing concrete structure deck, the Contractor shall give at least one week's notice to the Departmental Representative in writing.

**1.4                QUALITY CONTROL**



- .1 Protection board: protection board shall be tested using the Water Absorption Test. Two (2) specimens of protection board 150mm x 50mm shall be cut. The specimens shall be oven dried to constant mass of  $60\text{C} \pm 1^\circ\text{C}$ . The mass of the specimens before and after drying shall be recorded. The specimens shall then be submerged horizontally under 25mm of water three (3) times as follows:
  - .1 First immersion: the water temperature shall be  $23^\circ\text{C} \pm 2^\circ\text{C}$  and the duration of the immersion shall be 4 hours.
  - .2 Second immersion: the water temperature shall be  $23^\circ\text{C} \pm 2^\circ\text{C}$  and the duration of the immersion shall be 20 hours.
  - .3 Third immersion: the water temperature shall be  $60^\circ\text{C} \pm 2^\circ\text{C}$  and the duration of the immersion shall be 80 hours.
- .2 After each immersion the specimens shall be towel dried and the mass recorded.
- .3 The percent mass loss or gain from the original oven dry mass shall be recorded.
- .4 Departmental Representative may take samples for testing at any time during installation of the waterproofing system.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Tack Coat for Bridge Deck Surface: liquid asphalt primer in accordance with Section 32 12 13.16 – Asphalt Tack Coat.
- .2 Hot Applied Rubberized Asphalt Waterproofing Membrane: to be hot applied, rubberized asphalt conforming to CGSB 37-GP-50M and as certified by the manufacturer. Waterproofing to conform to the following physical requirements:

<u>Test</u>	<u>Specification (mm)</u>
Cone Penetration at $25^\circ\text{C}$	110 (max)
Cone Penetration at $50^\circ\text{C}$	160 (max)
Flow at $60^\circ\text{C}$	3 (max)
- .3 The waterproofing membrane shall be supplied to the job site in cakes, in the manufacturer's sealed and labeled containers, ready for melting and application.
- .4 Protection Board: to be formed of asphalt and fillers between two sheet materials. Boards to be uniform over its entire area to the thickness specified and free from perforations when applied:
  - .1 Protection board shall be so packaged as to permit shipping, handling and storage without damage to the contents.
  - .2 Protection board shall be formed of asphalt and fillers between two sheet materials. The board shall be of uniform thickness and free from penetrations when applied.

- .3 Thickness of the protection board shall be  $3.6\text{mm} \pm 0.4\text{mm}$ . Width of the board shall be  $1000\text{mm} \pm 150\text{mm}$  and the length of the board shall be  $1500\text{mm} \pm 150\text{mm}$ . Board shall have straight edges, square corners and edges free of burrs and breakaways.
- .4 Notwithstanding the size tolerance above, all sheets shall be of the same length and width with a tolerance of  $\pm 5.0\text{mm}$  and of uniform thickness within a tolerance of  $\pm 0.25\text{mm}$ .
- .5 The protection board shall have a water absorption of 5.0% maximum and shall show no deterioration or loss of mass during the Water Absorption Test.

### **Part 3 Execution**

#### **3.1 GENERAL**

- .1 Waterproofing required for bridge deck.
- .2 All waterproofing operations shall be carried out when the air and concrete surface temperature are both  $5^{\circ}\text{C}$  or higher.
- .3 The applicator shall be approved by both the Departmental Representative and the manufacturer of the waterproofing system. Perform the work in strict conformance with the manufacturer's written instructions and this specification. In the event there is a discrepancy between the manufacturer's written instructions and this specification, the more stringent requirement shall prevail. The Departmental Representative shall have sole discretion on these matters.
- .4 Perform all of the operations involved in waterproofing in sequential order, such that there are no delays between individual operations other than those necessary to meet the requirements of these specifications.
- .5 Do not plug drainage holes through the deck by either waterproofing membrane or protection boards or asphalt concrete.
- .6 Waterproofing operations shall not commence until the Departmental Representative has approved all preparation work.
- .7 Ensure silane sealer applied to bridge deck is compatible with waterproofing membrane.

#### **3.2 SURFACE PREPARTATION**

- .1 The surface of the concrete shall be completely treated by abrasive blast cleaning, or such methods as approved by the Departmental Representative to ensure that sound, latence-free concrete is exposed. If a curing compound had been used on the concrete surface, it shall be completely removed. Abrasive blast cleaning shall also remove all dirt, debris, oil, etc., from deck resulting from phased construction method/vehicles driving on unpaved bridge deck during construction.
- .2 The flatness of the surface shall be checked after the surface preparation has been completed. Areas that do not meet a 3mm in 3m planeness shall be ground by the Contractor.

- .3 All dirt and debris shall be swept off and disposed of before tack coating. Immediately prior to the application of the tack coat, the concrete surface shall be cleaned with a jet of oil-free compressed air to remove all dust and foreign material.

### **3.3 TACK COATING OF PREPARED CONCRETE DECK**

- .1 A tack coat of Liquid Asphalt Primer shall be field-applied to the concrete deck at a rate of 0.25 L/m<sup>2</sup> with approved equipment which shall provide a uniform application at the required rate. The tack coat shall be applied when the concrete is dry and clean.
- .2 Waterproofing equipment shall not be permitted upon the tack coat until it has fully cured.

### **3.4 HEATING AND MIXING HOT APPLIED MEMBRANE**

- .1 Cakes of the waterproofing membrane shall be melted on the job site in a double boiler oil heat transfer type mechanically agitated heating and mixing kettle. This unit shall keep the contents continuously agitated until the material can be drawn free flowing and lump free from the mixing kettle at a temperature within the range recommended by the manufacturer. The kettle shall be equipped with functional permanently installed dial type thermometers to measure the temperature of the melted compound and the oil.

### **3.5 APPLICATION OF MEMBRANE AND MEMBRANE REINFORCEMENT**

- .1 Waterproofing membrane shall not be applied until the tack coat of liquid asphalt primer has cured completely, and is free of any surface moisture and dirt. The waterproofing shall be applied within the temperature range recommended by the manufacturer in the following sequence:
- .1 Apply the waterproofing along the edge of the deck for a width of 300mm and up to face of the curbs or barrier walls to a height of 80mm.
  - .2 Place a sheet of rubber membrane reinforcement (minimum 150mm wide by 1.2mm thick) up the face of the curbs or barrier walls to a height of 40mm while the waterproofing is still tacky.
  - .3 Apply waterproofing over the rubber membrane reinforcement in each location.
  - .4 Apply the waterproofing to the tack coated deck, so as to form a uniform film having a thickness of  $5 \pm 1$ mm, unless otherwise specified and approved by the Departmental Representative.

### **3.6 APPLICATION OF PROTECTION BOARD**

- .1 Protection boards shall be laid on the waterproofing membrane while the surface is still tacky with the length of the board transverse to the deck centerline. Materials or substances shall not be applied to remove the tackiness prior to installation of the protection board. The protection boards shall be placed with edges overlapping 25mm both longitudinally and transversely, unless otherwise approved by the Departmental Representative. The protection board edge shall be within 6mm of all curbs, drain verticals and expansion joint verticals. Protection boards shall be placed such that the longitudinal (direction of traffic flow) joints are, staggered a minimum of 150mm. The board shall remain free from perforations when applied.

**3.7 PAVING OF DECK**

- .1 Asphalt concrete paving shall be placed within 48 hours of the completion of waterproofing unless otherwise directed by the Departmental Representative.
- .2 Asphalt concrete shall be placed without disturbing or damaging the waterproofing system. Immediately remedy any disturbance or damage to the waterproofing system before continuing with paving operations.

**3.8 SEALING INTERFACE BETWEEN ASPHALT CONCRETE AND CURB**

- .1 Within 24 hours of asphalt concrete paving of the deck, the interface between the asphalt concrete and the face of the curb shall be sealed by pouring waterproofing along the joint such that the material extends 25 to 50mm from the face of the curb and to a thickness of 2 to 4mm above the asphalt concrete.

**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, on to 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 repellent silane sealer which prevents water and chloride intrusion into the concrete and conforms to the following requirements:
  - .1 Penetration into concrete: 3 - 6mm.
  - .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 adsorption: 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. The coating shall be applied along the exterior edge of the deck and curbs, with the coating terminated at the top edge of the 19 x 19 chamfer at the top of the curbs, leaving the top surface and inside edge of both the narrow and wide curbs uncoated.
- .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                RELATED REQUIREMENTS**

- .1        Section 01 33 00 - Submittal Procedures.
- .2        Section 01 45 00 - Quality Control.
- .3        Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .4        Section 03 30 00 - Cast-In-Place Concrete.

**1.2                REFERENCES**

- .1        ASTM C719-93(2005), Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
- .2        ASTM C793-05, Standard Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants.
- .3        ASTM D1475-98(2008), Standard Test Method For Density of Liquid Coatings, Inks, and Related Products.
- .4        ASTM D7116-05, Standard Specification for Joint Sealants, Hot Applied, Jet Fuel Resistant Types, for Portland Cement Concrete Pavements.
- .5        CTM 0098.
- .6        CTM 0208.
- .7        MIL-2-8802, Sealing Compound.

**1.3                SUBMITTALS**

- .1        Submit product data in accordance with Section 01 33 00 – Submittal Procedures.
- .2        Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
- .3        Submit manufacturer's instructions in accordance with Section 01 33 00 – Submittal Procedures.

**1.4                DELIVERY, STORAGE, AND HANDLING**

- .1        Deliver, handle, store and protect materials to prevent damage to packaging.
- .2        Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

**1.5                WASTE MANAGEMENT AND DISPOSAL**

- .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 facilities.

- .3 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .4 Divert unused joint sealing material from landfill to official hazardous material collections site approved by Departmental Representative.
- .5 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.
- .6 Fold up metal banding, flatten, and place in designated area for recycling.

## 1.6 PROJECT CONDITIONS

- .1 Environmental Limitations: conform to manufacturer's written instructions.
- .2 Substrate conditions:
  - .1 Do not proceed with installation of materials until contaminants capable of interfering with adhesion are removed from substrates.

## 1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

## Part 2 Products

### 2.1 MATERIALS

- .1 Two component, 100% silicone rubber sealant designed to seal joints and accommodate typical thermal movements to the following requirements:

<u>Test Method</u>	<u>Test</u>	<u>Value</u>
As Supplied		
MIL-2-8802	Extrusion Rate, g/min	200-550
ASTM D1475	Specific Gravity	1.25-1.35
As Installed - at 25°C (77°F) and 50 percent RH		
CTM2 0093	Skin-Over Time, minutes, maximum	20
CTM 0208	Non-Volatile Content, percent minimum	93
ASTM D3585	Joint Elongation, percent minimum	600
ASTM D3583	Joint Modulus at 100 percent, psi (kPa)	3-12 (21-83)



<u>Test Method</u> As Supplied	<u>Test</u>	<u>Value</u>
Performance ASTM C719	Movement, 10 cycles at +100/-50 percent, joints 1-3" (25.4-76.2mm) wide Accelerated	Pass
ASTM D793	Weathering at 5,000 hours	No cracks, blisters or bond loss
<u>Joint Cure Rate, percent of total cure</u>	<u>Hours</u>	
50 percent	4-6	
75 percent	24	
100 percent	48-160	

**Part 3 Execution**

**3.1 JOINT SEALANT APPLICATION**

- .1 Apply sealant to the following:
  - .1 Between approach slab and approach road.
  - .2 Between approach slab and bridge deck.
  - .3 Between approach slab and wingwalls.
  - .4 Between bridge deck curb and curb on approach slab.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .3 Ensure joint surfaces are dry and frost free.
- .4 Prepare surfaces in accordance with manufacturer's directions.
- .5 Apply sealant to manufacturer's instructions.
- .6 Curing: to manufacturer's recommendations.
- .7 Cleanup:
  - .1 Clean adjacent surfaces immediately and leave Work neat and clean.
  - .2 Remove excess and droppings, using recommended cleaners as work progresses.
  - .3 Remove masking tape after initial set of sealant.

**3.2 WARRANTY**

- .1 Products applied under this Section shall include a three-year performance warranty beyond the manufacturer's normal one-year warranty.

**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 01 74 21 – Construction/Demolition Waste Management and Disposal
- .4 Section 32 12 16 – Asphalt Paving

**1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM D5329-09, Standard Test Methods for Sealant and Fillers, Hot-Applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements.
  - .2 ASTM D6690-12 (Type IV), Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS)
- .3 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

**1.3 SUBMITTALS**

- .1 Submit product data including printed product literature and data sheets, in accordance with Section 01 33 00. Data to include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit manufacturer's instructions in accordance with Section 01 33 00 – Submittal Procedures.
  - .1 Include installation instructions for each product used.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, handle, store and protect materials to prevent damage to packaging.
- .2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.
- .3 Replace defective or damaged materials with new.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .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 facilities.

- .3 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.
- .4 Divert unused joint sealing material from landfill to official hazardous material collections site approved by Departmental Representative.
- .5 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.
- .6 Fold up metal banding, flatten and place in designated area for recycling.

## 1.6 PROJECT CONDITIONS

- .1 Environmental Limitations: conform to manufacturer's written instructions. Do not apply joint sealing material when the ambient temperature is below 2°C or according to the sealant manufacturer's instructions.
- .2 Substrate Conditions:
  - .1 Do not proceed with installation of materials until contaminants capable of interfering with adhesion are removed from substrates.

## 1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials, and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

## Part 2 Products

### 2.1 MATERIALS

- .1 Sealants shall be a high performance, hot applied, single component, low modulus joint and crack sealant capable of undergoing thermal movements indicated on Contract Documents.
- .2 Sealant must exhibit low temperature bonding properties while still maintaining a high degree of resiliency to reject incompressibles.
- .3 Sealant shall permit high elongation at low temperatures with low stress development.
- .4 Sealant must have properties to prevent flowability out of the joint or from being picked up by tires of passing vehicles at high service temperatures.
- .5 Sealants to conform to the following requirements:

<u>PROPERTIES</u>	<u>TEST METHODS</u>	<u>SPECIFICATIONS</u>	<u>TYPICAL RESULTS</u>
Penetration @ 25°C 150G, 5 sec	ASTM D5329	90-150	120

Flow @ 60°C	ASTM D5329	3 MM MAX.	1.0
Bond at -29°C 200% ext – 1/2"	ASTM D5329	PASS 3 CYCLES	PASS
Resiliency @ 25°C	ASTM D5329	60% min	70%
Asphalt Compatibility	ASTM D5329	PASS	PASS
Ductility @ 25°C	ASTM D113		50 CM
Heat Stability 6 hours @ pouring temp.	ASTM D5329	PASS ALL REQUIREMENTS	PASS
Min softening point	ASTM D36	Min. 80°C	84°C

## 2.2 EQUIPMENT

- .1 Contractor shall supply all tools, machinery and equipment required in the execution of all phases of the work.
- .2 Routing and Cutting Equipment: The routing and cutting equipment shall be of a type which can expeditiously cut and form joint to the sizes specified. Be capable of continually creating well defined right angle routs. The equipment shall have cutter tools which are capable of cutting grooves 20 mm wide by 40 mm deep leaving the sides of the joint absolutely clean, smooth and ready for sealing.
- .3 Compressor: Compressed air equipment is required to effectively clean the routed joints. The compressor, which may be attached to the hot air lance, shall provide a clean oil-free air jet of a minimum flow of 4m<sup>3</sup>/min, a minimum velocity of 990 m/s and a minimum pressure of 600 kPa.
- .4 Hot Air Lance: Hot air lance is required to dry and pre-heat joints prior to applying sealing material. The hot air lance must be used at all times to warm the joint and remove moisture. It is acceptable to use the compressor and air lance simultaneously. Tiger torches are not permitted.
- .5 Heating Equipment for melting sealant:
  - .1 Double-jacketed melting boiler capable of providing indirect heating and constant agitation of the joint sealing material.
  - .2 Totally automatic temperature control system controlling both head transfer oil temperature and sealing compound temperature. Temperature controls will be capable of maintaining the temperature of the sealant within manufacturer's tolerances.
  - .3 Heated sealant applicator wand shall be attached to a heated hose and attached to a heated sealant chamber.

**Part 3 Execution**

**3.1 PROTECTION**

- .1 Protect installed Work of other trades from staining or contamination.

**3.2 PREPARATION**

- .1 Rout joint to dimensions indicated on the contract documents.
- .2 Following routing, joint shall be cleaned with high compressed air free of oil to rid joint of debris and/or moisture.

**3.3 JOINT SEALANT APPLICATION**

- .1 Install asphalt impregnated fiber board beneath expansion joint system at approach end of each approach slab as indicated on Contract Documents prior to installing joint sealant.
- .2 Do not use sealant material that has been frozen.
- .3 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil, grease and other matter which may impair Work using materials and methods recommended by the low modulus sealant manufacturer.
- .4 Ensure joint surfaces are dry and frost free. Verify that conditions of substrate previously installed under other Section or Contracts are acceptable for pavement sealant application in accordance with manufacturer's written instructions.
- .5 Prepare joint sealant product in accordance with manufacturer's directions.
- .6 Prepare surfaces in accordance with manufacturer's directions.
- .7 Apply sealant to manufacturer's instructions.
  - .1 The joint sealing material shall be applied by heated sealant applicator wand. The sealing material shall be placed within two minutes after heating of the joint with the hot compressed air lance.
- .8 Curing: to manufacturer's recommendations.
- .9 Cleanup:
  - .1 Care shall be taken to avoid spillage of the material on the pavement. Should spillage occur, the contractor shall clean it up at his own expense.
  - .2 Clean adjacent surfaces immediately and leave Work neat and clean.
- .10 Prior to opening the area to traffic, all joints shall be thoroughly checked for areas exhibiting adhesion failure, damage to the sealant, foreign objects in the sealant or other problems. All areas not meeting the acceptable criteria shall be prepared and resealed until satisfactory.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 01 33 00 - Submittal Procedures.
- .2    Section 01 74 11 - Cleaning.
- .3    Section 01 78 00 - Closeout Submittals.

**1.2                MEASUREMENT FOR PAYMENT**

- .1    See section 01 29 00 – Payment Procedures

**1.3                REFERENCES**

- .1    Manual of Uniform Traffic Control Devices for Canada (MUTCD-C) - (most recent version).
- .2    American Association of State Highway and Transportation Officials (AASHTO):
  - .1    Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, (5th Edition).
- .3    ASTM International:
  - .1    ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .2    ASTM A276-10, Standard Specification for Stainless Steel Bars and Shapes.
  - .3    ASTM B209M-10, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate Metric.
  - .4    ASTM B210M-05, Standard Specification for Aluminum-Alloy Drawn Seamless Tubes Metric.
  - .5    ASTM B211M-03, Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire Metric.
- .4    Canadian General Standards Board (CGSB):
  - .1    CGSB 62-GP-9M-80, Prefabricated Markings, Positionable, Exterior, for Aircraft Ground Equipment and Facilities.
  - .2    CGSB 62-GP-11M-78, Marking Material, Retroreflective, Enclosed Lens, Adhesive Backing and Amendment.
- .5    CSA International:
  - .1    CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2    CAN/CSA O80 Series-08, Wood Preservation.
  - .3    CSA O121-08, Douglas Fir Plywood.
  - .4    CSA W47.2-11, Certification of Companies for Fusion Welding of Aluminum.

.5 CAN/CSA-Z809-08, Sustainable Forest Management.

.6 The Master Painters Institute (MPI):

.1 Architectural Painting Specification Manual - current edition.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

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

.2 Submit shop drawings in accordance with Section 01 33 00 Submittal Procedures.

.3 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for traffic signage, including product characteristics, performance criteria, physical size, finish and limitations.

.4 Sustainable Design Submittals:

.1 Wood Certification: submit manufacturer's Chain-of-Custody Certificate number for CAN/CSA-Z809 or FSC or SFI certified wood.

.5 Indicate dimensions, sizes, assembly, anchorage and installation details for each furnishing specified.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

.1 Deliver, store and handle materials in accordance with section 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 off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

.4 Develop Waste Reduction Workplan related to Work of this Section.

#### **1.6 DESIGN REQUIREMENTS**

.1 Sign supports to be capable of withstanding summation of following loads:

.1 Wind load in any direction of 0.60 kPa on signboards and 0.60kPa on sign supports and appurtenances.

.2 Dead load of signboards, sign supports and appurtenances.

.3 Ice load of 0.25kPa on one face of signboards and around surface of all structural members and appurtenances.

.2 Structural deflections and vibration in accordance with American Association of State Highway and Transportation Officials (AASHTO), "Specifications for the Design and Construction of Structural Supports for Highway Signs".

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**Part 2 Products**

**2.1 MATERIALS**

- .1 Sawn Timber Posts:
  - .1 Acceptable Material:
    - .1 Accepted species: Eastern Hemlock, Red Pine, Mixed Hardwood (Birch, Maple, Oak or Ash.
    - .2 Type: pressure treated in accordance with CAN/CSA-O80 Series.
    - .3 Grade: in accordance NST & IR Standards.
  - .2 Dimensions: As shown on drawings.
- .2 Fasteners: Bolts, nuts, washers and other hardware for roadside sign to be cast aluminum alloy, or galvanized steel.

**2.2 SIGNBOARDS**

- .1 Aluminum sheet: to ASTMB209M, precut to required dimensions. Thickness to be 1.6 mm for signboards up to 750 mm wide. Thickness to be 2.1 mm for sign boards 750/1200 mm wide. Use 1.0 mm thickness for refurbishing existing sign panel.
- .2 Aluminum extrusions: to ASTMB211M, 150 mm or 300 mm panels suitable for bolting together.
- .3 T-shape stiffeners for signboards: to ASTMB210M.
- .4 Connecting straps and brackets: to ASTMB209M.
- .5 Aluminum materials: to ASTMB209M.
- .6 Xylene thinner: to CAN/CGSB1.94.
- .7 Chemical conversion coating for aluminum: to CGSB31GP101Ma.
- .8 Primer for aluminum: to CAN/CGSB1.132.
- .9 Finish paint: to CAN/CGSB1.59.
- .10 Silk screen ink.
- .11 Transparent or opaque colours: to CGSB1GP12c, and as indicated.
- .12 Reflective sheeting and tape: to CGSB62GP11M. Adhesive, class of reflectivity and colour as indicated.
- .13 Transparent tape: flexible, smooth surfaced and moisture resistant tape.

**2.3 FABRICATION**

- .1 Signboards:
  - .1 Aluminum blanks:
    - .1 Degrease, etch and bonderize with chemical conversion coating.
    - .2 Clean surfaces with xylene thinner. Dry.



- .3 For non-reflective signs, spray face with one coat vinyl pretreatment coating and two finish coats of required colour.
- .4 For aluminum signboards that are to be painted before installation, spray and bake face of signboards with two coats of enamel in accordance with CAN/CGSB-1.104.
- .5 Cut and apply in accordance with Manufacturer's instructions.
- .6 Apply adhesive coated material with heat lamp vacuum applicator or by squeeze roll application method. Apply pressure sensitive material with roller or squeegee.
- .7 Edge wrap sheeting on each extrusion prior to bolting extrusions. Match pieces of sheeting from different rolls for each signboard to ensure uniform appearance and brilliance by day and night.
- .8 Reflective signboard faces may be prepared using silk screen transparent ink.
- .2 Reflective background sheeting and lettering.
- .3 Non-reflective lettering and symbols: cut from vinyl film as specified in CGSB62-GP-9M, or paint using required colour of finish paint or silk screen transparent ink.
- .4 Clean signboards completely and apply transparent tape over top edge and extending 25 mm minimum down back and front of signboard.
- .2 Sign identification:
  - .1 Apply sign number and date of installation with 25mm high stencil painted black letters on lower left back face of each signboard.
- .3 Hardware:
  - .1 All hardware and fasteners shall be double tip galvanized.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 All regulatory and warning signs shall be new and mounted on new sign supports.
- .2 All Parks Canada signs shall be salvaged and reposted on new sign supports.
- .3 Posts:
  - .1 Set posts by instrument for alignment, and locations as indicated and as directed by Departmental Representative.
  - .2 Excavate post holes to depths as indicated and to diameter of 360 mm plus or minus 20 mm. Compact bottom to provide firm foundation. Set post plumb and square in hole.
  - .3 Backfill around posts using excavated material and compact in uniform layers not exceeding 150 mm compacted thickness.
  - .4 Cut off tops of posts as indicated, with tops parallel to grade of pavement edge.

- .5 Worker protection: workers must wear gloves respirators dust masks long sleeved clothing eye protection protective clothing when handling, drilling, sawing, cutting or sanding preservative treated wood and applying preservative materials.
- .6 Treat cut tops with two coats of 2% copper naphthenate wood preservative.
- .4 Signboard:
  - .1 Fasten signboards to supporting posts and brackets as indicated.
  - .2 Use T-shape aluminum stiffeners to join portions of sign panel on site. Cover face of T-stiffener with material identical to face of sign panel.

### **3.2 PROTECTION**

- .1 Place temporary covering on signboards where indicated. Covering to be capable of withstanding rain, snow, and wind and be non-injurious to signboard. Replace deteriorated covering and remove covers as directed by Departmental Representative.

### **3.3 CORRECTING DEFECTS**

- .1 Correct defects, identified by Departmental Representative, in sign message, consistency of reflectivity, colour or illumination. Correct angle of signboard and adjust luminaire aiming angle for optimum performance during night conditions to approval of Departmental Representative.

### **3.4 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.

### **3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by traffic signage installation and salvage operations.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 01 33 00 - Submittal Procedures.
- .2            Section 32 11 16.01 - Granular Sub-Base.
- .3            Section 32 11 23 - Aggregate Base Courses.

**1.2                MEASUREMENT FOR PAYMENT**

- .1            See Section 01 29 00 – Payment Procedures

**1.3                REFERENCES**

- .1            American Society for Testing and Materials (ASTM) - Most recent edition:
  - .1            ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
  - .2            ASTM C117, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .3            ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .4            ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .5            ASTM 127, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.
- .2            Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR):
  - .1            Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) - Standard Specification - (Latest Edition) - Division 3 - Granular Materials.
  - .2            Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) - TPW TM-1.
  - .3            Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) - TPW TM-3.
- .3            Nova Scotia Environment and Labour:
  - .1            Pit and Quarry Guidelines.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Samples:
  - .1 Allow continual sampling by the Owner during production.
  - .2 Provide the Owner with access to source and processed material for sampling.
  - .3 Install sampling facilities at discharge end of production conveyor, to allow the Owner to obtain representative samples of items being produced. Stop conveyor belt when requested by the Owner to permit full cross section sampling.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances. All aggregate materials shall be produced from quarried rock.
- .2 Granular Sub-Base:
  - .1 See Section 32 11 16.01 – Granular Sub-Base.
- .3 Granular Backfill:
  - .1 Conform to Granular Sub-Base, Section 32 11 16.01 – Granular Sub-Base .
- .4 Granular Base Course:
  - .1 See Section 32 11 23 – Aggregate Base Courses.
- .5 Bedding Material:
  - .1 Conform to Aggregate Base Courses, Section 32 11 23 – Aggregate Base Courses.
- .6 Approved Fill:
  - .1 To be constructed to grades and elevations on provided drawings.
  - .2 Approved Fill material to be reclaimed granular material from road reconstruction areas.
  - .3 Fines content (passing 75µm) maximum 15%.

.4 Use of material subject to approval by Departmental Representative.

.7 Fill Against Structure:

.1 The material must be crushed and screened gravel or rock and conform to the grading specified below:

Sieve Size, <i>µm</i>	Percent Passing by Weight
112,000	100
40,000	60 - 85
5,000	25 - 50
315	5 - 15
80	2 - 7

.2 Physical Properties: Fill Against Structure shall conform to the following physical properties:

Property	Test Method	Fill Against Structure
Plasticity Index (sand portion)	ASTM C 127	6
LA Abrasion % max	ASTM C 131	45

.3 Construction Methods:

.1 Fill Against Structure shall be placed in layers not exceeding 300mm in thickness and each layer shall be compacted by means of a vibratory compactor and as directed by the Departmental Representative.

.8 Free-Draining Backfill:

.1 The Free-draining backfill shall be clean, sound durable crushed rock, crushed gravel or pit run gravel and conform to the grading specified below:

Sieve Size, <i>µm</i>	Percent Passing by Weight
63,000	100
50,000	90 - 100
25,000	35 - 100
19,000	15 - 85
12,500	0 - 53

Sieve Size, <i>µm</i>	Percent Passing by Weight
9,500	0 - 30
4,750	0 - 4
1,180	0 - 2

.2 Construction Methods:

- .1 Free-draining backfill shall be placed simultaneously with the placing of adjacent embankment of backfill material
- .2 The free-draining backfill shall be placed to the dimensions as indicated in the Contract Documents.

**2.2 SOURCE QUALITY CONTROL**

- .1 Inform the Owner of proposed source of aggregates and provide access for sampling at least two (2) 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 the Owner at least two (2) 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 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as approved by authority having jurisdiction.
  - .2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.
  - .3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
  - .4 When excavation is completed dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.

- .5 Trim off and dress slopes of waste material piles and leave site in neat condition.
- .6 Provide silt fence or other means to prevent contamination of existing watercourse or natural wetland features.
- .2 Processing:
  - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
  - .2 Blend aggregates, as required, include 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, as specified:
    - .1 Use methods and equipment approved in writing by the Departmental Representative.
  - .3 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.
  - .4 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.
- .3 Handling:
  - .1 Handle and transport aggregates to avoid segregation, contamination and degradation.
- .4 Stockpiling:
  - .1 Stockpile aggregates in sufficient quantities to meet project schedules.
  - .2 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  - .3 Stockpile aggregates on ground but do not incorporate bottom 200 mm of pile into Work.
  - .4 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
  - .5 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by the Departmental Representative within 48 h of rejection.
  - .6 Do not cone piles or spill material over edges of piles.

**3.2 CLEANING**

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .2 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

**END OF SECTION**



**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 01 33 00 - Submittal Procedures.
- .2    Section 01 74 11 - Cleaning.
- .3    Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .4    Section 31 61 13 - Pile Foundations, General Requirements.

**1.2                REFERENCES**

- .1    American Society for Testing and Materials International (ASTM):
  - .1    ASTM A252-98(2002), Standard Specification for Welded and Seamless Steel Pipe Piles.
  - .2    ASTM A307-04, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile.
  - .3    ASTM A325M-05, Standard Specification for Structural Steel Bolts, Steel, Heat Treated 830 Mpa Minimum Tensile Strength Metric.
  - .4    ASTM A490M-04a, Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3 for Structural Steel Joints Metric.
- .2    Canadian Standards Association (CSA International):
  - .1    CAN/CSA-G40.20/G40.21-2004, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.
  - .2    CAN/CSA-S16-01, Consolidated (Consists of the CAN/CSA-S16-01, along with S16S1-05 and Updates # 1 and # 2 to CAN/CSA-S16-01).
  - .3    CAN/CSA-S16-01, Limit States Design of Steel Structures.
  - .4    CSA W47.1-03, Certification of Companies for Fusion Welding of Steel Structures.
  - .5    CSA W48-01(R2006), Filler Metals and Allied Materials for Metal Arc Welding.
  - .6    CSA W59-03, Welded Steel Construction (Metal Arc Welding) (metric version).
- .3    Canadian General Standards Board (CGSB):
  - .1    CAN/CGSB-1.171-98, Inorganic Zinc Coating.
  - .2    CAN/CGSB-1.184-98, Coal Tar-Epoxy Coating.
- .4    The Master Painters Institute (MPI)/Architectural Painting Specification Manual, (ASM-February 2004):
  - .1    MPI #19, Inorganic Zinc Rich Primer.
- .5    The Society for Protective Coatings (SSPC):
  - .1    SSPC-SP5/NACE No.1-2000, White Metal Blast Cleaning Joint Surface Preparation Standard.

### **1.3 SYSTEM DESCRIPTION**

- .1 Design Requirements: design templates to safely withstand following loads:
  - .1 Gravity loads to which template are subjected.
  - .2 Lateral loads to firmly hold pile in position when driving.

### **1.4 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit manufacturer's printed product literature, specifications and datasheet:
  - .1 Include product characteristics, performance criteria, and limitations.
- .3 Submit shop drawings and indicate following items:
  - .1 Material.
  - .2 Anchorage, field control and alignment methods.
  - .3 Design parameters.
  - .4 Tolerance for driving pile.
  - .5 Removable members.

### **1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Type 300W.
- .2 Pile sleeves: to CAN/CSA-G40.20/G40.21:
  - .1 Fabricate vertical pile sleeves in two half-sleeves if approved by Departmental Representative.
- .3 Welding materials: to CSA W48 and CSA W59.
- .4 Bolts, nuts and washers: ASTM A325M.

### **2.2 FABRICATION**

- .1 Fabricate structural steel for templates: to CAN CSA-S16.
- .2 Welding: to CSA W59.
- .3 Use welding companies qualified under CSA W47.1.

**Part 3 Execution**

**3.1 PREPARATION**

- .1 Lining:
  - .1 Line inside surfaces of sleeves and pile guides with timber strips 25 mm thick or nylon roping 25 mm thick to provide protection to pile coating during driving operation:
    - .1 Show full details of linings and attachment on shop drawings.
  - .2 Painting:
    - .1 Prepare vertical sleeves of templates and other steel used for connection to piling for painting by blast cleaning to SSPC-SP5/NACE No.1 and apply one coat of inorganic zinc and two coats of coal tar epoxy.
  - .3 Repairs:
    - .1 Repair damaged coatings with compatible material to approval of Departmental Representative.

**3.2 POSITIONING**

- .1 Position and hold template in location to receive piles:
  - .1 Ensure pile positions are within tolerances specified.
- .2 Secure templates to vertical piles in accordance with shop drawings before battered piles are placed.

**3.3 REMOVAL OF TEMPLATES**

- .1 Avoid damage to piling when removing templates.
- .2 When instructed by Departmental Representative, remove templates from Project site.

**3.4 TEMPLATES TO REMAIN**

- .1 Remove perishable materials when directed by Departmental Representative and fasten templates to piles to become part of permanent structure.
- .2 Full vertical pile sleeves permitted to remain as part of permanent structure:
  - .1 Fill annular gap between sleeve with grout consisting of 1 part cement containing expanding agent and 1 part sand.

**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.

**3.6 PROTECTION**

- .1 Protect templates from damage.
- .2 Repair damage to templates, formwork or concrete arising from operations [as reviewed by Departmental Representative at no extra cost.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 01 33 00 - Submittal Procedures.
- .2    Section 31 09 16.01 - Pile Driving Templates.
- .3    Section 31 61 13 - Pile Foundations, General Requirements.

**1.2                REFERENCES**

- .1    American Society for Testing and Materials International (ASTM):
  - .1    ASTM D1143-81(1994)e1, Standard Test Method for Piles Under Static Axial Compressive Load.
  - .2    ASTM D4945-00, Standard Test Method for High-Strain Dynamic Testing of Piles.
- .2    AASHTO T298-99, Standard Method of Test for High-Strain Dynamic Testing of Piles.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Quality assurance submittals:
  - .1    Test reports: submit 3 copies of dynamic test reports for piles from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

**Part 2            Products**

**2.1                MATERIALS**

- .1    Not Used.

**Part 3            Execution**

**3.1                GENERAL**

- .1    Cost of Pile Driving Analyser (PDA) testing shall be included in the contract unit price, per meter, for Steel H-Piles as per Section 31 62 16.16.
- .2    If a pile is suspect of meeting refusal on a boulder and within native soil, Pile Driving Analyser (PDA) testing shall be conducted to confirm capacity.
- .3    Contractor to notify Departmental Representative of pile driving operations at least seven (7) days in advance of work.
- .4    Supply and erect equipment and temporary structures necessary for making tests.

- .5 Departmental Representative to select piles for testing during performance of Work.
- .6 Test to be performed in presence of Departmental Representative.
- .7 Provide shelter, enclosures and lighting for observation, testing and recording of data.
- .8 PDA tests shall be performed on at least two (2) 508 mm dia x 12.7 mm thick pipe piles per abutment to ensure pile capacities coted on the Drawings are met.

### **3.2 TESTING**

- .1 Do PDA testing in accordance with AASHTO T298.

### **3.3 TEST EVALUATION**

- .1 Qualified geotechnical engineer to interpret results for predicting pile performance and capacity.
- .2 Carry out additional load tests as directed by Departmental Representative if pile fails to sustain test load.
- .3 Test validity determined by Departmental Representative.

### **3.4 CLEANING**

- .1 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 01 29 00 - Payment Procedures.
- .2        Section 01 35 29.06 - Health and Safety Requirements.
- .3        Section 01 35 43 - Environmental Procedures.
- .4        Section 01 74 11 - Cleaning.
- .5        Section 31 23 33.01 - Excavating, Trenching and Backfilling.

**1.1                MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 – Payment Procedures.

**1.2                REFERENCES**

- .1        Nova Scotia Department of Transportation and Infrastructure Renewal - Standard Specification - (Latest Edition) - Division 2 - Earthworks, Section 1 - Clearing.
- .2        Nova Scotia Department of Transportation and Infrastructure Renewal - Standard Specification - (Latest Edition) - Division 2 - Earthworks, Section 2 - Grubbing.

**1.3                DEFINITIONS**

- .1        Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2        Grubbing consists of excavation and disposal of stumps and roots to not less than 200 mm below existing ground surface.

**1.4                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit manufacturer's installation instructions.

**1.5                QUALITY ASSURANCE**

- .1        Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

**1.6                STORAGE AND PROTECTION**

- .1        Prevent damage to fencing, bench marks, underground utilities, water courses, and root systems of trees which are to remain.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Not Used.

**Part 3 Execution**

**3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 All installation and maintenance of temporary erosion and sedimentation control shall be completed in accordance to the latest version of the Standard Specification, Nova Scotia Department of Transportation and Infrastructure Renewal - Division 7 - Environmental Protection, Section 1- Sediment Barriers, and Section 2 - Flow Check and Section 01 35 43 Environmental Procedures.
- .2 Provide temporary erosion and sedimentation control measures (silt fencing and erosion control structures) 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.
- .3 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .4 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.2 PREPARATION**

- .1 Inspect site and verify with the 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 and grubbing.
- .4 Keep roads and walks free of dirt and debris.

**3.3 CLEARING**

- .1 Clearing includes felling, trimming and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush and rubbish occurring within cleared areas.



- .2 Clear as directed by the Departmental Representative, by cutting at height of not more than 300 mm.
- .3 Timber materials less than 100 mm in diameter must be chipped and spread evenly as directed by the Department Representative.
- .4 The maximum chip size shall be no more than 300 mm long by 75 mm in thickness.
- .5 Timber greater than 100 mm in diameter must be cut to 1200 mm lengths, transported and stockpiled neatly, as directed by the Departmental Representative for future use by the Park.

### **3.4 GRUBBING**

- .1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.
- .2 Grub out stumps and roots to not less than 200 mm below ground surface.
- .3 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

### **3.5 REMOVAL AND DISPOSAL**

- .1 Remove grubbed materials outside the Park to a disposal area approved for such materials by applicable regulations.

### **3.6 FINISHED SURFACE**

- .1 Leave ground surface in condition suitable for stripping of topsoil to approval of the Departmental Representative.

### **3.7 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 01 35 29.06 – Health and Safety Requirements.
- .2 Section 01 35 43 – Environmental Procedures.
- .3 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

**1.2 REFERENCES**

- .1 Nova Scotia Department of Transportation and Infrastructure Renewal – Standard Specification – (Latest Edition) – Division 2 – Earthworks, Section 3 – Roadway and Drainage Excavation.
- .2 Canadian Environmental Protection Act (Available on-line Government of Canada Website).
- .3 Nova Scotia Environmental Act and Regulations.
- .4 Nova Scotia Department of Environment:
  - .1 Erosion and Sedimentation Control Handbook for Construction Sites – Section 2.2 Guidelines for Preparing Erosion and Sedimentation Control Plans.
- .5 Occupational Health & Safety Act – Province of Nova Scotia.

**1.3 STANDARD**

- .1 All work of this section shall comply with the requirements of the most recent version of the Nova Scotia Department of Transportation and Infrastructure Renewal – Standard Specification – (Latest Edition) – Division 2 – Earthworks, Section 3 – Roadway and Drainage Excavation, except as amended herein.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**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, sediment and erosion control drawings and sediment and erosion control plan, specific to site, that complies with the requirements of authorities having jurisdiction.

- .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 STRIPPING OF TOPSOIL**

- .1 Ensure that procedures are conducted in accordance with applicable Provincial requirements.
- .2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.
- .3 Handle topsoil only when it is dry and warm.
- .4 Any suitable topsoil material from stripping shall be salvaged and stockpiled at a location as directed by the Departmental Representative.
- .5 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation as directed by Departmental Representative.
- .6 Remove brush from targeted area by non-chemical means and dispose of as directed by Departmental Representative.
- .7 Soil Stripping by scraper to a depth of 150 mm as directed by Departmental Representative.
  - .1 Avoid mixing topsoil with subsoil.
- .8 Remove and dispose of all stripped materials outside the Park to a disposal area approved for such materials by applicable regulations.
- .9 Protect any stockpiles from contamination and compaction.
- .10 Cover topsoil that has been piled for long term storage, with trefoil or grass to maintain agricultural potential of soil.

### **3.3 PREPARATION OF GRADE**

- .1 Verify that grades are correct and notify Departmental Representative if discrepancies occur do not begin work until instructed by Departmental Representative.
  - .1 Grade area only when soil is dry to lessen soil compaction.
  - .2 Grade soil with scrapers establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

### **3.4 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 01 33 00 - Submittal Procedures.
- .2        Section 01 35 29.06 - Health and Safety Requirements.
- .3        Section 01 74 11 - Cleaning.
- .4        Section 31 23 33.01 - Excavating, Trenching and Backfilling.

**1.2                MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 – Payment Procedures.

**1.3                REFERENCES**

- .1        Definitions:
  - .1        Rock: any solid material in excess of 1.00 m<sup>3</sup> and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m<sup>3</sup> bucket. Frozen material not classified as rock.
  - .2        PPV: peak particle velocity.

**1.4                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Sustainable Standards Certification:
  - .1        Construction Waste Management: submit copy of Waste Management Plan for project highlighting recycling and salvage requirements.
  - .2        Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
  - .3        Erosion and Sedimentation Control: submit copy of Erosion and Sedimentation Control Plan for project highlighting implementation measures.

**1.5                DELIVERY, STORAGE AND HANDLING**

- .1        Deliver, store and handle materials in accordance with manufacturer's written instructions.

**Part 2            Products**

**2.1                MATERIALS**

- .1            Not used.

**Part 3            Execution**

**3.1                ROCK REMOVAL**

- .1            Perform excavation in accordance with Erosion and Sedimentation Control Plan.
- .2            Co-ordinate this section with Section 01 35 29.06 - Health and Safety Requirements.
- .3            Remove rock to alignments, profiles, and cross sections as indicated.
- .4            Use rock removal procedures to produce uniform and stable excavation surfaces. Minimize overbreak, and to avoid damage to adjacent structures.
- .5            Excavate rock to horizontal surfaces with slope not to exceed 5%.
- .6            Prepare rock surfaces which are to bond to concrete, by scaling, pressure washing and broom cleaning surfaces.
- .7            Excavate trenches to lines and grades to minimum of 300 mm below pipe invert indicated. Provide recesses for bell and spigot pipe to ensure bearing will occur uniformly along barrel of pipe.
- .8            Cut trenches to widths as indicated.
- .9            Use pre-shearing or other smooth wall drilling unless specified otherwise or directed by Departmental Representative.
- .10           Remove boulders and fragments which may slide or roll into excavated areas.
- .11           Correct unauthorized rock removal at no extra cost, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

**3.2                CLEANING**

- .1            Clean in accordance with Section 01 74 11 - Cleaning.

**3.3                PROTECTION**

- .1            Prevent damage to surroundings and injury to persons.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Excavation for levelling and rough grading and including the trenching for the installation of culverts under Section 33 42 13 – Pipe Culverts.

**1.2 RELATED REQUIREMENTS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 29.06 - Health and Safety Requirements.
- .3 Section 01 35 43 - Environmental Procedures.
- .4 Section 31 05 16 - Aggregate Materials.
- .5 Section 31 24 13 - Roadway Embankments.
- .6 Section 31 32 19.01 - Geotextiles.
- .7 Section 33 42 13 - Pipe Culverts.

**1.3 MEASUREMENT FOR PAYMENT**

- .1 See Section 01 29 00 – Payment Procedures.

**1.4 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM): latest edition:
  - .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 (600 kN-m/m<sup>3</sup>).
  - .5 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian Standards Association (CSA International); latest edition:
  - .1 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001, Cementitious Materials for Use in Concrete.

- .2 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
- .3 Nova Scotia Department of Transportation and Infrastructure Renewal - Standard Specification - (Latest Edition) - Division 2 - Earthworks, Section 3 - Roadway and Drainage Excavation.
- .4 Nova Scotia Department of Transportation and Infrastructure Renewal - Standard Specification - (Latest Edition) - Division 5 - Structures, Section 12 - Underground Drainage Systems.
- .5 Canadian Environmental Protection Act (Available on-line Government of Canada Website).
- .6 Nova Scotia Environmental Act and Regulations.
- .7 Nova Scotia Department of Environment:
  - .1 Erosion and Sedimentation Control Handbook for Construction Sites - Section 2.2 Guidelines for Preparing Erosion and Sedimentation Control Plans.
- .8 Occupational Health & Safety Act - Province of Nova Scotia.

## 1.5 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<sup>3</sup> and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m<sup>3</sup> bucket. Frozen material not classified as rock.
  - .2 Common excavation: excavation of materials of whatever nature up to required depth, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .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 Fill against structure: material supplied, placed and compacted adjacent to structures, as shown in Contract Documents. Material is crushed and screened gravel or rock meeting the requirements specified in Section 31 05 16 - Aggregate Materials.
- .6 Free-draining backfill: clean, sound durable crushed rock, crushed gravel or pit run gravel placed behind abutment wall meeting the requirement specified in Section 31 05 16 - Aggregate Materials.



- .7 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 D422 and ASTM C136.
- .2 Table:
- | Sieve Designation | % Passing |
|-------------------|-----------|
| 2.00 mm           | 100       |
| 0.10 mm           | 45 - 100  |
| 0.02 mm           | 10 - 80   |
| 0.005 mm          | 0 - 45    |
- .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
- .8 Backslope: the slope in a cut between the invert of the roadside ditch and the point where the slope intersects original ground.
- .9 Rock Face: the vertical or near vertical face between the top of the existing rock surface and the designated rock or ditch grade line.

## 1.6 QUALITY ASSURANCE

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Where the Consultant is employee of the Contractor, submit proof that Work by the Consultant is included in Contractor's insurance coverage.
- .3 Submit design and supporting data at least two (2) weeks prior to beginning Work.
- .4 Design and supporting data submitted to bear stamp and signature of qualified Professional Engineer registered or licensed in the Province of Nova Scotia.
- .5 Keep design and supporting data on site.
- .6 Engage services of a qualified Professional Engineer who is registered or licensed in the Province of Nova Scotia in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .7 Do not use soil material until written report of soil test results are reviewed and approved by the Departmental Representative.
- .8 Health and Safety Requirements:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

**1.7 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Samples:
  - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

**1.8 EXISTING SITE CONDITIONS**

- .1 Contractor to visit site prior to submission of tender.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Granular Backfill: properties to Section 31 05 16 - Aggregate Materials.
- .2 Bedding Material: properties to Section 31 05 16 - Aggregate Materials.
- .3 Geotextile: woven material with properties to 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 sediment and erosion control plan, specific to site, that complies with the Nova Scotia Environment Act and Regulations, in accordance with the Nova Scotia Erosion and Sedimentation Control Handbook for Construction Sites 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.

**3.2 SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

**3.3 PREPARATION/PROTECTION**

- .1 Protect existing features in accordance with applicable local regulations.
- .2 Keep excavations clean, free of standing water, snow, ice and loose soil.

- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to the 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 the Departmental Representative:
  - .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

### **3.5 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for the 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 to approved collection areas and in a 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.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

### **3.6 EXCAVATION**

- .1 Advise the 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 directed by the Departmental Representative.
- .3 Complete mass site excavation as specified in Section 31 24 13 – Roadway Embankments, Items 3.3.1, 3.3.2 and 3.3.3 and 3.3.4.
- .4 All surplus excavated material shall be stockpiled at locations as directed by the Departmental Representative.
- .5 One lane traffic must be kept at all time during construction and two lane traffic must be reinstated during non-construction hours.
- .6 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by the Departmental Representative.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus by stockpiling on site as directed by the Departmental Representative.
- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .11 Notify the Departmental Representative when bottom of excavation is reached.
- .12 Obtain the Departmental Representative's approval of completed excavation.
- .13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by the Departmental Representative.
- .14 Correct unauthorized over-excavation as follows:
  - .1 Fill over excavated space with approved fill compacted to not less than 100% of Standard Proctor maximum dry density.
  - .2 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .15 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 the Representative.
- .16 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

### **3.7 FILL TYPES AND COMPACTION**

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698:

- .1 Embankments: compact to 98%.
- .2 Backfilling: compact to 98%.

### **3.8 BEDDING AND SURROUND OF UNDERGROUND SERVICES**

- .1 Place and compact granular material for bedding and surround of underground services as specified.
- .2 Place bedding and surround material in unfrozen condition.

### **3.9 BACKFILLING**

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 The Departmental Representative has inspected and approved installations.
  - .2 The 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 Place backfill material in uniform layers not exceeding 200 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 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. Difference not to exceed 0.2 m.
  - .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 the Departmental Representative.
    - .2 If approved by the Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by the Departmental Representative.
- .6 Place fill in areas as indicated.
- .7 Consolidate and level unshrinkable fill with internal vibrators.

- .8 Install drainage system in backfill as directed by the Departmental Representative.
- .9 This project is anticipated to be a cut/fill surplus of approximately 5,000 cu. m. (fill) and no borrow is anticipated.

**3.10 RESTORATION**

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1        Section 01 29 00 - Payment Procedures.
- .2        Section 01 74 11 - Cleaning.
- .3        Section 31 11 00 - Clearing and Grubbing.
- .4        Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .5        Section 31 32 19.01 - Geotextiles.
- .6        Section 31 37 00 - Rip-Rap.

**1.2                MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 - Payment Procedures.

**1.3                REFERENCES**

- .1        Definitions:
  - .1        Rock Excavation: excavation of:
    - .1        Material from solid masses of igneous, sedimentary or metamorphic rock which, prior to removal, was integral with parent mass. Material that cannot be ripped with reasonable effort from Caterpillar D9L or equivalent to be considered integral with parent mass.
    - .2        Boulder or rock fragments measuring in volume one (1) cubic metre or more.
  - .2        Common Excavation: excavation of materials that are not Rock Excavation or Stripping.
  - .3        Unclassified Excavation: excavation of whatever character other than stripping encountered in the work.
  - .4        Free Haul: distance that excavated material is hauled without compensation. Free haul distance to be unlimited.
  - .5        Stripping: excavation of organic material covering original ground.
  - .6        Over Haul: authorized hauling in excess of free haul distance that excavated material is moved.
  - .7        Embankment: material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.
  - .8        Waste Material: material unsuitable for embankment, embankment foundation or material surplus to requirements.

- .9 Borrow Material: material obtained from areas outside right-of-way and required for construction of embankments or for other portions of work.
- .2 Reference Standards:
  - .1 American Society for Testing and Materials International, (ASTM):
    - .1 ASTM D698-07e1, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m<sup>3</sup>).
    - .2 Nova Scotia Department of Transportation and Infrastructure Renewal - Standard Specification - (Latest Edition) - Division 2 - Earthworks, Section 3 - Roadway and Drainage Excavation.

#### **1.4 PROTECTION**

- .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 the 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.

#### **1.5 QUALITY ASSURANCE**

- .1 Regulatory Requirements:
  - .1 Adhere to regulations of authority having jurisdiction when blasting is required.
  - .2 Adhere to Provincial and National Environmental requirements when potentially toxic materials are involved.
- .2 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

### **Part 2 Products**

#### **2.1 MATERIALS**

- .1 Embankment materials require approval by the Departmental Representative.
- .2 Material used for embankment not to contain more than 3% organic matter by mass, frozen lumps, weeds, sod, roots, logs, stumps or other unsuitable material.



- .3 Borrow Material:
  - .1 Obtain from borrow pit approved by the Departmental Representative.
  - .2 Material shall meet the requirements of NSTIR Specifications - Division 2, Earthworks, Section 5 - Borrow.

### **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 EXCAVATING**

- .1 General:
  - .1 Notify the Departmental Representative when waste materials are encountered and remove to depth and extent directed.
  - .2 Excavation limits as provided in contract drawings, unless directed otherwise directed by the Departmental Representative. In the event that undercut is required as directed by the Departmental Representative, compact top 150 mm below undercut to minimum 95% maximum dry density. ASTM D698 (AASHTO T99). Final/top 150 mm shall be compacted to 98% SP. Replace with approved rock fill material and compact.

- .3 Treat ground slopes, where subgrade is on transition from excavation to embankment, at grade points as directed by the Departmental Representative.
- .2 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.
- .3 Rock Excavation:
  - .1 Notify the Departmental Representative, when material appearing to conform to classification for rock is encountered. Provide 12 hour notification.
  - .2 All rock excavation is to be completed by ripping or jack-hammering.
- .4 Borrow Excavation:
  - .1 Completely use in embankments, suitable materials removed from existing roadway excavations before taking material from borrow areas.
  - .2 Obtain embankment materials, in excess of what is available from cut areas, from designated borrow areas:
    - .1 The Departmental Representative to designate extent of borrow areas and allowable depth of excavation.
    - .2 Remove waste and stripping material from borrow pits to designated locations.
  - .3 Slope edges of borrow areas to minimum 2:1 and provide drainage as directed.
  - .4 Trim and leave borrow pits in condition to permit accurate measurement of material removed.

### **3.5 EMBANKMENTS**

- .1 Scarify or bench existing slopes in accordance with Nova Scotia Department of Transportation and Infrastructure Renewal - Standard Drawing - Benching of Embankment Slopes, File No. S-2009-016.
- .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.
- .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. The 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 150 mm within 300 mm of subgrade elevation.
- .7 In the event that undercut is required as directed by the Departmental Representative, rock fill material shall be placed in the top 750 mm to subgrade. Material shall be placed in maximum 500 mm lifts using a vibratory roller of at least 11 tonnes mass.
- .8 Deductions from excavation will be made for overbuild of embankments.

### **3.6 SUBGRADE COMPACTION**

- .1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.
- .2 Compact each layer to minimum 95% maximum dry density, ASTM D698 (AASHTO T99) except top 150 mm of subgrade. Compact top 150 mm to 98% maximum dry density.
- .3 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.

### **3.7 FINISHING**

- .1 Shape entire roadbed to within 25 mm of design elevations.
- .2 Finish slopes, ditch bottoms and borrow pits 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.

### **3.8 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**

- .1 Maintain finished surfaces in condition conforming to this section until acceptance by the Departmental Representative.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1        Section 01 33 00 - Submittal Procedures.
- .2        Section 01 74 11 - Cleaning.
- .3        Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .4        Section 31 24 13 - Roadway Embankments.

**1.1                MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 – Payment Procedures.

**1.2                REFERENCES**

- .1        American Society for Testing and Materials International, (ASTM), most recent edition:
  - .1        ASTM D 4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  - .2        ASTM D 4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
  - .3        ASTM D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
  - .4        ASTM D4533, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
  - .5        ASTM D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
  - .6        ASTM D4355, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
- .2        Canadian General Standards Board (CGSB), most recent edition:
  - .1        CAN/CSA-G40.21, General Requirements for Rolled or Welded Structural Quality Steel.
  - .2        CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Submit product information of proposed product a minimum of 2 weeks prior to beginning work.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

**Part 2 Products**

**2.1 MATERIAL**

- .1 Physical properties as indicated in Table 1 - Requirements of non-woven and woven geotextile materials.
- .2 Geotextile: non-woven pervious sheets of synthetic fibre fabric and woven synthetic fibre fabric, supplied in rolls:
  - .1 Width: 3.5 m minimum.
  - .2 Length: 79 m minimum.
  - .3 Composed of: minimum 85% by mass of polypropylene and/or polyester, with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 30 days.
- .3 Securing pins and washers: to CAN/CSA-G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m<sup>2</sup> to CAN/CSA G164.
- .4 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

**Table 1- Requirements of Non-Woven and Woven Geotextiles**

Property	Unit	ASTM	Type of Fabric	
			N2	W2
Tearing Strength (Trapezoid Method)	N	D4533	250	500
Grab Tensile Strength (Both Directions)	N	D4632	600	1200
Elongation At Break	%	D4632	50	25 max.
Effective Opening Size	µm	D4751	50 to 250	300
UV Degradation at 500 HRS	% Ret.	D4355	N/A	50
Permittivity	sec <sup>-1</sup>	D4491	1.25 to 2.75	N/A
Permeability	cm/s	D4491	N/A	5*10 <sup>-3</sup>

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Place geotextile material, at locations directed by the Departmental Representative, by unrolling onto graded surface and retain in position with securing pins or fill.
- .2 Place geotextile material 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 Overlap each successive strip of geotextile 300 mm over previously laid strip.
- .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 Replace damaged or deteriorated geotextile to approval of the Departmental Representative.
- .8 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

**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.

**3.3 PROTECTION**

- .1 Vehicular traffic not permitted directly on geotextile.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1        Section 01 33 00 – Submittal Procedures.
- .2        Section 31 32 19.01 - Geotextiles.

**1.2                MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 – Payment Procedures.

**1.3                REFERENCES**

- .1        Nova Scotia Department of Transportation and Infrastructure Renewal - Standard Specification - (Latest Edition) - Division 3 - Granular Materials, Section 4 - Clear Stone, Section 6 - Loose Laid Rip-Rap and Section 8 - Armour Rock.
- .2        American Society for Testing and Materials (ASTM):
  - .1        ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar.
  - .2        ASTM C618-15, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- .3        Canadian Standards Association (CSA):
  - .1        CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2        CAN/CSA-A3000-08, Cementitious Materials Compendium.

**1.4                WASTE MANAGEMENT AND DISPOSAL**

- .1        Place materials defined as hazardous or toxic in designated containers.
- .2        Fold up metal banding, flatten and place in designated area for recycling.
- .3        Divert left over aggregate materials from landfill to local facility for reuse as approved by Departmental Representative.
- .4        Divert left over geotextiles to local plastic recycling facility as approved by Departmental Representative.



**Part 2            Products**

**2.1                STONE AND ARMOUR ROCK**

- .1        Random Rip Rap:
  - .1        Hard, durable, angular quarry stone, free from seams, cracks or other structural defects, to meet the size distribution for use intended, as shown on contract drawings. (See table “Random Rip-Rap Grading Limits” next page.).

**2.2                GEOTEXTILE FILTER**

- .1        Geotextile: as indicated on Plans and in accordance with Section 31 32 19.01 - Geotextiles, Type N2.

**Part 3            Execution**

**3.1                PLACING**

- .1        Rip-rap shall be machine placed.
- .2        Where rip-rap is to be placed on slopes and at the ends of culverts, excavate trench at toe of slope to dimensions as indicated.
- .3        Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.
- .4        Place geotextile on prepared surface in accordance with Section 31 32 19.01 - Geotextiles and as indicated. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.
- .5        Place rip-rap to thickness as indicated.
- .6        Place stones in manner approved by the Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.

**Random Rip-Rap Grading Limits**

Mass (kg)	Size (mm) (Note 1)	Finer by Mass (%)								
		R-A (Note 2)	R-5	R-25	R-50	R-100	R-250	R-500	R-1000	R-2000
6000	1600									100
4000	1400									70 - 90
3000	1300								100	
2000	1100							70 - 90	40 - 55	
1500	1000							100		
1000	900							70 - 90	40 - 55	
750	820						100			
500	710						70 - 90	40 - 55		
300	600					100				
250	570						40 - 55			
200	530					70 - 90				0 - 15
150	480				100					
100	420				70 - 90	40 - 55			0 - 15	
75	380			100						
50	330			70 - 90	40 - 55			0 - 15		
25	260			40 - 55			0 - 15			
15	220	100	100							
10	190		70 - 90			0 - 15				
5	150		40 - 55		0 - 15					
2.5	120	0		0 - 15						
0.5	70		0 - 15							
<b>Thickness (mm) (Note 3)</b>		300	300	500	600	800	1100	1400	1600	2200
Note 1	Approximate diameter (for information only)									
Note 2	Random riprap for abutment and slope protection									
Note 3	Measured perpendicular to the prepared surface									

**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 09 16.01 - Pile Driving Templates.
- .4 Section 31 09 16.28 - Pile Tests.

**1.2 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittals Procedures.
- .2 Sub-surface investigation report: when site conditions differ from those indicated, submit written notification to Departmental Representative and await further instructions.
- .3 Submit schedule of planned sequence of driving to Departmental Representative for review, as specified.
- .4 Spliced Piles: when authorized, submit design details of splice complete with signature and stamp of qualified professional engineer registered or licensed in Province of Nova Scotia, Canada. All splices of piles shall be designed and constructed as full-strength splices.
- .5 Equipment:
  - .1 Submit prior to pile installation for review by Departmental Representative, list and details of equipment for use in installation of piles.
  - .2 Impact hammers: submit manufacturer's written data as specified.
  - .3 Non-impact methods; submit characteristics to evaluate performance.
- .6 Submit driveability analysis as specified, to Departmental Representative for approval of hammers.
- .7 Quality Assurance Submittals:
  - .1 Test Reports: submit 3 copies of certified test reports for piles from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
  - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's instructions.
- .2 Protect piles from damage due to excessive bending stresses, impact, abrasion or other causes during delivery, storage and handling.
- .3 Replace damaged piles as directed by Departmental Representative.

#### **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.

#### **1.5 EXISTING CONDITIONS**

- .1 Sub-surface investigation report is available upon request.
- .2 Notify Departmental Representative in writing if subsurface conditions at site differ from those indicated and await further instructions from Departmental Representative.

#### **1.6 SCHEDULING**

- .1 Provide schedule of planned sequence of driving to Departmental Representative for review, not less than two weeks prior to commencement of pile driving.

### **Part 2 Products**

#### **2.1 MATERIALS**

- .1 Supply or fabricate full length piles as indicated and provide equipment to handle full length piles without cutting and splicing.
- .2 Splice piles only with written approval of Departmental Representative:
  - .1 When permitted, provide details for Departmental Representative review.
  - .2 Design details of splice to bear dated signature stamp of professional engineer registered or licensed in Province of Nova Scotia, Canada.

#### **2.2 EQUIPMENT**

- .1 Impact hammers: provide manufacturer's name, type, rated energy per blow at normal working rate, mass of striking parts of hammer, mass of driving cap and type and elastic properties of hammer and pile cushions.
- .2 Non-impact methods of installation such as augering, jacking, vibratory hammers or other means: provide full details of characteristics necessary to evaluate performance.
- .3 Hammer:
  - .1 Hammers to be selected on basis of driveability analysis using wave equation theory, performed to show that piles can be driven to levels indicated.
  - .2 Driveability analysis to include, but not be limited to, following: hammer, cushion, and cap block details; static soil parameters; quake and damping factors, total soil resistance, blow count, pile stresses and energy throughput at representative penetrations.
  - .3 When required criteria cannot be achieved with the proposed hammer, use larger hammer and take other measures as required.
  - .4 Refer to Geotechnical Report included in Appendix A (dated March 10, 2016) for additional information on hammer requirements.

**Part 3 Execution**

**3.1 PREPARATION**

- .1 Protection:
  - .1 Protect adjacent structures, services and work of other sections from hazards due to pile driving operations.
  - .2 Arrange sequencing of pile driving operations and methods to avoid damages to adjacent existing structures.
  - .3 When damages occur, remedy damaged items to restore to original or better condition at own expense.
- .2 Ensure that ground conditions at pile locations are adequate to support pile driving operation and load testing operation:
  - .1 Make provision for access and support of piling equipment during performance of Work.
- .3 Drive piles only when excavation has been completed.
- .4 Pre-boring of holes may be acceptable to facilitate pile alignment control.

**3.2 INSTALLATION**

- .1 Leads: construct pile driver to provide free movement of hammer:
  - .1 Hold leads in position at top and bottom, with guys, stiff braces, or other means reviewed by Departmental Representative, to ensure support to pile while being driven.
  - .2 Length: provide sufficient length of leads to ensure that use of follower is unnecessary.
  - .3 Swing leads:
    - .1 Not permitted.
- .2 Followers:
  - .1 Provide followers of such size, shape, length and mass to permit driving pile in desired location to required depth and resistance.
  - .2 Provide followers with socket or hood carefully fitted to top of pile to minimize loss of energy and prevent damage to pile.
  - .3 Drive applicable load test piles using similar follower.
- .3 Allowable design load capacity of pile as follows:
  - .1 Assumed design pile capacity at Ultimate Limit States = 1430 kN.
- .4 Installation of each pile will be subject to review of Departmental Representative:
  - .1 Departmental Representative will be sole judge of acceptability of each pile with respect to final driving resistance, depth of penetration or other criteria used to determine load capacity.

- .2 Departmental Representative to review final driving of all piles prior to removal of pile driving rig from site.
- .5 Closed end drive shoes shall be used to protect all piles during driving.
- .6 Drive each pile to pile tip elevation as indicated:
  - .1 Notify Departmental Representative if more than 5 blows per inch are incurred at design elevation.

### **3.3 APPLICATION / DRIVING**

- .1 Use driving caps and cushions to protect piles:
  - .1 Reinforce pile heads as required by Departmental Representative.
  - .2 Piles with damaged heads as determined by Departmental Representative will be rejected.
- .2 Hold piles securely and accurately in position while driving.
- .3 Deliver hammer blows along axis of pile.
- .4 Splice piles as required, with approval from Departmental Representative, according to details submitted to and approved by Departmental Representative.
- .5 Restrike already driven piles lifted during driving of adjacent piles to confirm set.
- .6 Remove loose and displaced material from around piles after completion of driving, and leave clean, solid surfaces to receive foundation concrete.
- .7 Use of Water jet:
  - .1 If permitted, provide details for Departmental Representative review.
  - .2 Restriction: when conditions are unacceptable, as determined by Departmental Representative, stop using water jet.
- .8 Cut off piles neatly and squarely at elevations as indicated to tolerance of plus or minus 5 mm:
  - .1 Provide sufficient length above cut-off elevation so that part damaged during driving is cut off.
  - .2 Do not cut tendons or other reinforcement, which will be used to tie pile caps to pile.
- .9 Remove cut-off lengths from site on completion of work.

### **3.4 OBSTRUCTIONS**

- .1 Where obstruction is encountered that causes sudden unexpected change in penetration resistance or deviation from specified tolerances, notify the Departmental Representative.
- .2 The presence of cobbles in approach fills and adjacent existing abutment footings may require that obstructions be removed by drilling during pile driving operations. All piles shall be driven to pile tip elevation as indicated.

### **3.5 REPAIR AND RESTORATION**

- .1 Pull out rejected piles and replace with new piles.
- .2 Remove rejected pile and fill hole as directed by Departmental Representative.
- .3 Leave rejected pile in place, place adjacent pile and modify pile cap as directed by Departmental Representative.
- .4 No extra compensation will be made for removing and replacing or other work made necessary through rejection of defective piles.

### **3.6 FIELD QUALITY CONTROL**

- .1 Pile Driving Analyzer:
  - .1 Use Pile Driving Analyzer and Wave Equation Analysis to determine and confirm driving criteria:
    - .1 Departmental Representative to select two piles per abutment.
    - .2 Departmental Representative will pay for PDA testing.
    - .3 Work to be performed by geotechnical engineer registered or licensed in Province of Nova Scotia, Canada.
  - .2 Prepare piles to be instrumented by drilling and tapping holes for installation of strain transducers and accelerometers, as directed by Departmental Representative.
  - .3 Provide assistance, as required, in instrumentation process during initial set-up and during test.
  - .4 Make allowance for probable interruption in driving for:
    - .1 Changing/modifying hammer, cap, cushions, or other equipment.
    - .2 Replacing/adjusting of transducers and accelerometers.
    - .3 Assessing of monitored results.
  - .5 Replace/adjust hammer and modify cap, cushions, and other equipment, as directed by Departmental Representative.
  - .6 Confirm that final set has been achieved, when instructed by restriking instrumented piles as directed.
  - .7 Measurement:
    - .1 Maintain accurate records of driving for each pile, including:
      - .1 Type and make of hammer, stroke or related energy.
      - .2 Other driving equipment including water jet, driving cap, cushion.
      - .3 Pile size and length, location of pile in pile group, location or designation of pile group.
      - .4 Sequence of driving piles in group.
      - .5 Number of blows per metre for entire length of pile and number of blows per 25 mm for last 300 mm.
      - .6 Final tip and cut-off elevations.

- .7 Other pertinent information such as interruption of continuous driving, pile damage.
- .8 Record elevation taken on adjacent piles before and after driving of each pile.
- .2 All measurements, observations and calculations associated with pile driving analyzer and wave equation analysis.
- .3 Provide Departmental Representative with three copies of records.

### **3.7**

#### **CLEANING**

- .1 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 01 33 00 - Submittal Procedures.
- .2        Section 01 74 11 - Cleaning.
- .3        Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .4        Section 31 61 13 - Pile Foundations, General Requirements.

**1.2            MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 – Payment Procedures

**1.3            REFERENCES**

- .1        Canadian General Standards Board (CGSB)
  - .1        CAN/CGSB-1.171M-98, Inorganic Zinc Coating.
  - .2        CAN/CGSB-1.184-98, Coal Tar-Epoxy Coating.
- .2        Canadian Standards Association (CSA International)
  - .1        CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
  - .2        CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
  - .3        CSA W59-13, Welded Steel Construction (Metal Arc Welding) (Metric Version).
  - .4        CSA-G40.20/G40.21-2013, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

**1.4            ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Submit shop drawings and indicate: pile shoes, splice detail, pile cap and tip reinforcement.
  - .1        Each drawing sealed by qualified professional engineer registered or licensed in Province of Nova Scotia.
- .3        Quality Assurance:
  - .1        Test Reports: submit 3 copies of mill test reports indicating yield and chemical analysis of steel piles if requested by Departmental Representative.
  - .2        Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .3        Instructions: submit manufacturer's installation instructions.
  - .4        Submit pile driving records, as described in PART 3 - RECORDS, for review by Departmental Representative.

## **1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Steel H piles: to CSA-G40.20/G40.21, Grade 350W.
  - .1 Size and weight as indicated on Contract Drawings.
- .2 Welding materials: to CSA W48.
- .3 Steel plates: to CSA-G40.20/G40.21, Grade 300W.
- .4 Splices: to CSA-G40.21/G40.21, Grade 350W
- .5 Welding electrodes: to CSA W48.
- .6 Welding and weld testing to CSA W59.
- .7 Pile driving shoes: to CSA-G40.20/G40.21, Grade 300W.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install piling in accordance with Section 31 61 13 - Pile Foundations, General Requirements.
- .2 Provide steel point reinforcement for piles as directed by Departmental Representative.
- .3 Provide full length piles when possible, avoiding field welding during installation.
- .4 Splice pile extensions to details as indicated on approved shop drawings, by using complete penetration groove welds:
  - .1 Align extension with driven pile when splicing.
  - .2 Limit to maximum of one splice per pile unless otherwise approved by Departmental Representative
  - .3 The quality of welds in steel H pile splices shall be in accordance with CSA W59, Section 12, clause 12.5.4.
  - .4 Acceptance criteria for weld defects shall be in accordance with CSA W59 clause 12.5.4. and shall meet the limits described in this clause for tension welds.
  - .5 All corrected welds to be retested.
- .5 Cut off piles squarely at required elevation.

- .6 The Contractor shall ensure that the pile remains within the specified tolerances throughout the entire length of the driven pile.
- .7 All piles shall be driven with a variation of not more than 10 mm/m from vertical or from the batter specified in the Contract Documents.
- .8 In no case shall the total variation exceed 100 mm from the specified location.
- .9 Pile tolerances shall be measured at the ground line and at the cut-off elevation and in no cases shall piles be loaded horizontally to move the pile within the specified tolerances.
- .10 For piles outside the specified tolerances, the Contractor shall submit a report, for the approval of the Departmental Representative, stamped and signed by a Professional Engineer, detailing the findings and, if required, any corrective measure(s) to remedy the Work.
  - .1 The Contractor shall carry out all remedial Work.

### 3.2

#### **WELDING**

- .1 Weld to CSA W59.
- .2 Welding certification of companies: to CSA W47.1.
- .3 Welding of field and shop splices for steel H piles, cap plate and pile point connections shall be by the SMAW or FCAW process.
- .4 The Departmental Representative may request to have the welder tested or approved on the welding procedures outlined in the Specifications.
- .5 Basic electrodes of E480 classification that are not used within 4 hours after removal from ovens shall be dried for at least one hour at a temperature between 370 °C and 430 °C before being used.
- .6 Roughness of oxygen cut surfaces shall not be greater than that defined by the ANSI Surfaces Roughness Value of 1000.
  - .1 Roughness exceeding this value and occasional notches or gouges, not more than 5 mm deep grinding on otherwise satisfactory surfaces, shall be removed by machining or
  - .2 Oxygen cut surfaces and edges shall be left free of adhering slag.
  - .3 Corrections of defects shall be flared to the oxygen cut surface with a Slope not exceeding 1 in 10.
- .7 Defects of oxygen cut surfaces shall not be repaired by welding except with the express approval of the Departmental Representative for correction of occasional notches or gouges less than 10 mm deep.
  - .1 These weld repairs shall be made by suitably preparing non-conforming surfaces, welding with basic electrodes not exceeding 4 mm in diameter, observing applicable SMAW requirements of 11.4.5 and grinding the completed weld smooth and flush with adjacent surface to produce a satisfactory finish.
- .8 The workmanship of the assembly shall meet the standards of CAN/CSA W59.

- .9 Welding of steel made of CAN/CSA G40.21, Grade 300W of 20 mm thickness and under, shall not require preheating when base metal temperature is above 0°C.
  - .1 When base metal temperature is 0°C or lower, the base metal shall be preheated to at least 10°C and maintained at a minimum temperature of 10°C during welding.
- .10 Steel over 20 mm thick shall be preheated to 10°C before any welding is done.
- .11 No welding shall be done when the ambient temperature is lower than -18°C.
- .12 The preheating zone shall be a minimum of 75 mm on each side of the joint.
- .13 Protection shall be provided for welding under adverse weather conditions of wind and/or precipitation.
  - .1 All methods of protection shall be subject to the approval of the Departmental Representative prior to any welding being carried out.
- .14 No pile shall be driven until the welded joint has been inspected and approved by the Departmental Representative.
- .15 When piles have been welded within a heated enclosure during cold weather, the pile shall not be removed from this enclosure until the welded joint has cooled so that it is warm to the bare hand.

### 3.3 RECORDS

- .1 Keep complete and accurate record of each pile driven.
- .2 Indicate:
  - .1 Pile location.
  - .2 Deviations from design location.
  - .3 Cross section shape and dimensions.
  - .4 Original length.
  - .5 Ground elevation.
  - .6 Tip elevation.
  - .7 Cutoff elevation.
  - .8 Penetration in blows per meter for entire length of penetration.
  - .9 Hammer data including: rate of operation, make and size.
  - .10 Unusual pile behavior or circumstances experienced during driving such as re-driving, heaving, weaving, obstructions, jetting, and unanticipated interruptions.

**3.4 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 01 33 00 - Submittal Procedures.
- .2        Section 31 05 16 - Aggregate Materials.

**1.2                MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 – Payment Procedures.

**1.3                DESCRIPTION**

- .1        This section specifies requirements for supplying, producing and placing crushed quarry stone as a granular subbase (Type 2 Gravel, except for gradation adjustment) to lines, grades and typical cross sections indicated, or as directed by Departmental Representative.

**1.4                REFERENCES**

- .1        Nova Scotia Transportation and Infrastructure Renewal:
  - .1        Nova Scotia Transportation and Infrastructure Renewal (NSTIR), Division 3 Section 2.
- .2        ASTM International - most recent edition:
  - .1        ASTM C117, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
  - .2        ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .3        ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4        ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.
  - .5        ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
  - .6        ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .3        Ministry of Transportation of Ontario:
  - .1        LS-618 Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.
- .4        Nova Scotia Environment and Labour:
  - .1        Pit and Quarry Guidelines.

**1.5 ACTION AND INFORMATIONAL SUBMITTALS**

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

**Part 2 Products**

**2.1 MATERIALS**

- .1 Granular subbase: to meet NSTIR Type 2 Gravel and the following requirements:
  - .1 Granular sub-base to be quarried, crushed rock.
  - .2 Gradations to be within limits as follows:

Sieve Size, <i>µm</i>	Type 2 - Percent Passing by Weight
80,000	100
56,000	70 - 100
28,000	50 - 80
14,000	35 - 65
5,000	20 - 50
160	3 - 10
80	2 - 5

- .3 Granular sub-base to be supplied by Contractor.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of subgrade are acceptable for Granular Sub-base installation in:
  - .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 approval to proceed from Departmental Representative.

### **3.2 PLACING**

- .1 Place Granular Sub-base after subgrade is inspected and approved by the Departmental Representative.
- .2 Construct Granular Sub-base to depth and grade in areas indicated on the plans or as directed by the Departmental Representative.
- .3 Ensure no frozen material is used in placing.
- .4 Place material only on clean unfrozen surface, properly shaped and compacted and free from snow or ice.
- .5 Begin spreading sub-base material on crown line or high side of one-way slope.
- .6 Place Granular Sub-base materials using methods which do not lead to segregation or degradation.
- .7 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. The Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
- .8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .9 Remove and replace portion of layer in which material has become segregated during spreading.

### **3.3 COMPACTION**

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Compact to density of not less than 100% maximum dry 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 compaction to obtain specified density. If aggregate is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
- .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by the Departmental Representative.
- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.



**3.4 CLEANING**

- .1 Leave work area clean at end of each day.

**3.5 SITE TOLERANCES**

- .1 Finished sub-base surface to be within 25 mm of elevation as indicated but not uniformly high or low.

**3.6 PROTECTION**

- .1 Maintain finished Granular Sub-base in condition conforming to this section until succeeding base is constructed, or until Granular Sub-base is accepted by the Departmental Representative.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REFERENCES**

- .1            Section 01 33 00 - Submittal Procedures.
- .2            Section 02 41.13.14 - Asphalt Pavement Removal.

**1.2                MEASUREMENT FOR PAYMENT**

- .1            See Section 01 29 00 – Payment Procedures

**1.3                DESCRIPTION**

- .1            This section specifies requirements for supplying, producing and placing crushed quarried stone as Type 1 granular base (except for gradation adjustment), to lines, grades and typical cross sections indicated, or as directed by Departmental Representative.

**1.4                REFERENCES**

- .1            Nova Scotia Transportation and Infrastructure Renewal:
  - .1            Nova Scotia Transportation and Infrastructure Renewal (NSTIR), Standard Specification Division 3 Section 2.
- .2            American Society for Testing and Materials (ASTM) - most recent edition:
  - .1            ASTM C117, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .2            ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .3            ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
  - .4            ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .5            ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
  - .6            ASTM D2922- Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods.
- .3            Ministry of Transportation of Ontario:
  - .1            LS-618 Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.
- .4            Nova Scotia Environment and Labour:

- .1 Pit and Quarry Guidelines.

## 1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

## Part 2 Products

### 2.1 MATERIALS

- .1 Granular base: to meet NSTIR Type 1 Gravel and the following requirements:
  - .1 Crushed rock consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, and other deleterious materials.
  - .2 Type 1 gravel shall be produced from quarried rock source.
  - .3 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117:

Sieve Size, $\mu m$	Type 1 - Percent Passing by Weight
20,000	100
14,000	50-85
5,000	20-50
160	5-12
80	3-5

- .4 Plasticity Index: to ASTM D4318, Maximum 3.
- .5 Los Angeles Abrasion: to ASTM C131. Max. % loss by weight: 40.
- .6 Crushed particles: 100% of particles by mass to have at least 2 freshly fractured faces.
- .2 Shoulder Material:
  - .1 Shoulder material to meet NSTIR Type 1S gravel.

**Part 3 Execution**

**3.1 INSPECTION OF UNDERLYING SUB-BASE**

- .1 Place granular base after surface is inspected and approved by Departmental Representative.

**3.2 PLACING**

- .1 Construct granular base to depth and grade in areas indicated on the plans or as directed by the Departmental Representative.
- .2 Ensure no frozen material is used in placing.
- .3 Place material only on clean unfrozen surface, properly shaped and compacted and free from snow and ice.
- .4 Begin spreading base material on crown line or high side of one-way slope.
- .5 Place granular base materials using methods which do not lead to segregation or degradation.
- .6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .7 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .8 Compacted shouldering to be flush with asphalt concrete surface.
- .9 Hand work will be required to form base for asphalt concrete gutters/offtakes.
- .10 Place, hand rake and compact new shoulder material under and behind guiderail.

**3.3 COMPACTION EQUIPMENT**

- .1 Vibratory compaction equipment must be used and capable of obtaining required densities on aggregates on project.

**3.4 COMPACTING**

- .1 Density of granular base course will be determined according to ASTM D2922.
- .2 Compaction equipment to be capable of obtaining required material densities.
- .3 Compact to density not less than 100% maximum dry density in accordance with ASTM D698.

- .4 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
- .5 Apply water as necessary during compacting to obtain specified density. If aggregate is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
- .6 In areas not accessible to rolling equipment, compact to specified density with vibratory mechanical tampers approved by the Departmental Representative.
- .7 Equipment:
  - .1 Compaction equipment to be capable of obtaining required material densities.
  - .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from the Departmental Representative before use.
  - .3 Equipped with device that records hours of work, not motor running hours.

### **3.5 FINISH 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.
- .2 Density of Granular Base Course will be determined according to ASTM2922.
- .3 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

### **3.6 CLEANING**

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

### **3.7 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 01 33 00 - Submittal Procedures.
- .2        Section 32 12 16 - Asphalt Paving.

**1.2                REFERENCES**

- .1        American Society for Testing and Materials (ASTM) - Most Recent Edition:
  - .1        ASTM D140/D140M, Standard Practice for Sampling Bituminous Materials.
- .2        Nova Scotia Transportation and Infrastructure Renewal:
  - .1        Nova Scotia Transportation and Infrastructure Renewal (NSTIR), Division 4 Section 1.

**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 asphalt tack coat and include product characteristics, performance criteria, physical size, finish and limitations.
- .3        Samples:
  - .1        Submit two - 1 L samples of asphalt tack coat material proposed for use in new, clean, airtight, sealed, wide mouth plastic lined cans 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        Submit manufacturer's test data and certification that asphalt tack coat material meets requirements of this Section.

**1.5                DELIVERY, STORAGE AND HANDLING**

- .1        Deliver, store and handle materials in accordance with manufacturer's written instructions.

**Part 2 Products**

**2.1 MATERIALS**

- .1 To NSTIR, Standard Specification, Division 4 Section 1, Table 4.1.1 grade: RS-1.
- .2 Water: clean, potable, free from foreign matter.

**Part 3 Execution**

**3.1 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 Designed, equipped, maintained and operated so that asphalt material can be:
    - .1 Maintained at a temperature not less than 20°C or more than 70°C.
    - .2 Applied uniformly on variable widths of surface up to 5 m.
    - .3 Applied at readily determined and controlled rates from 0.1 to 5.4 L/m<sup>2</sup> with uniform pressure, and with allowable variation from any specified rate not exceeding 0.1 L/m<sup>2</sup>.
    - .4 Distribute in uniform spray without atomization at temperature required.
  - .2 Equipped with nozzle spray bar capable of being raised or lowered.
  - .3 Equipped with hand application wand.
  - .4 Cleaned if previously used with incompatible asphalt material.

**3.2 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 approved to proceed by Departmental Representative.

**3.3 APPLICATION**

- .1 All milled and unmilled asphalt concrete surfaces to be tack coated before placement of new Hot Mix Asphalt (HMA).
- .2 Tack coat to be applied between lifts of new HMA.
- .3 Apply asphalt tack coat only on clean and dry surface.

- .4 Dilute asphalt emulsion as per manufacturer's recommendations.
- .5 Departmental Representative tack coat to be applied at a rate of 0.14 l/m<sup>2</sup> unless otherwise directed by Departmental Representative.
- .6 Apply asphalt tack coat evenly to pavement surface.
- .7 Paint contact surfaces of curbs, gutters, and like structures with thin, uniform coat of asphalt tack coat material.
- .8 Apply asphalt tack coat only when air temperature greater than 10 ° C and when rain is not forecast within 2 hours minimum of application.
- .9 Apply asphalt tack coat only on unfrozen surface.
- .10 Evenly distribute localized excessive deposits of tack coat by brooming as directed by Departmental Representative.
- .11 Keep traffic off tacked areas until asphalt tack coat has set.
- .12 Re-tack contaminated or disturbed areas as directed by Departmental Representative.
- .13 Permit asphalt tack coat to break before placing asphalt pavement.
- .14 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.

**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 32 12 13.16 - Asphalt Tack Coat.

**1.2                MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 – Payment Procedures.

**1.3                DESCRIPTION**

- .1        This section covers asphalt concrete on reconstructed roadbed and shall meet the general requirement of Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) Type “D-HF” except where noted.

**1.4                REFERENCES**

- .1        Nova Scotia Transportation and Infrastructure Renewal:
  - .1        Nova Scotia Transportation and Infrastructure Renewal (NSTIR), Division 4, Section 4, Asphalt Concrete Hot Mixed - Hot Placed.
  - .2        Nova Scotia Department of Transportation and Infrastructure Renewal, Division 4, Section 2, Performance Graded Asphalt Binder (PGAB).
- .2        AASHTO – most recent edition:
  - .1        AASHTO T283 - Standard Method of Test for Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage.
  - .2        AASHTO P66 Standard Practice for Grading or Verifying the Performance Grade of an Asphalt Binder.
  - .3        AASHTO TP33 Standard Test Method for Uncompacted Void Content of Fine Aggregate.
- .3        ASTM International - most recent edition:
  - .1        ASTM C88, Test method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.

- .2 ASTM C117, Test Method for Material Finer than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .3 ASTM C127, Test Method for Specific Gravity and Absorption of Coarse Aggregate.
- .4 ASTM C128, Test Method for Specific Gravity and Absorption of Fine Aggregate.
- .5 ASTM C131, Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .6 ASTM C136, Method for Sieve Analysis of Fine and Coarse Aggregates.
- .7 AASHTO M156, Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
- .8 ASTM D6927, Standard Test Method for Marshall Stability and Flow of Asphalt Mixtures.
- .9 ASTM D2419, Test method for Sand Equivalent Values of Soils and Fine Aggregate.
- .10 ASTM D2041, Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
- .11 ASTM D2950, Standard Test Method for Density of Bituminous Concrete in place by Nuclear Methods.
- .12 ASTM D3203, Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
- .13 ASTM D4469- Standard method for Calculating Percent Asphalt Absorption by the Aggregate in an Asphalt Pavement Mixture.
- .4 Nova Scotia Environment and Labour:
  - .1 Proposed 1981 - Asphalt Paving Plant Regulation.

## **1.5 SAMPLES**

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 At least 4 weeks prior to commencing work, submit samples of following materials proposed for use:
  - .1 One 4L container of asphalt cement.

**1.6 MATERIAL CERTIFICATION**

- .1 At least 4 weeks prior to commencing work, submit viscosity-temperature chart for asphalt cement to be supplied showing kinematic viscosity in mm<sup>2</sup>/s versus temperature range from 105° to 175° C.
- .2 At least 4 weeks before commencing work, submit refinery's test data and certification that asphalt cement meets requirements of this section which also includes the specific gravity of the asphalt cement.

**1.7 SUBMISSION OF MIX DESIGN**

- .1 Samples of aggregate for mix design shall be derived from stockpiles not less than 1000 tonnes of each of fine and course aggregate.
- .2 The Contractor shall submit, in writing, asphalt concrete mix design and trial mix test results to Departmental Representative for review at least 2 weeks prior to commencing work. The mix design shall contain the job mix formula which shall include the following:
  - .1 Type and specific gravity of asphalt cement.
  - .2 Asphalt cement content.
  - .3 Specific gravity and absorption of each aggregate.
  - .4 Percentage of each aggregate.
  - .5 Gradation of job mix formula.
  - .6 Marshall stability and flow.
  - .7 Bulk specific gravity, kg/m<sup>3</sup>.
  - .8 Maximum theoretical density, kg/m<sup>3</sup>.
  - .9 Percentage voids in mineral aggregate.
  - .10 Percentage air voids.
  - .11 Percentage voids filled with asphalt.
  - .12 Percentage of absorbed asphalt cement.
  - .13 TSR (AASHTO T283).

**1.8 DELIVERY AND STORAGE**

- .1 Deliver and stockpile aggregates. Stockpile outside of park boundaries, a minimum 50% of total amount of aggregate required before commencing asphalt concrete operations.

- .2 When necessary to blend aggregates from one or more sources to produce required gradation, do not blend in stockpiles.
- .3 Stockpile fine aggregate separately from coarse aggregate.
- .4 Provide approved storage, heating tanks and pumping facilities for asphalt cement.
- .5 There will be no separate payment for mobilization and demobilization to site.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Asphalt Cement: to AASHTO PP6, PG 58-28 Grade.
- .2 RAP shall be permitted in asphalt mixes, however, none is available from this contract.
- .3 Aggregate shall be crushed quarried stone.
- .4 Aggregate: The aggregate shall meet the following gradation requirements.

<b>Sieve Designation</b>	<b>Cumulative % Passing Surface, Type D-HF</b>
14 000	100
10 000	95 - 100
5 000	55 - 70
2 500	25 - 55
315	5 - 20
80	2 - 9

- .1 Coarse aggregate is aggregate retained on 5000  $\mu$ m sieve and fine aggregate is aggregate passing 5000  $\mu$ m sieve when tested to ASTM C136.
- .2 When dryer drum plant or plant without hot screening is used, process fine aggregate through 5000  $\mu$ m sieve and stockpile separately from coarse aggregate.
- .3 Fine Aggregate Angularity: AASHTO TP33, Min 45%.
- .4 Sand Equivalent: to ASTM D2419, Min: 50.
- .5 Magnesium Sulphate Soundness: to ASTM C88, Max % loss by mass: 15.
- .6 Los Angeles Abrasion: ASTM C131. Max % loss by mass, 30.

- .7 Absorption: to ASTM C127 and ASTM C128. Max % by mass:
  - .1 Coarse aggregate: 1.75.
  - .2 Fine aggregate: 2.00.
- .8 Flat and elongated particles: ASTM D 4791 (with length to thickness ratio greater than 4): Max % by mass 10%.
- .9 Crushed fragments: at least 95% of particles by mass to have at least 2 freshly fractured faces. Material to be crushed from quarried aggregate source.
- .10 Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.
- .11 Petrographic Analysis: TPW TM-2 Modified Petrographic Analysis, maximum 135.
- .5 Mineral Filler:
  - .1 Finely ground particles of limestone, hydrated lime, Portland cement or other approved non-plastic mineral matter, thoroughly dry and free from lumps.
  - .2 Add mineral filler when necessary to meet job mix aggregate gradation or as directed to improve mix properties.
  - .3 Mineral filler to be dry and free flowing when added to aggregate.
- .6 Anti-Stripping Agents:
  - .1 Do not use anti-strip agent without the approval of the Departmental Representative.
  - .2 Minimum mix TSR based on ASHTO T283 testing is 80 %:
    - .1 Requirements for liquid anti-stripping agent will also be based on past history of aggregates, and visual examination of test specimens.
    - .2 No additional payment shall be made for the use of anti-stripping agent in the mix.

**Part 3 Asphalt Concrete Mix**

**3.1 MIX DESIGN**

- .1 Mix Design and Job Mix Formula to be provided by Contractor.
- .2 Design to Mix: by Marshall Method to requirements below and as directed by Departmental Representative:
  - .1 Compaction blows on each face of test specimens: 75:
    - .1 Design of Mix: by the Marshall Method to the requirements below and submit to the Departmental Representative for approval:

Property	Mix Type D-HF
Marshall Stability at 60°, kN, min	7.5
Marshall Flow Value, mm	2 - 4
Air Voids, %	2.5 - 4.0
Voids in Mineral Aggregate, %, min	15
VFA %, min	65 - 78
Stripping Test, % min	80

- .2 Asphalt cement content shall be determined by mix design.
- .3 The Contractor shall use professional engineering services and a qualified testing laboratory to assess the aggregate materials, asphalt binders, blending sands, mineral fillers, anti-stripping agents and asphalt cement rejuvenation agents proposed for use and to carry out the design of the asphalt concrete mix.
- .4 Measure physical requirements as follows:
  - .1 Marshall stability and flow value: to ASTM D6927.
  - .2 Compute void properties on basis of bulk specific gravity of aggregate (to ASTM D2041 and ASTM D4469). Make allowance for volume of asphalt cement absorbed into aggregate.
  - .3 Air voids: to ASTM D3203.
  - .4 Stripping: to AASHTO T283.
- .5 Do not change job-mix without prior approval of Departmental Representative. Should change in material be proposed, submit new to Departmental Representative for approval.

- .6 Return plant dust collected during processing to mix in quantities acceptable to Departmental Representative.

### 3.2 PLANT AND MIXING REQUIREMENTS

- .1 Feeder lines for loading asphalt cement to the asphalt tanks shall be elevated and drained and the use of diesel fuel to clean asphalt cement pump feeder lines is not permitted. When necessary to use diesel to flush lines and pump, all flushed material shall be collected and not permitted to enter asphalt cement tanks or dumped on the ground.
- .2 Batch and Continuous Mixing Plants:
  - .1 Heat asphalt cement and aggregates to mixing temperatures specified as per the approved mix design. Do not heat asphalt cement above 164°.
  - .2 Before mixing, dry aggregates to a moisture content not greater than 0.5% by mass or to a lesser moisture content if required to meet mix design requirements.
- .3 Based on current asphalt cement viscosity and specific gravity data measured at the plant, the required temperature of completed asphalt at the plant and at the paver is to be determined based on the consideration of current hauling and placing conditions.
- .4 Feed aggregates from individual stockpiles through separate bins to cold elevator feeders. Aggregate will not be fed directly to the plant from the crusher.
- .5 Feed cold aggregates to plant in proportions that will ensure continuous operations.
- .6 Immediately after drying, screen aggregates into hot storage bins in sizes to permit recombining into gradation meeting job-mix requirements.
- .7 Store hot screened aggregates in a manner to minimize segregation and temperature loss.
- .8 Maintain temperature of materials within plus or minus 5°C of specified mix temperature during mixing.
- .9 Mixing Time:
  - .1 In batch plants, wet mixing shall continue as long as necessary to obtain a thoroughly blended asphalt concrete but not less than 30 s or more than 75 s.
  - .2 In continuous mixing plants, mixing time shall be not less than 45 s.
  - .3 Do not alter mixing time unless directed by Departmental Representatives.

- .10 Dryer Drum Mixing Plant:
- .1 Feed aggregates to burner end of dryer drum by means of a multi-bin cold feed unit and blend to meet job-mix requirements by adjustments of variable speed feed belts and gates on each bin.
  - .2 Meter total flow of aggregate by an electronic weigh belt system with an indicator that can be monitored by plant operator and which is interlocked with asphalt pump so that proportions of aggregate and asphalt cement entering mixer remain constant.
  - .3 Provide for easy calibration of weighing systems for aggregates without having material enter drum.
  - .4 Make provisions for conveniently sampling the full flow of aggregate from the cold feed.
  - .5 Provide screens or other suitable devices to reject oversize particles or lumps of aggregates from cold feed prior to entering drum.
  - .6 Provide a system interlock which will stop all feed components if either asphalt or aggregate from any bin stops flowing.
  - .7 Accomplish heating and mixing of asphalt concrete in an approved parallel flow dryer-mixer in which aggregate and asphalt cement enter drum at burner end and travel parallel to flame and exhaust gas stream. Control heating to prevent fracture of aggregate or excessive oxidation of asphalt cement. Equip systems with automatic burner controls and provide for continuous temperature sensing of asphalt concrete at discharge, with a printing recorder that can be monitored by plant operator. Submit printer record of mix temperatures at end of each week.
  - .8 Mixing period and temperature to produce a uniform mixture in which particles are thoroughly coated, and moisture content of material as it leaves plant to be less than 0.5%.
- .11 Temporary Storage of Hot Asphalt Concrete:
- .1 Provide storage of sufficient capacity to permit continuous operation and designed to prevent segregation.
  - .2 Do not keep in storage bins in excess of 3 h.
  - .3 While producing asphalt concrete for this project, do not produce it for other users unless separate storage and pumping facilities are provided for materials supplied to this project.
- .12 Mixing Tolerances:
- .1 Gradations to conform to Section 2.1.4.



- .2 Permissible variation of asphalt cement from Job Mix Formula:
  - .1 0.35%.
- .3 Permissible variation of asphalt concrete temperature at discharge from plant, 5°C.

## **Part 4 Execution**

### **4.1 EQUIPMENT**

- .1 General: All equipment used on this project shall be in top operating condition because the project is located on a roadway with very steep grades and sharp curves.
- .2 Pavers: Mechanical grade controlled self-powered pavers capable of spreading asphalt concrete within specified tolerances, true to line, grade and crown indicated:
  - .1 Pavers to be equipped with automatic screed controls, as recommended by manufacturer for control on longitudinal grade and transverse slope.
  - .2 Pavers to be equipped with joint matching shoe to operate with longitudinal grade control.
  - .3 Transverse slope control shall be capable of operating from either side of paver.
  - .4 Pavers to be equipped with an approved 12 m ski:
    - .1 Where such ski is a flexible unit, it shall be equipped with a spring tensioned wire extending between brackets fitted on and slightly above each end of ski.
    - .2 Sensing grid shall ride on wire and not on ski.
    - .3 Equivalent paving technology may be submitted for approval by Departmental Representative.
- .3 Rollers: Sufficient number of rollers of type and mass to obtain specified density of compacted mix:
  - .1 Vibrator Rollers:
    - .1 Minimum drum diameter: 1200 mm.
- .4 Haul Trucks: Of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
  - .1 Boxes with tight metal bottoms.
  - .2 Covers (tarps) of sufficient size and weight to completely cover and protect asphalt concrete when truck fully loaded.

- .3 In cool weather for long hauls, insulate entire contact area of each truck box.
- .4 Truck tailgate assemblies must be such that they do not strike paver hoppers when emptying into the hopper.
- .5 Hand Tools:
  - .1 Lutes or rakes with covered teeth for spreading and finishing operations.
  - .2 Tamping irons having mass not less than 12 kg and a bearing area not exceeding 310 cm<sup>2</sup> 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, 3 m in length, to test finished surface.
- .6 Material Transfer Vehicle: Transfer asphalt concrete from haul units to spreader with an approved Material Transfer Vehicle.

#### **4.2 PREPARATION**

- .1 Apply tack coat in accordance with Section 32 12 13.16 - Asphalt Tack Coat prior to paving.
- .2 Verify all grades prior to paving.

#### **4.3 TRANSPORTATION OF ASPHALT CONCRETE**

- .1 Transport asphalt concrete to job site in vehicles clean of foreign material.
- .2 Paint or spray truck beds with limewater, soap or detergent solution, at least once a day or as required. Elevate truck bed and thoroughly drain. No excess solution will be permitted. Diesel fuel is not permitted.
- .3 Schedule delivery of asphalt concrete for placing in daylight, unless Departmental Representative approves artificial lighting.
- .4 Deliver asphalt concrete to paver at a uniform rate and in an amount within capacity of paving and compacting equipment.
- .5 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place asphalt concrete at temperature within range as directed by Departmental Representative but not less than 135°.
- .6 Tarpaulins or other coverings for trucks must be of sufficient mass to prevent rapid cooling of asphalt concrete surface.

#### 4.4 PLACING

- .1 Obtain Departmental Representative's approval of base and existing surface and tack coat prior to placing asphalt.
- .2 Place asphalt concrete to thickness, grades and lines as indicated or as directed by Departmental Representative.
- .3 Placing Conditions:
  - .1 Place asphalt concrete only when air temperature is above 5°C and rising.
  - .2 When temperature of surface on which asphalt concrete is to be placed falls below 10°C, provide extra rollers as necessary to obtain required compaction before cooling.
  - .3 Do not place asphalt concrete when pools of standing water exist on surface to be paved, or during rain, or when surface is damp.
- .4 Place asphalt concrete in compacted lifts of thickness as indicated on drawings.
- .5 Spread and strike off asphalt concrete overlay with self-propelled mechanical finisher.
- .6 Place individual mats so that the days paving leaves minimal exposed longitudinal cold joint (<10m).
- .7 Construct longitudinal joints and edges true to design.
- .8 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.
- .9 Correct irregularities in alignment left by paver by trimming directly behind machine.
- .10 Correct irregularities in surface of pavement course directly behind paver. Remove by shovel or lute excess asphalt concrete forming high points. Fill and smooth dips with asphalt concrete.
- .11 Do not broadcast asphalt concrete over surface.
- .12 The forward speed of the paver shall be regulated by capacity of the plant and the rollers but shall not exceed a forward speed of 10m/min.
- .13 When hand spreading is used:
  - .1 Approved wood or steel forms, rigidly supported to ensure correct grade and cross section, may be used. Use measuring blocks and intermediate strips to aid in obtaining required cross-section.
  - .2 Distribute material uniformly. Do not broadcast material.

- .3 During spreading operation, thoroughly loosen and uniformly distribute asphalt concrete by lutes or covered rakes. Reject asphalt concrete that has formed into lumps and does not break down readily.
- .4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.
- .5 Provide heating equipment to keep hand tools free from asphalt. Avoid high temperatures which may burn asphalt concrete. Do not use tools at a higher temperature than temperature of asphalt concrete being placed.

#### **4.5 COMPACTING**

- .1 Compact asphalt concrete continuously using established rolling pattern.
- .2 Do not change rolling pattern unless asphalt concrete changes or lift thickness changes. Change rolling pattern only as directed by Departmental Representative.
- .3 General:
  - .1 Provide at least three rollers or as many additional rollers as necessary to achieve specified pavement density.
  - .2 Start rolling operations as soon as asphalt concrete can bear mass of roller without undue displacement of asphalt concrete or cracking of surface.
  - .3 Operate roller slowly initially to avoid displacement of asphalt concrete. For subsequent rolling do not exceed 5 km/h for static steel - wheeled rollers and 8km/h for pneumatic - tired rollers.
  - .4 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 20 impacts per meter of travel.
  - .5 Overlap successive passes of roller 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 asphalt concrete 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.

- .10 Where rolling causes displacement of asphalt concrete, loosen affected areas at once with lutes or shovels and restore to original grade of loose asphalt concrete before re-rolling.
- .11 Do not refuel rollers on fresh asphalt concrete.
- 4 Breakdown Rolling:
  - .1 Commence breakdown rolling with static steel wheeled roller vibratory roller immediately following rolling of transverse and longitudinal joint and edges.
  - .2 Operate rollers as close to paver as necessary to obtain the specified 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 for this work.
- .5 Second Rolling:
  - .1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving asphalt concrete temperatures allows maximum density from this operation.
  - .2 Rolling shall be continuous after initial rolling until asphalt concrete placed has been thoroughly compacted.
- .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 93% of Theoretical Maximum Relative Density (TMRD) in accordance with ASTM D2726.
- .8 The Contractor will supply additional compaction equipment if required density is not achieved.
- .9 Gutters will be compacted with vibratory compactors which operate perpendicular to the direction of the gutter.

#### **4.6 JOINTS**

- .1 General:
  - .1 Trim vertical face to provide true surface and cross section against which new pavement may be laid. Remove loose particles.

- .2 Paint joint face with tack coat emulsified asphalt cement prior to placing of fresh asphalt concrete.
  - .3 Overlap previously laid strip with spreader by 100 mm.
  - .4 Rake fresh asphalt concrete against joint and thoroughly tamp and roll.
  - .5 Remove surplus material from surface of previously laid strip. Dispose of surplus material as directed by Departmental Representative.
  - .6 Do not throw surplus material on freshly screened mat surface.
- .2 Transverse Joints:
- .1 Carefully construct and thoroughly compact transverse joints to provide a smooth riding surface.
  - .2 Hold transverse joints to a minimum.
- .3 Longitudinal Joints:
- .1 Before rolling, carefully remove with a lute or rake and discard coarse aggregate in asphalt concrete overlapping joint.
  - .2 Roll longitudinal joints directly behind paving operation.
  - .3 When rolling with static roller, shift roller cover onto previously placed lane in order that no more than 150 mm of roll rides on edge of newly laid lane, then operate roller to pinch and press fines gradually across joint. Continue rolling until a thoroughly compacted neat joint is obtained.
  - .4 When rolling with vibratory roller, have most of drum width ride on newly placed lane with remaining 100 to 150 mm extending onto previously placed and compacted lane.
  - .5 When abutting lane is not placed in same day, or when joint is distorted during day's work by traffic or other means, carefully trim edge of lane to line and paint with a thin coating of asphalt before abutting lane is placed.
  - .6 Ensure joints are offset at least 150 to 200 mm from those in lower layers.

#### **4.7 FINISH TOLERANCES**

- .1 Finished asphalt concrete to be within 6 mm of design elevation but not uniformly high or low.
- .2 Finished asphalt concrete not to have irregularities exceeding 6 mm when checked with a 3 m straight edge placed in any direction.

**4.8 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.

**4.9 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.

**END OF SECTION**

**Part 1 General**

**1.1 GENERAL**

- .1 This section consists of the application of asphalt concrete on the bridge deck (North Aspy River (South) Branch Bridge) after the waterproofing membrane and tack coat are applied.

**1.2 RELATED REQUIREMENTS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 07 11 00 – Bridge Deck Waterproofing.
- .3 Section 32 12 13.16 – Asphalt Tack Coat.
- .4 Section 32 12 16 - Asphalt Paving.

**1.3 REFERENCES**

- .1 Nova Scotia Transportation and Infrastructure Renewal (NSTIR):
  - .1 Standard Specifications Highway Construction and Maintenance.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Asphalt Tack Coat: Rapid Setting Emulsified Asphalt RS-1 in accordance with Section 32 12 13.16 – Asphalt Tack Coat.
- .2 Asphalt Binder: Performance Graded Asphalt Binder PG58-28, in accordance with NSTIR Standard Specification, Division 4 Section 2 – Performance Graded Asphalt Binder (PGAB).
- .3 Asphalt Concrete: hot mixed, hot-placed combination of mineral aggregates, uniformly coated and mixed with an asphaltic binder in a suitable mixing plant. Asphalt materials and aggregates shall meet the requirements of NSTIR Standard Specification, Division 4 Section 4 - Asphalt Concrete Hot Mixed – Hot Placed (Method Specification) and Division 4 Section 8 – Asphalt Concrete Paving of Bridge Decks.
- .4 Composition of Asphalt Concrete: to grading and asphalt content to meet requirements of NSTIR Standard Specification, Division 4 Section 4 - Asphalt Concrete Hot Mixed – Hot Placed (Method Specification), Asphalt Mix Type D-HF, as indicated.



**Part 3 Execution**

**3.1 CONSTRUCTION**

- .1 Equipment, Transportation of Mix, Placing and Compacting to be in accordance with Section 32 12 16 – Asphalt Paving.
- .2 Apply tack coat in accordance with Section 07 15 00 Bridge Deck Waterproofing.
- .3 Apply a tack coat of RS-1 emulsion to asphalt surface prior to placing the next lift of mix.
- .4 Place asphalt concrete paving of bridge deck and approach slabs in accordance with manufacturer's specifications of bridge deck waterproofing.
- .5 The deck shall be paved with Asphalt Mix Type D-HF at 2 lifts of 40 mm / lift.
- .6 Trucks or pavers shall not start, stop or turn too quickly on the deck as it is could cause a rupture of the waterproofing. The paver shall travel at a maximum speed of 4 m per minute to provide maximum traction.
  - .1 Material Transfer Vehicle (MTV) shall be used in the placement of all asphalt concrete on this project.
- .7 Breakdown rolling of the asphalt concrete shall commence when the mat cools to 105°C, using a steel wheel roller weighing a minimum of 7 ton. The steel wheel roller shall make only one pass over the mat, running off the deck to stop and turn. Vibratory rollers are not permitted to be used on bridge decks. Final rolling shall be performed with a rubber- tired roller, also running off the deck to stop and turn.
- .8 The final lift of asphalt mix shall provide a smooth transition between bridge and approaches.
- .9 Within 24 hours of paving of the deck and approach slabs, seal the interface between the asphalt concrete and the face of the curb by pouring waterproofing along the joint such that the material extends 25 to 50 mm from the face of the curb and to a thickness of 2 to 4 mm above the asphalt concrete.
- .10 Finish Tolerances and Defective Work to be in accordance with Section 32 12 16 – Asphalt Paving.

**END OF SECTION**

**Part 1            General**

**1.1**

- .1      This section consists of the application of water to the surface of the Work to suppress dust.

**1.2                RELATED REQUIREMENTS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 74 11 - Cleaning.
- .3      Section 31 24 13 – Roadway Embankments.
- .4      Section 32 11 16.01 – Granular Sub-Base.
- .5      Section 32 11 23 – Aggregate Base Courses.

**1.1                MEASUREMENT FOR PAYMENT**

- .1      See Section 01 29 00 – Payment Procedures.

**1.2                REFERENCES**

- .1      Nova Scotia Department of Transportation and Infrastructure Renewal – Standard Specification – (Latest Edition) – Division 2 – Earthworks, Section 9 – Water for Compaction and Dust Control.

**Part 2            Products**

**2.1                MATERIALS**

- .1      Water: to Departmental Representative's approval.
- .2      All water required for roadway dust control must be acquired from outside the Park boundaries.
- .3      All water required for roadway dust control must be acquired from an approved source.

**Part 3 Execution**

**3.1 APPLICATION**

- .1 Apply water with equipment approved by Departmental Representative at a rate of 1L/m<sup>2</sup> for liquid when directed by the Departmental Representative.
- .2 Apply water with distributors equipped with means of shut-off and with spray system to ensure uniform application.
- .3 Application equipment shall be calibrated to provide the proper application rate.
- .4 Failure of the Contractor to provide adequate dust control measures resulting in suspension of Work will be the responsibility of the Contractor.

**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                STANDARD**

- .1        All work of this section shall comply with the requirement of the most recent version of Nova Scotia Department of Transportation and Infrastructure Renewal - Standard Specification - (Latest Edition) - Division 6 - Miscellaneous, Section 6 - Non-Coning Traffic Paint, except as amended herein.

**1.2                MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 – Payment Procedures
- .2        No separate payment for:
  - .1        Painted Arrows
  - .2        Stop Bars
  - .3        Cross-hatching
  - .4        Symbols and Letters
  - .5        Parking Stall Lines

**1.3                REFERENCES**

- .1        Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) - Standard Specification - (Latest Edition) - Division 6 - Miscellaneous, Section 6 - Non-Coning Traffic Paint.
- .2        All pavement lines and markings shall be applied and performed in accordance with the Transportation of Canada (TAC) Manual on Uniform Traffic Control Devices for Canada (MUTDC), Part C.
- .3        Temporary Workplace Traffic Control Manual (TWTCM) (most recent version).

**Part 2            Products**

**2.1                MATERIALS**

- .1        Per the most recent version of the NSTIR - Standard Specification - (Latest Edition) - Division 6 - Miscellaneous, Section 6 - Non-Coning Traffic Paint.

**Part 3 Execution**

**3.1 GENERAL**

.1 As per the requirements of the most recent version of the NSTIR - Standard Specification - (Latest Edition) - Division 6 - Miscellaneous, Section 6 - Non-Coning Traffic Paint, and in conformance with the Contract Documents:

.1 The Departmental Representative shall coordinate pavement pre-marking by NSTIR.

**.2 TRAFFIC CONTROL**

.1 Traffic control shall be provided as per the NSTIR & PW TWTCM.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 01 33 00 - Submittal Procedures.

**1.1                MEASUREMENT FOR PAYMENT**

- .1            See Section 01 29 00 – Payment Procedures.

**1.2                REFERENCES**

- .1            Nova Scotia Department of Transportation and Infrastructure Renewal - Standard Specification - (Latest Edition) - Division 7 - Environmental Protection, Section 5 - Hydroseeding.
- .2            Nova Scotia Department of Transportation and Infrastructure Renewal - Standard Specification - (Latest Edition) - Division 7 Section 6 - Dry Mulching.

**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 Section 01 35 29.06 - Health and Safety Requirements.
- .3            Submit in writing ten (10) days prior to commencing work:
  - .1            Volume capacity of hydraulic seeder in litres.
  - .2            Amount of material to be used per tank based on volume.
  - .3            Number of tank loads required per hectare to apply specified slurry mixture per hectare.
- .4            Samples:
  - .1            Submit 0.5 kg container of each type of fertilizer used.
- .5            Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

- .6 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 Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.
  - .2 Inoculant containers to be tagged with expiry date.
- .3 Storage and Handling Requirements:
  - .1 Store fertilizer off ground and in accordance with manufacturer's recommendations.
  - .2 Replace defective or damaged materials with new.

#### **1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with good environmental practice.
- .2 Divert unused fertilizer from landfill to official hazardous material collections site approved by the Departmental Representative.
- .3 Do not dispose of unused fertilizer into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

#### **1.6 WARRANTY**

- .1 For hydroseeding, 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.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Seed: "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations:
  - .1 Seed Mixture: "Nova Scotia Highway Seed Mix":
    - .1 Mixture composition:
      - .1 40% Creeping Red Fescue.
      - .2 15% Timothy.
      - .3 15% Tall Fescue.
      - .4 10% Kentucky Blue Grass.
      - .5 10% Alsike Clover.
      - .6 5% Red Top.
      - .7 5% Perennial Rye.
    - .2 Mulch: specially manufactured for use in hydraulic seeding equipment, non-toxic, water activated, green colouring, free of germination and growth inhibiting factors with following properties:
      - .1 Type I mulch:
        - .1 Made from wood cellulose fibre.
        - .2 Organic matter content: 95% plus or minus 0.5%.
        - .3 Value of pH: 6.0.
        - .4 Potential water absorption: 900%.
      - .2 Type II mulch:
        - .1 Made from straw, processed to produce fibre lengths of 15 mm minimum and 25 mm maximum. Greater proportions of ingredients to be straw.
      - .3 Tackifier: water soluble vegetable carbohydrate powder.
      - .4 Water: free of impurities that would inhibit germination and growth.
      - .5 Fertilizer:
        - .1 To Canada "Fertilizers Act" and "Fertilizers Regulations".
        - .2 Complete synthetic, slow release with 35% of nitrogen content in water-insoluble form.
      - .6 Inoculants: inoculant containers to be tagged with expiry date.



**Part 3 Execution**

**3.1 WORKMANSHIP**

- .1 Do not spray onto structures, signs, guide rails, fences, plant material, utilities and other than surfaces intended.
- .2 Clean-up immediately, any material sprayed where not intended, to satisfaction of the Departmental Representative.
- .3 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.
- .4 Protect seeded areas from trespass until plants are established.

**3.2 PREPARATION OF SURFACES**

- .1 Fine grade areas to be seeded free of humps and hollows. Ensure areas are free of deleterious and refuse materials.
- .2 Cultivated areas identified as requiring cultivation to depth of 25 mm.
- .3 Ensure areas to be seeded are moist to depth of 150 mm before seeding.

**3.3 PREPARATION OF SLURRY**

- .1 Measure quantities of materials by weight or weight-calibrated volume measurement satisfactory to the Departmental Representative. Supply equipment required for this work.
- .2 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder.
- .3 After all materials are in the seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.

**3.4 SLURRY APPLICATION**

- .1 Hydraulic Seeding Equipment:
  - .1 Slurry tank.
  - .2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and/or mechanical agitation method.
  - .3 Capable of seeding by 50 m hand operated hoses and appropriate nozzles.
  - .4 Tank volume to be certified by certifying authority and identified by authorities "Volume Certification Plate".

- .2 Slurry Mixture Application:
  - .1 Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate of 275 Kg per 100 square metres evenly in one pass.
- .3 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed:
  - .1 Using correct nozzle for application.
  - .2 Using hoses for surfaces difficult to reach and to control application.
- .4 Blend application 300 mm into adjacent grass areas or sodded areas to form uniform surfaces.
- .5 Re-apply where application is not uniform.
- .6 Remove slurry from items and areas not designated to be sprayed.
- .7 Protect seeded areas from trespass satisfactory to the Departmental Representative.
- .8 Remove protection devices as directed by the Departmental Representative.

### **3.5 MULCH**

- .1 Dry mulch in accordance with the Nova Scotia Transportation and Infrastructure Renewal Standard Specification (Latest Edition). Dry Mulch shall be applied through blowing.

### **3.6 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Perform following operations from time of seed application until acceptance by the Departmental Representative.
- .2 Grass Mixture:
  - .1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.
  - .2 Fertilize seeded areas 10 weeks after germination provided plants have mature true leaves. Spread half of required amount of fertilizer in one direction and remainder at right angles; water in well.

### **3.7 ACCEPTANCE**

- .1 Seeded areas will be accepted by the Departmental Representative provided that:
  - .1 Seeded areas are free of rutted, eroded, bare or dead spots.
  - .2 Areas have been fertilized.
- .2 Areas seeded in fall will achieve final acceptance in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

**3.8 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.

**3.9 CLEANING**

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**

**Part 1            General**

**1.1                SUMMARY**

- .1        The Work in this section includes the supply of all labour, supervision, materials, plant, equipment, and transportation necessary for the installation of pipe culverts as shown on the Drawings, per the Specifications, and as directed by the Departmental Representative, complete in every respect. All new culverts shall be reinforced concrete pipes.

**1.2                SECTION INCLUDES**

- .1        Materials and installation for pipe culverts.

**1.3                RELATED REQUIREMENTS**

- .1        Section 01 33 00 - Submittal Procedures.  
.2        Section 31 05 16 - Aggregate Materials.  
.3        Section 31 23 33.01 - Excavating, Trenching and Backfilling.  
.4        Section 31 24 13 - Roadway Embankment.  
.5        Section 31 32 19.01 – Geotextiles.  
.6        Section 31 37 00 – Rip-Rap.  
.7        Section 03 20 00 – Concrete Reinforcing.  
.8        Section 03 30 00 - Cast-In-Place Concrete.

**1.4                MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 - Payment Procedures.

**1.5                REFERENCES**

- .1        American Society for Testing and Materials International, (ASTM):  
.1        ASTM C14M-99, Standard Specification for Concrete Sewer, Storm Drain and Culvert Pipe (Metric).  
.2        ASTM C76M-02, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).  
.3        ASTM C117-95, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.  
.4        ASTM C136-01, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

- .5 ASTM C144-02, Standard Specification for Aggregate for Masonry Mortar.
- .6 ASTM C443M-02, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
- .7 ASTM D698-00a, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m<sup>3</sup>).
- .2 Canadian General Standards Board (CGSB):
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International):
  - .1 CAN/CSA-A3000-08, Cementitious Materials Compendium:
    - .1 CAN/CSA-A5-98, Portland Cement.
    - .2 CAN/CSA-A257 Series-09, Standards for Concrete Pipe.
    - .3 CAN/CSA G401-07, Corrugated Steel Pipe Products.
- .4 Nova Scotia Department of Transportation and Infrastructure Renewal - Standard Specification – (Latest Editions) – Division 2 – Earthworks – Section 12 – Foundation Excavation.
- .5 Nova Scotia Department of Transportation and Infrastructure Renewal - Standard Specification – (Latest Editions) – Division 3 – Granular Materials – Section 2 – Gravel Type 1, 1S, 2 & M.
- .6 Nova Scotia Department of Transportation and Infrastructure Renewal - Standard Specification – (Latest Editions) – Division 5 – Structures – Section 12 – Underground Drainage Systems.

## **1.6 SUBMITTALS**

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Inform the Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
- .3 Submit to Departmental Representative for testing, at least 4 weeks prior to beginning Work, samples of materials proposed for use.
- .4 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work.
- .5 Certification to be marked on pipe.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in suitable locations as to not interfere with the work and protect it from damage.

**1.8 WASTE MANAGEMENT AND DISPOSAL**

- .1 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .2 Divert unused concrete materials from landfill to local facility as approved by Departmental Representative.
- .3 Divert unused aggregate materials from landfill to facility for reuse as approved by Departmental Representative.
- .4 Fold up metal banding, flatten and place in designated area for recycling.

**Part 2 Products**

**2.1 CONCRETE PIPE**

- .1 Reinforced concrete pipe: to CSA A257.
- .2 Rubber gaskets for joints: to CSA A257.
- .3 Cement mortar joint filler:
  - .1 Portland cement: to CSA A3000 - type 10.
  - .2 Sand: to ASTM C144.
  - .3 Mortar: one part by volume of cement to two parts of clean, sharp sand mixed dry. Add sufficient water after mixing to give optimum consistency for hand application.

**2.2 GRANULAR BEDDING**

- .1 Granular bedding and backfill material to Section 31 05 16 - Aggregate Materials.

**Part 3 Execution**

**3.1 TRENCHING**

- .1 Do trenching Work in accordance with the contract drawings and NSTIR Standard Specifications.
- .2 Obtain the Departmental Representative's approval of trench line and depth prior to placing bedding material or pipe.

**3.2 BEDDING**

- .1 Place bedding in accordance with the contract drawings, NSTIR Standard Specifications or the manufacturer specifications; whichever is the most stringent.

- .2 Dewater excavation, as necessary, to allow placement of culvert bedding in dry condition.
- .3 Place minimum thickness of 300 mm of approved granular material on bottom of excavation and compact to minimum 95% maximum density to ASTM D698.
- .4 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 the Departmental Representative.
- .5 Place bedding in unfrozen condition.

### **3.3 LAYING CONCRETE PIPE CULVERTS**

- .1 Begin at downstream end of culvert with flanged end of first pipe section facing upstream.
- .2 Ensure first and last pipe sections are properly positioned and secured in cut-off wall.
- .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.

### **3.4 JOINTS: CONCRETE PIPE CULVERTS**

- .1 Joints may be made with rubber gaskets, bituminous jointing compound or Portland cement mortar:
  - .1 Rubber gasket joints:
    - .1 Install in accordance with manufacturer's written recommendations.
    - .2 Ensure that tapered ends are fully entered into flanged ends.
  - .2 Bituminous filled joint:
    - .1 Make joint with excess of filler to form continuous bead around outside of pipe and finish smooth on inside.
  - .3 Mortar joints:
    - .1 Prepare mortar as specified herein.
    - .2 Clean pipe ends and wet with water before joint is made.
    - .3 Place mortar in lower half of flanged end of pipe section in place.
    - .4 Apply mortar to upper half of tapered end of pipe section being installed.
    - .5 Join pipe ends and force joint up tight, taking care to ensure inner surfaces of abutting pipe sections are flush and even.
    - .6 Clean inside of pipe and annular space between ends of pipes after each joint is made.
    - .7 Fill joint with mortar and finish smooth and even.

- .8 For pipes 800 mm or less diameter, fill joints before mortar in joints has set.
- .9 For pipes over 800 mm diameter, postpone filling joint until backfilling has been completed. Re-clean joints before applying mortar.

### **3.5 BACKFILLING**

- .1 Place backfill in accordance with contract drawings, NSTIR Standard Specifications and to the Approval of the Departmental Representative.
- .2 Backfill around and over culverts as indicated or as directed by the Departmental Representative.
- .3 Place backfill material, approved by the Departmental Representative in 150 mm layers to full width, alternately on each side of culvert, so as not to displace it laterally or vertically.
- .4 Compact each layer to 95% maximum density to ASTM D698 taking special care to obtain required density under haunches.
- .5 Protect installed culvert with minimum 900 mm cover (or as recommended by the Manufacturer) of compacted fill before heavy equipment is permitted to cross. During construction, width of fill, at its top, to be at least twice diameter or span of pipe and with slopes not steeper than 1:2.
- .6 Place backfill in unfrozen condition.

### **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.

**END OF SECTION**



**Part 1            General**

**1.1                STANDARD**

- .1        All work of this section shall comply with the requirement of the most recent version of the Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) - Standard Specification - (Latest Edition) - Division 5 - Section 6 - Steel Guard Rail Systems and Wooden Guide Posts, except as amended herein.

**1.2                RELATED REQUIREMENTS**

- .1        Section 01 33 00 - Submittal Procedures.
- .2        Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .3        Section 32 11 16.01 – Granular Sub-Base.

**1.3                MEASUREMENT FOR PAYMENT**

- .1        See Section 01 29 00 – Payment Procedures

**1.4                REFERENCES**

- .1        Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) - Standard Specification - (Latest Edition) - Division 5 - Section 6 - Steel Guard Rail Systems and Wooden Guide Posts.

**Part 2            Products**

**2.1                MATERIALS**

- .1        Per the most recent version of the Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) - Standard Specification - (Latest Edition) - Division 5 - Section 6 - Steel Guard Rail Systems and Wooden Guide Posts.

**Part 3            Execution**

**3.1                GENERAL**

- .1        As per the requirements of the most recent version of the Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) - Standard Specification - (Latest Edition) - Division 5 - Section 6 - Steel Guard Rail Systems and Wooden Guide Posts.

- .2 150 mm x 150 mm posts and blocks will not be permitted. All posts and blocks shall be 200 mm x 200 mm.
- .3 Bury both ends of guard rail, as per NSTIR standard drawing (HS520).
- .4 2 – 100 mm spike toe nails are required through the block into each post.
- .5 Cutting of posts is not permitted without approval of the Departmental Representative.

**END OF SECTION**

**APPENDIX A**

**FINAL REPORT, GEOTECHNICAL  
INVESTIGATION, NORTH ASPY  
BRIDGE, CAPE BRETON  
HIGHLANDS NATIONAL PARK,  
NOVA SCOTIA**

File No: 133346833



Prepared for:  
Parks Canada

Prepared by:  
Stantec Consulting Ltd.  
102-40 Highfield Park Drive  
Dartmouth NS B3A 0A3  
Tel: (902) 468-7777  
Fax: (902) 468-900

March 10, 2016

March 10, 2016

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# FINAL REPORT, GEOTECHNICAL INVESTIGATION, NORTH ASPY BRIDGE, CAPE BRETON HIGHLANDS NATIONAL PARK, NOVA SCOTIA

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## 1.0 INTRODUCTION

Acting on the request and authorization of Parks Canada, Stantec Consulting Ltd. (Stantec) has completed a geotechnical investigation for the proposed reconstruction of the North Aspy Bridge in Cape Breton Highlands National Park, Nova Scotia.

The existing North Aspy Bridge is a single-span (16.5 m) bridge consisting of a concrete deck on steel girders, rehabilitated in 1995. We understand that the proposed work consists of the reconstruction of the bridge with a new single-span structure. The purpose of this geotechnical investigation is to determine the subsurface soil, rock, and groundwater conditions at the site and to provide geotechnical comments and recommendations to assist with site earthworks and foundation design.

The scope of work completed for this project was in general accordance with Stantec's proposal dated January 9, 2015 and included the following:

- Completion of a geotechnical field investigation consisting of six boreholes;
- Completion of a laboratory testing program;
- Preparation of this report presenting the findings of the field investigation and laboratory analyses, as well as comments and recommendations to aid with site earthworks and foundation design.

This report has been prepared specifically and solely for the proposed project described herein and contains all of the findings of this investigation.

## 2.0 SITE AND GEOLOGY

North Aspy Bridge spans Aspy River and is located at the Big Intervale boundary at kilometer marker 51.0 along the Cabot Trail in Cape Breton Highlands National Park. The location of the existing bridge (to be reconstructed) is shown on Drawing No. 1, Borehole Location Plan, in Appendix A. We understand that the proposed new alignment, also shown on Drawing 1, is located approximately 20 to 30 m south of the existing bridge.

Previous experience in the area and geological mapping indicates that the native overburden material consists of alluvial deposits extending to bedrock of the Horton Group.

## 3.0 INVESTIGATIVE PROCEDURES

The geotechnical field investigation, consisting of six boreholes, was completed between November 21<sup>st</sup> and December 4<sup>th</sup>, 2015. Conditions at each test location were observed and logged by our geotechnical personnel.



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Two boreholes were advanced at or near the proposed west abutment (BH-2 and BH-3), one was advanced along the west approach (BH-1), two were advanced at or near the proposed east abutment (BH-4 and BH-5) and one borehole was advanced along the east approach (BH-6).

Boreholes were drilled to depths ranging from 5.9 m and 7.3 m below the ground surface near the bridge approaches, and depths of up to 15.3 m and 27.4 m below ground surface near the west and east bridge abutments, respectively. Upon completion of drilling, standpipes were installed in selected boreholes.

The boreholes were advanced using a combination of 100-mm solid stem augers and HW-sized casing. Soils sampling was carried out at regular intervals using conventional split spoon samplers while performing standard penetration testing as described in ASTM D1586. The Standard Penetration Test (SPT) "N-value" is the number of blows required to advance a 50-mm outer-diameter split-spoon sampler a distance of 300 mm into the soil using a standardized drop height and weight. N-values generally provide an indication of soil consistency or compactness and may also be used to aid in estimation of other soil parameters.

Samples recovered from the boreholes were taken to our geotechnical laboratory in Dartmouth, Nova Scotia for final classification and testing. Laboratory testing on selected soil samples included water content determinations (ASTM D2216) and grain size analyses (ASTM D422). Unconfined compressive strength testing (ASTM D4543) and point load testing were conducted on samples of rock core recovered from the boreholes.

Detailed logs of the subsurface conditions encountered, along with the sampling and testing performed, are presented on the appended Borehole Records or on separate figures in Appendix A. Soil descriptions used throughout this report are in general accordance with the Unified Soil Classification System (ASTM D2487/D2488).

The locations and ground surface elevations for each borehole were surveyed by others, on behalf of Parks Canada. Elevations are referenced to geodetic.

## 4.0 SUBSURFACE CONDITIONS

The subsurface conditions observed in the boreholes are summarized in Table 1 and in the following paragraphs and are described in detail on the appended Borehole Records.



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**Table 1 Summary of Subsurface Conditions**

Location	Ground Elevation <sup>(a)</sup> (m)	Thickness					Bedrock		Groundwater	
		Surficial Layer (m)	Fill (m)	Sand with Silt and Gravel (m)	Sand (m)	Sand with Gravel to Gravel with Sand (m)	Depth to Surface (m)	Surface Elev. <sup>(a)</sup> (m)	Depth (m)	Elev. <sup>(a)</sup> (m)
BH-1	39.2	0.3	1.8	-	3.8	>1.4	-	-	2.4	36.9
BH-2	38.1	0.8	-	13.6	6.4	3.7	24.4	13.7	2.1	36.0
BH-3	37.9	0.5	-	16.3	1.5	2.7	21.0	16.8	-	-
BH-4	38.7	0.6	-	11.1	-	-	11.7	27.0	2.5	36.2
BH-5	47.0	0.6	-	>13.6	-	-	-	-	-	-
BH-6	50.0	0.3	2.6	-	0.3	-	3.2	46.8	3.1	46.9

(a) Elevations are referenced to geodetic.

## 4.1 SURFICIAL LAYER (ASPHALT/TOPSOIL)

A 0.30 m thick layer of asphalt was encountered at the surface of boreholes BH-1 and BH-6. A 0.46 m to 1.39 m thick layer of sod, topsoil and organic soil was encountered at the surface of boreholes BH-2, BH-3, BH-4, and BH-5.

## 4.2 FILL

Brown fill, ranging in thickness from 1.8 m to 2.6 m, was encountered underlying the surficial layer of asphalt in BH-1 and BH-6.

Based on our field classifications, the fill may be described as brown well-graded gravel with silt and sand. The water contents of the two samples tested from this layer were 6.5% and 6.0%.

## 4.3 SAND WITH SILT AND GRAVEL

In the boreholes near the abutments (BH-2, BH-3, BH-4 and BH-5) a layer of brown sand with silt and gravel was encountered below the topsoil. Occasional to some cobbles were identified within the matrix. Where encountered, this layer ranged in thickness from 11.1 m to 16.3 m.

Based on Standard Penetration Test N-Values, the relative density of this layer may be described as compact to dense.

A grain-size analysis performed on BH-4 SS8 resulted in 39% gravel, 53% sand and 8% silt- and clay-sized particles. The natural water contents of seventeen samples ranged from 10% to 15%, with an average of 11%.



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## **4.4 SAND**

A layer of brown sand was encountered beneath the fill in BH-1 and BH-6 and beneath the sand with silt and gravel in boreholes BH-2 and BH-3. It ranged in thickness from 0.30 m (BH-6) to 6.39 m (BH-2).

A grain size analysis performed on BH-2 SS20 resulted in 3% gravel, 95% sand, and 2% silt- and clay-sized particles. The natural water contents of three samples ranged from 13% to 23%, with an average of 18%.

Based on Standard Penetration Test N-Values the relative density of this layer may be described as very loose to compact.

## **4.5 SAND WITH GRAVEL TO GRAVEL WITH SAND**

Brown gravel with silt and sand to sand with silt and gravel was encountered underlying the sand in borehole BH-1, BH-2 and BH-3. Some cobbles and boulders were encountered.

The natural water content of one sample (BH-2 SS24) was 14%.

Based on Standard Penetration Test N-Values, the relative density of this layer may be described as compact to dense.

## **4.6 BEDROCK**

Bedrock was encountered in BH-2, BH-3, BH-4 and BH-6 at depths ranging from 3.2 m to 24.4 m below the ground surface. Bedrock may generally be described as poor to good quality, brown to grey, moderately weathered limestone. Unconfined compressive strength testing was performed on two samples of HQ-sized rock core. Point load strength testing was performed on four samples of HQ-sized rock core; the results are summarized in Table 2.

**Table 2 Unconfined Compressive Strength and Point Load Strength Test Results**

<b>Borehole and Sample</b>	<b>Depth (m)</b>	<b>Compressive Strength (MPa)</b>	<b>Average Inferred <math>Q_u</math> (MPa) for Point Load</b>
BH-2, HQ-25	24.5	49	-
BH-3, HQ-17	24.1	45	-
BH-2, HQ-25	25.6	-	55
BH-3, HQ-17	22.2	-	12
BH-4, HQ-13	13.1	-	22
BH-4, HQ-14	14.3	-	12

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## **4.7 GROUNDWATER**

Groundwater levels were measured in four boreholes (BH-1, BH-2, BH-4 and BH-6) on December 5<sup>th</sup>, 2015. Near the west approach (BH-1) the measured groundwater level was 2.4 m below ground surface. Near the west abutment (BH-2) the measured groundwater level was 2.1 m below ground surface. Near the east abutment (BH-4) the measured groundwater level was 2.5 m below ground surface. Near the east approach (BH-6) the measured groundwater level was 3.1 m below ground surface. Due to the close proximity of boreholes BH-2 and BH-4 to the North Aspy, South Branch River, it is anticipated that groundwater levels near the abutments will be at or near, and fluctuate with, the river elevation. Water levels may fluctuate with construction activity and in response to precipitation events and climatic and seasonal weather trends.

## **5.0 DISCUSSION AND RECOMMENDATIONS**

We understand that a single-span bridge is proposed to replace the existing bridge; integral abutments are proposed. We further understand that the new bridge alignment will be slightly to the south of the existing bridge alignment. The old bridge will remain in service while the new bridge is being constructed.

### **5.1 SITE PREPARATION**

Based on our understanding of the proposed alignment, it is anticipated that approach fills up to approximately 3.0 m thick (at the eastern abutment) may be necessary to achieve design grades.

It is recommended that any existing rootmat/topsoil beneath the footprints of the approach fill embankments be grubbed. Exposed site soils may be susceptible to deterioration due to trafficking, especially during periods of precipitation or when working below/near the groundwater table. Therefore, prepared surfaces should be protected to minimize the amount of degradation. It would be prudent to provide a stabilizing layer of rock fill (300 to 600 mm in thickness) in areas where exposed soils will be subject to high construction traffic.

Existing site materials may, subject to testing, be suitable to support the approach fills. All material within the zone of influence of the approach fills should be inspected by qualified geotechnical personnel and any deleterious materials (i.e., organic materials, debris) should be removed. The exposed soil surface should be re-graded and compacted prior to fill placement.

Our field investigation indicates that the majority of the native site soils (gravel with sand to sand with gravel) have a compact to dense compactness condition, although a layer very loose to compact sand is also present beneath the west abutment. It is understand that approach fills up to 3.0 m thick may be required. A 3.0 m thick layer of fill is expected to result in less than 50 mm

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of settlement, with the majority of this occurring during and immediately following construction (within several days to several weeks).

Portions of the existing site material (generally native sand and gravel; inorganic materials from above the groundwater level at a water content that allows for compaction to the requirements below) or imported fill would be a suitable option for use as approach fill. Approach fill should generally be compacted to at least 95% of the standard Proctor maximum dry density (SPMDD) and the upper 1.5 m below subgrade should be compacted to a minimum of 100% of the material SPMDD. Approach fill should be placed in lifts compatible with the compaction equipment used and at a water content that will allow compaction to the specified density.

Prior to placement of pavement gravels, the subgrade should be tested with a loaded tandem truck under the supervision of qualified geotechnical personnel. Any soft areas or yielding material with deflections greater than 20 mm within the subgrade should be removed and replaced with suitable material.

If water is encountered in excavations, it should be directed to sumps and pumped. Good practice suggests that surface water should be directed away from excavations using ditches/swales. Any water discharged from site should meet all applicable regulatory requirements.

## 5.2 SLOPES

Temporary slopes (for construction) of the approach fills should be no steeper than 1.5 horizontal to 1 vertical (1.5H:1V) and permanent slopes in the approach fills should be no steeper than 2.0H:1V.

If required, temporary cut slopes in the existing sand and gravel should be no steeper than 1.5H:1V. Permanent cut slopes in the existing sand and gravel should be no steeper than 2.5H:1V. Permanent cut slopes should be vegetated or provided with a coarse gravel blanket to mitigate erosion.

## 5.3 ABUTMENTS (PILES)

### 5.3.1 Axial Capacity

The use of steel H-piles or open-ended pipe piles driven to practical refusal in bedrock is a suitable option to support the bridge abutments. These piles may be designed using a ULS geotechnical axial compressive resistance of 75 MPa based on the cross-sectional area of the steel. In accordance with the Canadian Highway Bridge Design Code (CAN/CSA S6-14, 2014) Clause 6.9.1 this includes a resistance factor of 0.4. The capacity of pile groups may be calculated as the sum of the individual pile capacities provided that the centre-to-centre

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spacing of the piles is a minimum of three pile diameters. The expected SLS settlement of piles driven to refusal on or in bedrock is negligible.

The factored compressive axial resistance of several sections is provided below; we would be pleased to review other sections upon your request. To achieve this capacity, the piles should penetrate the overburden and may also be required to penetrate into the bedrock.

<u>Pile Type</u>	<u>Factored Axial Resistance</u>
HP 360 x 152	1750 kN (compression)
HP 360 x 132	1500 kN (compression)
HP 310 x 125	1430 kN (compression)

The proposed approach fills will raise the existing grade. As a result, there will be drag loads due to negative skin friction on the piles. Drag loads should be considered in structural design of the piles. The negative skin friction on the pile, the pile cap, and the abutment surface may be taken as 0.3 times the vertical effective stress in the existing sand and gravel. The total unit weight of the sand with gravel to gravel with sand material used in this analysis should be taken as 21 kN/m<sup>3</sup> and the total unit weight of the sand layer should be taken as 20 kN/m<sup>3</sup>.

### 5.3.2 Lateral Resistance

The lateral capacity of piles was analyzed using the program LPile Plus v5.0 developed by Ensoft (Ensoft, 2004). An HP 310x132 pile section was modeled in weak axis bending, with a modulus of elasticity of 200,000 MPa for steel. In addition, the piles were assumed to have a fixed head condition (that is, the slope at the pile head is 0 degrees, and the pile is in double curvature).

Several p-y curves were generated by LPile, which relate the non-linear soil response of a pile, i.e., load (p) with the lateral deflection (y). From the p-y curves, the linear spring constant, k, was generated for the elastic region of the curve by determining the slope of each curve between the origin (0,0) and the maximum allowable deflection. Spring constants were generated for each 0.25 m segment and are shown on Figure 2 in Appendix A.

### 5.3.3 Group Effects on Lateral Deflections

If piles are spaced less than 8 pile diameters, centre to centre, parallel to the direction of lateral load, or less than 4 pile diameters, centre to centre, perpendicular to the load, group effects will need to be considered. The lateral load at a specific deflection may need to be decreased.

The nature of pile-soil-pile interaction is complex; however, it is generally broken down into the following main components:

- alteration of the soil state due to pile installation and the potential overlap of the alterations when nearby piles are driven; and
- superposition of strains and alterations of the soil failure zones when nearby piles are simultaneously loaded.



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Reese *et al.* (2006) have reported the following reduction factors between single piles and pile groups in terms of pile group efficiency.

**Table 3 Reduction Factors for Pile Groups (adapted from Reese et al., 2006)**

<b>Case 1: Load Parallel to Pile Spacing</b>		
<b>Pile Centre-to-Centre Spacing in Pile Diameters</b>	<b>Trailing Pile Group Efficiency <math>e_T</math></b>	<b>Leading Pile Group Efficiency <math>e_L</math></b>
7	1.0	1.0
4	0.8	1.0
3	0.7	0.9
2	0.6	0.8
<b>Case 2: Load Perpendicular to Pile Spacing</b>		
<b>Pile Centre-to-Centre Spacing in Pile Diameters</b>	<b>Pile Group Efficiency (<math>e_p</math>)</b>	
4	1.0	
3	0.9	
2	0.75	

If piles are on a skew to each other with respect to the direction of load, the efficiency of the pile group ( $e_s$ ) may be calculated as (Reese *et al.*, 2006):

$$e_s = (e_B^2 \cos^2\alpha + e_p^2 \sin^2\alpha)^{1/2}$$

$e_B$  = either  $e_T$  or  $e_L$  from the above table (Table 3), and

$\alpha$  = angle between direction of loading and the skew.

Note that when piles are more than 3.3 pile diameters apart in the direction perpendicular to the direction of the load, the skew correction is not necessary. The lateral load at a specific deflection for each individual pile must consider the interaction of all piles within the group.

The reduction factor applied to a pile is the product of the efficiencies of all of the interactions of piles within that pile group.

### **5.3.4 Pile Installation**

The piles should be driven with a hammer having a minimum rated energy of 450 Joules/cm<sup>2</sup> of steel cross-sectional area. Practical refusal in bedrock should be taken as pile penetration of less than 25 mm for 15 blows. To protect the pile during installation, drive shoes should be used and the contractor should provide full details on the method of installation and equipment prior to starting the work. A WEAP analysis should be carried out prior to driving the piles using the specific hammer proposed and the selected pile, to ensure the hammer is capable of advancing the piles to the required depth and refusal to obtain the necessary resistance.

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Dynamic pile monitoring (e.g. Pile Driving Analyzer System) should be carried out on the initial pile installations to verify that overstressing does not occur, that the hammer is operating within normal efficiencies, and that the estimated resistance provided for design is achieved at the set criteria. As a minimum, dynamic pile monitoring should consist of at least one initial drive and one re-strike for each abutment. Full-time inspection by qualified geotechnical personnel is recommended during pile installation.

To evaluate the potential for relaxation to occur following initial driving, at least two piles at each abutment should be re-struck a minimum of 24 hours after initial driving refusal. If relaxation occurs, all piles should be re-driven to the refusal criteria and the cycle repeated until the refusal criteria can be achieved during the re-strike. If significant relaxation continues to occur, dynamic pile monitoring should be carried out to determine if the required load capacity is being developed.

Pile caps should be founded a minimum of 1.2 m below finish grade to provide adequate frost protection.

Previous experience with other river crossings in the National Park suggest the bedrock is likely to have a significant change in elevation over relatively short distances, typically getting deeper toward the river. Allowances for variable pile lengths should be accommodated in the design.

## 5.4 RETAINING WALLS

Backfill placed against retaining walls should be a non-frost susceptible, non-expansive, non-corrosive, free-draining, well-graded material such as fill against structure, Gravel Type 1, or Gravel Type 2 as specified by Nova Scotia Transportation and Infrastructure Renewal's Standard Specification for Highway Construction and Maintenance. The extent of the granular backfill should be in accordance with the wall design requirements.

Retaining walls should be designed to ensure thorough drainage of the backfill material. This may be accomplished with a drainage system such as a longitudinal drain pipe discharging to a positive outlet. Backfill should be placed in lifts and compacted to a minimum 95 percent of standard Proctor maximum dry density. To limit compaction-induced stresses, compaction immediately adjacent to the wall should be accomplished using lightweight compaction equipment and relatively thin soil lifts.

The earth pressure coefficients used for design should be selected based on the appropriate finished back-slope angle. The unfactored values for the parameters presented in Section 5.5 may be used for design purposes. Walls that can tolerate little or no movement should be designed for at-rest lateral earth pressures.

## 5.5 SOIL PARAMETERS

The following unfactored values for the indicated parameters may be used for design purposes:



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**Table 4 Unfactored Geotechnical Material Parameters**

Parameter	Value		
	In-Situ Sand with Gravel to Gravel with Sand	In-Situ Sand	Compacted NSTIR Fill Against Structure, Gravel Type 1 or 2 (a)(b)
Effective Angle of Internal Friction, degrees	34	32	36
Cohesion, kPa	0	0	0
Total Unit Weight, kN/m <sup>3</sup>	21.0	20.0	21.0
Submerged Unit Weight (c), kN/m <sup>3</sup>	11.0	10.0	11.0
Coefficient of Active Earth Pressure <sup>(d)</sup>	0.28	0.31	0.26
Coefficient of Passive Earth Pressure <sup>(d)</sup>	3.54	3.25	3.85
Coefficient of At-Rest Earth Pressure <sup>(d)</sup>	0.44	0.47	0.41
Friction Factor, Soil/Concrete Interface <sup>(e)</sup>	0.50	0.40	0.50

- (a) Material shall be placed in lifts and suitably compacted as described in geotechnical investigation report.
- (b) As per Nova Scotia Transportation and Infrastructure Renewal's Standard Specification for Highway Construction and Maintenance (2011).
- (c) For uplift design the groundwater table should be assumed at the ground surface and submerged unit weights should be used.
- (d) Coefficients of earth pressure assume a frictionless wall with a vertical back face and a horizontal back slope.
- (e) For mass concrete or masonry; lower values will be required for formed or pre-cast concrete.

## 5.6 PAVEMENT DESIGN

Based on the existing soil conditions, proposed approach fills, and expected traffic loadings, the following pavement structure is recommended:

**Table 5 Pavement Structure**

Materials	Pavement Structure
Asphalt Type C-HF	50 mm
Asphalt Type B-HF	60 mm
Type 1 Gravel	150 mm
Type 2 Gravel	450 mm

The pavement design is based on the subgrade soils being in a stable condition at the time the granular materials are placed. The subgrade soils may become soft and constructability can be a problem. In such cases, a stabilizing layer of rockfill and/or filter fabric may be required.

The asphalt concrete and Type 1 and Type 2 granular material should conform to the most recent version of the Nova Scotia Transportation and Infrastructure Renewal Standard Specification.



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## **5.7 WINTER WEATHER CONDITIONS**

If practical, earthwork during freezing temperatures should be avoided. In the event of winter construction, special measures will be required to ensure that fills and foundations are not placed on frozen ground and that the soils are protected from freezing after placement. Even following these procedures and precautions experience has shown that earthworks in these types of soils become impractical at temperatures below approximately  $-5^{\circ}\text{C}$ .

## **5.8 SEISMIC SITE CLASSIFICATION**

Based on the findings at boreholes, the site classification for seismic site response in accordance with Clause 4.4.3.2 of the Canadian Highway Bridge Design Code (CAN/CSA-S6-14, 2014) is Seismic Site Class D (stiff soil).

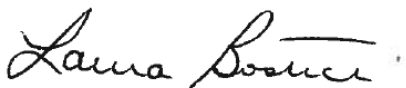
## **6.0 CLOSURE**

Use of this report is subject to the Statement of General Conditions, attached. It is the responsibility of Parks Canada, who is identified as "the Client", within the Statement of General Conditions, and its agents to review the conditions and to notify Stantec should any of these not be satisfied. The Statement of General Conditions addresses the following: use of the report; basis of the report; standard of care; interpretation of site conditions; varying or unexpected site conditions; and planning, design or construction.

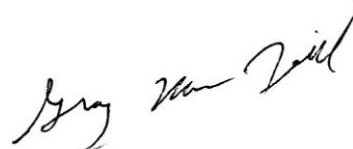
Stantec requests an opportunity to review the comments and recommendations provided herein when the project specifications and drawings become available. We trust this report meets your present requirements. Should any additional information be required, please do not hesitate to contact our office at your convenience.

Sincerely,

**STANTEC CONSULTING LTD.**



Laura Bostwick, M.Sc.(Eng.), P.Eng.  
Geotechnical Engineer  
Phone: (506) 636-9636  
Fax: (506) 634-8104  
Laura.Bostwick@stantec.com



S. Greg MacNeill, P.Eng.  
Principal, Geotechnical Engineering  
Phone: (902) 468-0426  
Fax: (902) 468-9009  
Gregory.MacNeill@stantec.com

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## **APPENDIX A**

Statement of General Conditions

Symbols and Terms Used on Borehole and Test Pit Records

Borehole Records

Grain-Size Analyses

Figure 2 – LPile Results

Drawing No. 1, Borehole Location Plan

## STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Consulting Ltd. and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec Consulting Ltd.'s present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec Consulting Ltd. is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Consulting Ltd. at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Consulting Ltd. must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Consulting Ltd. will not be responsible to any party for damages incurred as a result of failing to notify Stantec Consulting Ltd. that differing site or subsurface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec Consulting Ltd., sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Consulting Ltd. cannot be responsible for site work carried out without being present.

## SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

### SOIL DESCRIPTION

#### Terminology describing common soil genesis:

<i>Rootmat</i>	- vegetation, roots and moss with organic matter and topsoil typically forming a mattress at the ground surface
<i>Topsoil</i>	- mixture of soil and humus capable of supporting vegetative growth
<i>Peat</i>	- mixture of visible and invisible fragments of decayed organic matter
<i>Till</i>	- unstratified glacial deposit which may range from clay to boulders
<i>Fill</i>	- material below the surface identified as placed by humans (excluding buried services)

#### Terminology describing soil structure:

<i>Desiccated</i>	- having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
<i>Fissured</i>	- having cracks, and hence a blocky structure
<i>Varved</i>	- composed of regular alternating layers of silt and clay
<i>Stratified</i>	- composed of alternating successions of different soil types, e.g. silt and sand
<i>Layer</i>	- > 75 mm in thickness
<i>Seam</i>	- 2 mm to 75 mm in thickness
<i>Parting</i>	- < 2 mm in thickness

#### Terminology describing soil types:

The classification of soil types are made on the basis of grain size and plasticity in accordance with the Unified Soil Classification System (USCS) (ASTM D 2487 or D 2488) which excludes particles larger than 75 mm. For particles larger than 75 mm, and for defining percent clay fraction in hydrometer results, definitions proposed by Canadian Foundation Engineering Manual, 4<sup>th</sup> Edition are used. The USCS provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

#### Terminology describing cobbles, boulders, and non-matrix materials (organic matter or debris):

Terminology describing materials outside the USCS, (e.g. particles larger than 75 mm, visible organic matter, and construction debris) is based upon the proportion of these materials present:

<i>Trace, or occasional</i>	Less than 10%
<i>Some</i>	10-20%
<i>Frequent</i>	> 20%

#### Terminology describing compactness of cohesionless soils:

The standard terminology to describe cohesionless soils includes compactness (formerly "relative density"), as determined by the Standard Penetration Test (SPT) N-Value - also known as N-Index. The SPT N-Value is described further on page 3. A relationship between compactness condition and N-Value is shown in the following table.

Compactness Condition	SPT N-Value
<i>Very Loose</i>	<4
<i>Loose</i>	4-10
<i>Compact</i>	10-30
<i>Dense</i>	30-50
<i>Very Dense</i>	>50

#### Terminology describing consistency of cohesive soils:

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by *in situ* vane tests, penetrometer tests, or unconfined compression tests. Consistency may be crudely estimated from SPT N-Value based on the correlation shown in the following table (Terzaghi and Peck, 1967). The correlation to SPT N-Value is used with caution as it is only very approximate.

Consistency	Undrained Shear Strength		Approximate SPT N-Value
	kips/sq.ft.	kPa	
<i>Very Soft</i>	<0.25	<12.5	<2
<i>Soft</i>	0.25 - 0.5	12.5 - 25	2-4
<i>Firm</i>	0.5 - 1.0	25 - 50	4-8
<i>Stiff</i>	1.0 - 2.0	50 - 100	8-15
<i>Very Stiff</i>	2.0 - 4.0	100 - 200	15-30
<i>Hard</i>	>4.0	>200	>30

## ROCK DESCRIPTION

Except where specified below, terminology for describing rock is as defined by the International Society for Rock Mechanics (ISRM) 2007 publication "The Complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring: 1974-2006"

### Terminology describing rock quality:

RQD	Rock Mass Quality
0-25	Very Poor Quality
25-50	Poor Quality
50-75	Fair Quality
75-90	Good Quality
90-100	Excellent Quality

Alternate (Colloquial) Rock Mass Quality	
Very Severely Fractured	Crushed
Severely Fractured	Shattered or Very Blocky
Fractured	Blocky
Moderately Jointed	Sound
Intact	Very Sound

**RQD (Rock Quality Designation)** denotes the percentage of intact and sound rock retrieved from a borehole of any orientation. All pieces of intact and sound rock core equal to or greater than 100 mm (4 in.) long are summed and divided by the total length of the core run. RQD is determined in accordance with ASTM D6032.

**SCR (Solid Core Recovery)** denotes the percentage of solid core (cylindrical) retrieved from a borehole of any orientation. All pieces of solid (cylindrical) core are summed and divided by the total length of the core run (It excludes all portions of core pieces that are not fully cylindrical as well as crushed or rubble zones).

**Fracture Index (FI)** is defined as the number of naturally occurring fractures within a given length of core. The Fracture Index is reported as a simple count of natural occurring fractures.

### Terminology describing rock with respect to discontinuity and bedding spacing:

Spacing (mm)	Discontinuities	Bedding
>6000	Extremely Wide	-
2000-6000	Very Wide	Very Thick
600-2000	Wide	Thick
200-600	Moderate	Medium
60-200	Close	Thin
20-60	Very Close	Very Thin
<20	Extremely Close	Laminated
<6	-	Thinly Laminated

### Terminology describing rock strength:

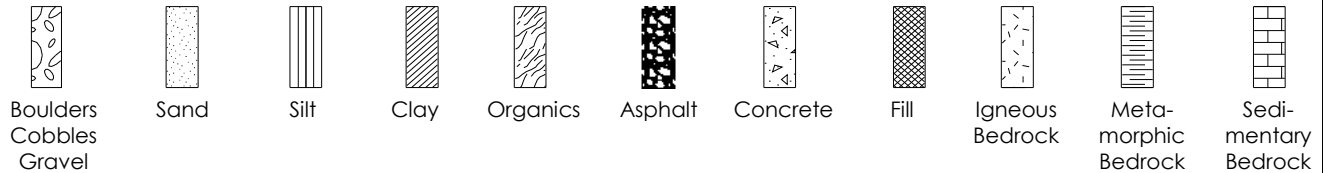
Strength Classification	Grade	Unconfined Compressive Strength (MPa)
Extremely Weak	R0	<1
Very Weak	R1	1 – 5
Weak	R2	5 – 25
Medium Strong	R3	25 – 50
Strong	R4	50 – 100
Very Strong	R5	100 – 250
Extremely Strong	R6	>250

### Terminology describing rock weathering:

Term	Symbol	Description
Fresh	W1	No visible signs of rock weathering. Slight discoloration along major discontinuities
Slightly	W2	Discoloration indicates weathering of rock on discontinuity surfaces. All the rock material may be discolored.
Moderately	W3	Less than half the rock is decomposed and/or disintegrated into soil.
Highly	W4	More than half the rock is decomposed and/or disintegrated into soil.
Completely	W5	All the rock material is decomposed and/or disintegrated into soil. The original mass structure is still largely intact.
Residual Soil	W6	All the rock converted to soil. Structure and fabric destroyed.

## STRATA PLOT

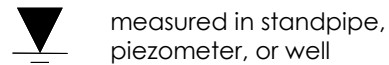
Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols. The dimensions within the strata symbols are not indicative of the particle size, layer thickness, etc.



## SAMPLE TYPE

SS	Split spoon sample (obtained by performing the Standard Penetration Test)
ST	Shelby tube or thin wall tube
DP	Direct-Push sample (small diameter tube sampler hydraulically advanced)
PS	Piston sample
BS	Bulk sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond coring bits.

## WATER LEVEL MEASUREMENT



measured in standpipe, piezometer, or well



inferred

## RECOVERY

For soil samples, the recovery is recorded as the length of the soil sample recovered. For rock core, recovery is defined as the total cumulative length of all core recovered in the core barrel divided by the length drilled and is recorded as a percentage on a per run basis.

## N-VALUE

Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 140 pound (63.5 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (300 mm) into the soil. In accordance with ASTM D1586, the N-Value equals the sum of the number of blows (N) required to drive the sampler over the interval of 6 to 18 in. (150 to 450 mm). However, when a 24 in. (610 mm) sampler is used, the number of blows (N) required to drive the sampler over the interval of 12 to 24 in. (300 to 610 mm) may be reported if this value is lower. For split spoon samples where insufficient penetration was achieved and N-Values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75). Some design methods make use of N-values corrected for various factors such as overburden pressure, energy ratio, borehole diameter, etc. No corrections have been applied to the N-values presented on the log.

## DYNAMIC CONE PENETRATION TEST (DCPT)

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to 'A' size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone one foot (300 mm) into the soil. The DCPT is used as a probe to assess soil variability.

## OTHER TESTS

S	Sieve analysis
H	Hydrometer analysis
k	Laboratory permeability
$\gamma$	Unit weight
$G_s$	Specific gravity of soil particles
CD	Consolidated drained triaxial
CU	Consolidated undrained triaxial with pore pressure measurements
UU	Unconsolidated undrained triaxial
DS	Direct Shear
C	Consolidation
$Q_u$	Unconfined compression
$I_p$	Point Load Index ( $I_p$ on Borehole Record equals $I_p(50)$ in which the index is corrected to a reference diameter of 50 mm)

	Single packer permeability test; test interval from depth shown to bottom of borehole
	Double packer permeability test; test interval as indicated
	Falling head permeability test using casing
	Falling head permeability test using well point or piezometer



# BOREHOLE RECORD

# BH 1

CLIENT PARKS CANADA

PROJECT No. 133346833

LOCATION NORTH ASPY BRIDGE, CABOT TRAIL, NS

BH SIZE HW

DATES: BORING 2015/11/22 WATER LEVEL 2015/12/5

DATUM GEODETIC

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa												
					TYPE	NUMBER	RECOVERY	N-VALUE OR-RQD %		WATER CONTENT & ATTERBERG LIMITS			DYNAMIC PENETRATION TEST, BLOWS/0.3m							STANDARD PENETRATION TEST, BLOWS/0.3m		
								mm		$W_p$ $W$ $W_L$			10   20   30   40   50   60   70   80   90									
0	39.21																					
	38.91	ASPHALT																				
		FILL: Brown gravel with silt and sand																				
1																						
2	37.08																					
		Very loose to compact grey to brown SAND - trace wood at a depth of 3.5 meters																				
3																						
4																						
5																						
6	33.27																					
		Very dense brown GRAVEL with silt and sand																				
7																						
8	31.89																					
		End of Borehole - standpipe installed																				
9																						
10																						

MBH 2/23/16

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# BOREHOLE RECORD

**BH 2**

CLIENT PARKS CANADA

PROJECT No. 133346833

LOCATION NORTH ASPY BRIDGE, CABOT TRAIL, NS

BH SIZE HW

DATES: BORING 2015/11/26 WATER LEVEL 2015/12/5

DATUM GEODETIC

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa									
					TYPE	NUMBER	RECOVERY	N-VALUE OR-RQD %		WATER CONTENT & ATTERBERG LIMITS									
								mm		20 40 60 80 W <sub>p</sub> W W <sub>L</sub> * DYNAMIC PENETRATION TEST, BLOWS/0.3m STANDARD PENETRATION TEST, BLOWS/0.3m 10 20 30 40 50 60 70 80 90									
0	38.06	TOPSOIL - brown silty SAND - with organics								●									
1	37.30	Compact to dense SAND with silt and gravel - trace silt - occasional cobbles								●									
2									S	○ ●									
3		- occasional cobbles from a depth of 3 to 6 meters								○ ●									
4										○ ●									
5										○ ●									
6										○ ●									
7										○ ●									
8									S	○ ●									
9										○ ●									
10										○ ●									

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# BOREHOLE RECORD

**BH 3**

CLIENT PARKS CANADA  
 LOCATION NORTH ASPY BRIDGE, CABOT TRAIL, NS  
 DATES: BORING 2015/11/29 WATER LEVEL N/A

PROJECT No. 133346833  
 BH SIZE HW  
 DATUM GEODETIC

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa									
					TYPE	NUMBER	RECOVERY	N-VALUE OR-RQD %		WATER CONTENT & ATTERBERG LIMITS									
									DYNAMIC PENETRATION TEST, BLOWS/0.3m <span style="float:right">★</span> STANDARD PENETRATION TEST, BLOWS/0.3m <span style="float:right">●</span>										
									20 40 60 80 10 20 30 40 50 60 70 80 90										
20		Cont'd: SAND with silt and gravel			SS	14	400	40		●									
21	16.84	Poor to excellent quality, grey LIMESTONE - slightly weathered			HQ	15	100%	RQD	100%										
22					HQ	16	92%	40%											
23					HQ	17	88%	58%											
24	13.49	End of Borehole																	
25																			
26																			
27																			
28																			
29																			
30																			

MBH 2/23/16

App'd LF Feb 23 2016 12:27:54



# BOREHOLE RECORD

## BH 4

CLIENT PARKS CANADA

PROJECT No. 133346833

LOCATION NORTH ASPY BRIDGE, CABOT TRAIL, NS

BH SIZE HW

DATES: BORING 2015/12/02 WATER LEVEL 2015/12/5

DATUM GEODETIC

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa									
					TYPE	NUMBER	RECOVERY	N-VALUE OR-RQD %		WATER CONTENT & ATTERBERG LIMITS			DYNAMIC PENETRATION TEST, BLOWS/0.3m		STANDARD PENETRATION TEST, BLOWS/0.3m				
					mm														
0	38.68	TOPSOIL			SS	1	350	12	S										
	38.07	- brown silty SAND - with organics			SS	2	400	23											
1		Compact to dense brown SAND with silt and gravel			SS	3	350	40											
2					SS	4	425	45											
3					SS	5	475	39											
4					SS	6	350	49											
5					SS	7	400	35											
6					SS	8	450	33											
8					- silty sand layer at a depth of 8 meters	SS	9	475		24									
10						SS	10	300		57									

MBH 2/23/16

App'd LF Feb 23 2016 12:27:57









# BOREHOLE RECORD

**BH 5**

CLIENT PARKS CANADA

PROJECT No. 133346833

LOCATION NORTH ASPY BRIDGE, CABOT TRAIL, NS

BH SIZE HW

DATES: BORING 2015/12/03 WATER LEVEL N/A

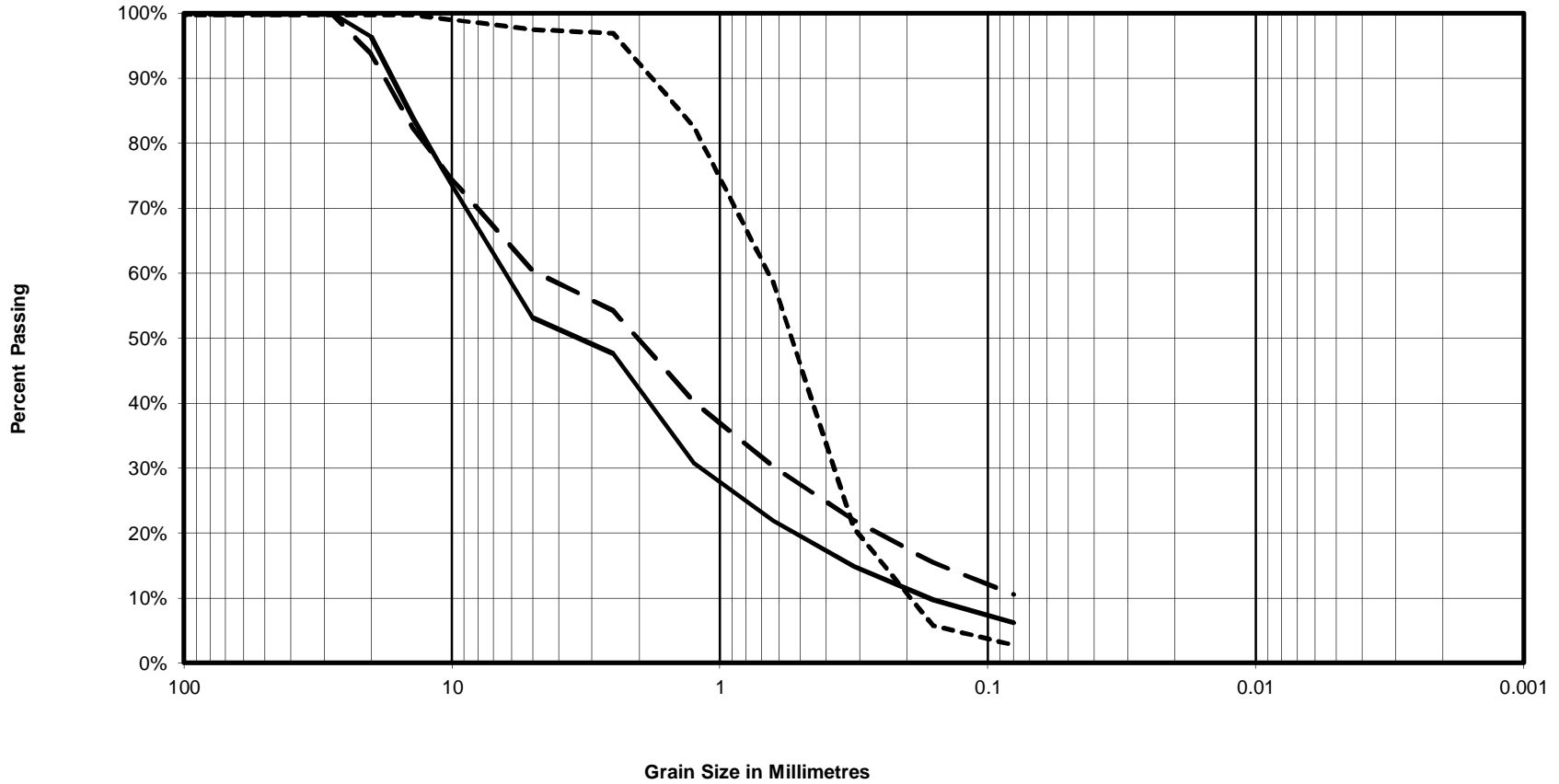
DATUM GEODETIC

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa													
					TYPE	NUMBER	RECOVERY	N-VALUE OR-RQD %		WATER CONTENT & ATTERBERG LIMITS													
								mm		DYNAMIC PENETRATION TEST, BLOWS/0.3m <span style="float:right">★</span> STANDARD PENETRATION TEST, BLOWS/0.3m <span style="float:right">●</span>													
										10	20	30	40	50	60	70	80	90	$W_p$ $W$ $W_L$				
10		Cont'd: SAND with silt and gravel																					
11					SS	9	350	33															
12																							
13																							
14	32.83	End of Borehole																					
15																							
16																							
17																							
18																							
19																							
20																							

MBH 2/23/16

App'd LF Feb 23 2016 12:27:59





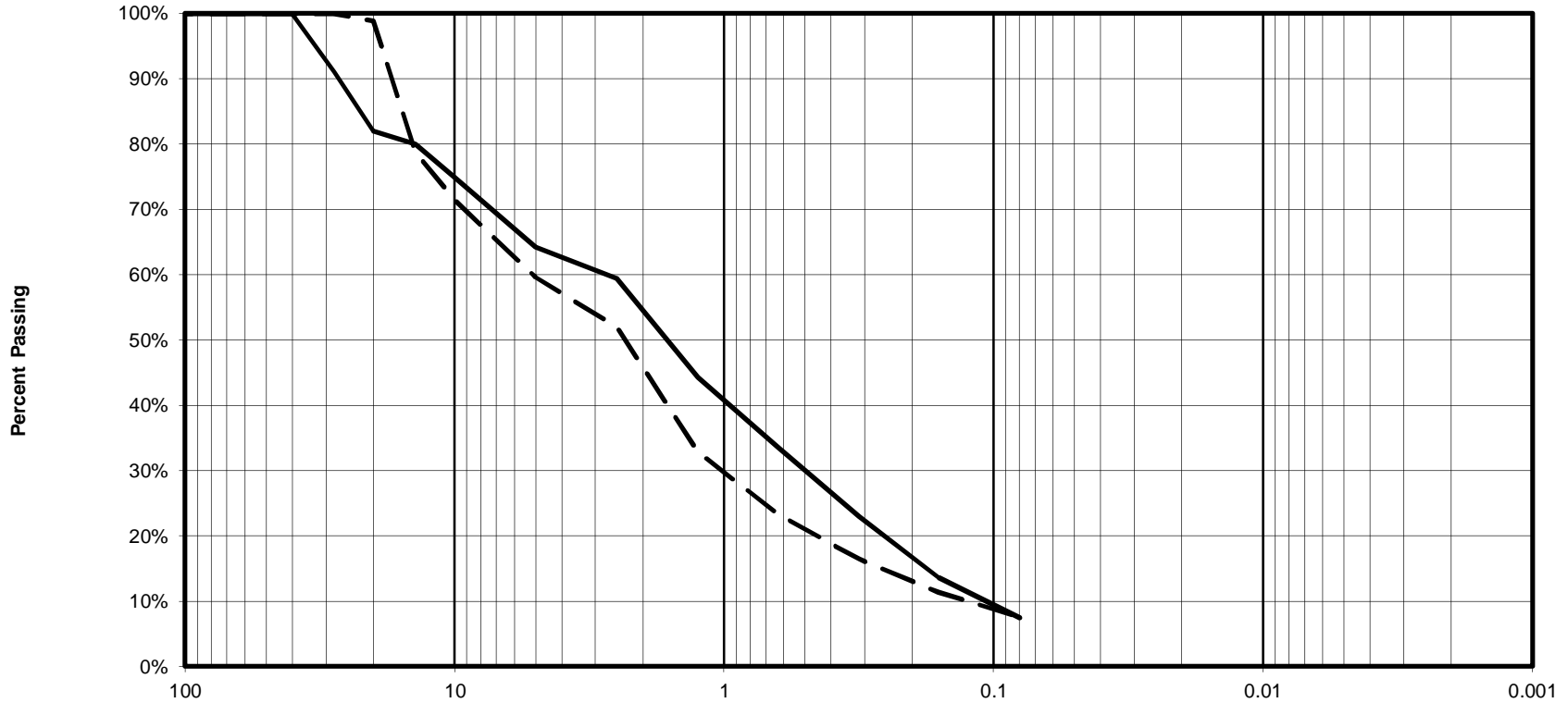
Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Unified Soil Classification System ASTM D 2487/2488

Curve	BOREHOLE/TESTPIT	SAMPLE	DEPTH (m)	Soil Fractions			Soil Description
				Gravel	Sand	Silt/Clay	
—	BH2	SS3	1.53 - 2.14	47%	47%	6%	SAND with silt and gravel
- · - ·	BH2	SS11	7.62 - 8.23	40%	50%	10%	SAND with silt and gravel
- - - -	BH2	SS20	15.54 - 16.15	3%	95%	2%	SAND

Job No.: 133346833



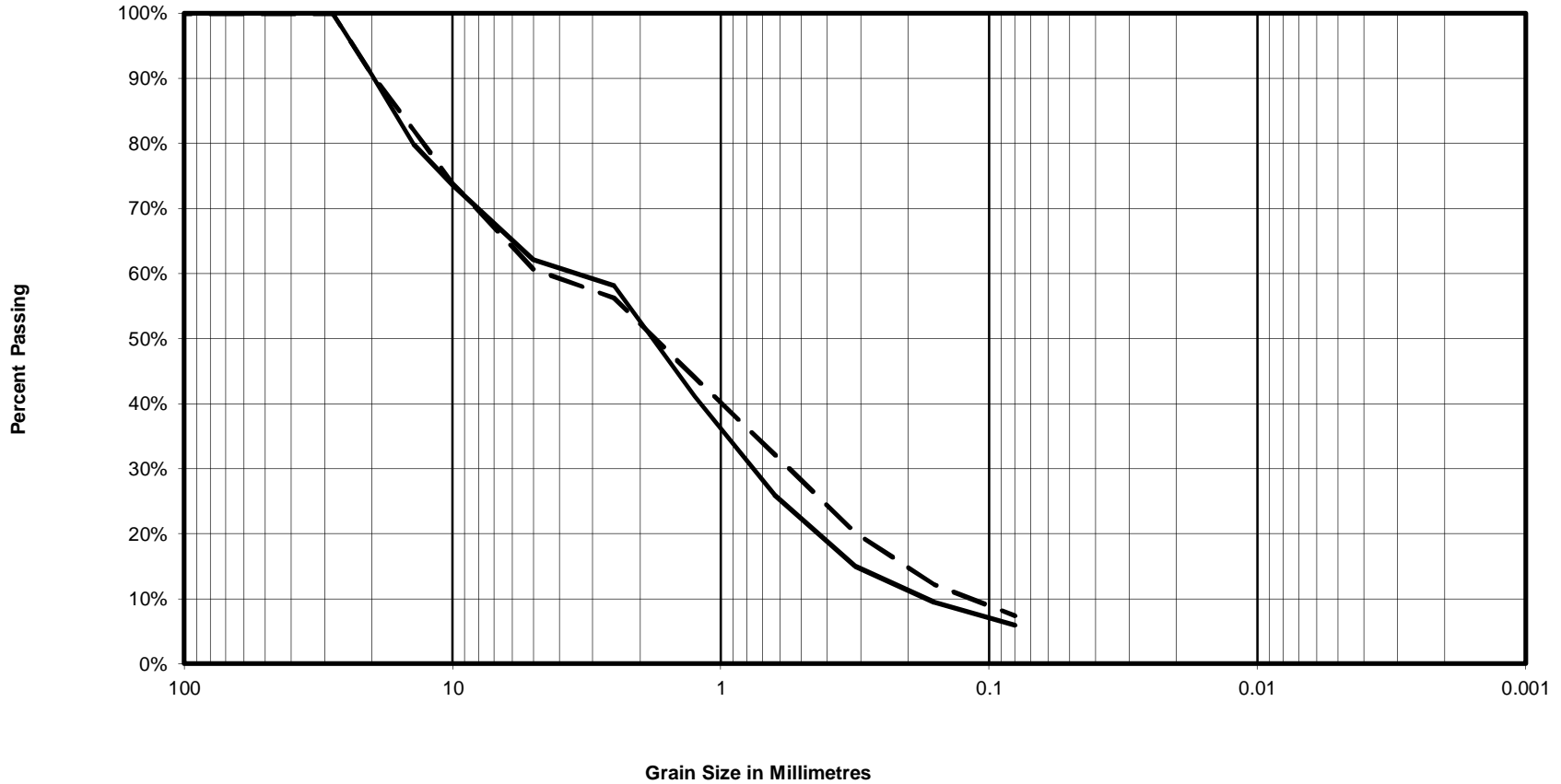


Grain Size in Millimetres

Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Unified Soil Classification System ASTM D 2487/2488

Curve	BOREHOLE/TESTPIT	SAMPLE	DEPTH (m)	Soil Fractions			Soil Description
				Gravel	Sand	Silt/Clay	
—	BH3	SS3	3.05 - 3.66	36%	57%	7%	SAND with silt and gravel
- - -	BH3	SS5	6.40 - 7.01	40%	52%	8%	SAND with silt and gravel



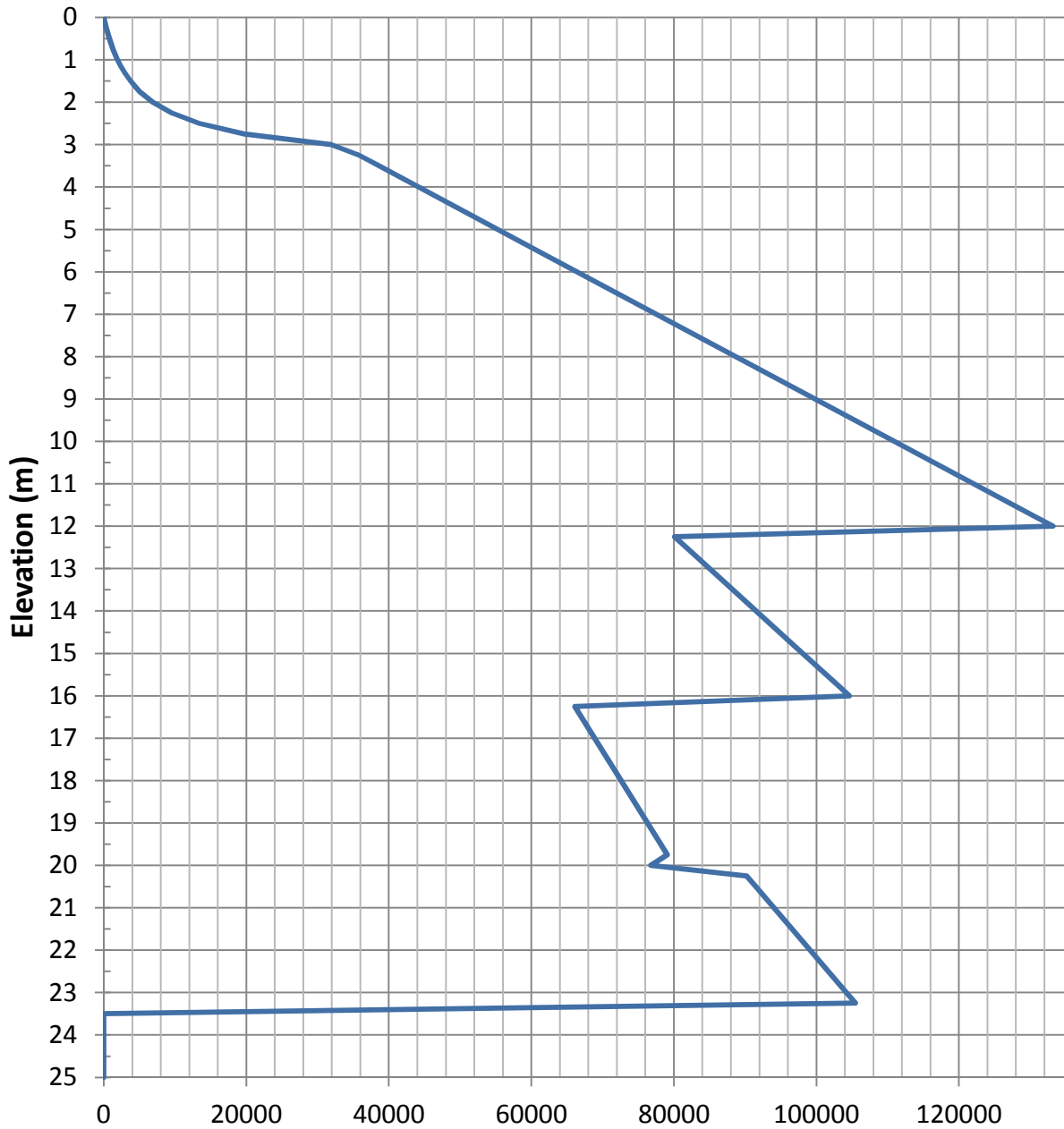
Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Unified Soil Classification System ASTM D 2487/2488

Curve	BOREHOLE/TESTPIT	SAMPLE	DEPTH (m)	Soil Fractions			Soil Description
				Gravel	Sand	Silt/Clay	
—	BH4	SS5	3.05 - 3.66	38%	56%	6%	SAND with silt and gravel
- - -	BH4	SS8	5.18 - 5.69	39%	53%	8%	SAND with silt and gravel

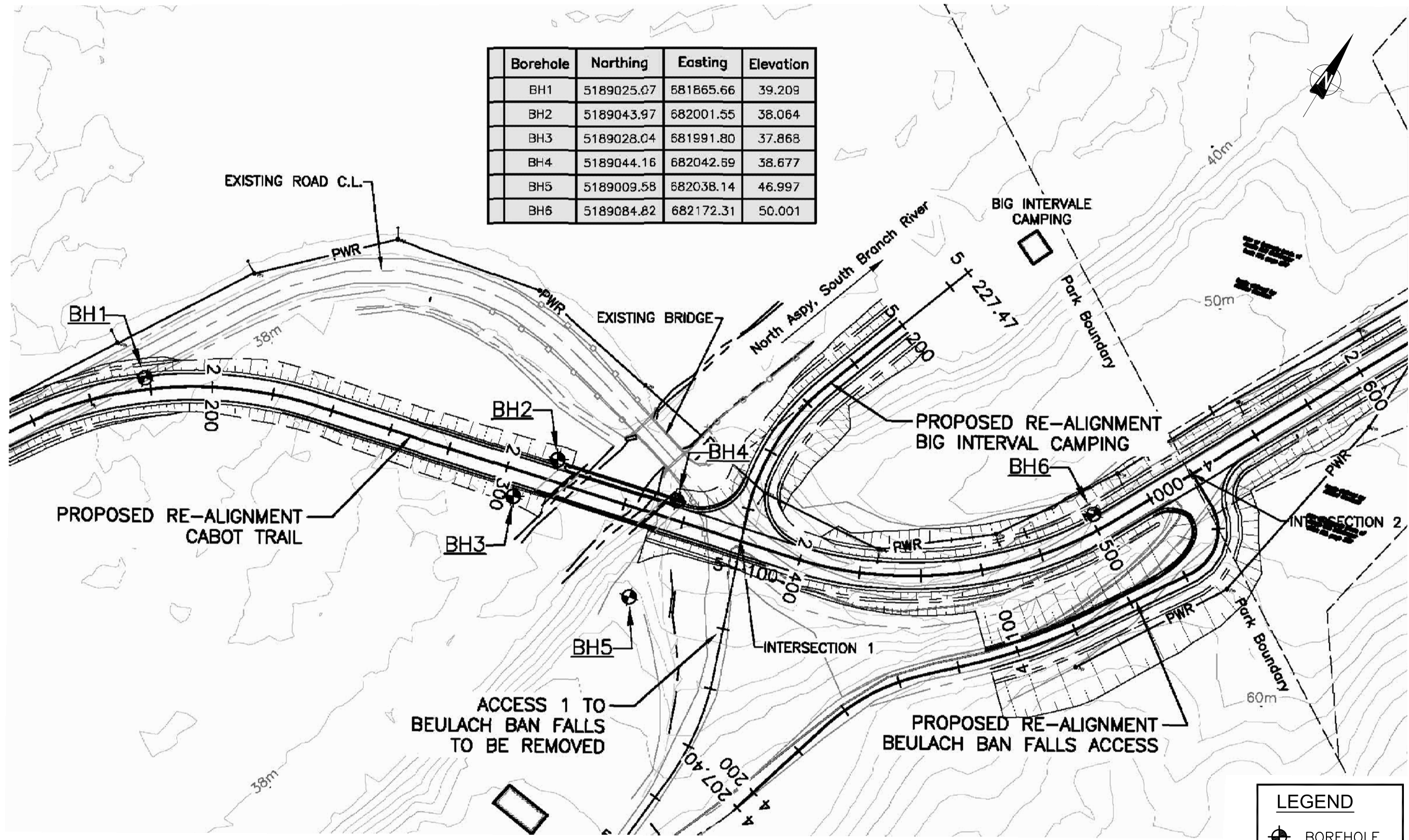


### LPile Results - Soil Springs



**Figure 2**  
**Soil Springs for HP 360x132 Piles**

Borehole	Northing	Easting	Elevation
BH1	5189025.07	681865.66	39.209
BH2	5189043.97	682001.55	38.064
BH3	5189028.04	681991.80	37.868
BH4	5189044.16	682042.69	38.677
BH5	5189009.58	682038.14	46.997
BH6	5189084.82	682172.31	50.001



**LEGEND**

⊕ BOREHOLE

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

T:\1333XXX\133346833 North Aspy\133346833-2.dwg PRINTED: Feb 17, 2016

Reference:	Job No.:	133346833	Client:	PARKS CANADA	Project:	ASPY COVE BRIDGE	Drawing Title:	BOREHOLE LOCATION PLAN	Dwg. No.:	2	
	Scale:	1:1250		Site Address		CAPE BRETON HIGHLANDS		National Park			
	Date:	2016/02/17									
	Dwn. By:	BSP									
	App'd By:	LF				ASPY COVE, NOVA SCOTIA					

**APPENDIX B**





## BASIC IMPACT ANALYSIS

### North Aspy South River Bridge Replacement & Big Intervale Campground Rehabilitation

Cape Breton Highlands National Park of Canada  
Parks Canada Agency



March 2017

CBFU2017-004





<b>PROJECT TITLE &amp; LOCATION</b>	North Aspy <u>South</u> River Bridge Replacement & Big Intervale Campground Rehabilitation Cape Breton Highlands National Park of Canada
<b>PROPONENT INFORMATION</b>	Audrey Buchanan – Asset Manager Cape Breton Field Unit 902-733-3520 / <a href="mailto:audrey.buchanan@pc.gc.ca">audrey.buchanan@pc.gc.ca</a>
<b>PROPOSED PROJECT DATES</b>	Planned Commencement: October 1 <sup>st</sup> , 2017 Planned Completion: October 31 <sup>st</sup> , 2018
<b>INTERNAL PROJECT FILE #</b>	CBFU2017-004

## PROJECT DESCRIPTION

The current North Aspy South River Bridge and the Big Intervale Campground (cover photos), are located where the Cabot Trail crosses over the North Aspy South River in Cape Breton Highlands National Park, approximately 55 km northwest of the Ingonish park entrance (Figure 1.). A complete bridge replacement and campground decommissioning/rehabilitation and relocation have been proposed for 2017 - 2018.



Figure 1. Showing the location of the North Aspy South River Bridge and Big Intervale Campground in Cape Breton Highlands National Park.





## North Aspy South River Bridge

The current North Aspy South River Bridge was built in 1948 and is near the end of its design life. Numerous repairs have been carried out over the years and in 2015 an inspection was completed. The results recommended a complete rehabilitation or replacement occur within the next 5 years. The current structure is also located in the middle of a tight “S” curve that does not meet current Transportation Association of Canada (TAC) minimum design and safety standards. Construction of a new structure is being planned with realigned approaches to reduce the “S” curve and improve safety.

The new structure will be 30 m in length and have setback abutments with a clear span running across the river. This will result in a reduction of impacts to the waterway causing channel narrowing and straightening. A hydraulic study has been completed and a new bridge has been designed to accommodate 1:100 year modelled flows. It will be located approximately 20 m upstream of the current structure (Figure 2. and Appendix A) and the footprint of the new realignment will be approximately 4,500 m<sup>2</sup>, based on approximately 150 m of realigned approaches at an average disturbed width of 30 m. The intersection into Big Intervale Research Station and Beulach Ban Falls will also be realigned to improve on safety for the travelling public and the north driveway into the Big Intervale Research Station will be removed and the area rehabilitated, leaving only one main access route into the research station and Beulach Ban trailhead.

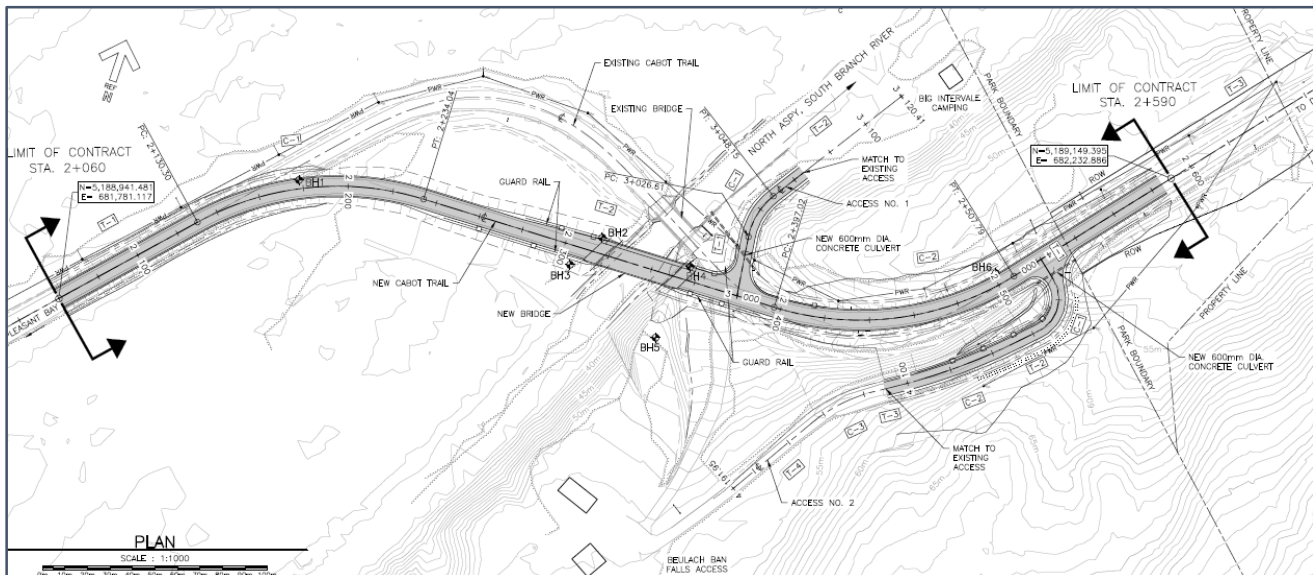


Figure 2. Showing the plan overview for the North Aspy South River Bridge Replacement in Cape Breton Highlands National Park.





## Big Intervale Campground and Day Use Area

Located immediately downstream from the current North Aspy South River Bridge is the Big Intervale Campground and Day Use Area (cover image). The campground sits immediately on the south river bank and is supported by a deteriorating steel retaining wall along the riverbank that runs about 100 m in length (Figure 3.). The 10 site campground/Day Use Area is unserviced with no potable water and only contains pit privies. This campground/day use area and the retaining wall will be removed and the area will be remediated (a footprint of approximately 2,000 m<sup>2</sup>). The bank alongside the river where the retaining wall currently stands, will be rehabilitated and stabilized at a 2:1 slope to support a more natural riparian zone. A new campground and day use area will be built on the opposite side of the river where the current roadbed sits after the roadbed/asphalt is removed and the area remediated to a more natural setting. The new campground/day use area will include a new vault privy, parking for 10 cars, 2 trailers and 5 overflow campsites with picnic tables (Appendix A).



Figure 3. Showing a section of the steel retaining wall to be removed on the south bank of the river at the Big Intervale Campground/DUA.



Figure 4. Showing the planned location to relocate the Big Intervale Campground/DUA on the opposite side of the river from where it currently stands.



The key project **objectives** are:

- Isolation of construction from the motoring public and traffic control to safely allow the safe access/egress of construction equipment and personnel onto the work site on both sides of the river.
- Vegetation clearing on both sides of the watercourse to accommodate the new approaches and abutments.
- Implementation of environmental controls in coordination with the sequence of work.
- Excavation and earthmoving activities in the construction of the realigned approaches for the replacement structure.
- Emphasis on erosion prevention and sediment release during construction.
- Potential salvage and reuse of native vegetation in final stabilization of the site whenever possible to promote the re-establishment of native vegetation.

The key project **components** are:

- Traffic will remain on the current alignment/bridge until the new alignment/bridge is complete.
- Delineation of buffer zones and separation of the work site from the motoring public.
- Installation of environmental protection measures (ie. silt fences, aquatic silt booms, etc.).
- Construction of abutment, formation of casting concrete (in the dry).
- Placement of armour stone/rip rap and/or native vegetation for slope protection in accordance with the project specifications.
- Erection of construction infrastructure support and placement of steel girders.
- Construction of approach alignments on each side of the river.
- Placement of fill-against-structure and sub-grade granular material to support the abutments/approaches.
- Paving of bridge deck and new approaches.
- Demolition/removal of existing approaches, bridge deck and abutments.
- Demolition of Big Intervale Campground and riverside retaining wall.
- Removal of the north access road into the Big Intervale Warden Station and realigning the south access road for safety to the traveling public.
- Removal of environmental protection devices once areas of the site(s) have stabilized.
- Demobilization of equipment and temporary infrastructure erected for construction.
- Rehabilitation of old approaches, the north access route into the Big Intervale Warden Station and the Big Intervale Campground site.
- Development of a new campground and DUA on the north side of the road within the current roadbed footprint (includes access road, shelter, privies, campsites and a walking path to the river).

Project plans can be found in [Appendix A](#) and aerial images of the site can be found in [Appendix B](#).

*Specific terms and conditions of project activities are available upon request.*





## Biophysical Resources Protection

There are some elements of the biophysical environment that hold high ecological value and may be impacted by the project. Atlantic Salmon (Eastern Cape Breton Population) are known to spawn in that branch of the North Aspy River in the fall and have been listed as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) for almost a decade. Their status is currently under review by the Species at Risk Act (SARA) and will soon be officially listed as Schedule I Endangered. Special care to protect this fragile population must be taken.

## Cultural Resources Protection

It has been identified that there are some 19<sup>th</sup>/20<sup>th</sup> c. cultural resources present in the area of the undertaking (Table 1.) as the Aspy Valley has an extensive history of human settlement. These locations have been mapped out in relation to the proposed undertaking (Figure 5.) and a level of risk has been assigned to each resource based on its location. The resources are identified as being circa 19<sup>th</sup> and 20<sup>th</sup> century and are associated with European settlement in the area.

*Table 1. Listing the documented cultural resource locations identified to be within the vicinity of the North Aspy South River Bridge Replacement and Big Intervale Campground/DUA Rehabilitation project.*

<b>CR Unique Identifier</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Resource Description</b>	<b>Circa</b>	<b>Significance of Risk</b>
<b>15B81</b>	45.82759	-60.61799	Rubble filled cellar w retaining walls	19 <sup>th</sup> /20 <sup>th</sup> c.	Null
<b>15B87</b>	46.82910	-60.61361	Outbuilding shell	19 <sup>th</sup> c.	Minimal
<b>15B88</b>	46.81477	-60.62577	Sawmill remnants	19 <sup>th</sup> c.	Null
<b>Unidentified</b>	E of the warden house and Beulach Ban		Group of house foundations	unknown	Null





## VALUED COMPONENTS LIKELY TO BE AFFECTED

Valued components related to the North Aspy South River Bridge Replacement and Big Intervale Campground rehabilitation have been considered using an Effects Identification Matrix ([Appendix C](#)) and are categorized based on the biophysical environment, potential cultural resources present and possible visitor experience impacts associated with the undertaking. These components are listed in the table below (Table 2.).

**Table 2.** The identified Valued Components that are potentially impacted by the proposed replacement and removal of the North Aspy South River Bridge and the Big Intervale Campground/DUA in Cape Breton Highlands National Park.

Biophysical Component	Potential Adverse Effects
Air Quality	<ul style="list-style-type: none"> <li>▪ Temporary decreased ambient air quality (ie. from dust, equipment emissions, etc.) during installation.</li> <li>▪ Temporary/intermittent increase in CO<sup>2</sup> levels and other pollutants during installation from use of heavy equipment.</li> </ul>
Soils & Landforms	<ul style="list-style-type: none"> <li>▪ Soil compaction in area of installation and in the staging area(s).</li> <li>▪ Soil contamination from contaminants/chemicals being used for installation (ie. concrete, hydrocarbons, etc.).</li> <li>▪ Increased disturbance footprint from construction activities.</li> <li>▪ Changes in land surface characteristics.</li> </ul>
Water Resources (ie. ground, surface, wetlands, etc.)	<ul style="list-style-type: none"> <li>▪ Groundwater contamination from chemicals, concrete sediment, wastewater or other liquids during installation/operation.</li> <li>▪ Localized changes to surface water hydrology could occur.</li> </ul>
Fish & Fish Habitat	<ul style="list-style-type: none"> <li>▪ Direct injury or mortality of fish, eggs, larvae, invertebrates, etc.</li> <li>▪ Stream bank erosion causing siltation in the waterbody.</li> <li>▪ Increased pollutants can breach the range of chemical parameters that support healthy aquatic communities and affect fish and fish habitat.</li> <li>▪ Channel modification can promote the introduction of invasive species or non-native aquatic species.</li> <li>▪ Alteration to water levels, flow characteristics and substrate characteristics can cause impacts to fish habitat.</li> </ul>
Terrestrial/Riparian Flora (ie. trees, shrubs & surface vegetation)	<ul style="list-style-type: none"> <li>▪ Damage to/and removal of vegetation in immediate or adjacent areas of the structure – could leading to increased erosion, decreased stability, etc.</li> <li>▪ Introduction or expansion of non-native species of vegetation in the freshly disturbed area.</li> </ul>
Terrestrial Fauna/Avifauna	<ul style="list-style-type: none"> <li>▪ Wildlife disturbance due to increased human presence and increased noise levels during construction – causing displacement/habitat avoidance.</li> <li>▪ The installation/construction of a new structure may impact avifauna in the immediate area causing displacement.</li> <li>▪ Damage to dens, nests, roosts and disruption of denning, nesting or roosting animals in the immediate area of the structure.</li> </ul>





Table 1. continued...

Cultural Resources Component	Potential Adverse Effects
Cultural Landscapes	<ul style="list-style-type: none"> <li>▪ Aesthetic impacts on character defining cultural landscapes.</li> </ul>
<i>In-situ</i> Cultural Resources	<ul style="list-style-type: none"> <li>▪ Adverse effects to <i>in-situ</i> archeological resources from construction activities (displacement &amp;/or destruction).</li> </ul>
Visitor Experience Component	Potential Adverse Effects
Visitor Access & Services	<ul style="list-style-type: none"> <li>▪ Reduced access during installation of structure.</li> <li>▪ Improved visitor experience providing a safer travel roadway for the travelling public.</li> </ul>
Viewscapes & Soundscapes	<ul style="list-style-type: none"> <li>▪ Ambient noise disruption from construction methods.</li> <li>▪ Aesthetic impacts on character defining natural viewscapes in the area.</li> </ul>
Recreational Opportunities	<ul style="list-style-type: none"> <li>▪ Reduced recreational opportunities in the immediate vicinity of the work site during construction.</li> </ul>
Visitor Safety	<ul style="list-style-type: none"> <li>▪ Public safety concerns in the immediate vicinity of the structure during installation and operation.</li> <li>▪ Improved visitor safety after completion of construction.</li> </ul>
Essence of Place	<ul style="list-style-type: none"> <li>▪ Contribution to an experience and a visitor's essence of place.</li> </ul>

## EFFECTS ANALYSIS

### Biophysical Environment Components

The key biophysical environmental elements to be implemented during the construction of the replacement structure and the demolition of the original structure and the campground include, but are not limited to, the following components:

- The implementation of perimeter control prior to an excavation to prevent the release of sediment-laden runoff offsite.
- Diversion of surface runoff directed at the work site so that construction can be conducted in the dry.
- Implementation of a Work Progression Schedule that limits the amount of time that base soil is left exposed.
- Final stabilization conducted immediately once sections of the site are brought to final grade (stabilization to be incorporated in the Work Progression Schedule for the project).
- Removal of the existing North Aspy South River Bridge and the stabilization of the decommissioned approaches to eliminate any future sediment impacts to the watercourse.
- Removal of the Big Intervale Campground and DUA retaining wall and all other associated infrastructure and stabilization of the riparian zone to eliminate any future sediment impacts to the watercourse.





The biophysical environment will experience impacts during the completion of the proposed undertaking, but with proper planning and the installation of appropriate environmental controls where necessary, the project impacts are considered minor. Positive impacts to the biophysical environment are anticipated from increased flow allowances during high water events due to the setback abutments and increased span of the new structure, as well as the removal of the retaining wall causing unnatural flow patterns along the shoreline. Approximately 5000 m<sup>2</sup> of previously disturbed area will be rehabilitated back to a natural setting.

### **Cultural Resources Components**

The Aspy Valley has an extensive history of agriculture and human settlement and the area surround the work location is no exception. There have be a number of cultural remnants documented in the area (Table 2. and Figure 3. above). With the involvement of PCA cultural resources staff in planning process and during the implementation of the different project phases, the projects impacts are considered to be negligible and the identified cultural resources do not fall within the footprint of the undertaking.

### **Visitor Experience Components**

The potential for impacts to the visitor experience will be present during the project from activities such as traffic delays, noise and unsightly viewsapes, but with the limited scope of the work, impacts to the visitor experience will be minor. There will also be a reduction in services offered in that area due to the relocation of the Big Intervale Campground and DUA to the other side of the river. Positive impacts are anticipated upon project completion when the safety of the roadway is improved for the travelling public and a new and improved Big Intervale Campground/DUA facilities are installed.





## MITIGATION MEASURES

The following mitigation measures have been developed to help reduce any adverse environmental and cultural resource impacts resulting from the planned activities of the proposed undertaking. The below listed PCA mitigation measures **must** be implemented along with the following listed mitigation measures recommended by the Department of Oceans and Fisheries (DFO) to avoid causing harm to fish and fish habitat.

### General

1. The contractor shall develop an *Environmental Protection Plan* that must be submitted to PCA for approval prior to work commencing to cover project components in need of special environmental protection.
2. The contractor shall develop an *Emergency Response Plan* to cover unplanned incidents such as accidents and malfunctions, fires, high winds, heavy rainfall and runoff, etc.
3. The contractor shall develop a *Spill Response Plan* and ensure spill kits are located on site at all times and workers are trained how to use them.
4. The EPP and all related plans will be communicated to machine operator(s), site supervisor(s), and all other onsite personnel.
5. Equipment and construction vehicles must be in good working order, cleaned and free of deleterious substances prior to entering the national park.
6. Equipment and construction vehicles must not be left idling when not in use.
7. Ensure stockpiled materials are covered with tarps or equivalent to reduce airborne particulate matter (dust) – this includes during transport to the site.
8. Stockpiled materials shall be located at least 30 meters away from a watercourse or wetland.
9. Sediment controls shall be installed around the perimeter of stockpiled materials to contain erodible material.
10. Avoid site preparation during dusty, dry and windy periods to keep dust to a minimum.
11. Consider using smaller machinery/tools or completing vegetation removal/excavation by hand to minimize impacts to the surrounding environment and cultural resources.
12. Place cut vegetation where it cannot be washed into a watercourse and no trees or chipped vegetation can be disposed of into a watercourse.
13. Vegetation must be chipped and evenly dispersed around the site, and/or large trees must be chipped or limbed and left full length on the ground in the surrounding forest. If the latter cannot be achieved, disposal will then occur at a PCA approved landfill.
14. The work shall be carried out “in the dry” – dewatering preparations must be completed during low tide and during dry weather as much as reasonably possible.
15. Material for rapid containment and clean-up of spills must be available during any activity in or near any watercourse/wetland or environmentally significant area.
16. Fuels, chemical and any other petroleum based products must not be stored within 30 meters of any waterbody (including drainage ditches).





17. Refuelling of machinery must take place a minimum of 30 meters away from any waterbody on a containable surface (ie. gravel, cement, asphalt).
18. Capture, contain and clean up spills of chemicals or any deleterious substances immediately and dispose of contaminated substances in a PCA approved facility. All spills must be reported to PCA.
19. All hazardous materials and waste must be clearly labelled with WHMIS labels and MSDS sheets are available on site.
20. Hazardous waste shall be disposed of off-site at a certified hazardous waste disposal facility.
21. If contamination is discovered, report to PCA and ensure prompt removal and disposal at an approved facility.
22. An invoice will be submitted to the proponent verifying that contaminated material has been properly disposed of.
23. Care will be taken when placing concrete to avoid overfilling or spills and concrete trucks are to be washed in a designated washout pit or somewhere outside of the historic site boundaries. Any washout that occurs on Parks Canada property must be pre-approved by PCA personnel and the washout materials and contaminated soils must be removed from the property and disposed of at an appropriate location.
24. Maintain a tidy work site and storage area free from accumulation of waste, debris and litter.
25. Construction and demolition material will be sorted and disposed of at an approved C&D landfill.
26. Consider reuse of material where feasible.
27. The site must undergo a thorough clean-up at project completion.
28. Construction materials must be stored within work site or designated areas approved by PCA.
29. Restore vegetation or surface cover as soon as possible to minimize duration of soil exposure.
30. Minimize size of trench or exposed area as well as exposure time where possible.
31. Dewater all excavations at appropriate locations (ie. salt laden water cannot be pumped into terrestrial vegetation – instead it must be pumped onto the beach and installed control measures must filter out sediment before the pumped water enters the harbour).
32. Backfilling must be undertaken using approved materials with adequate soil compaction levels to avoid ground subsidence or sink holes.
33. Ensure the optimal level of compaction is achieved to minimize erosion.
34. All temporary facilities shall be cleaned up, and stabilized by seeding and mulching, placing of riprap, or a combination thereof as per project specs.
35. Erosion and sediment control measures shall be maintained until which time vegetation has been established and protection measures are no longer warranted.
36. Only PCA-approved hydroseed mix will be used.
37. Hydroseeding will not be carried out on hardened, crusted or eroded soils.
38. Areas will be shaped or completed to the final grade prior to hydroseeding.
39. Hydroseeding will not be carried out during windy conditions or during heavy rainfall.
40. Hydroseed shall be monitored and maintained from the time of application until vegetation is established as an effective erosion and sedimentation control.





## **Fish & Fish Habitat**

41. Vegetation shall be maintained, where possible, along waterbodies to provide bank stability and adequate shade for fish.
42. Effective erosion and sedimentation control measures must be installed around work areas for containment purposes prior to work commencement.
43. Sediment control measures must be inspected daily and maintained daily. If the sediment exceeds half the height of the fence, it must be removed and disposed of at least 30 meters away from the watercourse.
44. Backfill and compact excavations as soon as reasonably possible to reduce sedimentation events impacting aquatic resources.
45. Abutment excavation must be done in a manner that minimizes release of sediment to a watercourse.
46. Sediment control devices shall remain in place until permanent stabilization is carried out, or approved by PCA personnel.
47. If pumping of sediment laden water is required, pumped water must be filtered to a vegetated areas at least 30 meters away from the watercourse.
48. Avoid construction activities around extreme weather events and high water conditions as this may cause unacceptable disturbance and subsequent discharges of sediments into the watercourse. Plan work around low flow and/or dry periods.
49. Fresh concrete shall not be discharged into a watercourse.
50. No water withdrawal is permitted from a watercourse and tankers using calcium chloride must not be washed out within 30 meters of a watercourse.

## **Flora & Fauna (Terrestrial & Avifaunal)**

51. All construction equipment/materials must be cleaned prior to entering the national park to minimize the risk of introducing invasive species.
52. Use existing roadways and already disturbed areas for site access and travel.
53. If appropriate, re-establish native vegetation where it has been impacted.
54. Schedule construction around sensitive periods for wildlife, especially during nesting, denning, migration etc.
55. Schedule high noise level activities and other intrusive activities around periods of critical life stages for local species (ie. breeding, nesting, rearing, and migration). Consult with PCA personnel for related information.
56. Survey work area for active nesting birds/wildlife dens prior to the start of work and delineate a buffer around and identified sensitive areas until young have been reared.
57. Concentrations of birds (e.g. waterfowl, seabirds and shorebirds) should not be approached when accessing a project site from water or from land.
58. Fence open excavations when workers are not present and try to minimize the time they are left open (including small boreholes and test pits) to avoid injury to wildlife.
59. Wildlife feeding, enticement or harassment is strictly prohibited.





60. Wildlife attractants or any toxic materials that may pose a threat to local wildlife needs to be stored in a secured building or animal proof container.
61. Store food, garbage and any other odorous products in wildlife proof containers when workers are not immediately present.
62. Garbage is to be removed from the work site daily, unless secured garbage facilities exist at the work site.

### **Cultural/Archeological Resources**

63. Plan work with a 10 m buffer around the identified cultural resource locations 15B81 and 15B87 (Figure 5. above).
64. In the event of any archeological resource discovery, all work shall cease in the immediate area until such time as PCA archeological personnel from the Fortress of Louisbourg have been notified (A\Cultural Resource Manager Maura McKeough – [maura.mckeough@pc.gc.ca](mailto:maura.mckeough@pc.gc.ca) / (902)733-3530).

### **Visitor Experience**

65. Evaluate proposed site layout, access routes and construction activities with PCA to minimize their visual impact to the landscape.
66. Ensure visitor safety by signing and securing dangerous areas of the work site when workers are not immediately present.
67. High noise periods may require scheduling restrictions to reduce visitor experience impacts (consult with PCA).
68. Ensure vehicles follow the posted construction speed limit on the site at all times.

### **Accidents and Malfunctions Mitigation**

With this type of work and the requirement for the use of heavy machinery and equipment to complete part of the work, there is a possibility of accidents or malfunctions occurring. Accidents or malfunctions that could occur are from improper equipment maintenance, vehicle collisions, chemical spills into terrestrial and/or aquatic environments and structural failures and could be attributed to human error. Adherence to the above listed mitigation measures will reduce the possibility of accidents or malfunctions from occurring on the work site. Regular service, inspection and maintenance of equipment will also reduce the possibility of any accidents of malfunctions.





## DFO MITIGATION

The remaining section involves DFO recommended measures to avoid causing harm to fish and fish habitat (<http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html>). Adherence will help avoid causing harm to fish and comply with the Fisheries Act.

### Planning (DFO recommendations)

1. Time work in-water to respect timing windows (June 1 to September 30) to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed. If more time is needed, the contractor must submit an application for an extension detailing schedule, aspects of the work, environmental protection measures, etc. to PCA.
2. Minimize duration of in-water work.
3. Conduct in-stream work during periods of low flow, or at low tide, to further reduce the risk to fish and their habitat or to allow work in water to be isolated from flows.
4. Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.
5. Design and plan activities and works in waterbody such that loss or disturbance to aquatic habitat is minimized and sensitive spawning habitats are avoided.
6. Design and construct approaches to the waterbody such that they are perpendicular to the watercourse to minimize loss or disturbance to riparian vegetation.
7. Avoid building structures on meander bends, braided streams, alluvial fans, active floodplains or any other area that is inherently unstable and may result in erosion and scouring of the stream bed or the built structures.
8. Undertake all in-stream activities in isolation of open or flowing water to maintain the natural flow of water downstream and avoid introducing sediment into the watercourse.
9. Plan activities near water such that materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, or other chemicals do not enter the watercourse.
10. Develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance and keep an emergency spill kit on site.
11. Ensure that building material used in a watercourse has been handled and treated in a manner to prevent the release or leaching of substances into the water that may be deleterious to fish;
12. Develop and implement an *Erosion and Sediment Control Plan* for the site that minimizes risk of sedimentation of the waterbody during all phases of the project. Erosion and sediment control measures should be maintained until all disturbed ground has been permanently stabilized, suspended sediment has resettled to the bed of the waterbody or settling basin and runoff water is clear. The plan should, where applicable, include:
  - a. Installation of effective erosion and sediment control measures before starting work to prevent sediment from entering the water body;
  - b. Measures for managing water flowing onto the site, as well as water being pumped/diverted from the site such that sediment is filtered out prior to the water entering a waterbody. For example, pumping/diversion of water to a vegetated area, construction of a settling basin or other filtration system;





- c. Site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment where in-water work is required (e.g., dredging, underwater cable installation);
- d. Measures for containing and stabilizing waste material (e.g., dredging spoils, construction waste and materials, commercial logging waste, uprooted or cut aquatic plants, accumulated debris) above the high water mark of nearby waterbodies to prevent re-entry;
- e. Regular inspection and maintenance of erosion and sediment control measures and structures during the course of construction;
- f. Repairs to erosion and sediment control measures and structures if damage occurs; and,
- g. Removal of non-biodegradable erosion and sediment control materials once site is stabilized.

#### **Shorelines** (DFO recommendations)

13. Clearing of riparian vegetation should be kept to a minimum: use existing trails, roads or cut lines wherever possible to avoid disturbance to the riparian vegetation and prevent soil compaction. When practicable, prune or top the vegetation instead of grubbing/uprooting.
14. Minimize the removal of natural woody debris, rocks, sand or other materials from the banks, the shoreline or the bed of the waterbody below the ordinary high water mark. If material is removed from the waterbody, set it aside and return it to the original location once construction activities are completed.
15. Immediately stabilize shoreline or banks disturbed by any activity associated with the project to prevent erosion and/or sedimentation, preferably through re-vegetation with native species suitable for the site.
16. Restore bed and banks of the waterbody to their original contour and gradient; if the original gradient cannot be restored due to instability, a stable gradient that does not obstruct fish passage should be restored.
17. If replacement rock reinforcement/armoring is required to stabilize eroding or exposed areas, then ensure that appropriately-sized, clean rock is used; and that rock is installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment.
18. Remove all construction materials from site upon project completion.

#### **Fish** (DFO recommendations)

19. Ensure all in-water activities, or associated in-water structures, do not interfere with fish passage, constrict the channel width, or reduce flows.
20. Retain a qualified environmental professional to ensure applicable permits for relocating fish are obtained and to capture any fish trapped within an isolated/enclosed area at the work site and safely relocate them to an appropriate location in the same waters. Fish may need to be relocated again, should flooding occur on the site.
21. Screen any water intakes or outlet pipes to prevent entrainment or impingement of fish. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself. In freshwater, follow these measures for design and installation of intake end of pipe fish screens to protect fish where water is extracted from fish-bearing waters:







- I. Screens should be located in areas and depths of water with low concentrations of fish throughout the year.
- II. Screens should be located away from natural or artificial structures that may attract fish that are migrating, spawning, or in rearing habitat.
- III. The screen face should be oriented in the same direction as the flow.
- IV. Ensure openings in the guides and seals are less than the opening criteria to make “fish tight”.
- V. Screens should be located a minimum of 300 mm (12 in.) above the bottom of the watercourse to prevent entrainment of sediment and aquatic organisms associated with the bottom area.
- VI. Structural support should be provided to the screen panels to prevent sagging and collapse of the screen.
- VII. Large cylindrical and box-type screens should have a manifold installed in them to ensure even water velocity distribution across the screen surface. The ends of the structure should be made out of solid materials and the end of the manifold capped.
- VIII. Heavier cages or trash racks can be fabricated out of bar or grating to protect the finer fish screen, especially where there is debris loading (woody material, leaves, algae mats, etc.). A 150 mm (6 in.) spacing between bars is typical.
- IX. Provision should be made for the removal, inspection, and cleaning of screens.
- X. Ensure regular maintenance and repair of cleaning apparatus, seals, and screens is carried out to prevent debris-fouling and impingement of fish.
- XI. Pumps should be shut down when fish screens are removed for inspection and cleaning.

**Machinery** (*DFO recommendations*)

22. Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species and noxious weeds.
23. Whenever possible, operate machinery on land above the high water mark, on ice, or from a floating barge in a manner that minimizes disturbance to the banks and bed of the waterbody.
24. Limit machinery fording of the watercourse to a one-time event (i.e., over and back), and only if no alternative crossing method is available. If repeated crossings of the watercourse are required, construct a temporary crossing structure.
25. Use temporary crossing structures or other practices to cross streams or waterbodies with steep and highly erodible (e.g., dominated by organic materials and silts) banks and beds. For fording equipment without a temporary crossing structure, use stream bank and bed protection methods (e.g., swamp mats, pads) if minor rutting is likely to occur during fording.
26. Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water.





## **PUBLIC/STAKEHOLDER ENGAGEMENT**

Due to the limited scope of the project and its minimal impacts to the environment, public and stakeholder engagement was not deemed necessary.

## **INDIGENOUS CONSULTATION**

Formal consultation with the local Indigenous community was initiated with a representative of the Mi'kmaq of Nova Scotia for the recent infrastructure work in the park. Based on their response, several measures to mitigate impacts are outlined in this environmental assessment.

## **SURVEILLANCE**

Periodic **environmental surveillance** monitoring is required by qualified PCA personnel and may include daily sites visits during different work activities, attending related meetings and briefings, evaluating effectiveness of mitigation measures and environmental protection controls, and consultation with staff and work crews during project completion.

*PCA is to be continuously updated on project developments as they unfold.*

## **FOLLOW-UP MONITORING**

Due to the scope of the undertaking, follow-up monitoring is not required.

## **SARA NOTIFICATION**

SARA notification is not a requirement of this project since it has not been identified that any components of the project will impact any SARA listed species (ie. impacts to listed individuals, their residences or any part of their habitat).

## **EXPERTS CONSULTED**

- James Bridgland – Park Ecologist; Cape Breton Highlands National Park  
[james.bridgland@pc.gc.ca](mailto:james.bridgland@pc.gc.ca) / 902-285-3007
- Maura McKeough – A\ Cultural Resource Manager; Cape Breton Field Unit  
[maura.mckeough@pc.gc.ca](mailto:maura.mckeough@pc.gc.ca) / 902-733-3530





**DECISION**

Taking into account the implementation and mitigation measures outlined in this document, the proposed project is:

- Unlikely** to cause significant adverse environmental effects.
- Likely** to cause significant adverse environmental effects.

**RECOMENDATION & APPROVAL**

<b>BIA Prepared by:</b> Kelly Murray – A/Resource Management Officer I Cape Breton Highlands National Park	March 2017
<b>BIA Approval Recommended by:</b> Archie Doucette – Environmental Assessment Coordinator Cape Breton Field Unit x <u>Archie Doucette</u> signature	Date:  29-March-2017
<b>BIA Approval Recommended by:</b> Maura McKeough – A/Manager Cultural Resources Cape Breton Field Unit x <u>Maura McKeough</u> signature	Date:  29 March 2017
<b>BIA Approval Recommended by:</b> Robert Howey – Manager Resource Conservation Cape Breton Highlands National Park x <u>Rob Howey</u> signature	Date:  2017/04/07
<b>Project Manager BIA Commitment:</b> Angelo Di Quinzio – Highway Engineering Services Parks Canada – Atlantic x <u>Angelo Di Quinzio</u> signature	Date:  2017/04/30
<b>BIA Approval:</b> Éric Le Bel – Superintendent Cape Breton Highlands National Park x <u>Éric Le Bel</u> signature	Date:  2017/05/07

**COMMENTS**

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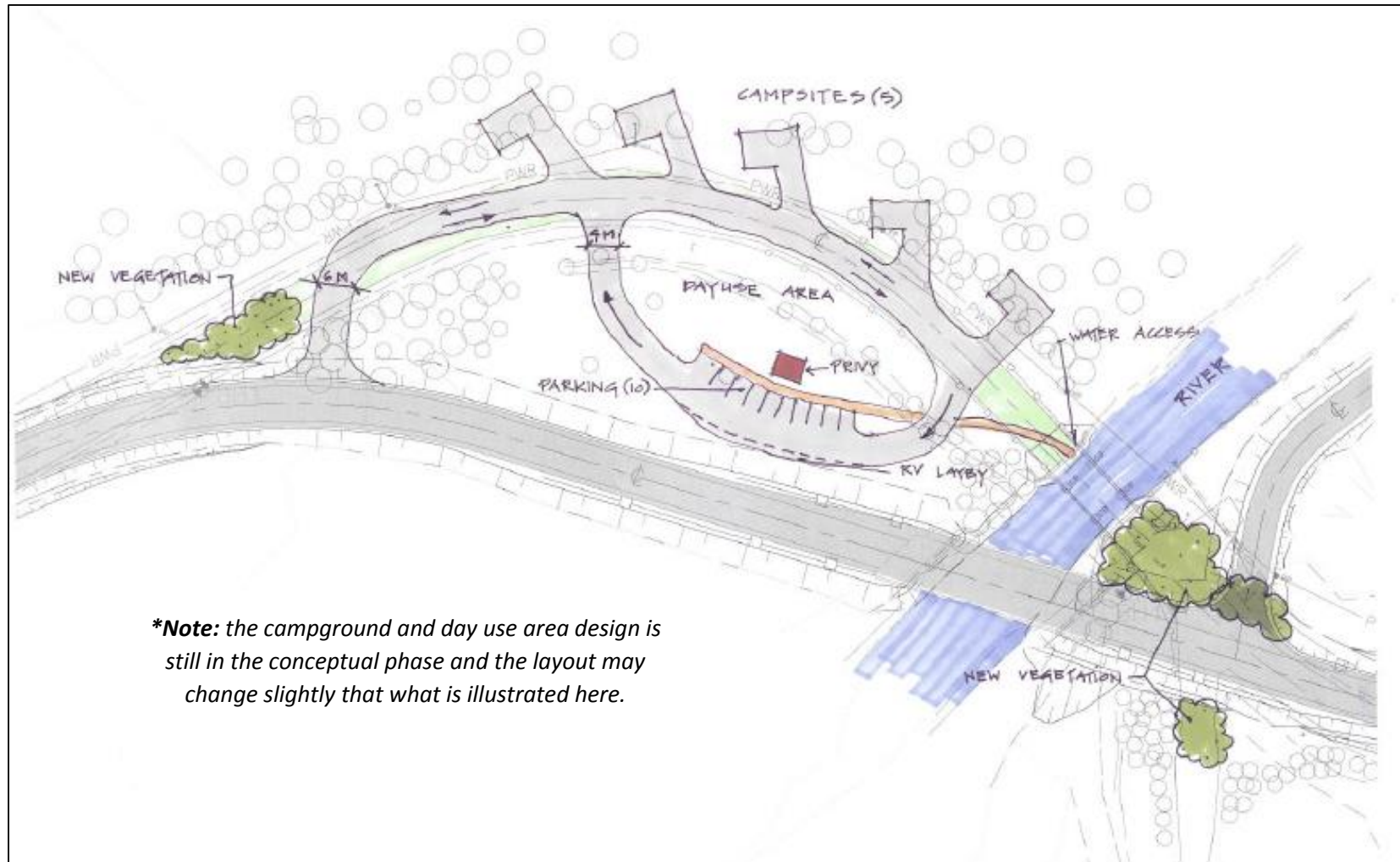


## Appendix A – Project Design Specs





## Plan – Campground and Day Use Area Conceptual Site Development Plan

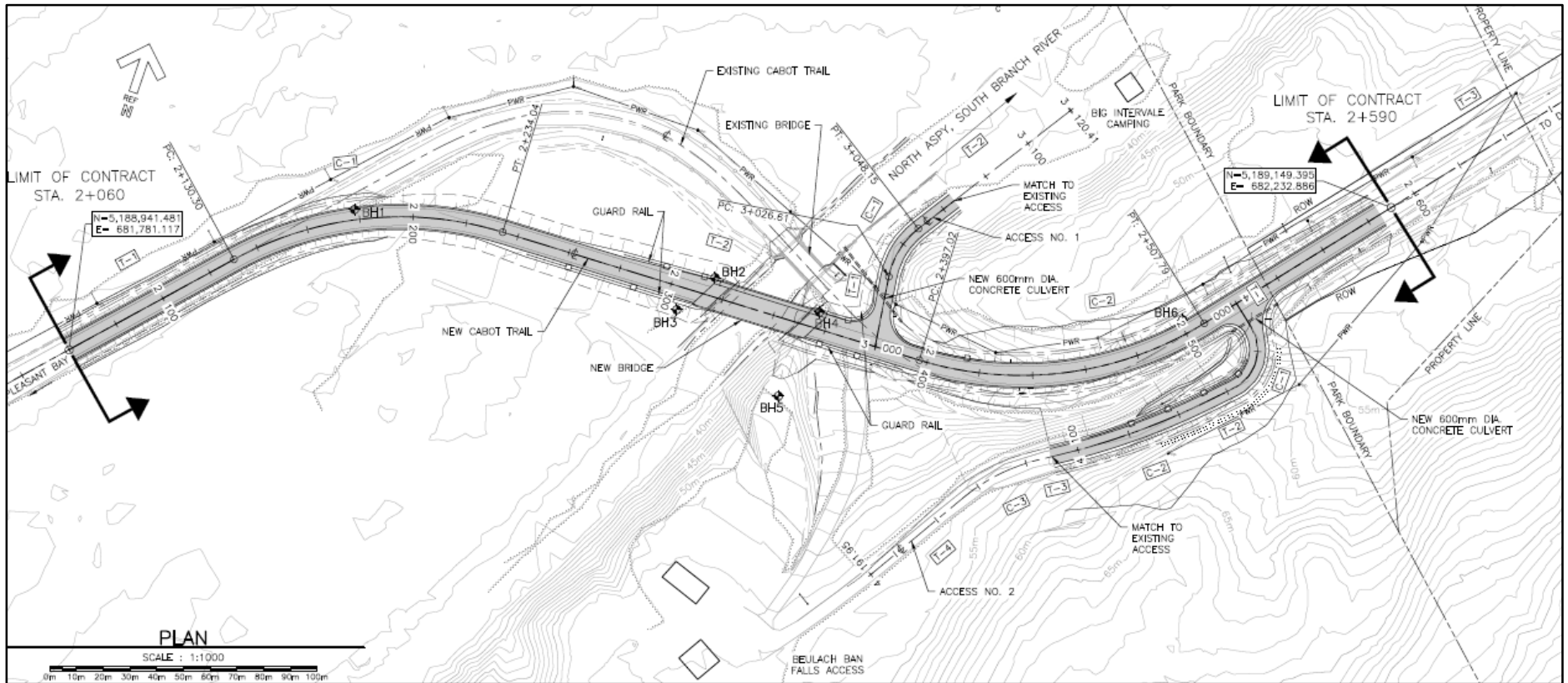


*\*Note: the campground and day use area design is still in the conceptual phase and the layout may change slightly that what is illustrated here.*



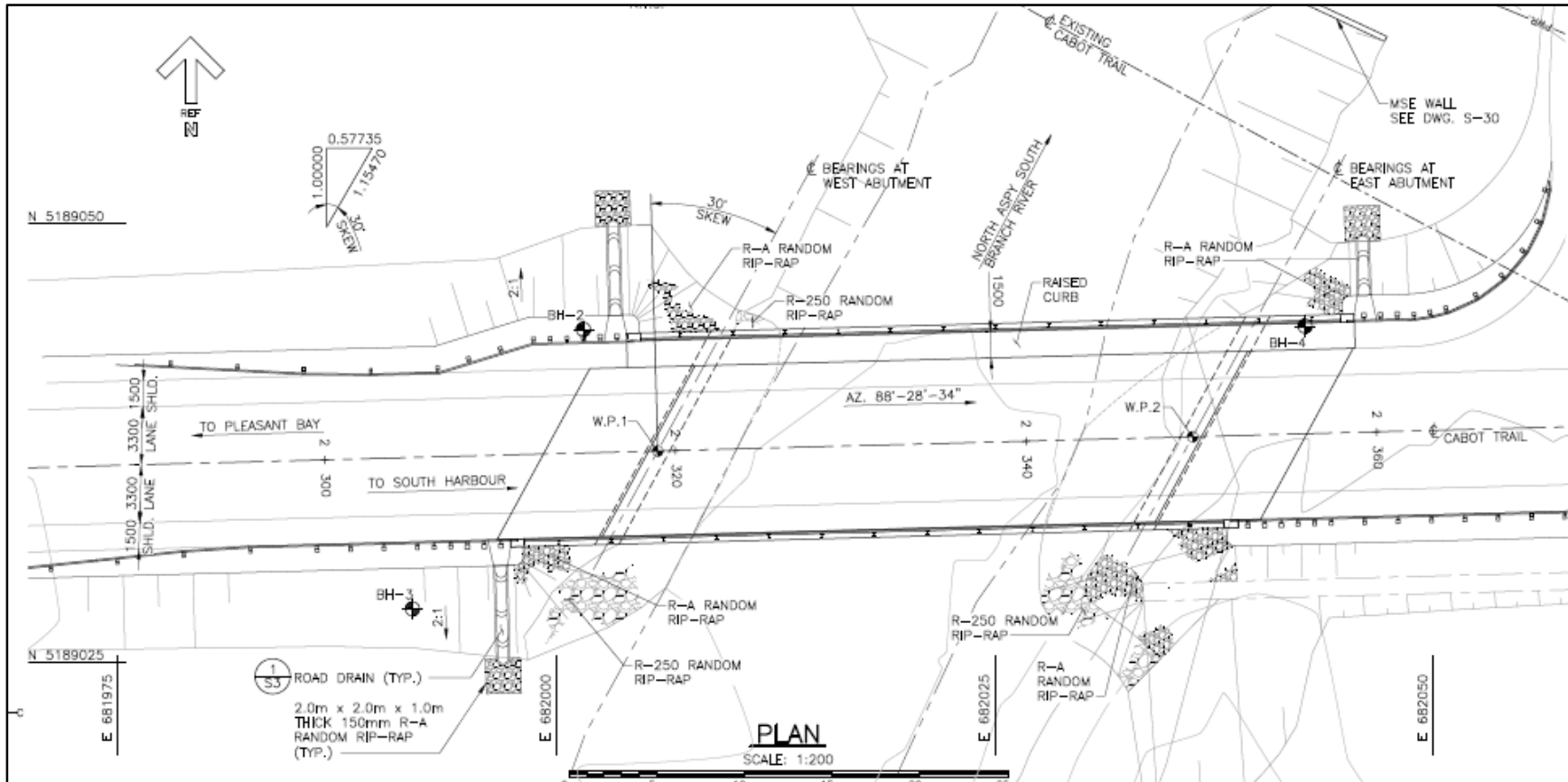


### Plan – Overview





### Plan – New Bridge







## Appendix B – Aerial Images









## Appendix C – Effects Identification Matrix

*This Effects Identification Matrix focuses specifically on direct effects related to the proposed project. There are not thought to be any adverse residual environmental effects if the proposed mitigation measures are followed.*

		Direct Effects (during site preparation/construction phases)												
Project Components	Operation, Implementation & Decommissioning Phases	Components potentially directly affected by the proposed project												
		Natural Resources							Cultural Resources		Visitor Experience			
		Air	Soil & Landforms	Water Resources (surface, ground, wetlands, etc.)	Fish and Fish Habitat	Terrestrial Flora (trees, shrubs & surface vegetation)	Terrestrial Fauna	Cultural Landscapes	In situ Cultural Resources	Visitor access & services	Recreational opportunities	Viewscapes & soundscapes	Visitor Safety	Essence of place
	<b>Associated Activities</b>													
	Supply and storage of materials	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Transport of materials/equipment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Set up of temporary facilities/detour	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Clearing & Grubbing	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Ditching & Excavation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Backfilling & grading	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Drainage/Culvert Installations	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Asphalt & Concrete	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Use of machinery	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Use of chemicals	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Construction traffic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Demolition of current structure	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Decommissioning of temporary facilities/detour	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Site remediation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓





Parks  
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Canada

# Parks Canada National Best Management Practices

## Roadway, Highway, Parkway and Related Infrastructure

Canada



Parks Canada National Best Management Practices for Roadway, Highway, Parkway and Related Infrastructure

Approved by

Original signed by Mike Wong

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Mike Wong, Executive Director Natural Resource Conservation Branch

Original signed by Calvin Mercer

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Calvin Mercer, Associate Vice-President Asset Management and Project Delivery

July 23, 2015

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Date



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## Introduction

The Parks Canada National Best Management Practices for Roadway, Highway, Parkway and Related Infrastructure will allow an identified suite of project activities to be undertaken in such a manner that there will not be resulting significant adverse environmental effects.

The Best Management Practice (BMP) pathway is applied when there is a suite of routine, repetitive projects (e.g. paving) or activities (e.g. de-watering), with well understood and predictable effects. This fulfils Park's Canada's obligations under the *Canadian Environmental Assessment Act 2012* as a manager of federal land, see the [Guide to the Parks Canada EIA Process](#). The BMP maximizes efficiency through creation of a pre-approved impact assessment for the defined suite of projects, to which standard mitigation and environmental management measures can be applied.

The impact assessment officer (IAO) will review a proposed project and advise the functional manager of the project if and how this BMP should be applied. The IAO's advice will be based on whether the project falls within the scope of the BMP, and whether application of the mitigation measures in the BMP will adequately address potential adverse effects of the project.

Project Managers are responsible to ensure all mitigation measures applicable to the project are added to the terms and conditions of any permits or contracts issued for the project.

The Impact Assessment Officers must ensure the project, EIA pathway applied and determination are recorded in the Parks Canada National Impact Environmental Assessment [Tracking System](#).

## Scope of Application

This BMP outlines the impact assessment of repetitive and routine projects on roadways, highways and parkways. If a project involves some or all of below activities, and the initial assessment of site and project indicate "the project is unlikely to result in significant adverse environmental effects" the BMP can be applied. Projects that this BMP would likely be applied to include:

- The proposed maintenance or repair of an **existing** sidewalk, or parking lot.
- The proposed maintenance or repair of an **existing** road, including pull-off areas, that would be carried out on the existing right of way<sup>1</sup>.

Activities included in the scope of this BMP are:

1. Project Design
2. General Activities
  - Worksite Conditions/Staging/Laydown
  - Equipment operations
  - Fuel storage and refueling

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<sup>1</sup> Highway Footprint or Right of Way (ROW): The permanent physical intrusion of a highway or freeway, including the road surface, shoulders, side slopes, drainage ditches and/or storm drainage ponds (Transport Canada, 2008).



- Site Clean Up/Waste Disposal
3. Asphalt Production and Handling
    - Asphalt Plant Operation
    - Gravel Crushing and Washing
    - Oiling of Truck Boxes
    - Clean Up and Disposal of Waste Products
  4. Concrete Handling
    - Operation, maintenance and inspection of Onsite Temporary Concrete Washout Facility
    - Removal of Temporary Concrete Washout Facilities
    - Onsite concrete management
  5. Paving, Resurfacing and Grading
    - Grading
    - Paving and Resurfacing
    - Pavement Marking and Barrier and Guardrail Reinstatement
  6. Barriers and Guardrails
    - Repair, replacement and upgrades of barriers and guardrails
  7. Vegetation Removal
    - Vegetation Removal
    - Grubbing
    - Brushing
    - Disposal of Vegetation Debris
    - Integrated Pest Management
  8. Excavation, Soil Stripping and Overburden Removal
    - Excavation
    - Soil Stripping
    - Topsoil Salvage
    - Excavated Material Storage
    - Excess Material and Waste (overburden removal)
  9. Slope Stabilization, Drilling and Blasting
    - Slope stabilization-scaling, hydraulic hammers
    - Drilling and blasting for Slope Stabilization and Geotechnical Investigations
  10. Soil and Vegetation Restoration
    - Topsoil Replacement
    - Soil Amendments
    - Seedbed Preparation
    - Species Selection
    - Seed Lot Selection
    - Seed Mixture Composition
    - Seeding
    - Alternatives to Seeding
    - Reclamation Standards
    - Reclamation Plot Evaluation
    - Time Limits



10. Drainage Structures
  - Drainage structures
  - Culverts
11. Bridge Maintenance
  - Bridge Cleaning
  - Bridge Repairs Using Treated Wood Products
  - Bridge and Structure Painting
12. Water Withdrawal and Dewatering
  - Water Withdrawal
  - Pump Screens
  - Dewatering

## Exceptions

This BMP is not suitable for the following project activities as they would require supplemental assessment and/or mitigations:

- Work that may impact aquatic or terrestrial wildlife habitat connectivity, such as fences or culverts;
- Elongation of culverts; realigning water courses; dredging; or work below the high water mark of a fish bearing water body;
- Bridge projects needing work to occur below the High-Water Mark<sup>1</sup>, with permanent alteration to the water course, such as replacement of piers/abutments or permanent installation of structures on the bed of a water body;
- Greater than 10% increase in land use footprint (e.g. gravel pit expansion); and,
- Work which might adversely impact any potential or established Aboriginal and Treaty rights or traditional use<sup>2</sup>.

If the project has the potential to have an adverse effect on the critical habitat of a species at risk (with endangered, threatened, or extirpated status) this BMP does NOT apply. The project will require a separate environmental impact analysis.

If the project has the potential for residual adverse effects on a listed species at risk (including effects to individuals and residence of the individuals) this BMP does NOT apply, the project will require a separate environmental impact analysis.

**Note:** If there is any uncertainty regarding potential adverse effects to species at risk, consult a member of the [National Office Species Conservation team](#).

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<sup>1</sup> High-water Mark is the usual or average level to which a body of water rises at its highest point and remains for a sufficient time so as to leave a mark on the land. (Fisheries and Oceans, 2015). Upper Controlled Water Elevation (UCWE) is used as definition of High-water Mark in managed waterways.

<sup>2</sup> Parks Canada must engage in additional and separate consultations with Aboriginal groups if there is a possibility of a project adversely affecting established or potential Aboriginal or Treaty rights. This is required to fulfill federal government responsibilities in upholding the honour of the crown. If there is uncertainty regarding the need for Aboriginal consultation with respect to a project, refer the matter to Parks Canada Legal Services for advice. Guidance on consultation may be sought from the [Aboriginal Affairs Secretariat](#) and from the guidance document "[A Handbook for Parks Canada Employees on Consultation with Aboriginal Peoples](#)".



## Approved geographic area of application

This BMP is intended for use in all Parks Canada administered protected heritage places with roadways, highways and parkways.

## Components of the environment that may be affected

Potential effects from projects of this type are well understood and predictable. They include:

### Water Resources:

- Adverse modifications to surface drainage patterns
- Reduced water quality due to increased erosion, sedimentation, transportation of debris and contamination (i.e. from leaks and accidental spills, etc.)

### Soil/Land Resources:

- Change in slopes, landforms, and landscape
- Soil compaction and rutting
- Slope instability, due to increased soil exposure and improper excavation and storage
- Soil contamination

### Air quality:

- Decreased ambient air quality (i.e. from dust, equipment emissions, etc.)
- Increased ambient noise levels
- Temporary increased levels of CO<sub>2</sub> and other pollutants
- Temporary increased localized temperatures from paving and equipment operation.

### Flora and Fauna:

- Damage to and/or removal of vegetation in immediate or adjacent areas
- Introduction of non-native species populations, or expansion of existing populations
- Wildlife sensory disturbance causing displacement/preferred habitat avoidance
- Wildlife habituation/attraction to artificial food sources
- Impeded/altered wildlife movement
- Damage to nests/disruption of nesting animals
- Mortality from project activities

### Cultural Resources:

- Adverse effects on the heritage value or character-defining elements of a cultural resource
- Impacts to archaeological resources (known or potential)

## Mitigation Measures

To use the document efficiently, keep the activity mitigation lists that apply to the project expanded and collapse the other activities by clicking on the section titles, print this as a pdf or



paper document and include with the EIA determination record. This will reduce the overall size and scope of the mitigations to present to contractors and project managers.

*Choose all that apply to project. Each title is hyperlinked to the related section.*

*Module*

1.	Project Design
2.	General Activities
3.	Asphalt Production and Handling
4.	Concrete Handling
5.	Paving, Resurfacing, Grading
6.	Barriers and Guardrails
7.	Vegetation Removal
8.	Excavations, Soil Stripping and Overburden Removal
9.	Slope Stabilization, Drilling and Blasting
10.	Soil and Vegetation Restoration
11.	Drainage Structures
12.	Bridge Maintenance
13.	Water Withdrawal and Dewatering



# 1. Project Design

When upgrades to infrastructure are planned opportunities to decrease the environmental impacts of long term operation should be considered in the engineering design. Some examples are: directing runoff into vegetated areas rather than directly into surface waters to decrease pollution in surface waters, increasing the span length of bridges during replacements to allow for terrestrial wildlife passage underneath and converting smaller culverts to larger culverts or clear span bridges to allow for better fish passage and less restricted flows.

## 2. General Activities Mitigations Module

Construction activities involve the use of laydown/staging areas, equipment operations, storage and handling of hazardous materials. Potential adverse effects include: destruction of vegetation, erosion and sedimentation, constriction for wildlife movements and introduction/spread of non-native vegetation.

### Work Site Conditions/Staging/Laydown

- 2.1. All employees must attend a briefing with an Impact Assessment Officer (IAO) or Surveillance Officer (SO) before beginning work at the site review and explain the mitigations that are conditions of the project approvals.
- 2.2. Minimize vegetation-clearing activities and ground disturbance by staging on existing hardened areas wherever possible.
- 2.3. Avoid or terminate activities on site that attract or disturb wildlife. Vacate the area and stay away from the immediate location if wildlife display aggressive behaviour or persistent intrusion.
- 2.4. Control materials that might attract wildlife (e.g. petroleum products, human food and garbage).
- 2.5. Notify the SO immediately about dens, litters, nests, carcasses (road kills), wildlife activity or encounters on or around the site or crew accommodation. Other wildlife-related encounters are to be reported to SO within 24 hours.
- 2.6. Delineate the work zone; clearly mark the limits to active construction and the access and egress locations.
- 2.7. When work involves the disturbance of soils or the use of erodible materials (e.g. sands, topsoil), prevent the transport of sediment by the installing of appropriate erosion and sediment control.
- 2.8. An Erosion and Sedimentation Management Plan shall be prepared for the components of the work undertaken in proximity to watercourses, wetlands or riparian environments. If sediment ponds are required, they shall be designed to settle all sediment particles 0.02 mm or larger. The ponds shall also be designed to handle 1:5 year storm events, with overflow spill capacity for 1:10 year storm events and emergency spillway capacity for 1:100 year storm events. All components require regular maintenance to ensure effectiveness.

### Equipment Operations

- 2.9. Equipment movements and workers' private vehicles shall be restricted to the 'footprint' of the construction area.



- 2.10. Ensure machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species, noxious weeds and soils from off-site.
- 2.11. Operate machinery on land above the high water mark, on ice, or in another manner that minimizes disturbance to the banks and bed of any water body.
- 2.12. Limit machinery crossing (fording) a stream or watercourse to a one-time event (i.e., over and back), and only if no alternative crossing method is available. If repeated crossings of the watercourse are required, construct a temporary crossing structure in compliance with the *Fisheries Act*.
- 2.13. For fording equipment without a temporary crossing structure, use stream bank and bed protection methods (e.g., swamp mats, pads) if minor rutting is likely to occur during fording.
- 2.14. Use temporary crossing structures or other practices to cross streams or water bodies with steep and highly erodible (e.g., dominated by organic materials and silts) banks and beds.

## Fuel Storage and Refueling/Emergency Plans

- 2.15. A Spill Response Plan will be prepared and detail the containment and storage, security, handling, use and disposal of empty containers, surplus product or waste generated in the application of these products in accordance with all applicable federal and provincial legislation. The Plan shall include a list of products and materials to be used or brought to the construction site that are considered or defined as hazardous or toxic to the environment. Such products include, but are not limited to, waterproofing agents, grout, cement, concrete finishing agents, hot poured rubber membrane materials, asphalt cement and sand blasting agents.
- 2.16. Spill kits shall be provided at re-fuelling, lubrication, and repair locations that are capable of dealing with 110% of the largest potential spill and shall be maintained in good working order. Site staff shall be informed of the location of the spill response kit(s) and be trained in its use.
- 2.17. If potentially hazardous materials (e.g. cement-based products, sealants or paints) are used on site ensure raw material, mixed compounds and wash water are not released to any watercourse or soils. Measures such as collection/drip trays and berms lined with occlusive material such as plastic and a layer of sand, and double-lined fuel tanks can prevent spills into the environment.
- 2.18. Hazardous or toxic products shall be stored no closer than 100 metres from streams, wetlands, water bodies or waterways.
- 2.19. Timely and effective action shall be taken to stop, contain and clean-up all spills as long as the site is safe to enter. The SO shall be notified immediately of any spill. In the event of a major spill, all other work shall be stopped and all personnel devoted to spill containment and clean-up.
- 2.20. The costs involved in a spill incident (the control, clean up, disposal of contaminants and site remediation to pre-spill conditions), shall be the responsibility of the proponent. The site will be inspected to ensure completion to the expected standard and to the satisfaction of Parks Canada.

## Site Clean Up/Waste Disposal

- 2.21. Clean tools and equipment off-site to prevent the release of wash water that may contain deleterious substances.



- 2.22. Where possible, sweep up loose material or debris. Any material thought to pose a risk of contamination to soils, surface water or groundwater should be disposed of appropriately off-site.
- 2.23. Construction, trade, hazardous waste and domestic waste materials shall not be burned, buried or discarded at the construction site or elsewhere in Parks Canada protected heritage places. These wastes shall be contained and removed in a timely and approved manner and disposed at an appropriate waste landfill site located outside the Parks Canada protected heritage place. Construction waste storage containers, shall be emptied when 90% full. Waste containers will have lids, be wildlife proof if there attractants and waste loads shall be covered while being transported.
- 2.24. Sanitary facilities, such as a portable container toilet, shall be provided and maintained in a clean condition.

### 3. Asphalt Production and Handling Mitigations Module

Asphalt is a common building material for transportation infrastructure. Its production requires the use of gravel, water, and petroleum products, and associated project activities include transportation, storage and handling of these materials. Installation of asphalt plants is common within the larger parks where gravel extraction is undertaken.

#### Timing of Works

- 3.1. Asphalt works are preferably undertaken during periods of dry weather as this allows easier control of contaminated runoff and sediment.
- 3.2. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters, particularly for surface repair works requiring the application of patching and sealing compounds, tar, asphalt, and chemical surface sealants.

#### Operation of Asphalt Plants

- 3.3. Asphalt plant operation must comply with all environmental pollution control regulations, including provincial regulations, and the plant operational plan.
- 3.4. Spoil piles and stock piles will be at least 30 meters from the edge of any water body.
- 3.5. There must be enough room between the stockpiles and the asphalt plant for a loader in the event of a spill at the asphalt plant.
- 3.6. A containment berm with an associated liner made of occlusive material (e.g. plastic of a thickness approved by the SO) and covered with absorbent sand or clay shall be installed under the asphalt storage tank to ensure containment of 110% of the tank's capacity.
- 3.7. The proponent shall be responsible for the purchase and safe delivery/storage/handling of asphalt cement and emulsions to the asphalt plant site.
- 3.8. Excess hot mix or reject new asphalt shall be temporarily in stored in the containment area sufficient to prevent runoff of petroleum into soils or surface waters as directed by the SO, and removed from the Parks Canada protected heritage place, prior to project completion.





- 3.9. Every effort will be made to recycle waste asphalt, either as a base course, or by recycling waste asphalt through the asphalt plant according to engineering specifications. Old cured ground asphalt material shall be removed, recycled, or stored for future recycling at an approved operational gravel pit or asphalt plant site. Stockpiles must be further than 30 metres from any surface waters.
- 3.10. Remaining stockpiles will be removed or incorporated into reclamation plans for the gravel pits or asphalt plant sites.
- 3.11. Asphalt to be removed must be sampled and analyzed to determine possible lead contamination. Contaminated asphalt will be transported to an approved waste disposal facility. A receipt of delivery is to be provided to the SO.
- 3.12. Proponent should protect containment/catchment areas and drip trays at the asphalt plant from rainfall since, if contaminated, all of the collected water will require disposal of at an approved disposal facility at the expense of the Proponent.
- 3.13. Dyking and ponding will be required to control the rate and quality of runoff from the plant site.
- 3.14. Ensure that the water in the settling ponds remains clean of petroleum products. Any contaminated water will require disposal at an approved disposal facility at the expense of the Proponent.

### Gravel Crushing and Washing

- 3.15. Where possible within engineering constraints, asphalt materials should be recycled to reduce the need for new gravel.
- 3.16. Gravel will be obtained from an approved operational borrow pit only. For gravel obtained from a borrow pit within a protected heritage place or borrow pit, gravel extraction within the footprint of the disturbed area of the approved operational borrow pit is permitted.
- 3.17. Gravel will not be crushed within 30 meters of any water body.
- 3.18. If water for cleaning is extracted from a watercourse, refer to [water withdrawal section](#) of this BMP.
- 3.19. If gravel requires washing, the water used will not be returned directly to any watercourse.
- 3.20. Water free from chemical contaminants will be discharged into ground where further erosion and runoff into surface water is prevented. Discharging into well vegetated ground surface, at a rate which prevents erosion can often provide increased absorption and reduction of sediment load.
- 3.21. Contaminated water must be treated to meet CCME guidelines or transported outside of the Parks Canada protected heritage place for disposal at an approved facility.
- 3.22. For waste removed from the park a detailed receipt of delivery to an approved facility will be provided to the SO.

### Oiling of Truck Boxes

Trucks for hauling asphalt mixture shall have tight, clean, smooth metal beds that have been sprayed with a minimum amount of thin fuel oil to prevent the mixture from adhering and causing waste asphalt.

- 3.23. Truck boxes may be oiled only when absolutely necessary.



- 3.24. Oiling will take place in a bermed area, consisting of a plastic underlay with 15 centimetres overlay of clean gravel. Oil contaminated gravel will be hand collected (so as to prevent tearing of the plastic) from the bermed area daily, and put through the asphalt plant.
- 3.25. Vehicle covers shall be securely fastened.

### **Air Quality Mitigations**

- 3.26. Asphalt plants should be 500 meters from buildings with human habitation.
- 3.27. Emissions from the asphalt plant and paving project equipment will comply with End Product Specifications (EPS) emission control standards and other provincial emissions regulations. Stack test results provided to the ESO by the operator or surveillance contractor may be required when the asphalt plant is at full capacity to ensure the plant is operating within the required standards. If the plant is not operating within the appropriate levels, production will cease until the requirements are met.
- 3.28. Sludge removed from the clarifier that is free of chemical contamination will be contained to prevent fine dust particles from becoming airborne during windy periods.
- 3.29. Unannounced stack tests will be conducted throughout the project. If the plant does not meet requirements, operation will cease until the requirements can be met.

### **Disposal and Clean Up of Other Waste Products**

- 3.30. To ensure regular clean-up of waste asphalt and petroleum spills, a defined clean up schedule will be established during the preconstruction meeting.
- 3.31. Leaks will be collected in drip-trays, the collected material will either be removed from the park, or recycled back through the Asphalt Plant. For any material removed outside the park to an approved facility, a detailed receipt will be provided to the ESO.
- 3.32. Used oil, filters, grease cartridges, oil cans and other waste products of plant servicing will be collected and disposed of at the nearest industrial waste facility.

## **4. Concrete Handling Mitigations Module**

Concrete is a common construction material used in transportation infrastructure. Its use ensures longevity of the infrastructure and safety for public use. One litre of concrete wash water or leachate in 1000L of water will kill fish. Cement-based products including grouts and concrete are lethal to fish and many other aquatic organisms. Raw product or leachate entering a watercourse will alter water chemistry, making it more basic or alkaline.

### **Onsite Temporary Concrete Washout Facility**

- 4.1. Temporary concrete washout facilities shall be located a minimum of 30m from storm drain inlets, open drainage facilities, and watercourses.
- 4.2. Temporary concrete washout facilities shall be temporary pit or bermed areas constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.
- 4.3. Straw bales, wood stakes, and sandbag materials can be used to construct temporary containment walls or “barriers”.



- 4.4. Plastic lining material shall be a minimum of 10-mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material.
- 4.5. The soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.
- 4.6. Perform washout of concrete mixer trucks in designated areas only.
- 4.7. Wash concrete from mixer truck chutes into approved concrete washout facility or collect in an impermeable bag for disposal.
- 4.8. Pump excess concrete in concrete pump bin back into concrete mixer truck.
- 4.9. Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed offsite.
- 4.10. Once concrete wastes are washed into the designated area and allowed to harden, the concrete shall be broken up, removed, and disposed of per federal and provincial regulations.

### **Maintenance and Inspection of Temporary Concrete Washout Facilities**

- 4.11. Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 100 mm (4 inches) for above grade facilities and 300 mm (12 inches) for below grade facilities.
- 4.12. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition.
- 4.13. Existing facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.
- 4.14. Temporary concrete washout facilities shall be inspected for damage (i.e. tears in PVC liner, missing sand bags, etc.).
- 4.15. Onsite concrete waste storage and disposal procedures should be monitored at least weekly or as directed by the ESO.

### **Removal of Temporary Concrete Washout Facilities**

- 4.16. Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled and restored.

### **Onsite Concrete Management**

- 4.17. Rolling concrete mixers with surplus concrete in amounts less than one cubic metre of wet concrete may waste this concrete in the grade right-of-way as directed by the Parks Canada Representative in areas that drain well away from watercourses. Surplus amounts in excess of one cubic metre are to be returned to the batching yard.
- 4.18. Water contaminated in the placing of cement and curing of concrete shall be contained and removed from the site to an approved disposal facility.
- 4.19. The concrete batching plant must be operated pursuant to applicable dust, air emission, and water quality control regulations.



- 4.20. Waste, solidified concrete from rolling concrete mixers in amounts less than 1 cubic meter and waste solidified concrete from construction pour shall be buried in the grade within 48 hours of the pour, subject to approval and direction from the Departmental Representative

## 5. Paving, Resurfacing, Grading Mitigations Module

Highway surface management activities are undertaken to ensure public safety on Parks Canada Agency highways by maintaining clean, level, and unbroken road surface conditions through activities such as pavement cleaning, patching, application of surface treatments, and pavement crack sealing. Grading is used to address drainage issues, vegetation encroachment, potholes and rough surfaces.

### Timing of Works

- 5.1. Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of contaminated runoff and sediment.
- 5.2. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters, particularly for surface repair works requiring the application of patching and sealing compounds, tar, asphalt, and chemical surface sealants.

### Grading

- 5.3. During grade construction conducted close to any watercourse, water body or wetland ensure materials are not pushed, fall or are eroded into the water or wetlands.
- 5.4. No grade building shall occur outside of the delineated work area or within 1 metre of the drip line of existing forest. Any material inadvertently falling outside the work limits will be removed promptly in a manner that does not damage trees or vegetation.
- 5.5. Materials shall be placed at storage sites or on the grade without spillage outside the work limits. Any material inadvertently falling outside the work limits will be removed promptly in a manner that does not damage trees or vegetation.
- 5.6. Retain a 30 metre vegetated buffer around water bodies or install runoff management structures.
- 5.7. If possible grade roads early in the spring before vegetation develops seed heads or late in season after vegetation has set seed and is dormant to minimize non-native vegetation propagation.
- 5.8. Ensure gravel or road bed material is free of weeds and comes from an approved operational gravel source free of other contaminants.

### Paving and Resurfacing

- 5.9. Minimize changes to the surface that could affect infiltration and runoff characteristics and maintain effective surface drainage to limit direct runoff into surface waters.
- 5.10. Minimize application of seal coats in wet conditions. Attempt to apply only to dry surfaces and not prior to (within 24 hrs.) or during rainfall. If unforeseen rain arrives ensure runoff from recently seal coated surfaces are prevented from entering surface waters.
- 5.11. For asphalt handling and management see the [Asphalt Mitigation Module](#) of the BMP.



## Pavement Marking and Barrier and Guardrail Reinstatement

- 5.12. Minimize changes to the surface that could affect infiltration and runoff characteristics and maintain effective surface drainage to limit direct runoff into surface water. Pavement marking shall be undertaken pursuant to standard methods applied in National Parks for control of paint products, both in transport and handling. The Contractor shall present a description of methods to be employed for transporting and controlling paint and hazardous products, application of paint, cleaning of equipment, containment and disposal of waste paint and cleaning products, etc. to the satisfaction of the Parks Canada Representative.
- 5.13. Where concrete barriers or guard rails are temporarily removed, for highway improvements, temporary glow posts shall be installed, at 20.0 m intervals on straight sections and at 10.0 m intervals on curves and shall remain in place until permanent barrier system has been installed.

## 6. Barriers and Guardrails Mitigations Module

Repair, installation and upgrade of barriers and guardrails involves laydown/staging areas, equipment operations, minor excavation (e.g., for barrier post holes) and use of concrete. Potential adverse effects include destruction of vegetation and erosion and sedimentation.

### Timing of Works

- 6.1. Where excavation is required, schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.
- 6.2. If the work schedule requires working in the rain, appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

### Repairs, Replacement and Upgrades

- 6.3. An Erosion and Sedimentation Management Plan shall be prepared for the components of the work undertaken within 100m of watercourses, wetlands or riparian environments. If sediment ponds are required, they shall be designed to settle all sediment particles 0.02 mm or larger.
- 6.4. Where use of concrete is required for guardrail post holes, Concrete Handling Mitigations apply.
- 6.5. If vegetation removal is required for barrier or guardrail works, Vegetation Removal Mitigations apply.
- 6.6. Where concrete barriers or guardrails are temporarily removed, temporary glow posts shall be installed, at 20.0 m intervals on straight sections and at 10.0 m intervals on curves and shall remain in place until permanent barrier system has been installed.

## 7. Vegetation Removal Mitigations Module

Roadside vegetation management activities include mowing, brushing, and landscape maintenance activities undertaken to maintain clear sight lines for highway users, control noxious weeds, facilitate effective drainage, and reduce possible fire hazards. Mature timber



may need to be removed for improving road alignments, improving sight lines or replacing or repairing associated infrastructure. Grubbing (stump and root removal) may be required to prepare the ground surface for other activities.

## Timing Windows

- 7.1. Vegetation clearing can negatively impact nesting birds and/or bats in spring and summer. Avoid all vegetation removal during this time. If vegetation removal is scheduled to occur within these times a qualified professional biologist/ecologist should further clarify the species presence and timing particular to the work site and any occupied bird nests, eggs, or nests of species protected under the Migratory Bird Convention Act (MBCA). See [appendix on regulatory guidance for further detail on the MBCA and SARA](#).
- 7.2. If a nest is found during the pre-work surveys, the vegetated area will be left intact with a suitable sized buffer of shrubs/trees around it until the young have fledged and left the nest. Size of buffer species dependent, to be determined in consultation with professional biologist or park ecologist.
- 7.3. Grass mowing and trimming should not occur during peak spring or fall reptile/amphibian migrations and hatching. Consult a local biologist/ecologist for site and species specific timing windows.

## Vegetation Removal Mitigations

- 7.4. Vegetation removal should be limited to the minimum Clear Zone Distance<sup>1</sup> dependent on type and size of road and maximum height needed to meet the road safety objectives.
- 7.5. Minimize full removal and retain vegetation when possible to reduce erosion.
- 7.6. Prior to the commencement of any vegetation removal, the worksite must be surveyed for species at risk. If species at risk are found, work must be stopped until site-specific mitigations to address potential adverse effects are developed.
- 7.7. Survey vegetation for non-native species, clear vegetation areas with non-native vegetation in spring and early summer to avoid further spread and development of the non-native seed bank.
- 7.8. Clearing activities shall be avoided during nesting seasons for birds, reptiles and amphibian species in the project area.
- 7.9. If wildlife is observed during work, if possible, give animals the opportunity to escape the work area to the surrounding forest or elsewhere to seek new shelter.
- 7.10. Avoid ground vegetation removal during dry, windy periods to prevent erosion of topsoil and reduction of air quality with dirt/dust.
- 7.11. Retain 30 metre vegetated buffer around water bodies, where disturbance is necessary and unavoidable restoration is required.
- 7.12. Debris will not be deposited in water bodies.
- 7.13. Ensure tree limbs/stumps are flush cut as close to the ground or stem as possible.

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<sup>1</sup> A clear zone is an unobstructed, traversable roadside area designed to enable a driver to stop safely or regain control of a vehicle that has accidentally left the roadway. The selection and design of appropriate clear zone dimensions is project-specific and should be the responsibility of professionals trained in roadside design.



- 7.14. Logs and other salvage materials are to be conveyed to and placed at a storage site without spread of debris or damage to other standing trees or landscape resources outside the marked clearing or storage limits. They shall not be skidded through wetlands, waterways or water bodies.
- 7.15. During the grubbing component, stumps, roots, imbedded logs and other non-soil debris shall be pulled and shaken free of loose soil and rocks before transport to a designated pit.
- 7.16. Where possible preserve identified wildlife trees by limbing or topping if they are not assessed as hazard trees.

## Disposal of Vegetation Debris

- 7.17. All vegetation debris must be removed as soon as possible from the right-of-way, either by transporting off-site for disposal or piling and burning on-site.
- 7.18. All vegetation containing non-native species will be piled and burnt or bagged and removed off site to disposal facility.
- 7.19. Piles will be made where trees are felled, piles will be 1.2-1.8 (4 to 6 feet) in diameter and no more than 1.2 m (4 feet) high (approximately 1 to 3 trees per pile) or as instructed by local fire and vegetation specialists.
- 7.20. Piles are to be located so that they do not scorch surrounding live trees and measures must be in place to ensure that fires do not spread (i.e., conduct burning on snow or on mineral soil).
- 7.21. Piles will be left until fall for burning to allow for curing of green fuels.
- 7.22. Provincial regulations for air quality must be met.
- 7.23. Where fire fuel loading is not a concern vegetation debris of limited amounts will be dragged in the forest to mimic natural tree fall.
- 7.24. If removal or burning are not feasible a chipper may be used for less than 50 boles per hectare. Chip depth is to be a maximum of 5 cm (2 inches), spread over area no greater of 5m x 5m per hectare so as to not cover underlying vegetation, prevent new native seedlings from sprouting, and cause soil/seed bank sterilization. Spreading of chips may extend beyond these parameters with permission from Parks Canada.
- 7.25. To facilitate chipping of woody debris, all trees/shrubs/vines can be left temporarily along the road shoulders and laid facing the same direction.
- 7.26. In some cases, logs from newly cut trees may be set aside for use elsewhere as directed by local park site managers and the ESO.
- 7.27. Store removed vegetation on already disturbed areas to minimize disturbance area.
- 7.28. In appropriate areas re-establish native vegetation where it has been completely removed/damaged.

## Integrated Pest Management

- 7.29. A Field Unit Integrated Pest Management Plan (IPMP) must be completed and approved prior to the use of herbicides to ensure the most effective and least harmful substances are properly used.



## 8. Excavations, Soil Stripping and Overburden Removal

### Mitigations Module

Construction projects often involve excavations. To successfully complete reclamation of disturbed areas, and protect areas from erosion proper soil handling and backfilling procedures must be followed. Post excavation and stripping soil and vegetation restoration mitigations should be applied. See section of this BMP for [Soil and Vegetation Restoration](#).

#### Timing of Works

- 8.1. Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.
- 8.2. If the work schedule requires working in the rain, appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

#### Excavation

- 8.3. Materials shall be placed at storage sites or on the grade without spillage outside the working limits. Any material inadvertently falling outside the work limits is to be removed promptly in a manner that does not damage trees or vegetation.
- 8.4. All sediment control measures must be in place before starting work in the vicinity of rivers, water bodies, watercourses, and wetlands.
- 8.5. Special precautions may have to be taken during excavation in the vicinity of intermittent or active drainage channels.
- 8.6. Excavation plans must be compared to local archaeological resource inventories, if available. If no archaeological information is available for the work area, an Archaeological Overview Assessment (AOA) may be required to determine the archaeological potential of the work area. Based on the results from the AOA, an Archaeological Impact Assessment might be required. It would be time and cost efficient to refer the plan to Parks Canada's Terrestrial Archaeology section before conducting any excavation to determine the appropriate course of action.
- 8.7. If cultural resources (eg. archaeological resources) are discovered, immediately cease work, and alert SO.
- 8.8. Minimize changes to the ground surface that affects its infiltration and runoff characteristics and maintain/re-establish effective surface drainage on completion of the project
- 8.9. Backfill and compact excavations as soon as possible. Optimize degree of compaction to minimize erosion and allow for re-vegetation.
- 8.10. All trenches or ditches left unattended overnight must be fenced or covered to prevent wildlife entrapment.

#### Soil Stripping

- 8.11. Strip topsoil under dry conditions, whenever possible.
- 8.12. No stripping shall occur outside of the delineated work area or within 1 metre of the drip line of existing forest.





- 8.13. In the event of a work program shutdown during inclement weather (e.g. winter conditions unfavourable for construction, heavy rain events, construction delays, etc.) erosion control of bared soils or excavated material stockpiles is required.
- 8.14. Stripping close to any watercourse, water body or wetland shall employ methods to ensure materials are not pushed, do not fall or erode into the water or wetlands.
- 8.15. Work within a 100 metre buffer from the high water mark of waterways or wetlands will require a site specific sediment and erosion control plan.
- 8.16. An erosion control plan is also needed to control dust generated from the construction site.

### **Topsoil Salvage**

- 8.17. Salvage topsoil at all excavation sites for reclamation purposes.
- 8.18. Usually the upper 15 cm of soil, below the sod layer if present, is considered topsoil, where depths exceed 15cm salvage the entire depth of topsoil.
- 8.19. Remove stumps and woody debris from topsoil, wherever possible.

### **Excavated Material Storage**

- 8.20. Allow space for separate storage of topsoil and spoil; where space is available separate stored topsoil from spoil by at least 1 m. Use appropriate material (e.g., geo-textile) to separate soil components where space is limited.
- 8.21. Topsoil may be stored on hardened surfaces, geo-textile material or directly on undisturbed vegetation. If storage occurs on vegetation, material recovery by hand may be required.
- 8.22. Cover all stockpiled material with heavy-duty plastic or filter cloth to prevent erosion during precipitation events.
- 8.23. Topsoil should be stockpiled on the uphill side of the disturbance on sloped terrain.
- 8.24. Construct barricades to prevent losses on steep terrain (>18°, 3:1) and within 100m of watercourses.

### **Excess Materials and Waste (Overburden Removal)**

- 8.25. Remove excess excavated material from site where it cannot be used for the final grading of the area. Site specific arrangements must be made for disposal locations and procedures of overburden.
- 8.26. Surplus excavated material may be used to fill depressions around the project site providing topsoil is stripped before filling, with approval from SO.

## **9. Slope Stabilization, Drilling and Blasting Mitigations Module**

Where standard excavation is not sufficient, scaling, hydraulic hammers, drilling units or trim blasting are used to break up rock or soil for removal. Accumulations of debris in ditches reduce their effectiveness at trapping rock fall and reduce public safety. Ditches will be cleaned using a loader and back hoe. Guardrails and rock fences may be temporarily removed to permit this activity.



## Timing of Works

- 9.1. Time any vegetation removal work should adhere to the Migratory Bird windows for the area.
- 9.2. Time work to reduce impact to mammals, amphibians and reptiles using rock faces during sensitive life stages such as birthing and rearing of young. This often occurs during the spring. Confirm timing windows with local wildlife ecologists.
- 9.3. Avoid ditch clearing during wet periods and wait until ditches are dry to reduce impacts to amphibians and reptiles and limit sedimentation.

## Slope Stabilization-Scaling, Hydraulic Hammers

The use of hydraulic hammers attached to excavators is considered the ideal solution for rock disintegration. It avoids rock blasting where the parent rock is no longer rippable by the excavator's bucket but still has enough planes of weakness for economical operation and effective use of the hydraulic hammer. Scaling is the manual removal of loose material on rock slopes using pry bars, hydraulic press, brooms, shovels and power equipment operated by personnel using roped access to a rock face.

- 9.4. For vegetation clearing refer to the [vegetation removal mitigation module](#) of this BMP.
- 9.5. For slope-stabilization in soils, please refer to the Excavation section.
- 9.6. Survey the work site for cultural resources such as rock art (ex. pictographs, petroglyphs, etc. prior to the work commencing, establish site specific mitigations for their protection.
- 9.7. Measures shall be taken to control dust as much as possible during the removal and falling of rock materials down slope.
- 9.8. Placement of rip rap and backfill on shorelines shall be undertaken without contacting the watercourse, wetted margins and must not be below the High Water Mark.
- 9.9. If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, then ensure that appropriately- sized, clean rock is used, and rock is installed at a similar slope to maintain a uniform bank.
- 9.10. Direct concentrated surface water (runoff) away from cut and fill slopes.
- 9.11. Immediately stabilize banks disturbed by any activity associated with the project to prevent erosion and/or sedimentation, preferably through vegetation restoration with native species suitable for the site-refer to [soil and vegetation restoration section of BMP](#).

## Drilling and Blasting for Slope Stabilization and Geotechnical Investigations

Trim blasting is used for controlled blasts in which explosive charges are placed in predetermined pattern of holes drilled into the rock face and then detonated. Potentially unstable masses of rock can sometimes be stabilized using rock bolts and long steel rods drilled into the rock to bind it together. Drilling is a common method of investigation to obtain geotechnical reports required for engineering design.



## Drilling

- 9.12. Debris from drilling will be contained (screened or settle out) so it will not cover the surrounding area or enter any water course. All debris will be removed, [see section on overburden removal](#) for further mitigations.
- 9.13. The cuttings from all drilling will be contained so they can be removed entirely from the site. If contaminated, the cuttings are to be disposed at an approved waste disposal facility.
- 9.14. Control of spoil and sediment loaded water is required on the drill site. Diking will be required to retain the deposit on non-vegetated surfaces. If contaminated, the spoil pile must be disposed at an approved waste disposal facility.
- 9.15. During aquifer tests, the water must be piped so it does not erode any soil or any part of the ground. If the water from the tests is piped to a creek, stream, or river, the pipe is to be situated so that there is no erosion of the stream bank or bed. If any sand or similar material is discharged during the aquifer test, care must be taken that the sand does not cover any vegetation.
- 9.16. All test wells will be filled in after the testing is completed. The proponent will be responsible for rectifying any future problems associated with any of the wells or test wells.

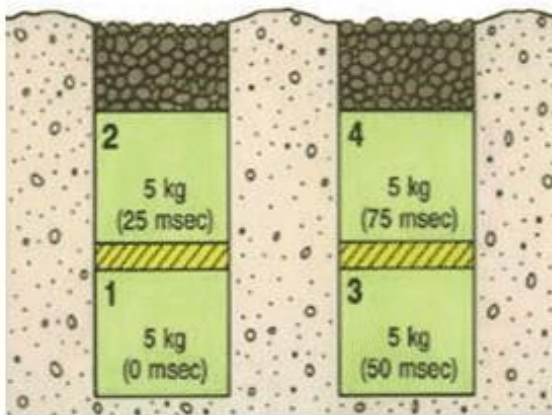
## Blasting

- 9.17. The Parks Canada Representative will identify a magazine location for explosives should a factory site or "ready-to-use" explosives storage site be required
- 9.18. The blasting supervisor will ensure no damage to infrastructure, people, surrounding vegetation or wildlife by mitigating risk of fly rock.
- 9.19. Avoid using explosives in or near water. Use of explosives in or near water produces shock waves that can damage a fish swim bladder and rupture internal organs. Blasting vibrations may also kill or damage fish eggs or larvae.
- 9.20. If explosives are required as part of a project (e.g., removal of structures such as piers, pilings, footings; removal of obstructions such as beaver dams; or preparation of a river or lake bottom for installation of a structure such as a bridge or culvert), the potential for impacts to fish and fish habitat will be minimized by implementing the following measures:
  - Time in water work requiring the use of explosives to prevent disruption of vulnerable fish life stages, including eggs and larvae, by adhering to appropriate fisheries [timing windows](#).
  - Isolate the work site to exclude fish from within the blast area by using bubble/air curtains (i.e., a column of bubbled water extending from the substrate to the water surface as generated by forcing large volumes of air through a perforated pipe/hose), cofferdams or aquadams.
  - Remove any fish trapped within the isolated area and release unharmed beyond the blast area prior to initiating blasting.
  - Minimize blast charge weights used and subdivide each charge into a series of smaller charges in blast holes (i.e. Decking) with a minimum 25 millisecond (1/1000 seconds) delay between charge detonations (see Figure 1).



- Back-fill blast holes (stemmed) with sand or gravel to grade or to streambed/water interface to confine the blast.
- Place blasting mats over top of holes to minimize scattering of blast debris around the area.
- Do not use ammonium nitrate based explosives in or near water due to the production of toxic by-products. Remove all blasting debris and other associated equipment/products from the blast area.

Figure 1: Sample Blasting Arrangement



Per Fig. 1: 20 kg total weight of charge; 25 msecs delay between charges and blast holes and decking of charges within holes. (Fisheries and Oceans Canada, 2015)

## 10. Soil and Vegetation Restoration Mitigations Module

Almost all projects activities included in this BMP will require some ecological restoration- *the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed*. The restoration plan can be a simple application of the following mitigations and can be at the site or both at the site and in concert with another site designated to offset the permanent impact of a project. For disturbance areas greater than a hectare a restoration plan is required. The restoration works can be often be considered projects in and of themselves. Soil and vegetation restoration must apply the principles of effective, efficient and engaging solutions.

### Timing Windows

- 10.1. Develop restoration plan as part of the project scoping and specifications prior to project approvals.



- 10.2. Vegetation restoration is most effective if seeded in the fall, this allows for full scarification of the seed over the winter and adequate moisture available. Spring and early summer will also work, consider using seed that requires shorter scarification times for these applications. Transplants will do best in the spring and summer and will require adequate watering.

## Topsoil Replacement

- 10.3. Implement restoration plan for the disturbed area immediately following completion of construction.
- 10.4. Replace topsoil to all areas immediately following fine grading.
- 10.5. Do not compact topsoil.
- 10.6. Where insufficient topsoil is available imported soil may be used as a last resort. Imported topsoil must be certified completely free of non-native seeds and compost developed from sewage treatment plants. Methods of improving vegetation succession using locally sourced, weed and contaminant free materials are preferred.
- 10.7. Slopes to be seeded should be no steeper than 2 horizontal to 1 vertical (2:1) and covered with a minimum of 5 cm (2 inch) of topsoil. Finish grading should always follow top soil placement.
- 10.8. Where remaining soils are unstable due to steepness or soil characteristics, immediate installation of sod or erosion control blanket is required.
- 10.9. Methods of bioengineering such as terracing, willow staking, live pole drain systems should be assessed as solutions where soils are steeper or remain unstable.

## Soil Amendments

### Fertilizer Application

- 10.10. Avoid use of fertilizer to limit non-native vegetation growth and allow for local species to use available nutrients.
- 10.11. If needed use locally sourced mycorrhizae compost teas to improve vegetative success.

### Topsoil substitute

- 10.12. Apply an organic cellulose only amendment as a soil substitute if reclamation standards are not being met within the defined time frame.
- 10.13. Determine the type of organic amendment based on the site-specific requirements (e.g., peat moss, compost).

## Seedbed Preparation

- 10.14. The seedbed will be scarified by hand or, with the approval of the SO, by machine on large areas (i.e., roadbeds) where it is accessible and appropriate.
- 10.15. The seedbed will be scarified if seeding takes place more than 7 days after final grading or if there has been a rainfall between final grading and the seeding date.



- 10.16. The cleats of a tracked vehicle or a harrow device will be used, where possible, to prepare an adequate seedbed with seedling safe-sites (microsites) substantially free of soil crusts.
- 10.17. Align cleat marks at right angles on slopes to trap seed and sediment and reduce erosion.

## Species Selection

- 10.18. When selecting species and varieties:
  - Use species of local native plant communities.
  - Species viability in proposed environment and climatic conditions.
  - Capability to effectively control erosion, where required.
  - Adaptation to the variable site conditions of undulating topography.
  - Consider palatability of some species to herbivores and avoid growing attractants in areas of increased risk to wildlife and visitors.
  - Variable life expectancy to produce variable, delayed die-out of seeded species and replacement with indigenous native plants.

## Seed Lot Selection

- 10.19. Select seed lots based on indigenous species variety and quality (guaranteed weed seed free content and highest purity and germination), consult with vegetation restoration specialist or fire/vegetation ecologist.
- 10.20. Reject any seed lots containing any seed of undesirable crop or weed species.

## Seed Mixture Composition

- 10.21. The proportion of each species should be calculated to provide an adequate quantity of pure live seed (PLS) per unit area of each key component.
- 10.22. Aim for density of about 140 seedlings/m<sup>2</sup> at the end of the first growing season to provide adequate ground cover and allow native species to re-colonize the site over time.
- 10.23. Consider that parameters such as seed lot purity, seed germination, seedling establishment, seed size and seeding method affect the final stand composition.

## Seeding

- 10.24. Use approved native seed mixes developed for site-specific conditions for various elevations.
- 10.25. Seed and stabilize (e.g. mulch/tackifier) bare areas as soon as possible after disturbance, preferably as soon as a significant area is graded and finished and before the next rain event. If there is a risk of seedling mortality as a result of fall frost stabilize until appropriate growing conditions exist.
- 10.26. Use sod in high traffic areas or places that need extra erosion control. Source sod grown from native species (often called fescue sod) and ensure adequate anchoring and watering is in place.
- 10.27. Use temporary seeding when outside the seeding dates for permanent vegetation
- 10.28. Apply a seed mixture which is appropriate for the climate, soil, and drainage conditions of the site.
- 10.29. Apply seed at a rate appropriate to the seed mixture, seeding method and existing vegetation conditions.



- 10.30. Conduct broadcast seeding under calm wind conditions. Hydro-seeding is acceptable where access is available.
- 10.31. Do not exceed 30 kg/ha for the broadcast method, ensure seed is integrated with the soil by light rake or harrow. Broadcast method seeding rate is 25 kg/ha (2.5g/m<sup>2</sup>) (e.g., 1x25 kg bag will cover 10,000m<sup>2</sup> or 1 hectare).
- 10.32. For hydro-seeding do not exceed 75 kg/ha with light mulch rates (500 kg/ha- of mulch with hydro-seeding) and 150 kg/ha with heavy mulch rates (1500 kg/ha of mulch with hydro-seeding).
- 10.33. Do not increase the seeding rate to compensate for poor seedbed conditions.
- 10.34. Monitor temporary erosion control measures to prevent seed loss.
- 10.35. Some seeding procedures may have to be completed or repeated in subsequent years.

### Alternatives to Seeding

- 10.36. Use topsoil seed bank in small areas when there is no risk of erosion or competition from invasive species (i.e., natural regeneration).
- 10.37. Use native transplants in areas where conventional seeding applications are not applicable or where slope stability is an issue.
- 10.38. Use conventional forestry planting methods for container grown transplants, see website for guidance.

### Reclamation Standards

- 10.39. Minimum standard for plant density is 25 plants/m<sup>2</sup>, with 90% frequency.
- 10.40. Minimum standard for plant cover is 80% ground cover, with 90% frequency.
- 10.41. Minimum standard for plant community composition standard is 50% cover and 90% frequency of native species.
- 10.42. Exclude species designated as weeds in the work sites from the plant density standard consult local vegetation ecologist for current site specific non-native vegetation management program.
- 10.43. Rock, plant litter and non-vascular species are included in the cover standard.
- 10.44. Remaining plant cover of seeded native species is acceptable.

### Reclamation Plot Evaluation

- 10.45. Select any site within reclamation area measuring 10 x 10 m, providing 100 plots of 1 square meter.
- 10.46. Measure the plant density, cover and composition in each of the 100 square meter plots.
- 10.47. The reclamation standard will have been met if 90 of the 100 plots match or exceed the criteria.
- 10.48. No fertilizer will be applied one year before the reclamation standard is evaluated.

### Time Limits

- 10.49. Inspect site annually during the growing season.
- 10.50. Minimum reclamation standard, as above, to be met within one season post planting.
- 10.51. Apply amendments annually, depending on reclamation progress.



- 10.52. Re-seed site if the plant density standard is not expected to be achievable within 5 years.
  - A new restoration plan will be prepared and implemented when reclamation standards have not been met after 5 years.

## 11. Drainage Structures Mitigations Module

Drainage structures on roadway, highway and parkways are structures such as culverts, ditches and drains. Drainage structure management activities are undertaken to ensure that surfaces are safe and efficiently drained, water is efficiently channeled to ditches and watercourses, and erosion of highways and adjacent properties is prevented. These mitigations include the cleaning and maintenance of drainage structures and related hardware, as well as the repair or replacement of existing and installation of new drainage structures.

### Timing of Works

- 11.1. Time work in water to respect **timing windows** to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed. Contact your local aquatics specialists and DFO offices for further information on **timing windows** in your region.
- 11.2. Conduct in-stream work during periods of low flow, or at low tide, to further reduce the risk to fish and their habitat or to allow work in water to be isolated from flows.
- 11.3. Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.
- 11.4. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

### Drainage Structures

- 11.5. Isolate your work area from any flowing water that may be present. Ensure any flows are temporarily diverted around the portion of the ditch or watercourse where you are working.
- 11.6. Select appropriate equipment and work access routes to reduce damage to riparian vegetation and watercourse banks when using earth-moving equipment.
- 11.7. For smaller scale debris and sediment removal activities, remove materials by hand.
- 11.8. To assist with bank stability and invasive plant prevention, leave topsoil and root systems intact on channel banks surrounding your work area.
- 11.9. Ensure any works to repair damaged structures retain the pre-repair channel conditions (e.g., streambed profile, substrate, channel cross section) and do not constrict the stream width.
- 11.10. Maintain effective sediment and erosion control measures until complete re-vegetation of disturbed areas is achieved.

### Culverts

If a proposed culvert crosses a stream where fish are present, the crossing should be designed or upgraded to provide fish passage and avoid interference with fish habitat. To mitigate the





impact of culverts on fish movement technical assessment of the water flows and fish species is required to establish a culvert design that will allow for passage of fish. Often there are regional or provincial best practices available online and qualified professionals can assist with designs. Some best management practices for installation or replacement of culverts follows.

#### Culvert Design and Alternatives

Utilize alternative crossing structures (e.g. clear span bridges, lock blocks and concrete decks) as a replacement for culverts, where possible.

- 11.11. Ideally, crossings should have natural streambed material through them to allow continuous substrate that matches the streambed below and above the crossing. Open bottom crossings are ideal for maintaining natural substrate.
- 11.12. Utilize a single large culvert design over a multiple culverts design (i.e. several smaller culverts) to reduce debris blockage and increased fish and wildlife passage, where hydrologically feasible
- 11.13. Design culvert bottoms to be placed at least 30cm below the stream bed elevation to ensure culverts remain passable by fish and wildlife by preventing culverts from becoming perched.
- 11.14. A minimum water depth of 200 mm should be provided throughout the culvert length. To maintain this water depth at low flow periods an entrance/downstream pool can be constructed. In some cases, an upstream pool may also be necessary.
- 11.15. The culvert slope should follow the existing streambed slope where possible.
- 11.16. The culvert, inlet(s) and outlet(s) should be adequately protected with rip-rap to prevent erosion and scour around the culvert during high runoff events. The following measures should be incorporated when using replacement rock to stabilize the culvert:
  - Place appropriately-sized, clean rocks into the eroding bank area by hand or machinery operating outside the water course.
  - Do not obtain rocks from below the ordinary high water mark of any water body.
  - Where possible, install rock at a slope similar to the stream bank to maintain a uniform stream profile and natural stream alignment. Otherwise, install the rock at the closest slope required to ensure it is stable.
  - Ensure rock does not interfere with fish passage or constrict the channel width.
- 11.17. Trash racks should not be used near the culvert inlet. Accumulated debris may lead to severely restricted fish passage and potential injuries to fish. Where trash racks cannot be avoided in culvert installations, they must only be installed above the water surface indicated by bank full flow. A minimum of 9 inches clear spacing should be provided between trash rack vertical members. If trash racks are used, a long term maintenance plan must be provided along with the design, to allow for timely clearing of debris.
- 11.18. Natural or artificial supplemental lighting should be considered in new or replacement culverts that are over 150 feet in length.
- 11.19. Ensure designs locate culvert structures in areas that minimize impacts to riparian vegetation and associated wildlife.



### Culvert Installation

- 11.20. It may be necessary to exclude fish from the immediate construction site while a culvert is being installed. If this practice is necessary, fish shall be salvaged by a qualified aquatics professional from within the exclusion area.
- 11.21. If dewatering is required refer to the [dewatering mitigation module](#) of this BMP for appropriate mitigations.
- 11.22. Maintain effective sediment and erosion control measures until complete re-vegetation of disturbed areas is achieved.
- 11.23. Remove any old structures to a suitable upland disposal facility away from the riparian area and floodplain to avoid waste material from re-entering the watercourse

### Wildlife Considerations for Culverts

At times, culverts are placed along portions of highways that bisect wetlands or specific habitats that support an abundance of wildlife. Consider building natural rock ledges through culverts to allow for small and medium-sized animals to walk on during periods of high flow.

## 12. Bridge Maintenance Mitigations Module

Bridge structure management activities include the cleaning and painting of bridge structures as well as the repair, rehabilitation, and replacement of bridge elements including decks, railings, abutments, and bearings. Works may include asphalt, concrete works, chipping, painting, grouting, timber truss, abutment and piling maintenance. These activities help ensure bridge structures remain structurally sound and safe for public use.

### Timing of Works

- 12.1. Time work in water to respect [timing windows](#) to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed. Contact your local aquatics ecologists, provincial jurisdictions and DFO offices for further information on [timing windows](#) in your region.
- 12.2. Conduct in-stream work during periods of low flow, or at low tide, to further reduce the risk to fish and their habitat or to allow work in water to be isolated from flows.
- 12.3. Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.
- 12.4. Cover or otherwise contain stockpiled materials during heavy rain events or extended absences.
- 12.5. If the work schedule requires working in the rain, the area of work must be isolated with appropriate sediment controls installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

### Bridge Cleaning

- 12.6. Schedule bridge-cleaning activities to coincide with the watercourse's spring freshet when possible. At freshet or during periods of high flow a large watercourse will often have its highest background levels of sediment. At this time, the introduction of a small amount of sediment to a watercourse (from bridge cleaning) will have a lower risk of potential impact when considered against those high natural background levels.



- 12.7. If works are planned outside the freshet or if your region does not experience a freshet, discuss the protocol and timing of these works with your local aquatic ecologist and/or DFO Officer.
- 12.8. Dry sweep and collect loose material off bridge surfaces before washing the bridge. Adequately seal drains and any open joints on the bridge deck before sweeping or washing to prevent material or sediment-laden wash water from entering any watercourse
- 12.9. If dry sweeping and preventing direct runoff to waterway is not a feasible way to clean the surface, discussion and planning with local aquatic ecologists will be required.
- 12.10. Use water alone. If your cleaning activities require degreasers or any other chemical, approval for use must be obtained from local aquatic specialists and/or DFO.
- 12.11. Contain any wash water or runoff to the bridge deck. Direct wash water towards the bridge approaches and away from the watercourse, then to a vegetated area or contained settling area (e.g., dry ditch channel unconnected to a watercourse) where it can infiltrate.
- 12.12. If superstructure cleaning is undertaken above or on the bridge deck level, prevent potentially harmful materials from entering into road drains. Block deck drains with suitable barriers (e.g., polyethylene or drain blocks) to prevent direct discharge to a watercourse, or re-route runoff through temporary piping onto adjacent settling pond or structure, using a hydro vacuum would be another option.
- 12.13. If water for cleaning is extracted from a watercourse, refer to [water withdrawal section](#) of this BMP.

## Repairs Using Treated Wood Products

- 12.14. Untreated wood products are recommended, if treated wood is to be used, ensure it has been treated with a wood preservative appropriate for the project. Refer to the [Parks Canada Guide for the Use, Handling and Disposal of Pressure Treated Wood 2009](#) and any further updates from [Parks Canada Real Property – Environmental Management](#).
- 12.15. If treated timber must be cut to size, ensure cutting takes place away from the bridge and watercourse. Sawdust from treated wood is harmful to aquatic organisms and must be prevented from entering any watercourse.
- 12.16. Wood preservatives should be applied in a contained area and not be applied over or within 200m of water.

## Bridge and Structure Painting

- 12.17. Ensure paint flakes, abrasive grits and abrasive/paint flake mixtures do not enter the watercourse as they may leach toxic heavy metals into receiving waters and/or be ingested by fish.
- 12.18. Install ground covers and/or vertical drapes such as sheets of plastic or air-permeable cloth (e.g., burlap or canvas) prior to removal activities to capture falling debris. Floating barges may be deployed in watercourses to capture falling debris, such as paint flakes and dust.
- 12.19. Waste materials collected during removal and application of protective coating operations (e.g., blasting abrasives, paint particles, rust and grease) should be



collected and retained for disposal at appropriate locations. Waste materials must not be deposited into watercourses or riparian areas.

- 12.20. Use hydro blasting or manual techniques, where possible, when removing road dirt, soluble salts and loose paint to minimize impacts to the watercourse.
- 12.21. Use water without cleaning agent additives if grease film removal is necessary.
- 12.22. Avoid use of toxic liquid paints, primers, solvents, degreasers and rust inhibitors.
- 12.23. Minimize spill potential by storing, mixing and transferring paints and solvents on land.

## 13. Water Withdrawal and Dewatering Mitigations Module

Construction often requires the use of water, many common methods of excavation and site isolation require dewatering. Temporary, short term water withdrawal provides an efficient uncontaminated water source for local project sites. Dewatering can allow sites to be effectively dry during construction, reducing the impact of sediment laden water entering fish bearing waters.

### Timing Windows

- 13.1. As a general guide to prevent taking more water than aquatic system can support, limit total take of water to less than 5 successive days and less than 10 days in any period of 30 days.
- 13.2. Avoid water withdrawal during breeding seasons of amphibians and reptiles to avoid destruction of egg masses, consult local aquatics ecologist for site specific guidance.

### Water Withdrawal

- 13.3. Water should not be withdrawn from a wetland or stream less than 5 metres wide at the surface or a lake less than one hectare in area.
- 13.4. Water withdrawal should follow the 10/90 rule which allows for up to 10% of the stream flow to be withdrawn, as long as the stream flow does not fall below the 90% exceedence flow (eg. 1 in 10 chance in a given year).
- 13.5. No permanent or semi-permanent works for water withdrawal should be placed in the stream channel.
- 13.6. Screen any water intakes or outlet pipes to prevent entrainment or impingement of fish, amphibians and/or reptiles. Entrainment occurs when a fish or amphibian is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish, reptile or amphibian is held in contact with the intake screen and is unable to free itself.

### Pump Screens

- 13.7. In freshwater, fish-bearing waters design and installation of intake end-of-pipe fish screens:
  - Locate screen in areas and depths of water with low concentrations of fish throughout the year away from natural or artificial structures that may attract fish that are migrating, spawning, or in rearing habitat.
  - Orient the screen face in the same direction as the flow of water.
  - Ensure openings in the guides and seals are less than the opening criteria to make “fish tight”.



- Screens should be located a minimum of 300 mm (12 in.) above the bottom of the watercourse to prevent entrainment of sediment and aquatic organisms associated with the bottom area.
- Provide structural support to the screen panels to prevent sagging and collapse of the screen. Large cylindrical and box type screens should have a manifold installed to ensure even water velocity distribution across the screen surface. The end of the structure should be made of solid materials and the end of the manifold capped.
- Heavier cages or trash racks can be fabricated out of bar or grating to protect the finer fish screen, especially where debris loading (woody material, leaves, algae mats, etc.) is a concern. A 150 mm (6 in.) spacing between bars is typical.
- Provision should be made for the removal, inspection, and cleaning of screens.
- Ensure regular maintenance and repair of cleaning apparatus, seals, and screens to prevent debris fouling and impingement of fish.
- Pumps must be shut down when fish screens are removed for inspection and cleaning.

## Dewatering

- 13.8. A site specific dewatering plan is required be provided before commencing a pump-out sump to dewater excavation sites with specific details on how and where the water will be discharge.
- 13.9. Site specific mitigations may be required depending on the conditions of the discharge area, freezing conditions operation, overflow avoidance, decanting and settlement pond reclamation.
- 13.10. Water containing suspended materials shall not be pumped into watercourses, drainage systems or on to land, except with the permission of the SO.
- 13.11. Soil and vegetation erosion protection is required for water pumped on to land.



## References

British Columbia Ministry of Transportation and Infrastructure. 2010. *Environmental best practices for highway maintenance activities 2<sup>nd</sup> ed.* Government of British Columbia.

British Columbia Ministry of Forests and Environment Lands and Parks. 2000. *Provincial Wildlife Tree Policy and Management Recommendations.* Government of British Columbia.

Coordinated Technology Implementation Program. 2011. *Current and Innovative Solutions to Roadside Revegetation Using Native Plants.* Federal Highway Administration U.S. Department of Transportation.

[http://www.nativer Revegetation.org/pdf/B1422\\_Roadside\\_revegetation\\_Report\\_complete.pdf](http://www.nativer Revegetation.org/pdf/B1422_Roadside_revegetation_Report_complete.pdf)

Dane, C. 1978 Culvert Guidelines: Recommendations for the Design and Installation of Culverts in British Columbia to Avoid Conflict with Anadromous Fish. Fisheries and Marine Service Technical Report No.811. Department of Fisheries and Environment. Government of Canada.

Environmental Protection Agency Office of Water. 2005. *National Management Measures to Control Nonpoint Source Pollution from Urban Areas.* United States Environmental Protection Agency Office of Water.

Environmental Protection Agency Office of Water. 2000. *A Guideline for Maintenance and Service of Unpaved Roads.* Choctawhatchee, Pea and Yellow Rivers Watershed Management Authority.

[http://water.epa.gov/polwaste/nps/urban/upload/2003\\_07\\_03\\_NPS\\_unpavedroads\\_ch5.pdf](http://water.epa.gov/polwaste/nps/urban/upload/2003_07_03_NPS_unpavedroads_ch5.pdf)

Fisheries and Oceans Canada. *Measures to Avoid Harm.* Accessed February 2015.

<http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html>

Fisheries and Oceans Canada. *Self Assessment Criteria.* Accessed February 2015.

<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>

Federal Highway Administration. 2011. *Clear Zones and Roadside Terrain.* United States Department of Transportation.

[http://safety.fhwa.dot.gov/roadway\\_dept/clear\\_zones/cmclearzones/](http://safety.fhwa.dot.gov/roadway_dept/clear_zones/cmclearzones/)

Government of British Columbia. 1996. *Water Act and Water Regulation.* Crown Publications, Queens Printer.

Parks Canada. 2007. Parks Canada Omnibus Environmental Protection Plan Mitigation Measures. Government of Canada.

Parks Canada. 2011. Waterton Lakes National Park of Canada Road Maintenance Guidelines. Government of Canada.

Parks Canada. 2012. Minor Repairs to Transportation Infrastructure in Atlantic Canada National Parks Replacement Class Screening Report. Government of Canada.

Parks Canada. 2012. Replacement Class Screening Report for Routine In-Water Works Projects Along the Rideau Canal and the Trent-Severn Waterway.



Parks Canada. 2013. *Flood 2013 Rehabilitation*. Government of Canada

Parks Canada. 2013. Best Management Practice for Roadside Vegetation Maintenance at Point Pelee National Park. Government of Canada.

Parks Canada. 2013 *Assessment of Highway Nighttime Paving*. Jasper National Park, Government of Canada.

Parks Canada. 2013. Best Management Practice for Routine Vegetation Trimming and Clearing Pukaskwa National Park. Government of Canada.

Parks Canada. 2014. *Highway Service Centre Engineering's Environmental Procedures*. Jasper National Park, Government of Canada.

Parks Canada. 2015. Parks Canada Directive on Impact Assessment. Government of Canada.

Parks Canada. 2015. *Basic Impact Analysis Rock Slope Remediation*. Kootenay National Park, B.C. Government of Canada.

Parks Canada. No Date. *Jasper Mitigation Manual*. Government of Canada.

Transport Canada. 2008. Replacement Class Screening Report for Minor Transportation Repairs. June 2008. TC Contract # 8080-07-0061.

United Nations Food and Agriculture Organization. 1998 *Manual for the Planning, Design and Construction of Forest Roads in Steep Terrain*.

<http://www.fao.org/docrep/w8297e/w8297e00.htm>



## Appendix 1 Regulatory Guidance

### Jurisdictions

While all projects on lands managed by Parks Canada must adhere to Federal law and regulation, it is considered best practice to refer to local community, regional, provincial regulation and best practices where federal guidance is silent and/or attempt to meet those targets if it can reduce the overall impact of the project.

Some of the project activities reviewed have potential environmental impacts that are addressed by various provincial, federal and territorial acts and regulations. All activities must meet current environmental law and regulations in their design and construction. The following is a brief description of some of the key federal acts and regulations. Further review, understanding and application of other federal, provincial and territorial environmental laws are part of a rigorous approach to project planning and execution.

#### ***Canada National Parks Act and Regulations-Parks Canada***

All work inside National Parks and Protected Areas must be performed in accordance with the laws and regulations set out in the *Canada National Parks Act* and Regulations. This includes the requirement for most activities described to only be done under a permit such as: business licence for contractor, disturbance of natural objects, travel in restricted areas, special events or use of disposal sites.

#### ***Fisheries Act - Fisheries and Oceans Canada***

If a project is to be conducted near water, it is the proponent's responsibility to ensure they avoid causing [serious harm to fish](#) in compliance with the *Fisheries Act*. The [advice in on the Fisheries and Oceans website](#) will help a proponent avoid causing harm and comply with the Act.

If the water body in the project area has fish or is connected to waters at any time that have fish the project must meet the [self assessment criteria on the Fisheries and Oceans website](#), if not a project review can be made by Fisheries and Oceans Canada to assess whether the project requires authorization or authorization can be requested directly. Given the level of detail required for a review and/or authorization request the EIA officer may need to consider a more involved EIA pathway in those circumstances.

#### ***Migratory Bird Convention Act – Environment Canada***

The purpose of this Act is to implement the Convention by protecting and conserving migratory birds - as populations and individual birds - and their nests. Section 6 - prohibits the disturbance, destruction, or taking of a nest, egg, or nest shelter of a migratory bird.

In Canada, the general nesting period may start as early as mid-March and may extend until end of August. This is a general nesting period that covers most federally protected migratory bird species. This period varies regionally across Canada mainly due to differences in species assemblages, climate, elevation and habitat type. Generally, the nesting period is delayed in more northerly latitudes, corresponding to vegetation development and food availability. (Environment Canada, 2014). To help with determining regionally relevant periods where





nesting is likely to occur, Environment Canada is publishing estimated regional nesting periods within large geographical areas across Canada referred as "nesting zones". These periods are estimated for each zone and consider the time of first egg-laying until the young have naturally left the vicinity of the nest. Field Units may wish to refine this section and add their known local nesting periods.

### *Species at Risk Act*

If a species listed under the *Species at Risk Act* (SARA) is found within the project area, any potential adverse effects from the proposed project to the individuals of the species, their residences and/or their critical habitat must be understood. Species at risk considerations require specific expertise, due to additional legal requirements under the SARA and CEAA 2012. If the projects or activities to be addressed by the BMP could affect a listed species or its critical habitat, the EIA officer may need to consider a more involved EIA pathway in those circumstances.

**APPENDIX C**

**APPENDIX C**

Material Disposal Site Release

**RELEASE**

IN CONSIDERATION of the delivery and unloading of fill material, **THE UNDERSIGNED** hereby for themselves, their administrators, successors and assigns release and forever discharge **Parks Canada Agency** from any and all action, causes of action, claims and demands for upon or by reason of any damage to property which heretofore has been or hereafter may be sustained in consequences of the material delivered in the County of \_\_\_\_\_, Nova Scotia on or about the \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_.

**THE UNDERSIGNED** hereby affirm the disposal site is not a wetland. Further, **THE UNDERSIGNED** hereby agrees the surplus excavated material shall not be placed in a wetland unless specifically permitted by the Nova Scotia Department of Environment and Labour. The **Contractor and/or recipient** of the surplus excavated material will be held responsible for all environmental permitting and liability.

**AND FOR THE SAID CONSIDERATION**, the undersigned agree not to make claim or take proceedings against any other person or corporation who might claim contribution or indemnity under the provisions of any statute or otherwise.

**WITNESS** this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_\_.

X \_\_\_\_\_ X \_\_\_\_\_  
Witness (please print) Signature of Witness

IN THE PRESENCE OF:

X \_\_\_\_\_ X \_\_\_\_\_  
Resident (please print) Contractor (please print)

X \_\_\_\_\_ X \_\_\_\_\_  
Signature of Resident Signature of Contractor

**Address of Resident:**

\_\_\_\_\_  
Civic number, Road name, City/town/village, Postal Code

**Location of Material Disposal:** (if different from resident's address)

\_\_\_\_\_  
Civic number, Road name, City/town/village, Postal Code

**APPENDIX D**

**Environmental Control Plan  
North Aspy River South Branch  
Bridge Replacement Project**

Road Realignment and  
Replacement of Existing Structure  
PCA Project No. 666  
Standing Offer No. 5P301-14-  
0001/002



Prepared for:  
Parks Canada Agency

Prepared by:

Stantec Consulting Ltd.  
40 Highfield Park Drive Suite 102  
Dartmouth, NS B3A 0A3

File: 133346833

March 17, 2016

## Sign-off Sheet

This document entitled Environmental Control Plan North Aspy River South Branch Bridge Replacement Project was prepared by Stantec Consulting Ltd. ("Stantec") for the account of Parks Canada Agency (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec should not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Shaun Helpard  
(signature)

**Shaun Helpard**

Reviewed by Denis Rushton  
(signature)

**Denis Rushton**

**ENVIRONMENTAL CONTROL PLAN NORTH ASPY RIVER SOUTH BRANCH BRIDGE REPLACEMENT PROJECT**

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# ENVIRONMENTAL CONTROL PLAN NORTH ASPY RIVER SOUTH BRANCH BRIDGE REPLACEMENT PROJECT

## Executive Summary

This report and the associated drawings in Appendix A and B comprise the Environmental Control Plan (ECP) for the replacement of the existing North Aspy River South Branch Bridge on the Cabot Trail within the Cape Breton Highland National Park, Nova Scotia. To accommodate the construction of the replacement bridge, south of the existing structure, the existing road alignment and bridge will be used to allow traffic flow around the construction site. Once completed, traffic will be switched over to the new road alignment and bridge. This will allow decommissioning of the existing roadway and bridge structure in isolation of traffic.

The North Aspy South Branch River Bridge, originally built in 1948, is a slab-on-girder bridge composed of a cast-in-place reinforced concrete slab with built-up riveted structural steel girders.

Included in this ECP report are the environmental controls or best management practices (BMPs) to be implemented for the following construction activities on this project:

1. Construction of a new 31 metre steel girder single span bridge with integral abutments on driven H-piles; and
2. Removal of the existing North Aspy River South Branch Bridge.

# ENVIRONMENTAL CONTROL PLAN NORTH ASPY RIVER SOUTH BRANCH BRIDGE REPLACEMENT PROJECT

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## 1.0 INTRODUCTION

### 1.1 BACKGROUND

The North Aspy South Branch River Bridge is a slab-on-girder bridge composed of a cast-in-place reinforced concrete slab with built-up riveted structural steel girders. It was originally built in 1948 and has undergone some evident repairs, such as abutment and wing wall patching and crack injection, girder repainting and deck soffit repairs. Finally, new two-rail aluminum barriers were provided (circa 1980's and 1990's) and the deck cantilever and curb was demolished and re-poured.

The existing roadway associated with the North Aspy South Branch River Bridge is an S-shaped alignment followed by long tangents at each end with the existing bridge located on a tangent between the two curves. The curved portion of the roadway is posted at 40 km/h for north/east bound motorists and 50 km/h for motorists traveling in the opposite direction which is inconsistent from a safety perspective.

The new alignment promotes improved sight lines for vehicles entering and exiting the Big Intervale picnic area. The lower access into Beulach Ban Falls will be removed which allows the approach guide rail to the new bridge structure to extend the required encroachment distance, improving overall safety for traffic approaching the structure from the east.

With the realignment located south of the existing bridge, the impact on the retaining wall and picnic area will be reduced. The new alignment will also provide for improved intersections enhancing sightlines and turning movements. Impact on traffic during construction will be minimized as the existing bridge and approaches can still be utilized while the new bridge is constructed beside it.

### 1.2 SCOPE OF THE ENVIRONMENTAL CONTROL PLAN (ECP)

This report including the associated drawings in Appendix A and B comprise the Environmental Control Plan (ECP) for the replacement of the North Aspy River South Branch Bridge located on the Cabot Trail within the Cape Breton Highlands National Park in Nova Scotia.

The ECP does not include the construction of approximately 650 metres of new approach road adjoining the bridge.

The ECP includes the construction and stabilization of the east and west abutments and decommissioning of the existing structure once the new bridge has been completed.

Included in this report are the environmental controls or best management practices (BMPs) to be implemented during the following construction activities associated with the project, namely:

# ENVIRONMENTAL CONTROL PLAN NORTH ASPY RIVER SOUTH BRANCH BRIDGE REPLACEMENT PROJECT

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1. Construction of the new steel girder single span bridge with integral abutments supported on driven H-piles.
2. Removal of the old bridge and road alignment.
3. Reclamation of disturbed areas after construction (i.e., revegetation of exposed soil).

Refer to Drawing No. S-1ES and S-2ES in Appendix A that identifies the order in which the construction activities should be undertaken and the related BMPs implemented.

## 1.3 DETOUR

The existing road and bridge will act as a detour during the construction of the new upstream bridge.

## 1.4 COMPONENTS OF THE ECP

The ECP for this project is comprised of the following distinct components:

- General specifications;
- Identification of the site specific erosion, sediment, water management and dewatering best management practices (BMPs) to be implemented during construction;
- Materials and specifications for the BMPs to be implemented;
- Construction details for the BMPs to be implemented;
- Responsibilities and communication;
- Monitoring and maintenance of BMPs;
- Contingency Plan; and
- Decommissioning of environmental controls.

## 1.5 GENERAL SPECIFICATIONS

1. The erosion and sediment controls (ESCs) included in this ECP report are provided as the suggested approach to erosion and sediment control during work on this project. The Contractor shall implement these measures as a minimum.
2. In order to control erosion and prevent sediment from leaving the site or being discharged into the North Aspy River South Branch it may be necessary for the Contractor to install additional environmental controls beyond those included in this ECP.
3. The Contractor shall ensure that copies of all pertinent approvals are kept onsite (including the ECP and any subsequent revisions to the ECP).
4. The Contractor shall comply with all permit requirements and conditions and maintain all ESCs until the site has been stabilized and approved by Parks Canada.



# ENVIRONMENTAL CONTROL PLAN NORTH ASPY RIVER SOUTH BRANCH BRIDGE REPLACEMENT PROJECT

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5. The Contractor shall endeavor to prevent the release of siltation to the North Aspy River South Branch and/or properties adjacent to the construction site.
6. Any changes to the ECP initiated by the Contractor on this project will have to be approved by Parks Canada or designate prior to their implementation in the field. If approved, the Contractor will then be responsible for submitting these revisions on a copy of the original ECP.

## 2.0 SITE SPECIFIC BMPs

### 2.1 REPLACEMENT BRIDGE CONSTRUCTION

#### 2.1.1 Work Description

Construction of the replacement bridge includes (but is not limited to); driving abutment piles, construction of new abutments; and the stabilization of the new embankment slopes with R2 Armour Rock and C2 Clear Stone.

#### 2.1.2 Water Management BMPs

Water Management BMPs proposed during the construction of the replacement structure includes the installation of Sandbag Cofferdams. The cofferdams should be offset from the eastern and western banks of the existing watercourse to allow the excavation and embedment of R2 Armour Rock in the dry.

#### 2.1.3 Erosion Control BMPs

Erosion Control BMPs proposed during the construction of the east and west abutments include:

- Stabilization of the embankment slopes immediately adjacent to the new structure;
- Placement of plastic sheets (16 mil) and tarpaulins over temporary stockpiles and exposed areas of soil (if required);
- Placement of R2 Armour Rock and C2 Clear Stone on the embankment slopes; and
- Placement of Dry Mulching on exposed areas of soil prior to precipitation events where there is the potential for sediment impacts to the watercourse.

#### 2.1.4 Sediment Control BMPs

Sediment Control BMPs proposed during the construction include the installation of Type 1 and/or Type 2 Silt Fence along the toe of the approach embankments and along the banks of the river to prevent sediment-laden runoff from leaving site or entering the watercourse.

The emphasis on this project will be on erosion control BMPs.



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## 2.1.5 Dewatering BMPs

Dewatering controls proposed during the construction of the replacement structure include:

- Dewatering behind the temporary instream Sandbag Cofferdam to allow the excavation and placement of R2 Armour Rock in the dry. Water shall be pumped to a Filter Bag or a Perforated PVC Header Pipe.
- Dewatering of ponded water in any excavations around the worksite. Water shall be pumped to a Filter bag or a Perforated PVC Header Pipe.

## 2.1.6 Construction Sequencing

Refer to Drawing No. S-1-ES in Appendix A for the proposed construction sequencing for the replacement bridge as described below (sequencing is same for both the east and west abutments).

RB-1 Stake clearing limits and clear within limits.

RB-2 Install Sandbag Cofferdams at a 1 m± offset from the existing river's edge to allow the placement of the R2 Armour Rock.

Placement of the Sandbag Cofferdams will require the displacement of some existing smaller rock and cobbles to allow the R2 Armour Rock to be placed with a continuous and uniform edge.

Install silt fence from the ends of the Sandbag Cofferdams and extend far enough along the bottom of the approach embankment slopes to prevent any sediment-laden water from discharging to the watercourse. This may involve tying into the Silt Fence associated with the construction of the approaches.

RB-3 Stake grubbing limits and grub within limits.

Consideration should be given to using the grubbing material onsite to construct grubbing berms (grubbing material can simply be pushed back to provide a continuous berm) to replace the installation of silt fence. The grubbing material can be reused to promote the reestablishment of native vegetation on the new embankment slopes.

RB-4 Excavate and place the R2 Armour Rock at the toe of the abutment embankments.

RB-5 Reinststate the embankment slopes to the lines and grades shown on the structural drawings up to an elevation to allow the driving of abutment piles. The embankment slopes shall be stabilized as soon as possible with R2 Armour rock and C2 Clear Stone.

RB-6 Drive piles and construct the east and west abutments.

# ENVIRONMENTAL CONTROL PLAN NORTH ASPY RIVER SOUTH BRANCH BRIDGE REPLACEMENT PROJECT

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Grout and associated muddy water from the drilling and cementing of the piles will be contained by the Contractor and directly disposed of offsite.

RB-7 Once the abutments are poured, construct the remainder of the embankment slopes to the design lines and grades shown on the structural drawings and stabilized with C2 Clear Stone. Backfill behind the abutments with Fill Against Structure.

RB-8 Once the ditch in the southeast quadrant has been constructed, install Rock Flow Checks at a 10-m spacing.

RB-9 Prepare all exposed soil for revegetation and stabilize by Hydroseeding and Dry Mulching. Contractor may elect to apply seed and fertilizer by mechanical application. Dry Mulching shall be placed by hand.

## 2.2 EXISTING BRIDGE DECOMMISSIONING

### 2.2.1 Work Description

Decommissioning of the existing bridge includes the demolition of the bridge deck and abutment structures; removal of girders; and the reclamation of the area where the abutments were demolished and removed (i.e., placement of R2 Armour Rock).

To protect the river from debris and material generated from demolition activities, a heavyweight net should be used to prevent any debris from falling into river.

### 2.2.2 Water Control BMPs

Water Management BMPs proposed during the decommissioning of the existing structure and approaches include the installation of temporary Sandbag Cofferdams. The cofferdams should be offset from the eastern and western banks of the existing watercourse (and bridge abutments) to allow removal of the abutments in the dry.

Consideration should be given to breaking the concrete and leaving the bottom portion of the existing abutments in place (to an elevation of 1 meter minimum above the high water elevation) to minimize impacts to the watercourse during and after the removal of the abutments. This option would also eliminate the need for the Sandbag Cofferdams.

### 2.2.3 Erosion Control BMPs

Erosion Control BMPs proposed during the decommissioning of the existing structure and approaches include:

- Placement of plastic sheets (16 mil) and tarpaulins over temporary stockpiles and exposed areas of soil during decommissioning; and

# ENVIRONMENTAL CONTROL PLAN NORTH ASPY RIVER SOUTH BRANCH BRIDGE REPLACEMENT PROJECT

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## 2.2.4 Sediment Control BMPs

There are no sediment control BMPs proposed during the construction of the replacement structure.

## 2.2.5 Dewatering BMPs

Dewatering BMPs proposed during the decommissioning of the existing structure and approaches include:

- Dewatering behind the temporary Sandbag Cofferdams to allow the removal of the abutments in the dry. Water shall be pumped to a Filter Bag or a Perforated PVC Header Pipe.

## 2.2.6 Construction Sequencing

Refer to Drawing No. S-2-ES in Appendix A for the proposed construction sequencing for the removal of the existing bridge.

BD-1 Remove the superstructure of the existing bridge (railings, parapet walls, deck, etc.).

To protect the North Aspy River (South Branch) from debris and material generated from demolition activity, a heavyweight net should be used to prevent any debris from falling into river. The girders should then be removed. All demolition material shall be removed from the site.

BD-2 Demolish the abutments by breaking concrete and hauling material offsite. Work will include excavation to expose abutments full depth to allow demolition and removal of concrete material from the site.

Dust generated during bridge demolition should be controlled by pre-wetting surfaces and employing wet-cutting methods and/or using alternative dust suppressing products.

Excavated material should be hauled offsite or temporarily stored onsite. If material is stored onsite for future reuse it should be covered with tarpaulins or plastic sheets (16 mil) weighed down by sandbags.

If full removal of the abutments is intended, a Sandbag Cofferdam shall be used so that the excavation and removal of the portion of the abutments below the normal water line can be removed in the dry.

BD-3 Prepare all exposed soil for revegetation and then stabilize by Hydroseeding and Dry Mulching.



# ENVIRONMENTAL CONTROL PLAN NORTH ASPY RIVER SOUTH BRANCH BRIDGE REPLACEMENT PROJECT

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## 3.0 MATERIALS, SPECIFICATIONS AND CONSTRUCTION DETAILS

The following is a description of the materials, specifications, and construction details for the water management, erosion control, sediment control and dewatering BMPs to be implemented on this project.

### 3.1 WATER CONTROL BMPs

#### 3.1.1 Sandbag Cofferdams

Sandbag Cofferdams shall be installed along the bottom perimeter of the east and west embankment slopes of the replacement structure (i.e., offset 1 m± inside the banks of the watercourse) to prevent the release of sediment during the excavation and the placement of R2 Armour Rock to prevent scouring.

Sandbag Cofferdams shall consist of woven geotextile bags (1.0 m x 1.0 m x 1.0 m) filled with washed sand or pea gravel (no silt). Smaller woven geotextile sandbags (150 mm x 150 mm x 450 mm) shall be used to fill gaps in the cofferdam. The small sandbags shall be filled with washed sand or pea gravel (no silt).

Dewatering behind the cofferdams will be required to allow the excavation and placement of armour rock in the dry.

Refer to Detail 5 on Drawing No. CD-1 in Appendix B for construction details on the installation of Sandbag Cofferdams.

### 3.2 EROSION CONTROL BMPs

#### 3.2.1 R2 Armour Rock

R2 Armour Rock should be placed along the bottom of the embankment slopes for the new abutment structures to act as a protective barrier against scouring of the slopes.

R2 Armour Rock should have a minimum density of 2,650 kg/m<sup>2</sup>. Shale, slate or rocks with thin foliations should not be acceptable. The greatest dimension of each rock should not exceed two times the least dimension. Refer to Table 1 for the gradation of R2 Armour Rock.

R2 Armour Rock shall be in compliance with Division 3, Section 10 of NSTIR's Standard Specification.

# ENVIRONMENTAL CONTROL PLAN NORTH ASPY RIVER SOUTH BRANCH BRIDGE REPLACEMENT PROJECT

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**Table 1      Armour Rock Gradation**

Approximate Maximum Dimension, mm	Percent Smaller Than
	R2
850	100
550	0-50
230	0-15

### 3.2.2      Hydroseeding and Dry Mulching

Hydroseeding on this project shall be carried out in compliance with Division 7, Section of 5 NSTIR's Standard Specification for Hydroseeding. This includes the specifications for seed mixture, fertilizer, mulch, binder and associated application rates for each.

Hydroseeding shall be carried out as soon as possible after completion of the surface preparation, in order to prevent erosion by wind and water.

Hydroseeding shall consist of the distribution of slurry composed of the required seed mixture, fertilizer, mulch and binder.

The Contractor may elect to revegetate exposed areas of soil by the mechanical application of seed and fertilizer at the same application rates as for Hydroseeding.

Dry Mulching (hay mulch) shall be applied by hand at an application rate of 4,000 kg/ha. Dry Mulching shall be carried out in compliance with Division 7, Section 6 of NSTIR's Standard Specification.

### 3.2.3      Fill Against Structure

Abutments shall be backfilled with Fill Against Structure material in compliance with Division 3, Section 10 of NSTIR's Standard Specification.

### 3.2.4      Rock Flow Checks

Rock Flow Checks shall be placed across ditches throughout areas of roadway excavation to reduce the velocity of flow and promote the deposition of suspended sediment.

C2 and C5 Clear Stone shall be used to construct Rock Flow Checks. The Contractor shall also maintain a quantity of C2 and C5 Clear Stone on site at all times as part of their Contingency Plan.

As soon as sections of roadway are brought to final grade, Rock Flow Checks shall be constructed in the ditches to control the velocity of flow and promote sediment deposition.

The construction of Rock Flow Checks shall be done in compliance with Division 7, Section 2 of NSTIR's Standard Specification.



# ENVIRONMENTAL CONTROL PLAN NORTH ASPY RIVER SOUTH BRANCH BRIDGE REPLACEMENT PROJECT

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Refer to Detail 1 on Drawing No. CD-1 in Appendix B for the gradation of C2 and C5 Clear Stone and for details on the construction of Rock Flow Checks.

## 3.3 SEDIMENT CONTROL BMPs

### 3.3.1 Plastic-lined Sandbag Barriers

Plastic-lined Sandbag Barriers shall be placed along the perimeter of North Aspy River South Branch as shown on drawings to prevent the release of sediment-laden runoff from discharging into the watercourse.

The barrier shall consist of sandbags of approximate dimensions 150 mm x 150 mm x 450 mm filled with washed sand or pea gravel (no silt).

The sandbags within each row shall be tightly abutted against one another and the sandbags in adjacent rows shall be uniformly staggered to one another. The sandbags in each layer shall overlap the layer below.

The plastic should be 10 mil polyethylene.

Plastic-lined Sandbag Barriers shall be installed in compliance with Division 7, Section 1 of NSTIR's Standard Specification.

Refer to Detail 4 on Drawing CD-1 in Appendix B for construction details on the installation of Plastic-lined Sandbag Barriers.

### 3.3.2 Type 1 and Type 2 Silt Fence

Type 1 and Type 2 Silt Fence shall be used as a perimeter control to prevent the release of sediment-laden runoff, resulting from grading and excavation work, to North Aspy River South Branch or outside the footprint of the Project. Silt fence shall be installed along the down gradient perimeter (of where bare soil may be exposed) and prior to the commencement of any construction.

Type 2 Silt Fence includes a wire mesh in addition to the geotextile fabric that provides additional stability to the structure, which makes it more applicable as a perimeter control where greater stability or longevity is required.

Type 1 and Type 2 Silt Fence shall be installed in compliance with Division 7, Section 1 of NSTIR's Standard Specification.

Refer to Detail 2a and 2b on Drawing No. CD-1, in Appendix B for construction details on the installation of Type 1 and Type 2 Silt Fence.

# ENVIRONMENTAL CONTROL PLAN NORTH ASPY RIVER SOUTH BRANCH BRIDGE REPLACEMENT PROJECT

March 17, 2016

## 3.4 DEWATERING BMPs

### 3.4.1 Dewatering to a Filter Bag

Dewatering of excavations involves the pumping of sediment-laden water to a Filter Bag placed on a 300 mm layer of C5 Clear Stone. The dimensions of the Filter Bag should be based on the size of the discharge pump. The Filter Bag should be located more than 30 m from any watercourse or wetland, in an area of dense vegetative cover.

Refer to Detail 3b on Drawing No. CD-1 in Appendix B for details on Dewatering to a Filter Bag.

### 3.4.2 Dewatering to a Perforated Header Pipe

Dewatering of excavations involves the pumping of sediment-laden water to a 15-m length of 100 mm diameter Perforated PVC Pipe laid parallel to the ground contour in an area of dense vegetation located more than 30 m from any watercourse or wetland.

Refer to Detail 3b on Drawing No. CD-1 in Appendix B for details on Dewatering to a Perforated PVC Header Pipe.

## 4.0 RESPONSIBILITIES AND COMMUNICATION

It is essential throughout the implementation of this ECP that communication between all parties be maintained.

The following are key issues that must be addressed:

- Prior to installation of the environmental controls, Parks Canada or designate should properly communicate the intention and details of the ECP to the Contractor. The Contractor should provide feedback on the measures if they appear ineffective when constructed.
- In the event that erosion and sediment controls fail, the Contractor should notify Parks Canada immediately of the failure and any potential impacts and provide the remedial action that is being undertaken to address those impacts as soon as possible.
- Decommissioning of sediment controls will be subject to the approval of the Parks Canada or designate.
- Field records should be kept by the Contractor of all activities that could affect erosion and sediment control on the project to demonstrate due diligence to the regulatory agencies.

## 5.0 MONITORING AND MAINTENANCE

Effective monitoring, including frequent inspections of environmental control measures is critical to demonstrating due diligence and for managing the consequences of the project. Through early detection of problems, long term consequences can be minimized.



## ENVIRONMENTAL CONTROL PLAN NORTH ASPY RIVER SOUTH BRANCH BRIDGE REPLACEMENT PROJECT

March 17, 2016

A monitoring program should be undertaken by the Contractor in an effort to ascertain the effectiveness of the ECP and compliance with regulatory requirements. Monitoring of environmental controls should be carried out on a daily basis. A more detailed examination of controls shall be carried out before and immediately after a rainfall event where the total rainfall is  $\geq 20$  mm. Areas that shall be routinely monitored include:

- Areas of exposed soil;
- Areas adjacent to watercourses; and
- Areas where environmental control measures have been installed.

If instructed by Parks Canada, the Contractor shall collect water samples from North Aspy River South Branch above and below the construction site before and during or within 6 hours after precipitation events where the total rainfall is predicted by Environment Canada or the Weather Network to be  $\geq 20$  mm. Results should then be submitted to Parks Canada within 24 hours of receipt for further consideration and action.

Maintenance and monitoring of BMPs are the responsibility of the Contractor. The maintenance of erosion and sediment controls should be carried out in accordance with the conditions outlined in this ECP.

Sediment control structures require sediment removal when the sediment reaches a height of one-half of the effective height of the control or a depth of 300 mm immediately upstream of the control device.

Inspection and maintenance requirements completed by the Contractor should be recorded.

### 6.0 CONTINGENCY PLAN

The Contingency Plan for this project includes the following implemented environmental control measures and the availability of materials and equipment

If there is a breach such that sediment-laden runoff is being discharged into the watercourse, augmentation of erosion control at the source or the diversion of runoff away from the worksite are two measures that should be considered.

The Contractor should have the following materials and equipment on site at all times to address any contingency. This should include the following:

- Hay bales (for breaking and spreading over exposed soil by hand);
- C2 and C5 Clear Stone; and
- Silt Fence, Type 1.

# ENVIRONMENTAL CONTROL PLAN NORTH ASPY RIVER SOUTH BRANCH BRIDGE REPLACEMENT PROJECT

March 17, 2016

## 7.0 DECOMMISSIONING OF ENVIRONMENTAL CONTROLS

It is important that temporary sediment controls be removed when appropriate and with approval of Parks Canada. These BMPs should only be removed after site inspection has concluded and it has been determined that areas are sufficiently stabilized and that downstream controls are no longer required. These controls will be removed once:

- The disturbed area is sufficiently stabilized;
- No areas of active erosion are observed; and
- Monitoring (if conducted) indicates stable conditions.

## 8.0 DOCUMENTATION

In order for the Contractor to establish due diligence in the event of the release on sediment-laden runoff during extreme events, it is important to demonstrate that all reasonable actions have been undertaken to prevent such an occurrence.

All ECP activities should be recorded in order to demonstrate that a process was followed. Copies of these documents should be kept on site for reference by the Contractor and the Contractor's Environmental Inspector. This documentation should include:

- Original ECP;
- Revisions to the ECP;
- Regular inspection and maintenance reports;
- Reports on effectiveness of environmental controls; and
- Maintenance control records.

## 9.0 CLOSURE

This ECP is based on an assessment of the site and its environmental sensitivities at a level of detail necessary to provide confidence that the plan will minimize offsite impacts during earthwork activities on this site.

This ECP is meant to be a living document and it is anticipated that changes in the plan may be warranted to ascertain that the most effective BMPs are incorporated on the project in a timely fashion. Changes to the ECP should be documented by the Contractor and reported to Parks or designate as soon as possible.

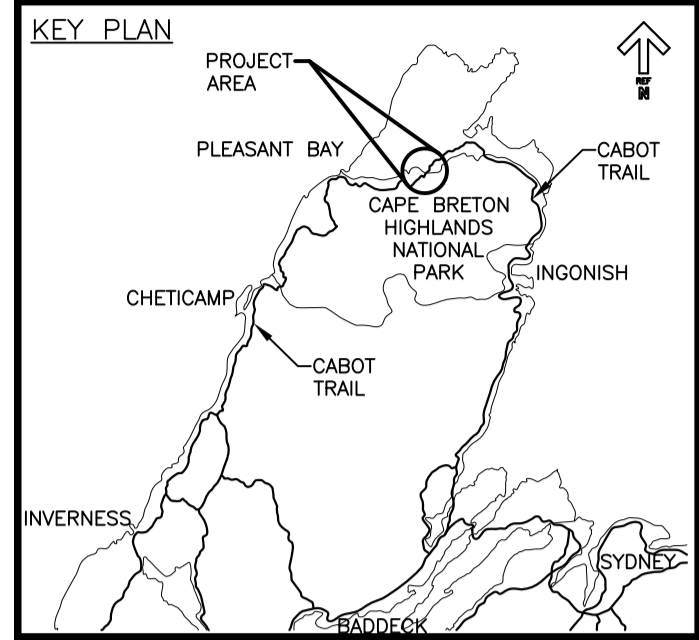
**ENVIRONMENTAL CONTROL PLAN NORTH ASPY RIVER SOUTH BRANCH BRIDGE REPLACEMENT  
PROJECT**

March 17, 2016

**APPENDIX A  
ECP Drawings**

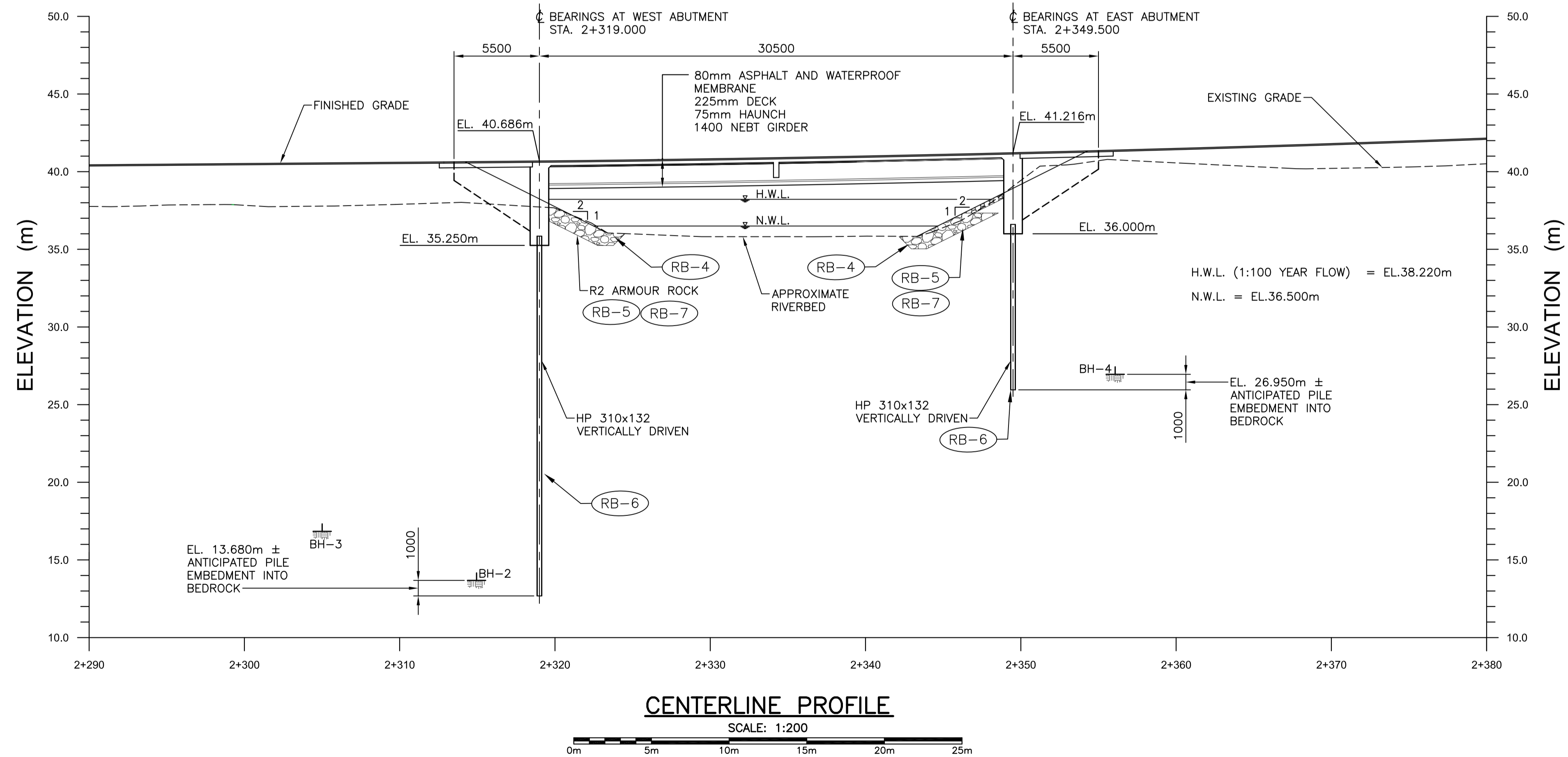
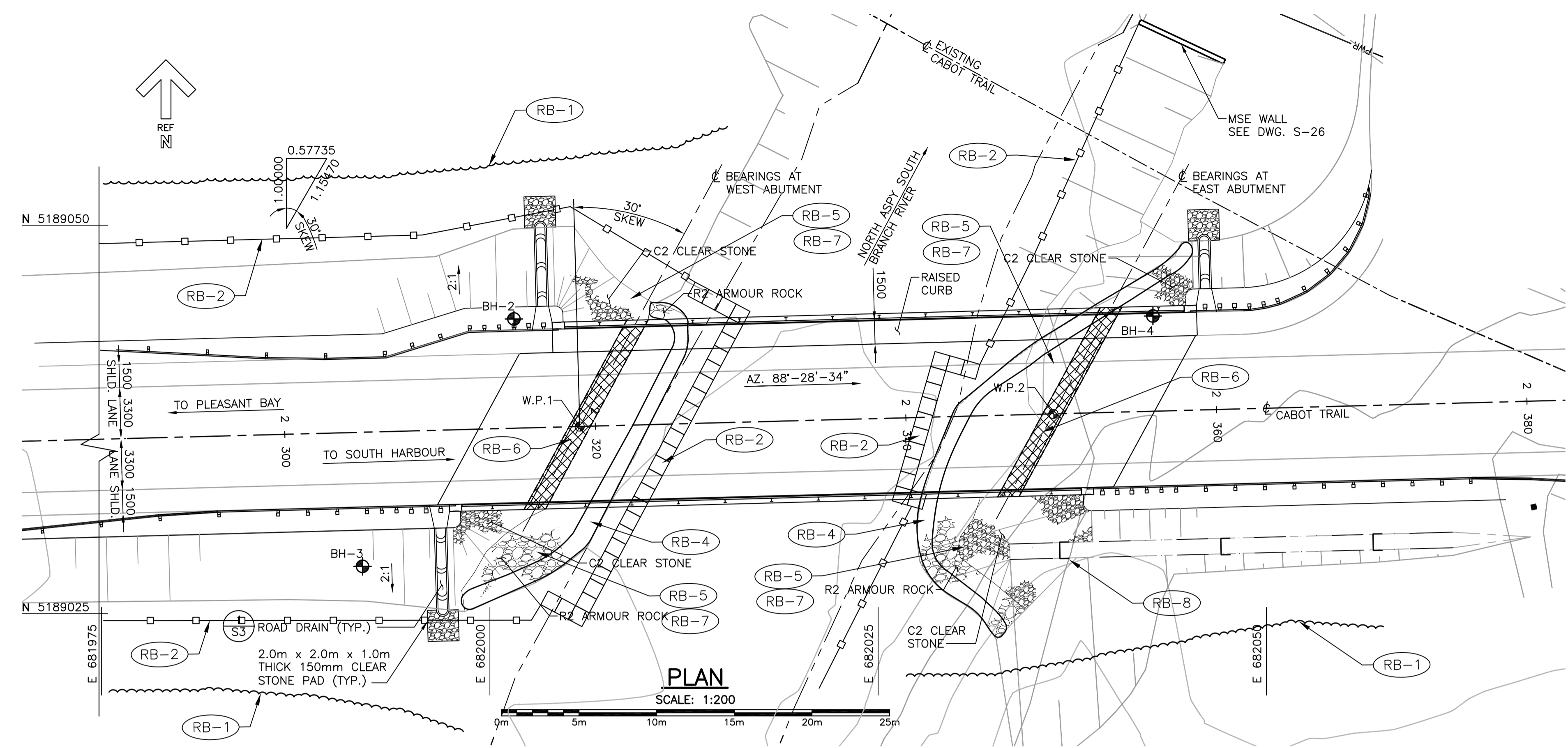


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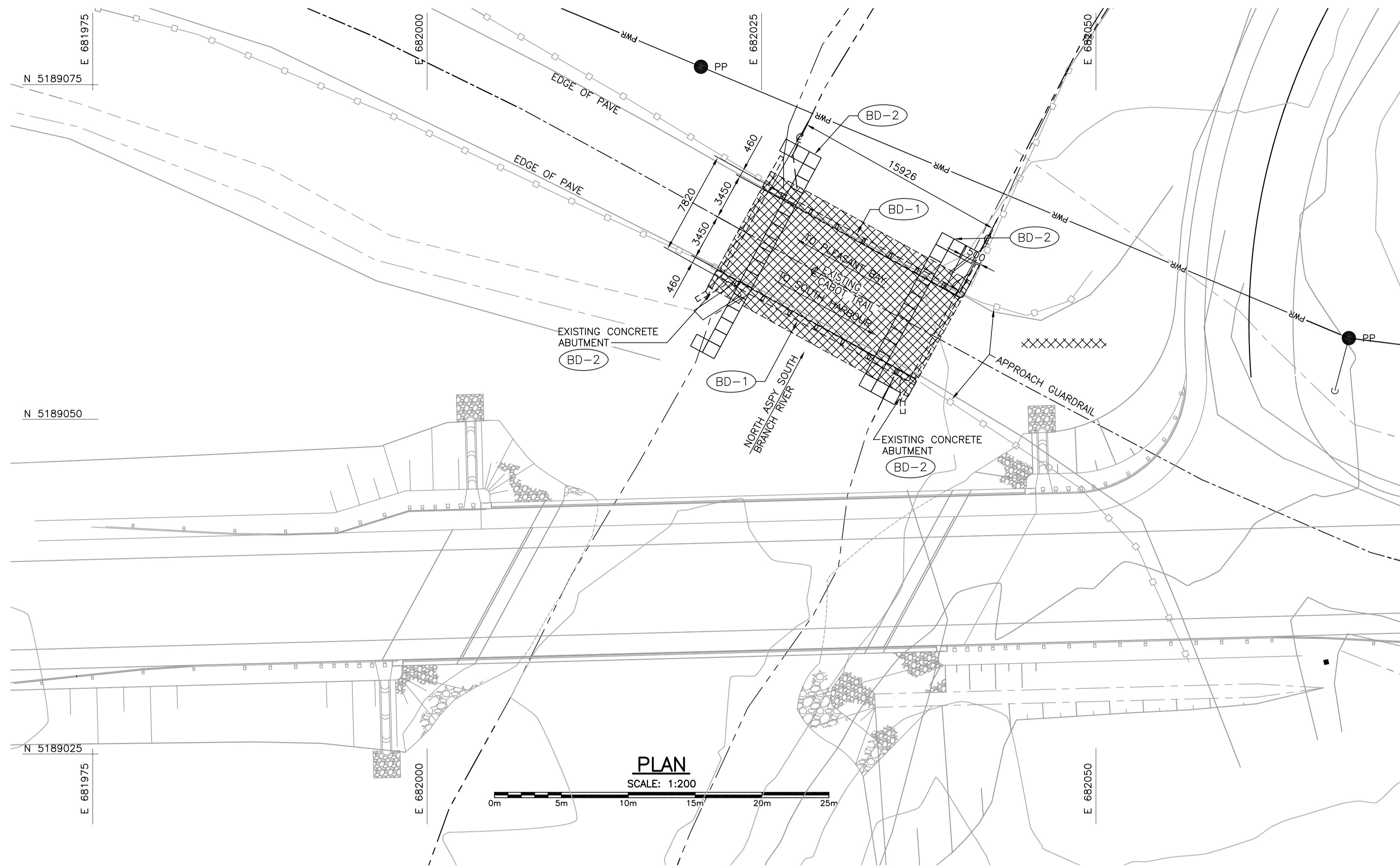
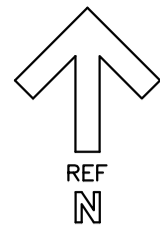
- LEGEND**
- NEW DITCH
  - CLEARING LIMIT
  - [Pattern] C2 CLEAR STONE
  - [Pattern] R1 ARMOUR ROCK
  - TYPE 1 AND TYPE 2 SILT FENCE (DESIGNATED ON PLAN)
  - [Symbol] SANDBAG COFFERDAM
  - [Symbol] ROCK FLOW CHECK
  - (RB-5) CONSTRUCTION SEQUENCE
- REFER TO SECTION 2.1.6 OF THE ECP FOR A DESCRIPTION OF THE CONSTRUCTION SEQUENCING AND ASSOCIATED BMPs TO BE IMPLEMENTED DURING THE CONSTRUCTION OF A REPLACEMENT STRUCTURE.



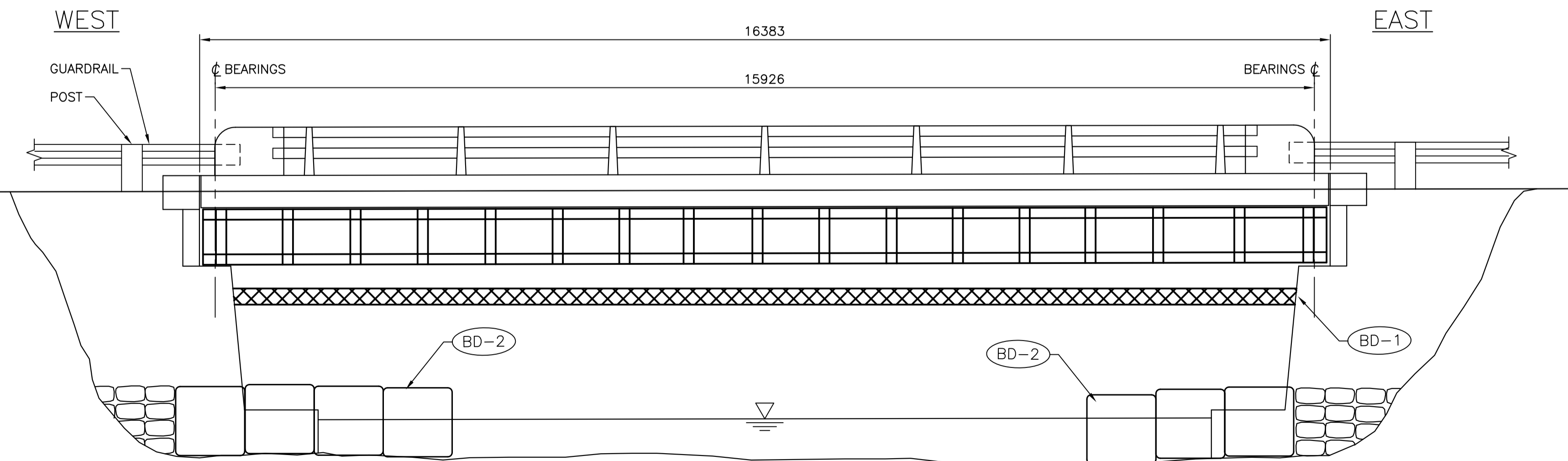
revisions	date
project	projct
<b>NORTH ASPY RIVER (SOUTH) BRIDGE REPLACEMENT</b>	
<b>CAPE BRETON HIGHLANDS NATIONAL PARK, NOVA SCOTIA</b>	
drawing	dessin
<b>ENVIRONMENTAL CONTROL PLAN</b>	
designed DR	conçu
date	
drawn BSP	dessiné
date 2016-03-18	
approved	approuvé
date	
Tender	Soumission
PCA Project Manager	Administrateur de projets PCA
project number	no. du projet
<b>133346833</b>	
drawing no.	no. du dessin
<b>S-1ES</b>	

**PRELIMINARY**

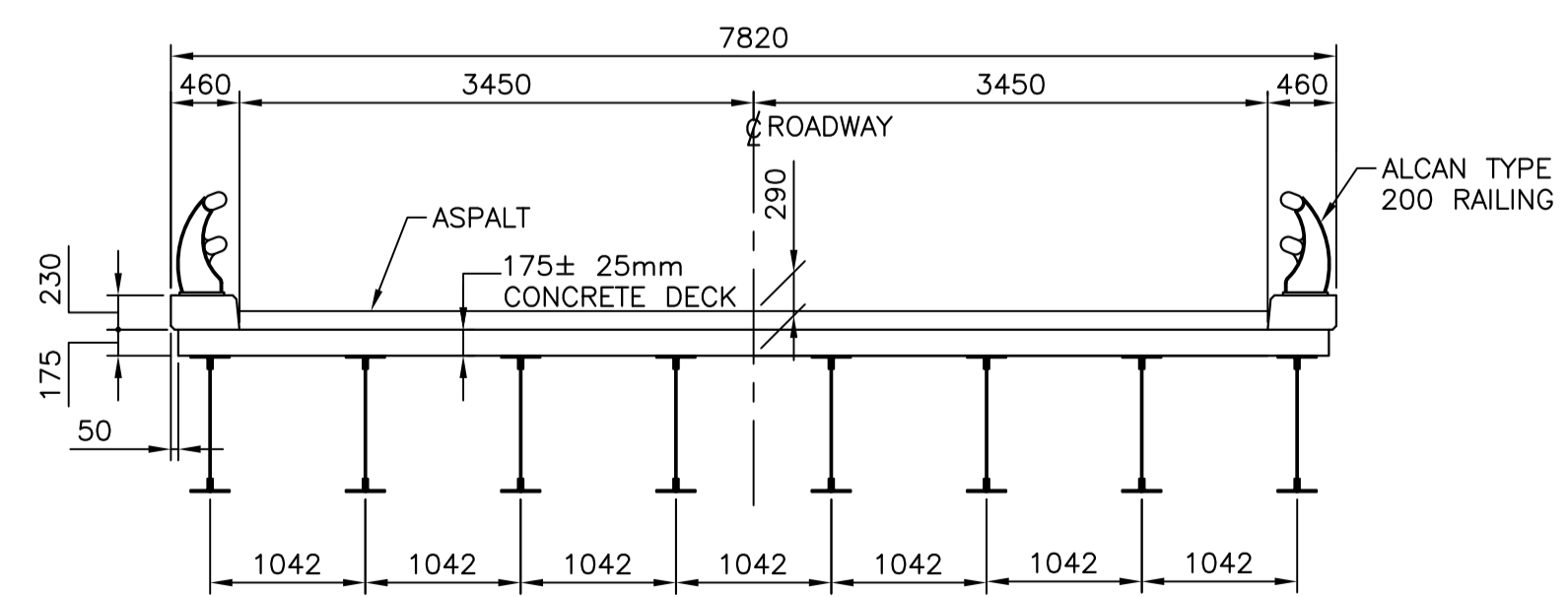
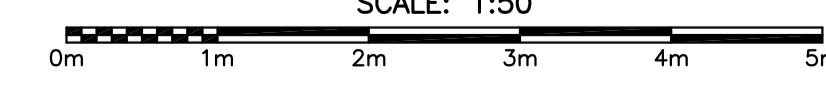




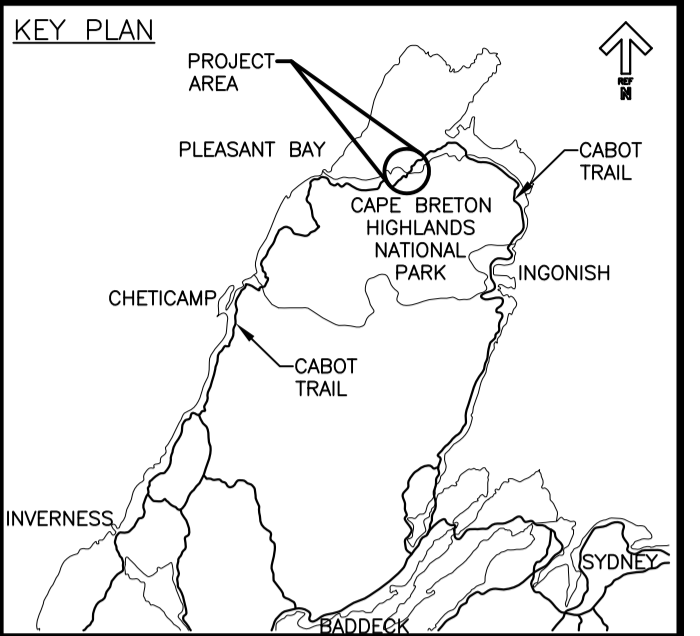
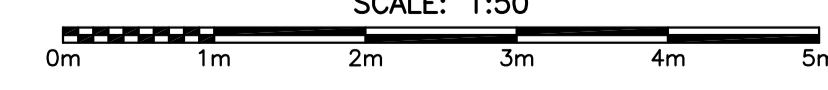
**PLAN**  
SCALE: 1:200



**ELEVATION**  
SCALE: 1:50



**TYPICAL BRIDGE SECTION**  
SCALE: 1:50



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**LEGEND**

- HYDROSEEDING AND DRY MULCHING (4000 kg/Ha)
- DEBRIS NET
- SANDBAG COFFERDAM
- ROCK FLOW CHECK
- CONSTRUCTION SEQUENCE

REFER TO SECTION 2.2.6 OF THE ECP FOR A DESCRIPTION OF THE CONSTRUCTION SEQUENCING AND ASSOCIATED BMPs TO BE IMPLEMENTED DURING THE DEMOLITION OF THE EXISTING NORTH ASPY RIVER BRIDGE.

revisions	date
project	projet

**NORTH ASPY RIVER (SOUTH) BRIDGE REPLACEMENT  
CAPE BRETON HIGHLANDS NATIONAL PARK, NOVA SCOTIA**

drawing	dessin
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**EXISTING STRUCTURE DEMOLITION ENVIRONMENTAL CONTROL PLAN**

designed DR	conçu
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date	
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drawn BSP	dessiné
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date 2016-03-18	
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approved	approuvé
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date	
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Tender	Soumission
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PCA Project Manager	Administrateur de projets PCA
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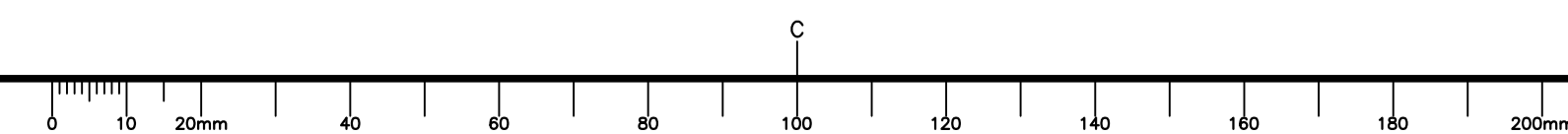
project number	no. du projet
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S-2ES	
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**PRELIMINARY**



**ENVIRONMENTAL CONTROL PLAN NORTH ASPY RIVER SOUTH BRANCH BRIDGE REPLACEMENT  
PROJECT**

March 17, 2016

**APPENDIX B  
BMPs Construction Details**

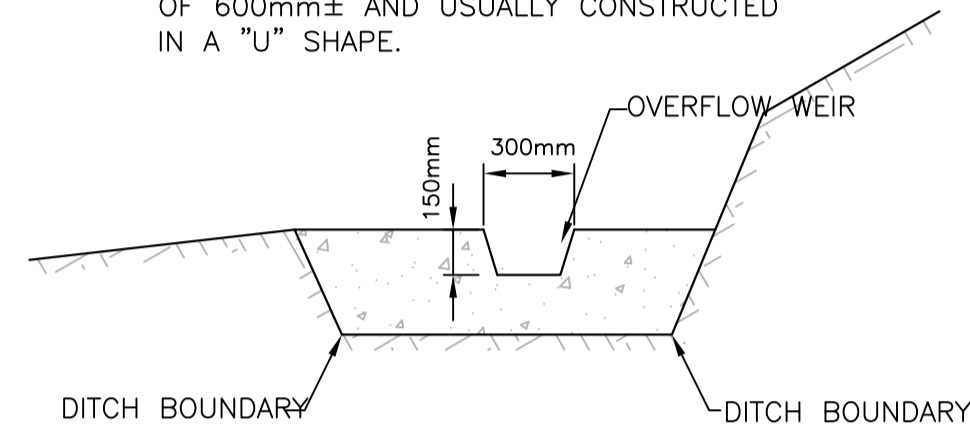


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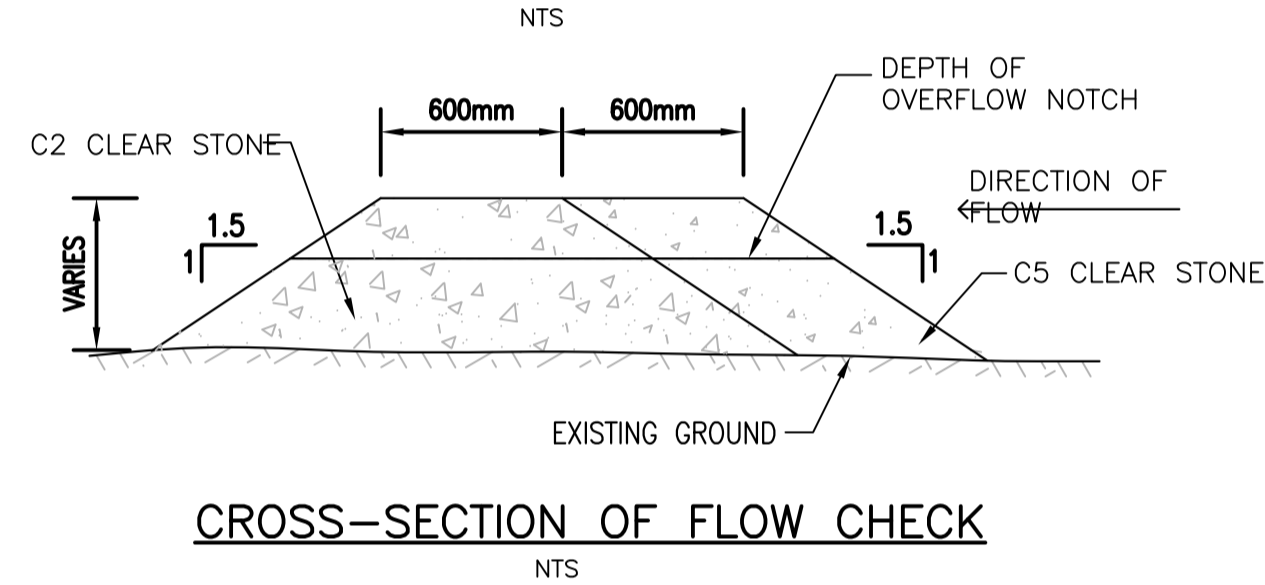
GRADATION - C2 & C5 CLEAR STONE

SIEVE SIZE (mm)	PERCENT PASSING	
	C2	C5
200	100	
150	90-100	
112	0-10	
28		100
20		90-100
10		0-40
5		0-10

NOTE: ROCK BERMS HAVE SAME X-SECTION AS ROCK FLOW CHECKS, HOWEVER DEPTH OF 600mm± AND USUALLY CONSTRUCTED IN A "U" SHAPE.



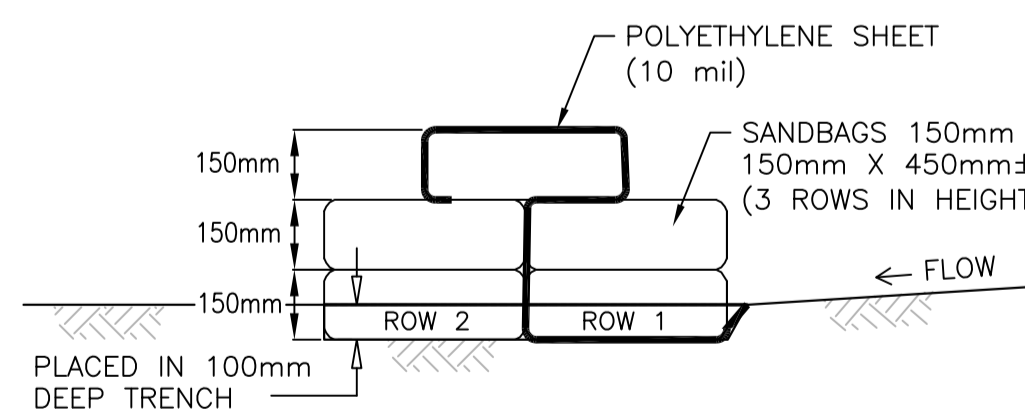
OVERFLOW WEIR DETAIL



CROSS-SECTION OF FLOW CHECK

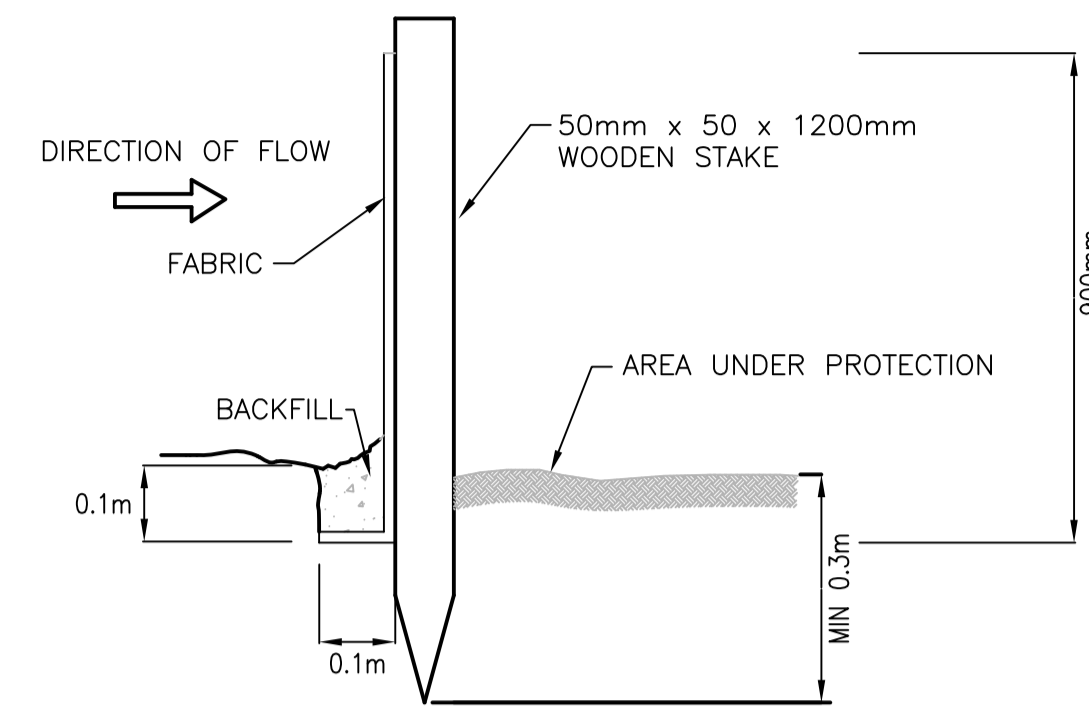
DETAIL 1  
ROCK FLOW CHECKS & ROCK BERMS

NOTE: SANDBAG BARRIER TO BE CONSTRUCTED USING PLASTIC LINED SANDBAG BARRIER. FOR EACH ADDITIONAL LAYER OF SANDBAGS ADD A SANDBAG ROW TO EACH LAYER



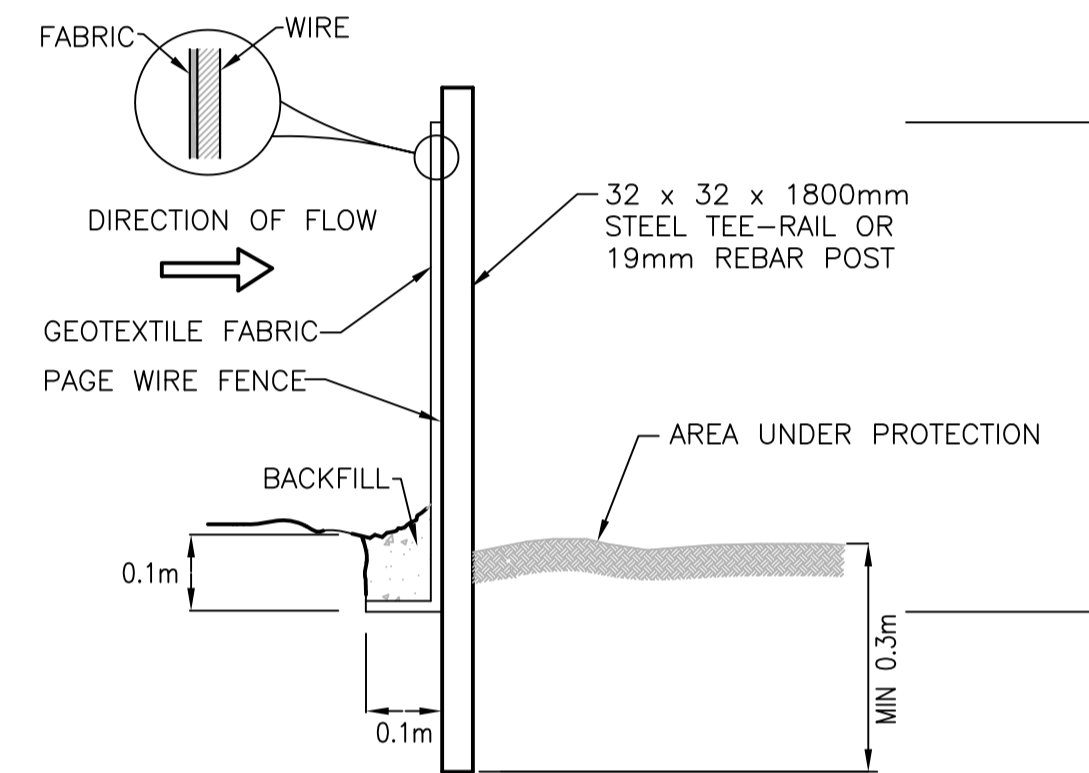
DETAIL 4

INSTALLATION OF PLASTIC-LINED SANDBAG BARRIER



DETAIL 2a

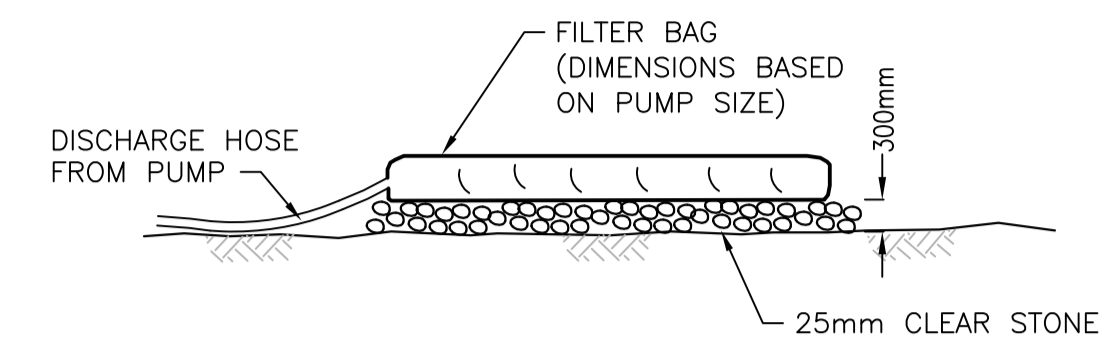
INSTALLATION OF TYPE 1 SILT FENCE



DETAIL 2b

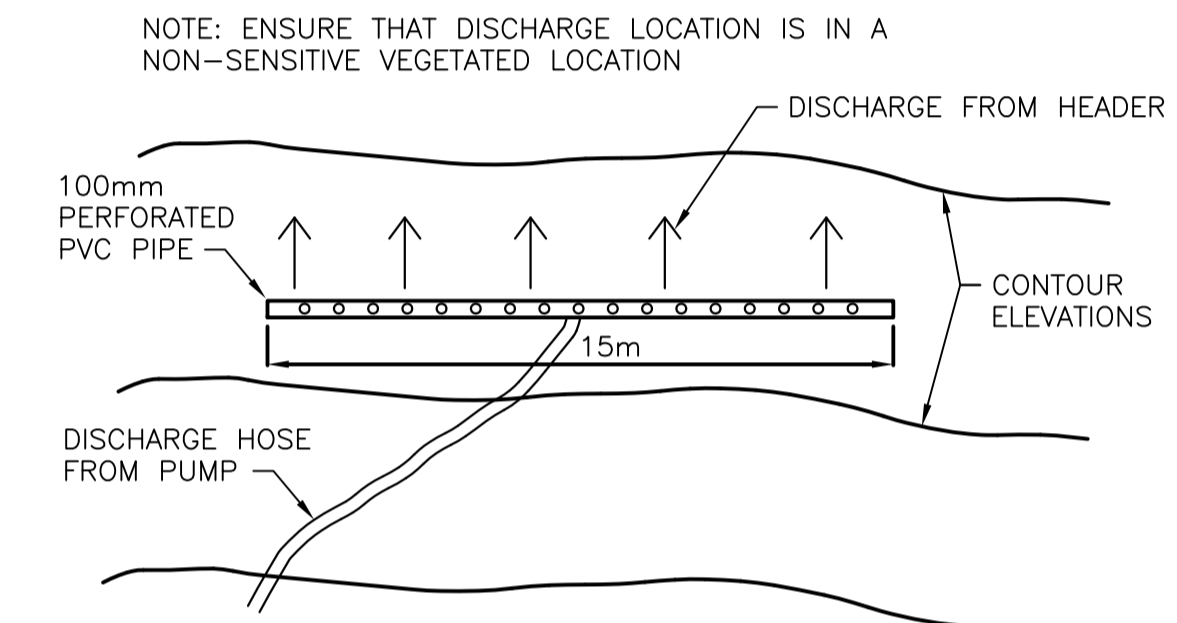
INSTALLATION OF TYPE 2 SILT FENCE

DEWATERING OPTIONS



NOTE: ENSURE THAT DISCHARGE LOCATION IS IN A NON-SENSITIVE VEGETATED LOCATION AND 30m FROM ANY WATERCOURSE OR WETLAND

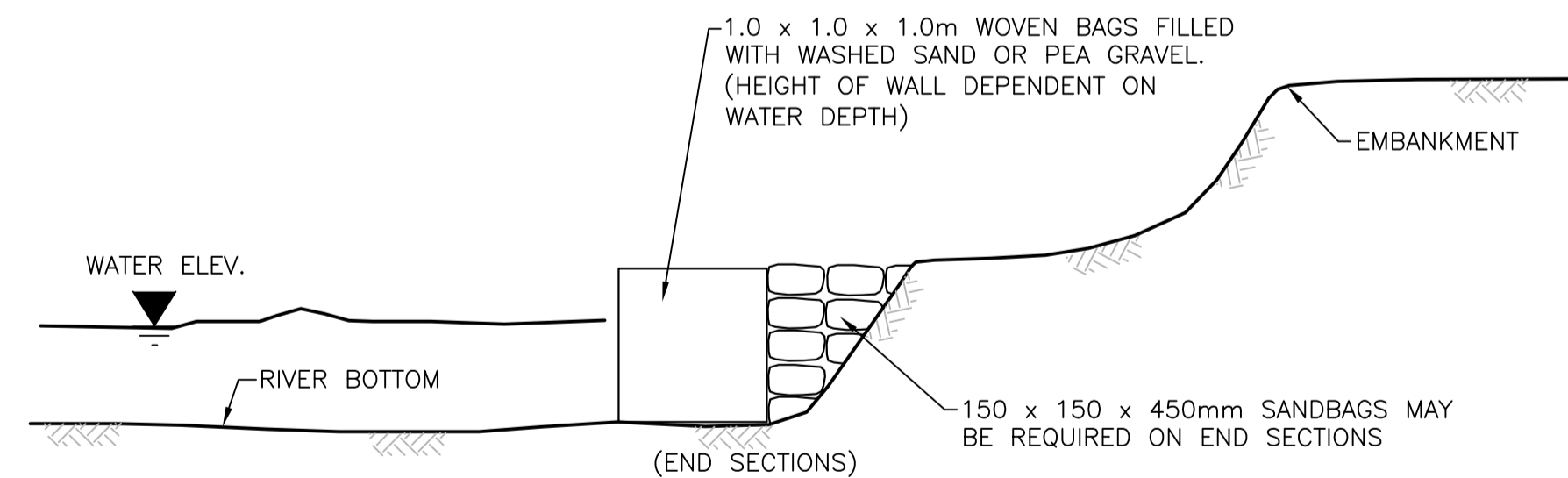
DETAIL 3a  
DISCHARGE TO A FILTER BAG



NOTE: ENSURE THAT DISCHARGE LOCATION IS IN A NON-SENSITIVE VEGETATED LOCATION

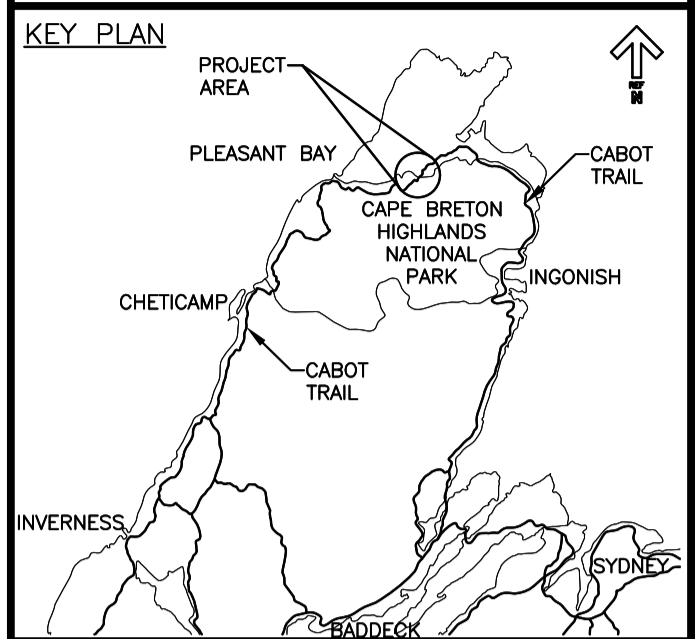
DETAIL 3b  
PERFORATED PVC PIPE (OPTION)

DEWATERING EXCAVATION OPTIONS



DETAIL 5

INSTALLATION OF SANDBAG COFFERDAM



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revisions	date
project	project

**NORTH ASPY RIVER (SOUTH) BRIDGE REPLACEMENT**  
CAPE BRETON HIGHLANDS NATIONAL PARK, NOVA SCOTIA

drawing dessin

**BEST MANAGEMENT PRACTICES CONSTRUCTION DETAILS**

designed DR conçu

date

drawn BSP dessiné

date 2016-03-16

approved approuvé

date

Tender Soumission

PCA Project Manager Administrateur de projets PCA

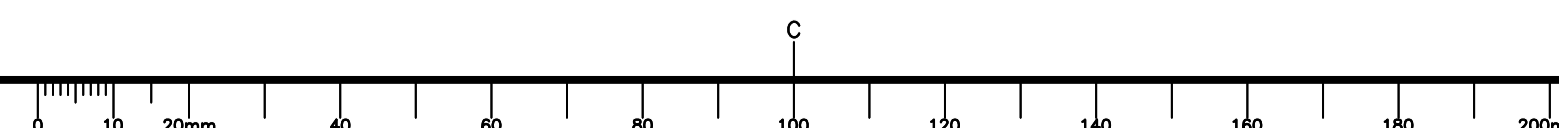
project number no. du projet

**133346833**

drawing no. no. du dessin

**CD-1**

**PRELIMINARY**



**APPENDIX E**



## Environmental Protection Plan Checklist

### What is an EPP?

An Environmental Protection Plan (EPP) is a field-ready, stand-alone document describing site-specific environmental protection actions and responsibilities during project implementation. An EPP is a ‘user-friendly’ and practical tool to ensure commitments and mitigations identified in an Environmental Impact Assessment (EIA) are implemented and monitored. An EPP isn’t necessary for all projects. It is typically required the more detailed an impact assessment is and when engineering and design work is still at a relatively high level during the EIA, with more refined details to follow. In the latter case, the EIA should specify the end goals, or outcomes for mitigation and the details of how to achieve the mitigation outcome, can be left to the EPP. The level of detail included in an EPP should be proportional to the complexity and risk of the proposed activity.

### How to use this checklist

This checklist is meant to assist in the development and/or review of an EPP to ensure that EPPs for Parks Canada projects are consistent and effective. The EPP format is flexible and can be written in a variety of ways. For example, a detailed sediment control plan can be attached in an Appendix, or measures can be integrated in a more general mitigation measures table. Contractors or specialists are responsible for developing the EPP and Parks Canada employees should review the document to ensure all mitigations in the EIA are addressed adequately in the EPP. The EPP must contain specific and direct instruction for achieving the environmental outcome identified in mitigation measures in the EIA. For example, general statements such as “Prevent sediment from entering streams” are not appropriate.

The table below is meant to be used as a guide as it has most of the content requirement that an EPP should have. However the Impact Assessment practitioner should adapt this table with every project. The mitigation sections are the ones which would usually require modification (e.g., do not keep the fish and fish habitat section if your EIA did not include it as a Valued Component). Keep in mind that some sections are essential in every EPP but the details are proportional to the complexity and risk. Once the modifications are done, carefully review the EPP to make sure all items on the checklist are addressed appropriately.

Contents	Y/N
PROJECT SETTING	
<b>Project Description:</b> <ul style="list-style-type: none"> <li>• Brief description</li> <li>• Location</li> <li>• Scope of work</li> <li>• List of all construction or related activities to be undertaken (include equipment types and methods as relevant)</li> <li>• Project schedule including restricted work period</li> <li>• Site drawing (eg. Site location, site set-up and layout, in-stream work areas, environmental sensitivities)</li> <li>• Project materials (with emphasis on those whose use carries higher environmental risk e.g. cast in place concrete in/near water bodies)</li> </ul>	
IMPLEMENTATION	
<b>Environmental Protection Plan Orientation and Awareness:</b> <ul style="list-style-type: none"> <li>• Environmental pre-work training and orientation record-attach signed copy</li> <li>• Pre-construction meeting (environmental component)</li> <li>• Contractor start-up meeting</li> <li>• Daily job planning meeting</li> </ul>	
<b>EPP Implementation:</b> <ul style="list-style-type: none"> <li>• Name and contact details for the contractor site representative and Parks Canada staff<sup>1</sup></li> <li>• Other project contacts with key responsibilities</li> <li>• Monitoring reporting</li> <li>• Training and communications strategy</li> <li>• Environmental Compliance</li> <li>• Environmental Suspension Order</li> <li>• Incident reporting</li> <li>• EPP review and update procedures</li> </ul>	
REGULATORY FRAMEWORK AND CONTENT REQUIREMENTS OF EPP	
<ul style="list-style-type: none"> <li>• List of permits, approvals, authorizations (responsibilities for and copies included, if required)</li> <li>• Ensure all relevant environmental and contingency plans/sections are included, such as: <ul style="list-style-type: none"> <li>- Erosion and sediment control plan</li> <li>- Turbidity control, drainage water and wastewater management plan</li> <li>- Soils and terrain management plan</li> <li>- Vegetation clearing plan</li> <li>- Waste management plan</li> <li>- Hazardous materials management plan</li> <li>- Health and safety plan</li> <li>- Traffic management plan</li> <li>- Wildlife and human conflict management plan</li> <li>- Equipment maintenance and fueling procedure</li> <li>- Air quality, odour, dust control and emission/pollution management plan</li> </ul> </li> </ul>	

<sup>1</sup> Parks Canada Construction Site Roles and Responsibilities:  
[http://intranet2/media/2384992/construction\\_site\\_roles\\_and\\_responsibilities\\_-\\_final.pdf](http://intranet2/media/2384992/construction_site_roles_and_responsibilities_-_final.pdf)

<ul style="list-style-type: none"> <li>- Noise pollution plan</li> <li>- Noxious weed/invasive alien species control plan</li> <li>- Site cleanup and restoration plan</li> <li>- Emergency and contingency response plans</li> <li>- Emergency key contact list, including Parks Canada contacts</li> <li>- Emergency spill response (Guide for spill response, Fuel and hazardous materials spills, Vehicle emergency spill kit contents...)</li> <li>- Incident report form</li> <li>- Fire response plan</li> <li>- Discovery of cultural resources procedure</li> </ul>	
<p><b>MITIGATION MEASURES</b></p> <p><i>Specify the environmental mitigation measures related to project construction activities for each section/separate plan (i.e. refer to list above). Ensure mitigation measures consider the following:</i></p>	
<p><b>Mitigations related to Environmental Regulations/Authorizations:</b></p> <ul style="list-style-type: none"> <li>• Environmental conditions and restrictions of all required project permits, approvals, authorization and notifications</li> <li>• Other regulatory compliance that impacts or restricts the construction project (Buffers, setbacks, timing windows...)</li> </ul>	
<p><b>Mitigations for Valued Components and related plans in the EIA such as:</b></p> <ul style="list-style-type: none"> <li>• Fish, Fish Habitat, Aquatic Species</li> <li>• Migratory Birds</li> <li>• Species at Risk</li> <li>• Wetlands, Watercourses and Riparian Areas</li> <li>• Water Quality and Quantity (hydrology, groundwater, surface water)</li> <li>• Air Quality</li> <li>• Soils</li> <li>• Wildlife</li> <li>• Vegetation</li> <li>• Cultural Resources</li> <li>• Visitor Experience</li> <li>• Traditional Use</li> </ul>	
<p><b>APPENDICIES</b></p>	
<ul style="list-style-type: none"> <li>• Maps</li> <li>• MSDS</li> <li>• Forms</li> <li>• Plans</li> <li>• CVs</li> </ul>	

**WHO TO CONTACT FOR HELP:**

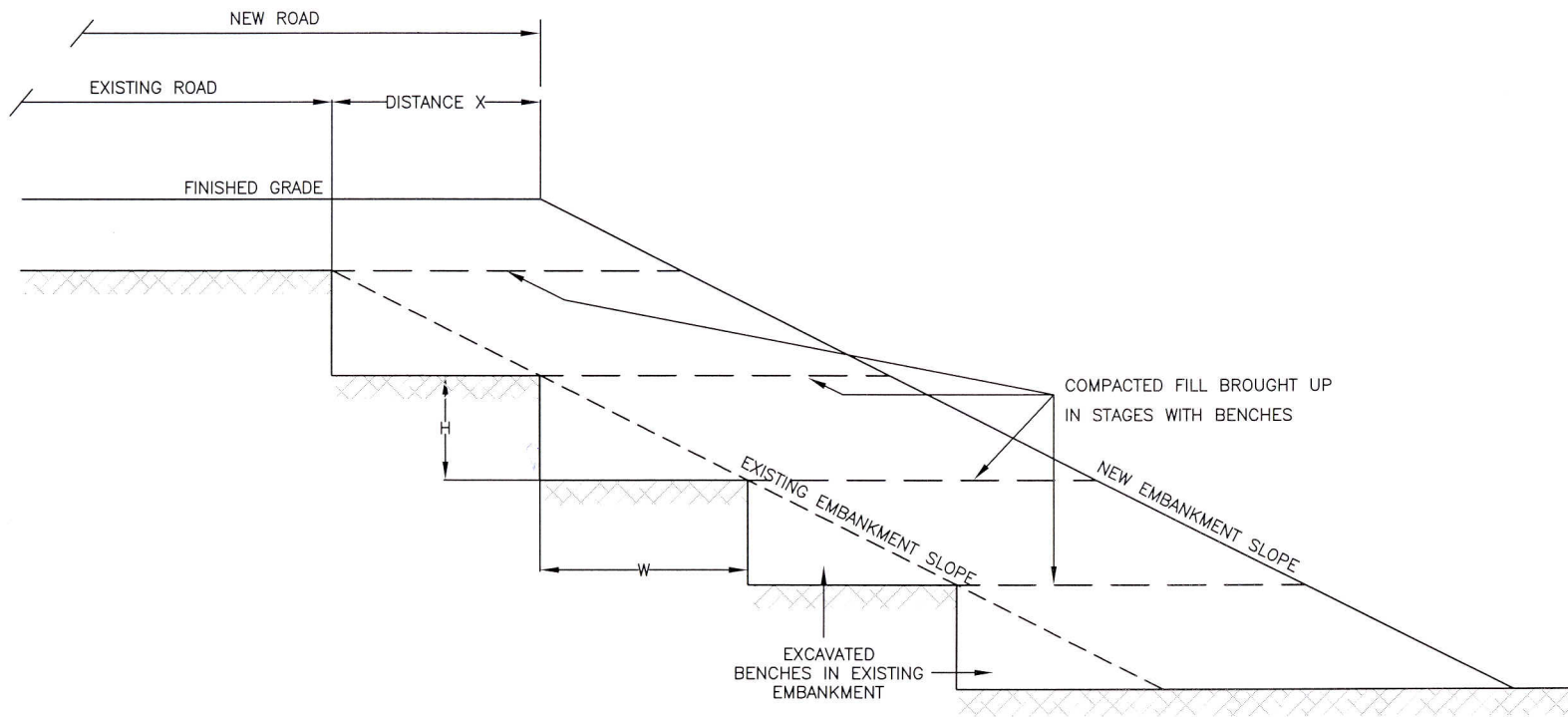
IA expertise: The [National IA Team and the Environmental Services, Infrastructure Planning Team](#) in the Natural Resource Conservation Branch provide expert advice regarding IA processes.

## APPENDIX F

### **NSTIR Detail Drawings**

The contract drawings reference the following detail drawings from the Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification – Highway Construction and Maintenance (Latest Edition). The details are provided for reference only and do not necessarily constitute a complete compilation of applicable standards.





MAXIMUM BENCH HEIGHT & WIDTH DIMENSIONS

EXISTING SLOPES	FILLS $\geq$ 4.0m	FILLS $<$ 4.0m
3:1 TO 2:1	W=2.5m H=VARIES	W=1.25m H=VARIES
2:1	W=VARIES H=1.25m	W=VARIES H=0.75m

NOTES:

1. THIS STANDARD APPLIES TO WIDENING OF EMBANKMENTS WHEN DISTANCE X  $\geq$  1.0m AT FINISHED GRADE LEVEL OF NEW ROADBED.
2. BENCHING NOT REQUIRED ON SLOPES FLATTER THAN 3:1 OR WHERE FIELD CONDITIONS SHOW IT UNNECESSARY AS DETERMINED BY THE ENGINEER.
3. BENCHES TO BE EXCAVATED ONE LEVEL AT A TIME AND COMPACTED FILL BROUGHT UP BEFORE NEXT LEVEL IS EXCAVATED.

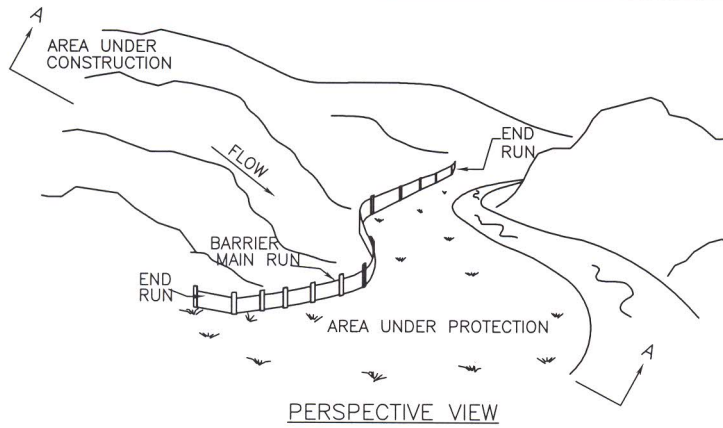
*Philip Cochran*  
 Manager Highway Planning and Design

*[Signature]*  
 Director Highway Engineering Services

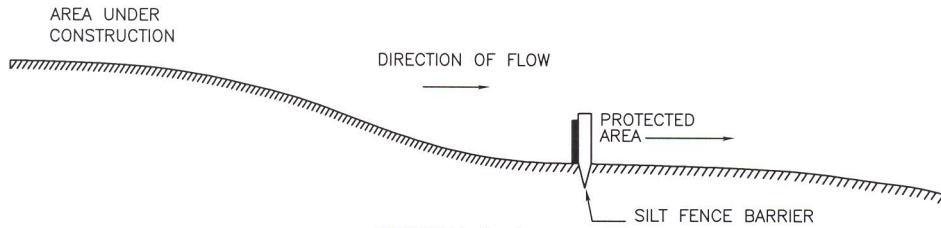
*[Signature]*  
 Executive Director Highway Engineering and Construction

No. REVISION

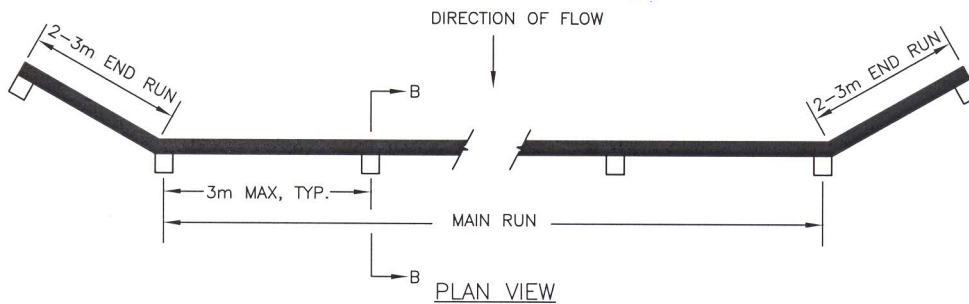
Scale : N.T.S.  
 Drawn by : M.LABRECHE  
 Checked by : K.BODDY  
 Date of Plan : AUG2009  
 File No. : S-2009-016



PERSPECTIVE VIEW

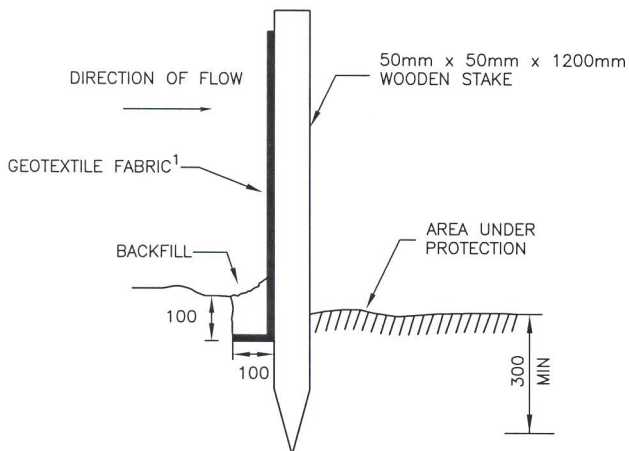


SECTION A-A



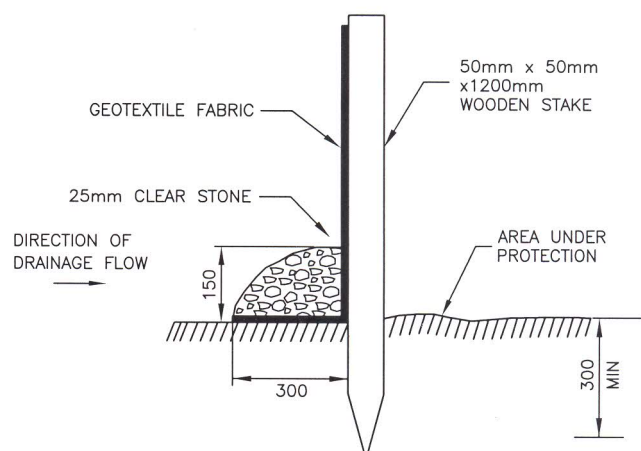
PLAN VIEW

OPTION #1



SECTION B-B

OPTION #2<sup>3</sup>



SECTION B-B

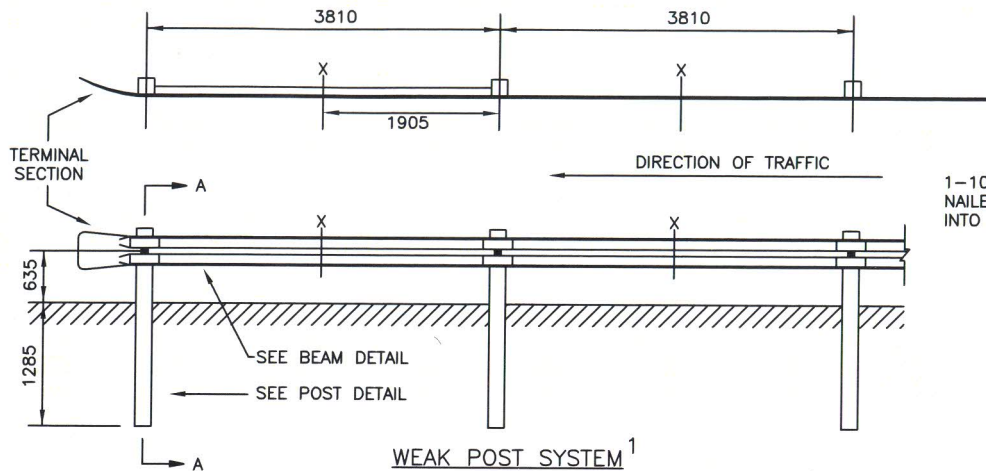
NOTES:

1. OVERALL HEIGHT OF FABRIC IS 0.9m WITH 20cm BURIED LEAVING 0.7m ABOVE GROUND LEVEL.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
3. OPTION 2 PERMITTED IN AREAS WHERE CONSTRUCTION OF TRENCH IS DIFFICULT TO EXCAVATE.

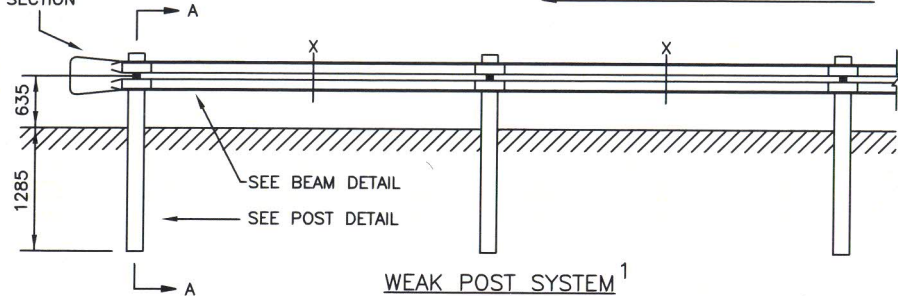
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 Checked by : B.PETT  
 Date of Plan : AUG2009  
 File No. : S-2009-132

*Christine Mac*  
 Manager Environmental Services  
*B. Pett*  
 Director Highway Engineering Services  
*John...*  
 Executive Director Highway Engineering and Construction

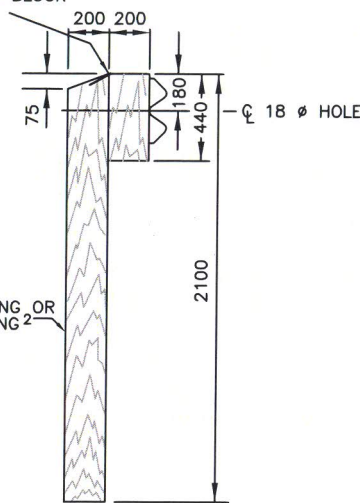
No.	REVISION
1	Added Option 2 and Notes -APR 2011



WEAK POST SYSTEM<sup>1</sup>

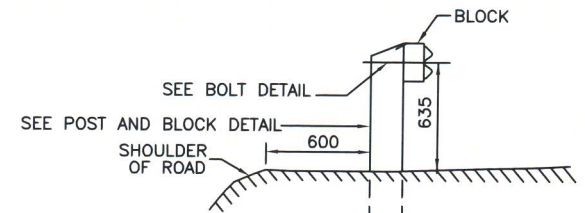


1-100mm SPIKE TOE  
NAILED THROUGH BLOCK  
INTO POST

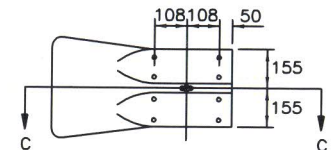


POST AND  
BLOCK DETAIL

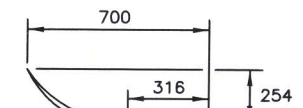
GUARD RAIL POST  
200 x 200 x 2100 LONG OR  
150 x 200 x 2100 LONG<sup>2</sup>



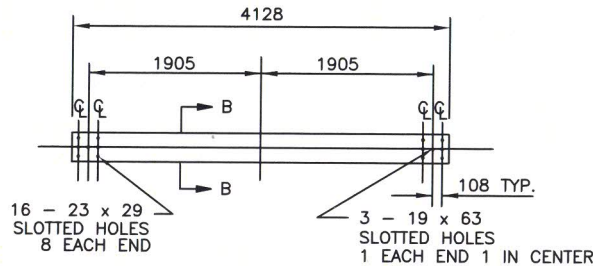
SECTION A-A



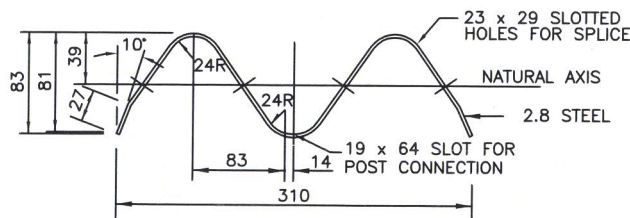
BEAM TERMINAL DETAIL<sup>3</sup>



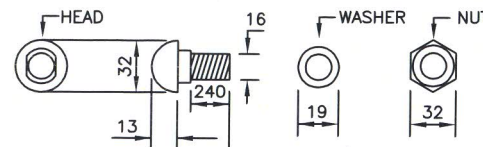
SECTION C-C



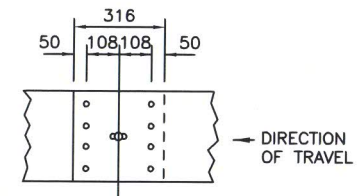
BEAM DETAIL



SECTION B-B



BOLT DETAIL<sup>4</sup>



BEAM  
SPLICE DETAIL

NOTES:

1. FOR STRONG POST SYSTEM, ADD POST AT POINT X.
2. IF 150 x 200 x 2100 LONG POSTS ARE USED, THE MATERIAL IS TO BE HARDWOOD.
3. TERMINAL SECTION ONLY APPROPRIATE FOR 4-LANE DIVIDED HIGHWAYS.

4. ALL BOLTS, NUTS AND WASHERS SHALL BE GALVANIZED BY THE HOT DIP PROCESS. BOLTS SHALL BE CAPABLE OF WITHSTANDING 106 kN IN SINGLE SHEAR. 16mm SQUARE NUT AND 19mm ROUND WASHERS ARE TO BE USED. ONE WASHER FOR EACH 240mm x 16mm BOLT. BOLTS ARE TO HAVE 75mm THREADS. FOR STRONG POST SYSTEM BOLT LENGTH SHALL BE 440mm.
5. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

*Burton*  
 Manager Highway Planning and Design  
*...*  
 Director Highway Engineering Services  
*...*  
 Executive Director Highway Engineering and Construction

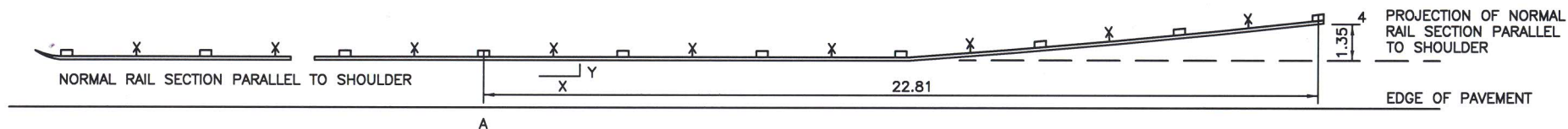
**GUARD RAIL AND POST DETAILS  
HS518**



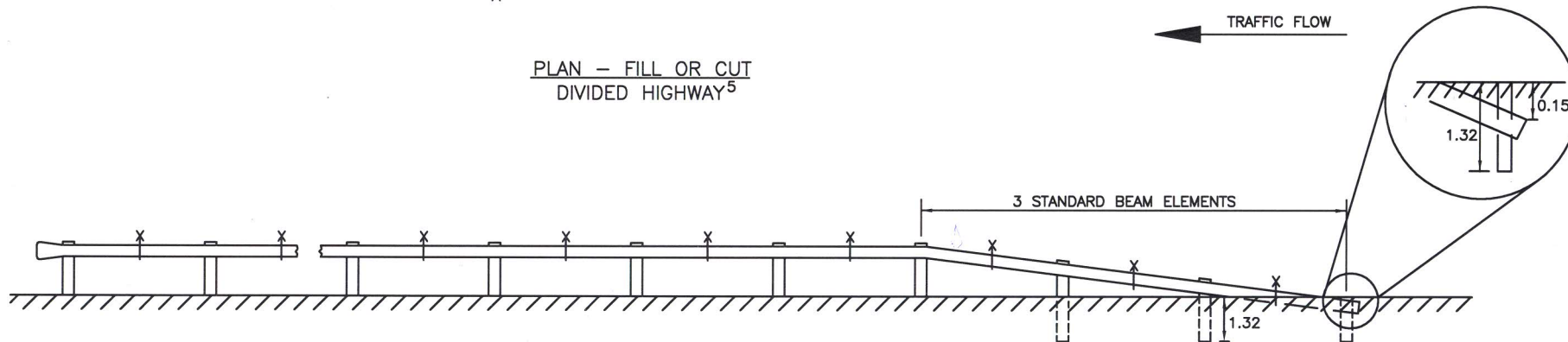
No.	REVISION
3	UPDATED TO AAHSTO STANDARD. JAN15
2	BEAM SPLICE DETAIL MODIFIED /SEP10
1	DETAILS, NOTES, TITLES /FEB 10

Scale : N.T.S.  
 Drawn by : M.LABRECHE  
 Checked by : J.RAE  
 Date of Plan : AUG2009  
 File No. : S-2009-071

POST OFFSET TABLE	
FILL OR CUT	
x	y <sup>3</sup>
3.81	0.04
7.62	0.15
11.42	0.34
15.22	0.60
19.02	0.94
22.81	1.35



PLAN - FILL OR CUT  
DIVIDED HIGHWAY<sup>5</sup>



ELEVATION  
DIVIDED HIGHWAY<sup>5</sup>

1. FOR STRONG POST SYSTEM, ADD POST AT POINT "X"
2. THIS STANDARD DRAWING IS NOT APPLICABLE TO NEW 100 SERIES HIGHWAY CONSTRUCTION WHERE ENERGY ABSORBING GUARD RAIL TERMINALS (EAGRT) SYSTEMS ARE SPECIFIED.
3. MEASURED FROM FACE OF RAIL BASED ON NORMAL RAIL SECTION PARALLEL TO SHOULDER AT A.
4. GUARD RAIL MAY BE PLACED AS PRACTICABLE FROM EDGE OF SHOULDER. IN NO CASE MAY GUARD RAIL BE PLACED DOWN THE SLOPE.
5. FOR 2-LANE/ 2-WAY ROADWAYS, BURY BOTH ENDS OF GUARD RAIL.
6. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

*Philip Colburn*  
Manager Highway Planning and Design

*[Signature]*  
Director Highway Engineering Services

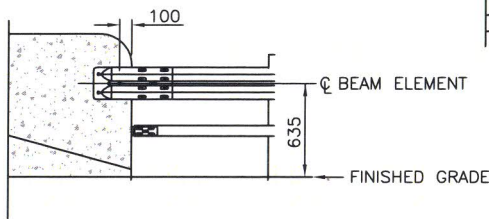
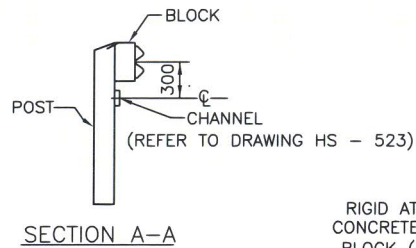
*[Signature]*  
Executive Director Highway Engineering and Construction



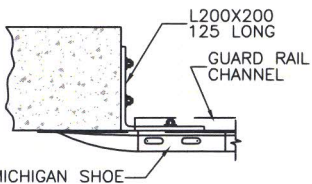
4	Addition of EAGRT note - Feb 12
3	Addition of post bury depth - FEB 11
2	Addition of "X" for strong post system
1	Notes, Titles - Feb 10
No.	REVISION

Scale : N.T.S.  
 Drawn by : M.LABRECHE  
 Checked by : J.RAE  
 Date of Plan : AUG2009  
 File No. : S-2009-072

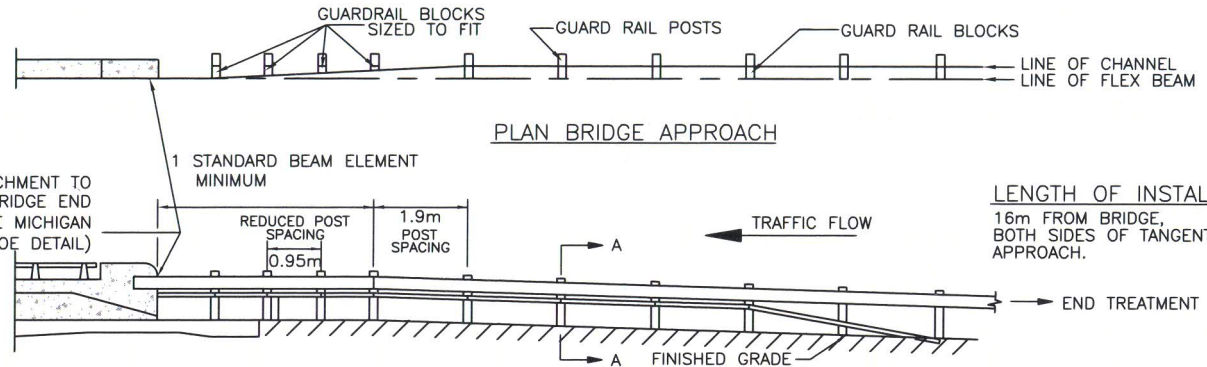
STEEL BEAM GUARD RAIL  
END TREATMENT HS520



ELEVATION END BLOCK CONNECTION



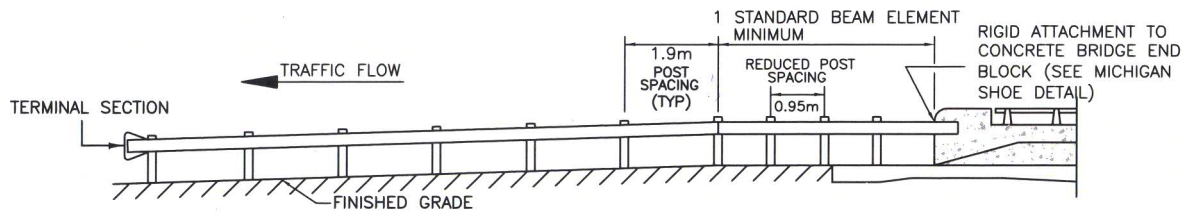
PLAN END BLOCK CONNECTION



LENGTH OF INSTALLATION  
16m FROM BRIDGE,  
BOTH SIDES OF TANGENT  
APPROACH.

ELEVATION - ROADSIDE BARRIER AT CONCRETE BRIDGE

- TWO WAY TRAFFIC AT ALL FOUR CORNERS OF BRIDGE
- DIVIDED HIGHWAY AT APPROACH TO BRIDGE ONLY



ELEVATION - ROADSIDE BARRIER AT CONCRETE BRIDGE (NO CHANNEL)

- DIVIDED HIGHWAY AT DEPARTURE OF BRIDGE ONLY

NOTES:

- SEE BEAM DETAIL, BEAM TERMINAL DETAIL, BEAM SPLICE DETAIL, POST AND BLOCK DETAIL, BOLT DETAIL, NOTE 2, NOTE 3, NOTE 4 ON STANDARD DRAWING S-2009-071.
- SEE STANDARD DRAWING S-2009-072 FOR END TREATMENT.
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.



5	GUARDRAIL RAISED 35mm ON BLOCK DETAIL-FEB 2015
4	Moved note 4 and 5 under headings - Jan 12
3	Length of installation note - Aug 11
2	Addition of Note 4 and 5 - Feb 11
1	SEC A-A, Notes - Feb 10
No.	REVISION

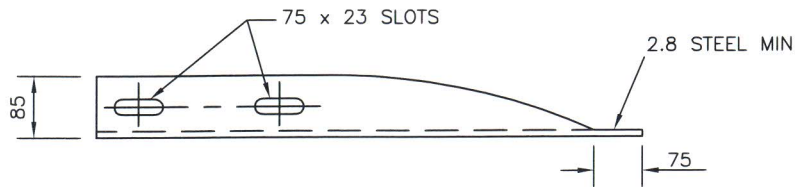
Scale : N.T.S.  
 Drawn by : M.LABRECHE  
 Checked by : J.RAE  
 Date of Plan : AUG2009  
 File No. : S-2009-073

*B. Labreche*  
 Manager Highway Planning and Design

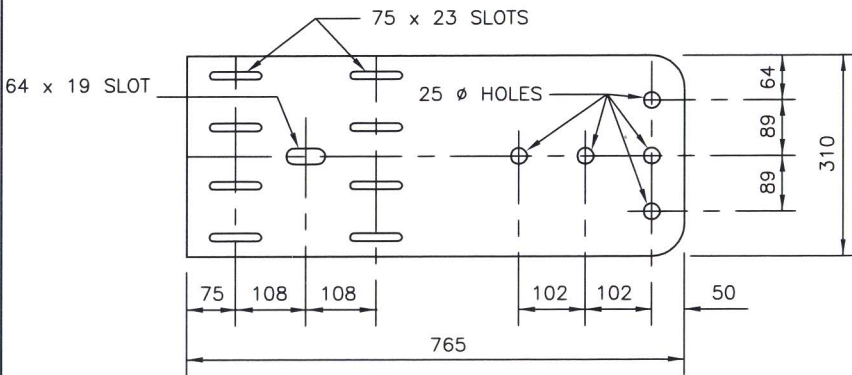
*[Signature]*  
 Director Highway Engineering Services

*[Signature]*  
 Executive Director Highway Engineering and Construction

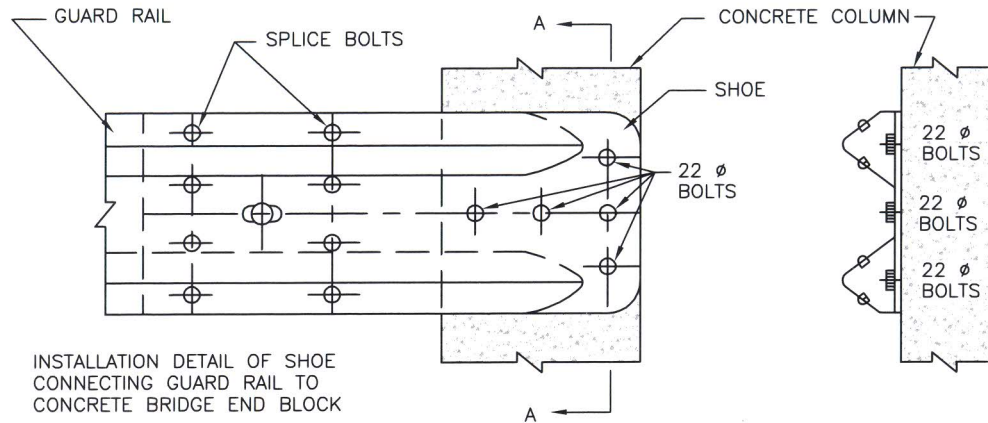
**ROADSIDE BARRIER AT CONCRETE  
 BRIDGE APPROACH HS521**



PLAN DETAIL OF SHOE



ELEVATION DETAIL OF SHOE



INSTALLATION DETAIL OF SHOE  
CONNECTING GUARD RAIL TO  
CONCRETE BRIDGE END BLOCK

ELEVATION DETAIL OF INSTALLED SHOE

SECTION A-A

NOTES:  
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

*Burkley*  
Manager Highway Planning and Design

*Ben*  
Director Highway Engineering Services

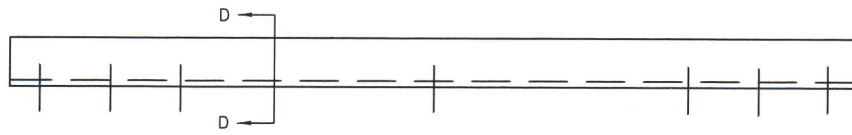
*John Hadjilov*  
Executive Director Highway Engineering and Construction



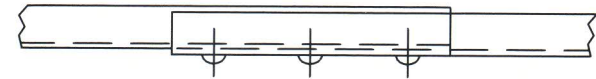
No.	REVISION
2	ADDITIONAL 25Ø HOLE
1	"HS" # ADDED TO TITLE

Scale : N.T.S.  
 Drawn by : M.LABRECHE  
 Checked by : J.RAE  
 Date of Plan : NOV2015  
 File No. : S-2009-074

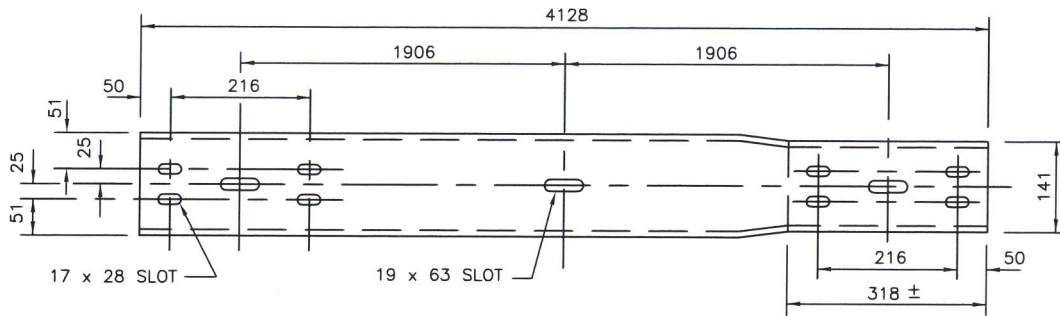
**MICHIGAN SHOE DETAIL  
HS522**



PLAN

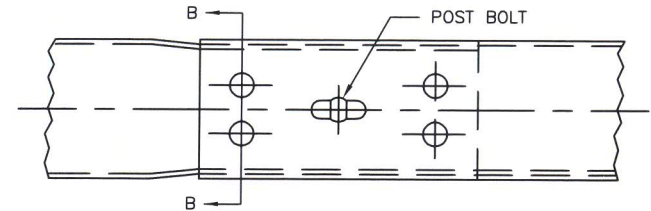


PLAN

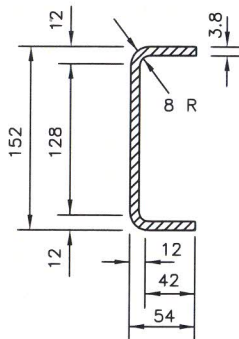


ELEVATION

SWAGGED SPLICE

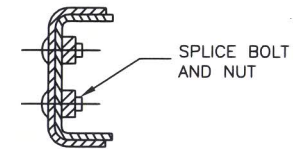


ELEVATION



SECTION D-D

COLD ROLLED CHANNEL DETAIL



SECTION B-B

SWAGGED SPLICE DETAIL

NOTES:  
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

*Burkholder*  
Manager Highway Planning and Design

*...*  
Director Highway Engineering Services

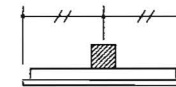
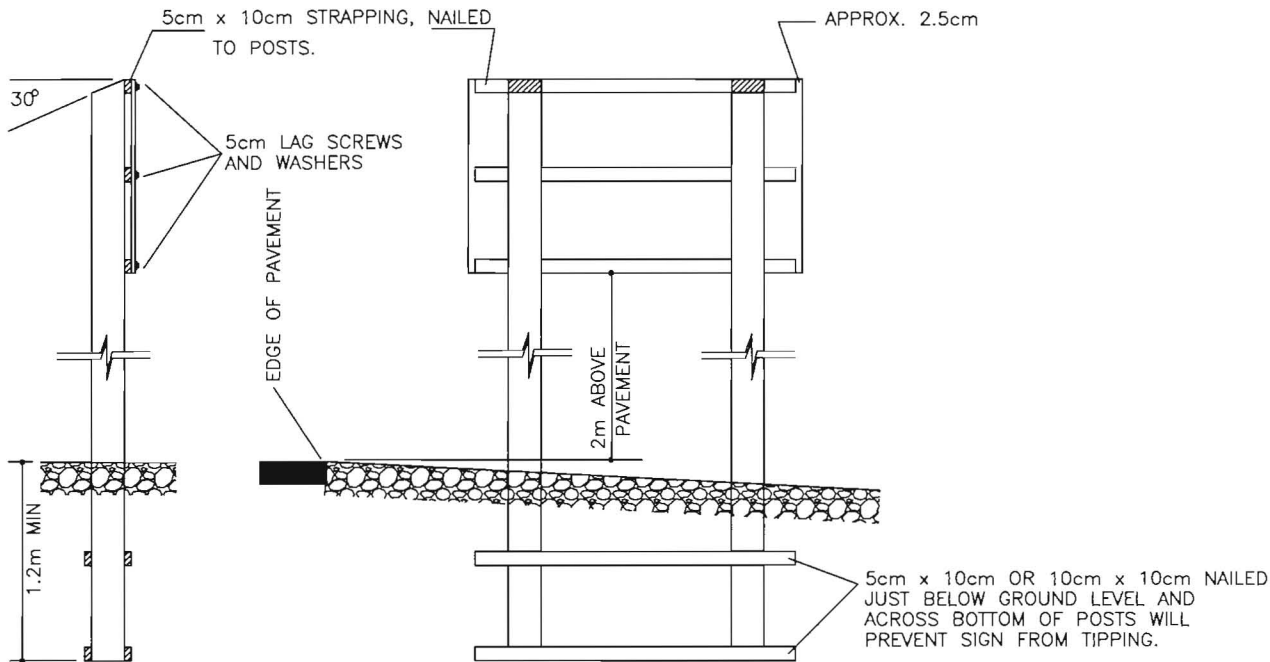
*...*  
Executive Director Highway Engineering and Construction

**GUARDRAIL CHANNEL DETAIL  
HS523**

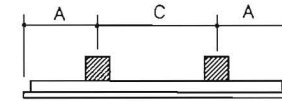


No.	REVISION
1	HS # ADDED TO TITLE

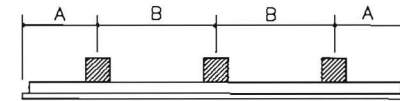
Scale : N.T.S.  
 Drawn by : M.LABRECHE  
 Checked by : J.RAE  
 Date of Plan : AUG2009  
 File No. : S-2009-075



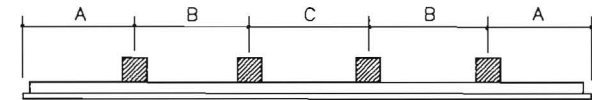
ONE POST



TWO POST



THREE POST



FOUR POST

POST SPACING DIAGRAMS  
(NOT TO SCALE)

SEE STANDARD PLAN S-2011-101 FOR POST SPACING

NOTES:

1. STRAPPING BEHIND SIGN ARE TO BE PAINTED THE SAME COLOUR AS THE SIGN.
2. SIGN POSTS TO BE PAINTED WHITE UNLESS PRESSURE TREATED.
3. SIGN SIZE SHOWN ON POST CHART ARE HEIGHT x LENGTH.
4. SEE CHART FOR NUMBER, SIZE AND SPACING OF POSTS.
5. SIGNS TO BE INSTALLED ON BACK SLOPE WHENEVER POSSIBLE.
6. FOR LARGER SIGNS USE MAXIMUM END SPACE OF 45cm AND MAXIMUM POST SPACING OF 120cm WITH 15cm x 15cm POSTS.
7. SEE STANDARD PLAN S-2011-101 FOR POST SPACING.
8. FOR SIGN OFFSET FROM THE LANE LINE, CONTACT THE DISTRICT TRAFFIC SUPERVISOR OR THE PROVINCIAL SIGNING OFFICER.

*J. Amadio*  
 Manager Traffic Engineering Services

*P. Hill*  
 Director Highway Engineering Services

*[Signature]*  
 Executive Director Highway Engineering and Construction

No.	REVISION

Scale : N.T.S.  
 Drawn by : B.STORRIE  
 Checked by : P.HILL  
 Date of Plan : MAY2011  
 File No. : S-2011-100



Sign Size	# of Posts	Post Size	Post Spacing		
			A	B	C
60 x 30 cm	1	10 x 10 cm	30 cm		
90 x 30 cm	1	10 x 10 cm	45 cm		
60 x 45 cm	1	10 x 10 cm	30 cm		
90 x 45 cm	1	10 x 10 cm	45 cm		
60 x 60 cm	1	10 x 10 cm	30 cm		
90 x 60 cm	1	10 x 10 cm	45 cm		
75 x 75 cm	1	10 x 10 cm	40 cm		
90 x 75 cm	1	10 x 10 cm	45 cm		
90 x 90 cm	1	10 x 10 cm	45 cm		
120 x 30 cm	2	10 x 10 cm	15 cm		90 cm
150 x 30 cm	2	10 x 10 cm	30 cm		90 cm
180 x 30 cm	2	10 x 10 cm	30 cm		120 cm
215 x 30 cm	2	10 x 10 cm	45 cm		120 cm
120 x 45 cm	2	10 x 10 cm	15 cm		90 cm
150 x 45 cm	2	10 x 10 cm	30 cm		90 cm
180 x 45 cm	2	10 x 10 cm	30 cm		120 cm
215 x 45 cm	2	10 x 10 cm	45 cm		120 cm
120 x 60 cm	2	10 x 10 cm	15 cm		90 cm
150 x 60 cm	2	10 x 10 cm	30 cm		90 cm
180 x 60 cm	2	10 x 10 cm	30 cm		120 cm
215 x 60 cm	2	10 x 10 cm	45 cm		120 cm
120 x 75 cm	2	10 x 10 cm	15 cm		90 cm
150 x 75 cm	2	10 x 10 cm	30 cm		90 cm
180 x 75 cm	2	10 x 10 cm	30 cm		120 cm
215 x 75 cm	2	10 x 10 cm	45 cm		120 cm
120 x 90 cm	2	10 x 10 cm	15 cm		90 cm
150 x 90 cm	2	10 x 10 cm	30 cm		90 cm

Sign Size	# of Posts	Post Size	Post Spacing		
			A	B	C
180 x 90 cm	2	10 x 10 cm	30 cm		120 cm
215 x 90 cm	2	10 x 10 cm	45 cm		120 cm
120 x 120 cm	2	10 x 10 cm	15 cm		90 cm
150 x 120 cm	2	10 x 10 cm	30 cm		90 cm
180 x 120 cm	2	10 x 10 cm	30 cm		120 cm
215 x 120 cm	2	10 x 10 cm	45 cm		120 cm
245 x 30 cm	3	10 x 10 cm	30 cm	90 cm	
245 x 45 cm	3	10 x 10 cm	30 cm	90 cm	
245 x 60 cm	3	10 x 10 cm	30 cm	90 cm	
245 x 75 cm	3	10 x 10 cm	30 cm	90 cm	
245 x 90 cm	3	10 x 10 cm	30 cm	90 cm	
275 x 90 cm	3	10 x 10 cm	45 cm	90 cm	
305 x 90 cm	3	15 x 15 cm	30 cm	120 cm	
335 x 90 cm	3	15 x 15 cm	45 cm	120 cm	
365 x 90 cm	3	15 x 15 cm	45 cm	135 cm	
245 x 120 cm	3	15 x 15 cm	30 cm	90 cm	
275 x 120 cm	3	15 x 15 cm	45 cm	90 cm	
305 x 120 cm	3	15 x 15 cm	30 cm	120 cm	
335 x 120 cm	3	15 x 15 cm	45 cm	120 cm	
365 x 120 cm	3	15 x 15 cm	45 cm	135 cm	
395 x 90 cm	4	15 x 15 cm	40 cm	105 cm	105 cm
425 x 90 cm	4	15 x 15 cm	40 cm	115 cm	115 cm
395 x 120 cm	4	15 x 15 cm	40 cm	105 cm	105 cm
425 x 120 cm	4	15 x 15 cm	40 cm	115 cm	115 cm
455 x 120 cm	4	15 x 15 cm	40 cm	125 cm	125 cm
485 x 120 cm	4	15 x 15 cm	40 cm	135 cm	135 cm

NOTES:




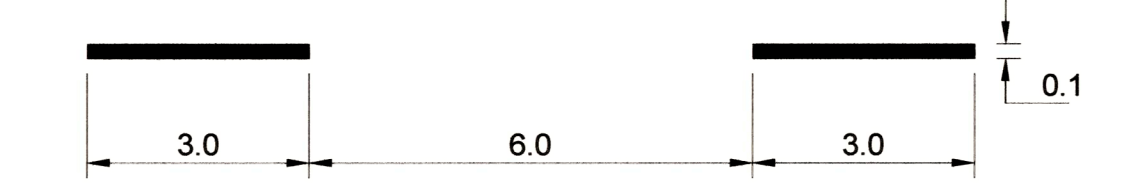
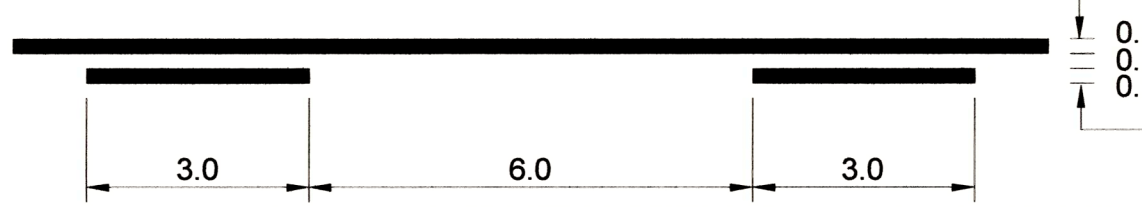


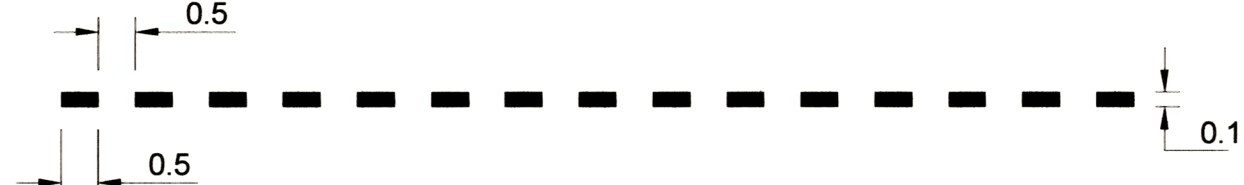



No.	REVISION

Scale : N.T.S.  
 Drawn by : J.MACINTOSH/B.STORRIE  
 Checked by : P.HILL  
 Date of Plan : MAY2011  
 File No. : S-2011-101



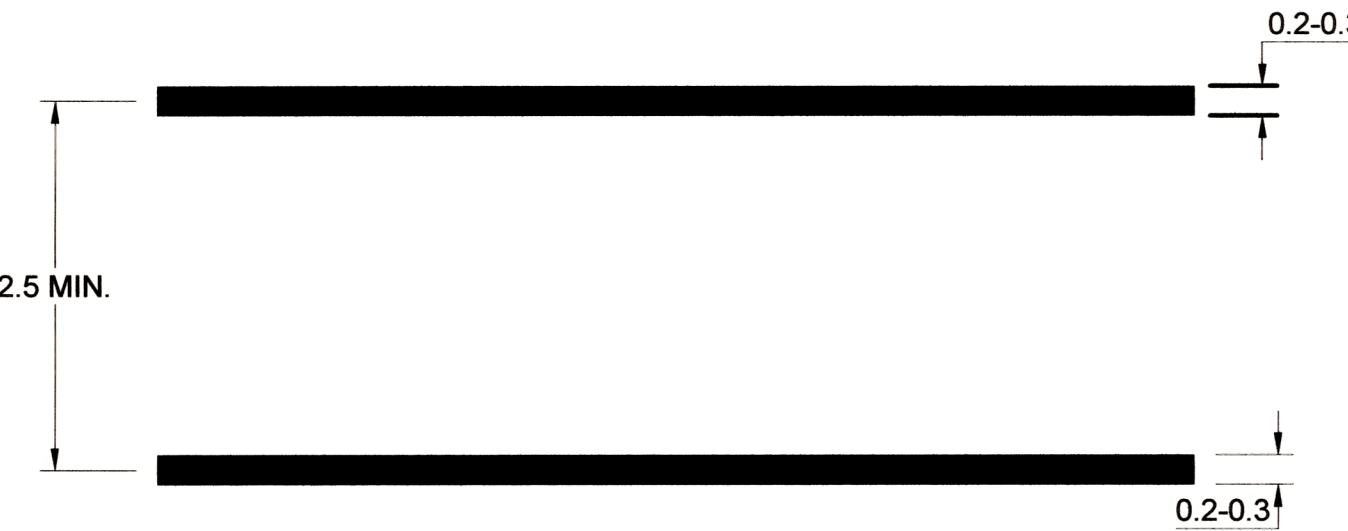
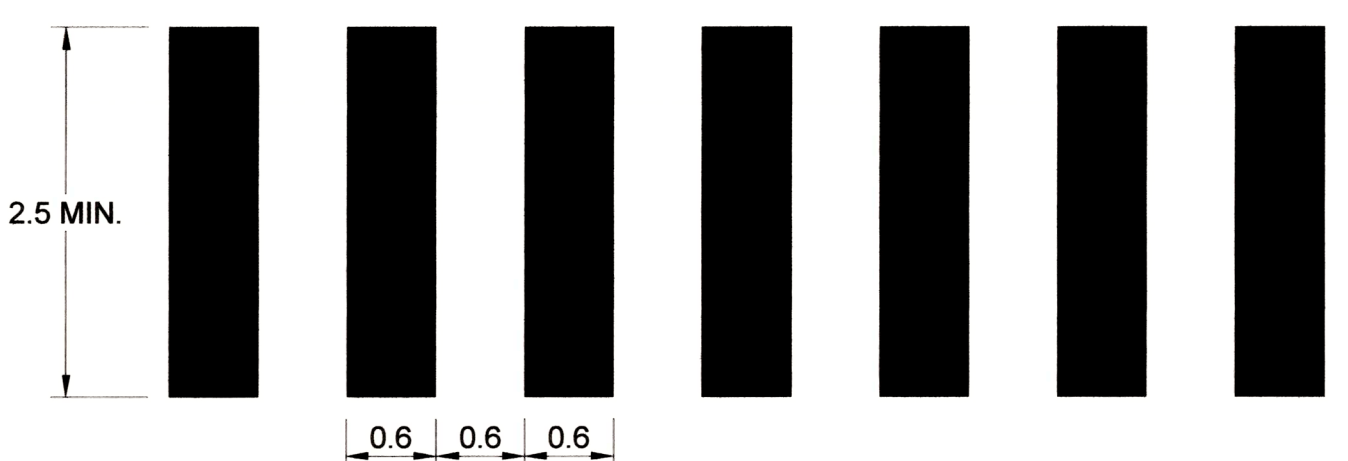
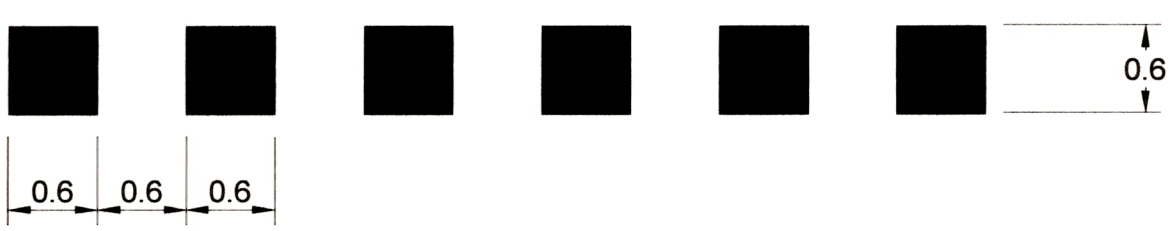

*[Signature]*  
 Manager Traffic Engineering Services  
*[Signature]*  
 Director Highway Engineering Services  
*[Signature]*  
 Executive Director Highway Engineering and Construction

**WOOD SIGN STRUCTURE  
 POST SPACING CHART**

**PATTERNS OF LONGITUDINAL LINES**

NAME OF LINE	DIMENSIONS (m)	USE
SOLID		<ul style="list-style-type: none"> <li>EDGELINES (WHITE OR YELLOW)</li> <li>DIRECTIONAL DIVIDING LINES (YELLOW)</li> <li>LANE LINES PROHIBITING LANE CHANGES (WHITE)</li> </ul>
BROKEN		<ul style="list-style-type: none"> <li>DIRECTIONAL DIVIDING LINES (YELLOW)</li> <li>LANE LINES (WHITE)</li> </ul>
SIMULTANEOUS SOLID AND BROKEN		<ul style="list-style-type: none"> <li>DIRECTIONAL DIVIDING LINES (YELLOW)</li> <li>TWO-WAY LEFT TURN LANES (YELLOW)</li> </ul>
DOUBLE SOLID		<ul style="list-style-type: none"> <li>DIRECTIONAL DIVIDING LINES (YELLOW)</li> </ul>
WIDE SOLID		<ul style="list-style-type: none"> <li>EDGELINES AT GORE AREAS OF 100 SERIES HIGHWAYS AND IN OTHER CRITICAL AREAS (WHITE ON RIGHT, YELLOW ON THE LEFT)</li> </ul>
DASHED 0.5m		<ul style="list-style-type: none"> <li>GUIDING LINES (E.G. INTERSECTION MOVEMENTS) (YELLOW OR WHITE BASED ON THE COLOUR OF LINE BEING EXTENDED)</li> </ul>
DASHED 1.8m		<ul style="list-style-type: none"> <li>LANE LINES IN ROUNDABOUTS (WHITE)</li> </ul>
DASHED 3.0m		<ul style="list-style-type: none"> <li>CONTINUITY LINES IN MERGING AND DIVERGING AREAS (WHITE)</li> <li>LANE LINES FOR LEFT TURN AND RIGHT TURN BAYS AND TAPERS (WHITE)</li> </ul>
WIDE DASHED 3.0m		<ul style="list-style-type: none"> <li>CONTINUITY LINES IN MERGING AND DIVERGING AREAS ON 100 SERIES HIGHWAYS (WHITE)</li> </ul>

**PATTERNS OF TRANSVERSE LINES**

NAME OF LINE	DIMENSIONS (m)	USE
STOP		<ul style="list-style-type: none"> <li>INTERSECTION STOP LINES (WHITE)</li> </ul>
DOUBLE STOP BAR		<ul style="list-style-type: none"> <li>RAILWAY CROSSINGS (WHITE) (OPTIONAL SEE S-2013-312 FOR CONDITIONS)</li> </ul>
PARALLEL CROSSWALK		<ul style="list-style-type: none"> <li>PEDESTRIAN CROSSWALKS (WHITE)</li> </ul>
ZEBRA CROSSWALK		<ul style="list-style-type: none"> <li>SCHOOL CROSSWALKS (WHITE)</li> <li>MID-BLOCK CROSSWALKS (WHITE)</li> </ul> <p>MUST BE APPLIED USING HIGH FRICTION MATERIAL</p>
ROUNDABOUT YIELD BAR 0.6 m		<ul style="list-style-type: none"> <li>ROUNDABOUT YIELD BAR FOR SINGLE LANE ENTRY (WHITE)</li> </ul>
ROUNDABOUT YIELD BAR 1.8 m		<ul style="list-style-type: none"> <li>ROUNDABOUT YIELD BAR FOR MULTI-LANE ENTRY (WHITE)</li> </ul>

( ADAPTED FROM MUTCDC FIGURE C1-1 )

Designed by:  
 Surveyed by:  
 Drawn by: R. Hird  
 Checked by: P. Hill  
 Approved by:

*Michael Pitt*  
 Manager Traffic Engineering and Road Safety  
 Date: DEC 9, 2014  
  
*Paul Hill*  
 Director, Highway Engineering Services  
 Date: DEC 9, 2014

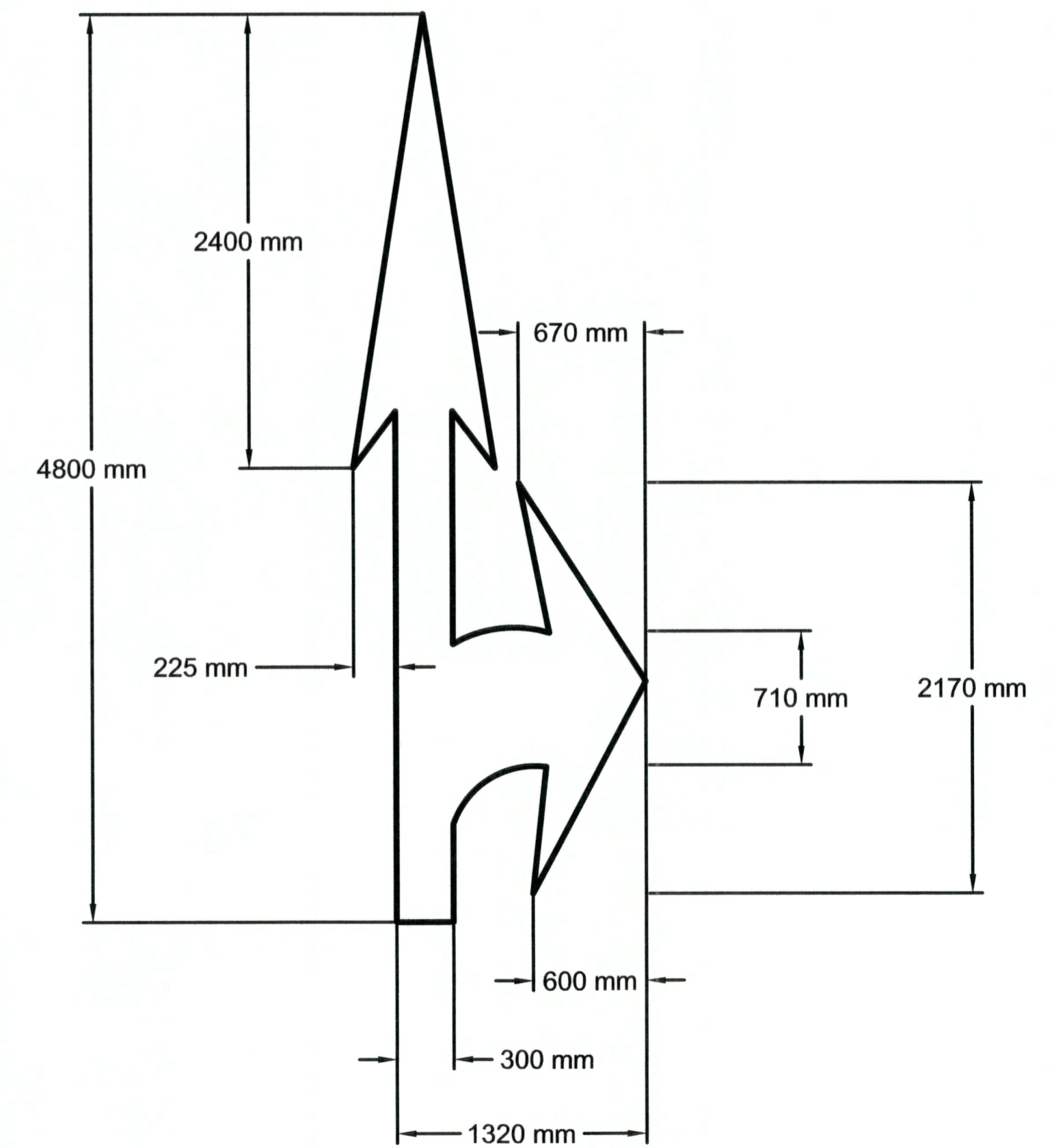
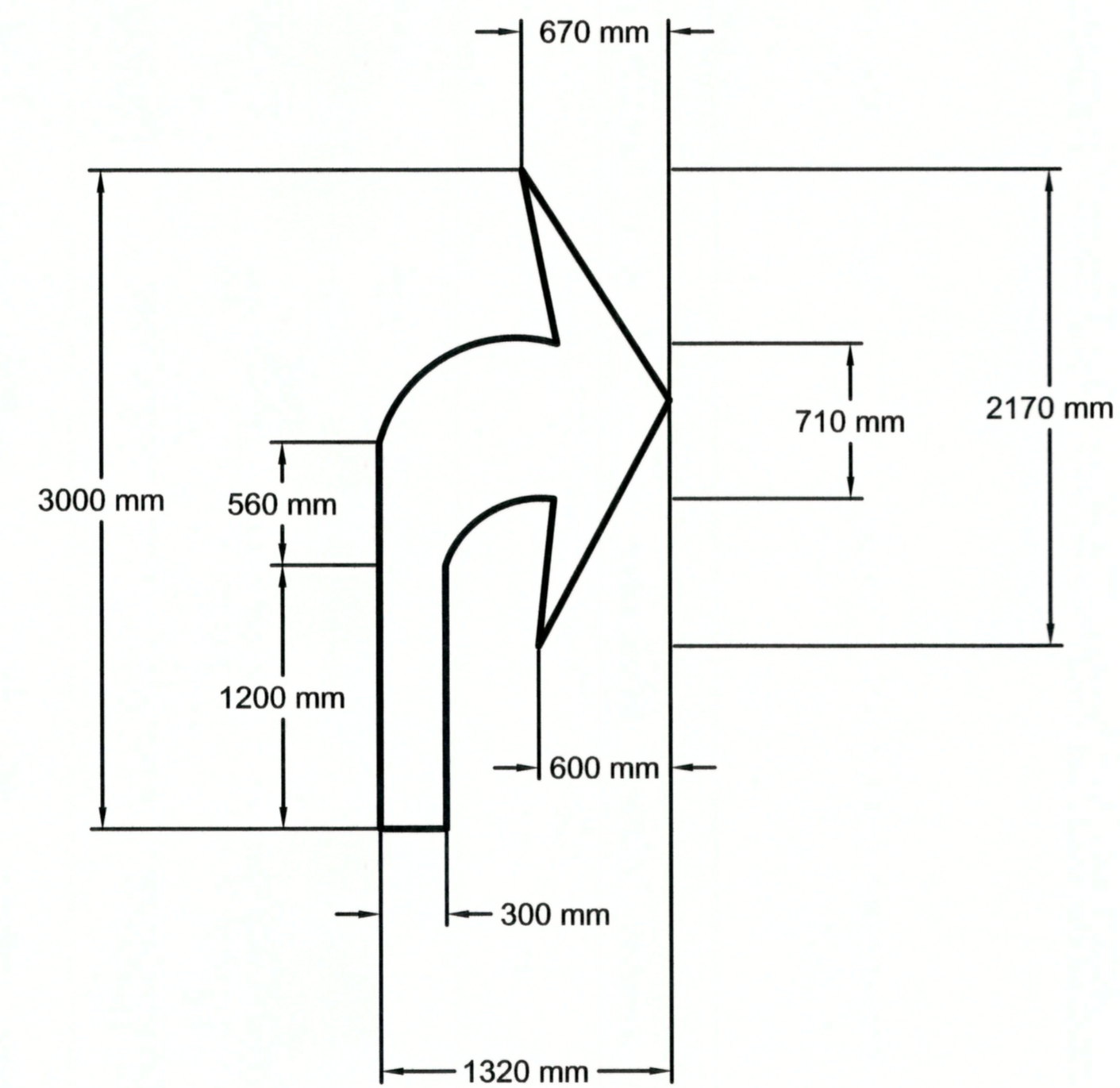
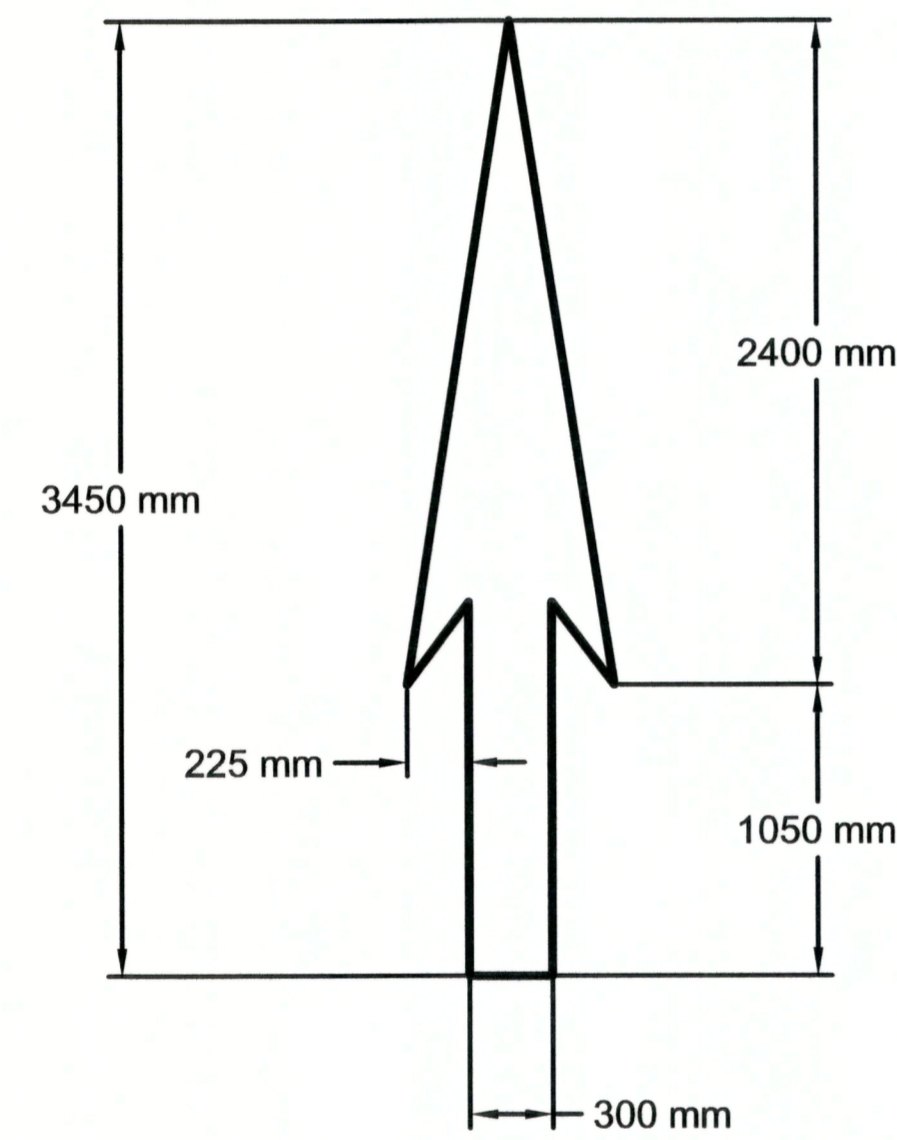
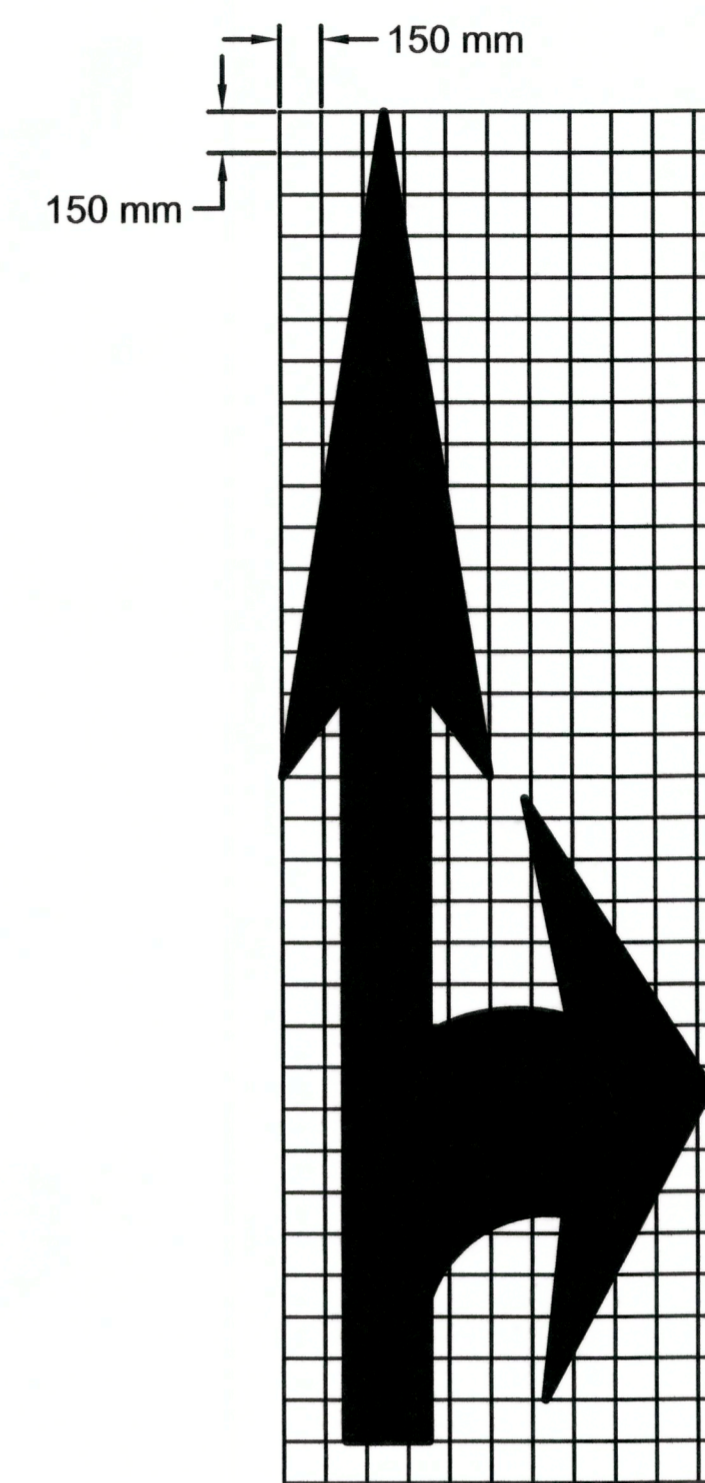
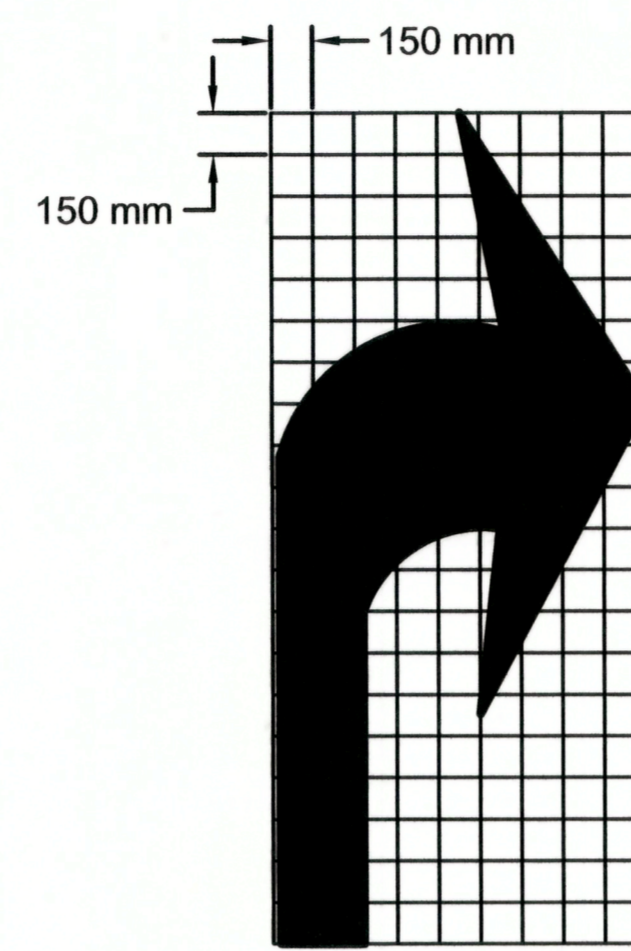
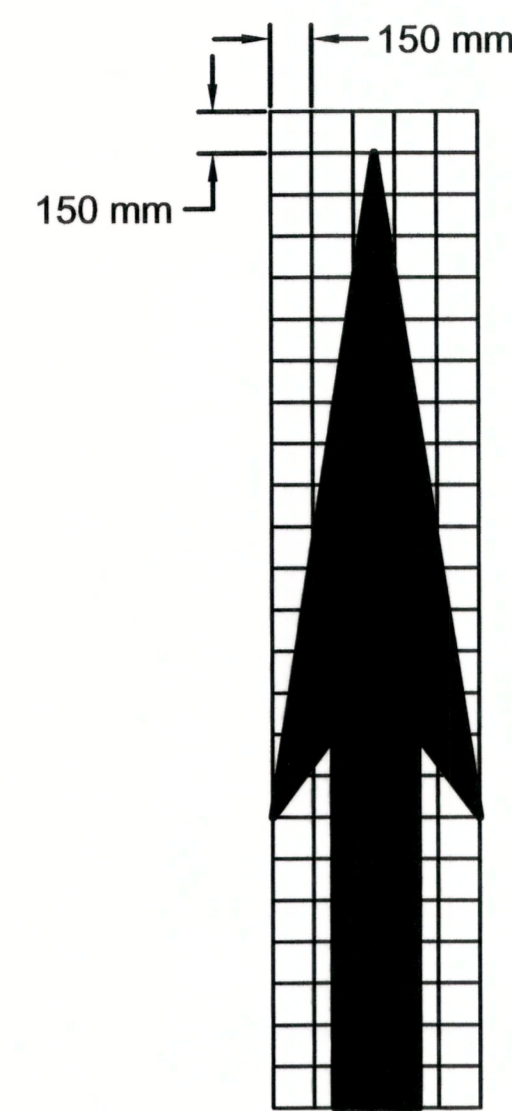
MK.	DATE	REVISION
1	Nov 10, 2014	Added Zebra Crosswalk Markings

**NOVA SCOTIA**  
 Transportation and  
 Infrastructure Renewal

Scale: NTS  
 Date: Dec 2013  
 File No.: S-2013-300  
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HIGHWAY PAVEMENT  
 MARKINGS

PATTERNS OF LINES



NOTES

1. Dimensions are measured from MUTCDC Figure C1-3
2. Arrows shown as they are to be placed on the pavement. Arrows will appear compressed to the driver. See MUTCDC Figure C1-3 for details.
3. On urban streets, the Area manager may approve the placement of directional arrow symbols that are 75% of the size shown above.

Designed by:	
Surveyed by:	
Drawn by:	R. Hird
Checked by:	
Approved by:	

	18 Dec 13
Manager Traffic Engineering Services	Date
	13 Dec 13
Director, Highway Engineering Services	Date

MK.	DATE	REVISION



Scale:	NTS
Date:	Dec 2013
File No.:	S-2013-301
Sheet No.:	1 of 1

HIGHWAY PAVEMENT MARKINGS

DIRECTIONAL ARROW SYMBOLS

**APPENDIX G**