



# Parks Canada Agency

Requisition No. \_\_\_\_\_

## SPECIFICATIONS

For:

**ʔapsčiiik ʔašii**  
(Ups-cheek ta-shee)  
“Going in the Right Direction on the Trail”  
**Trail, Road, and Bridge Works in  
Pacific Rim National Park Reserve,  
British Columbia**

Project No.  
PCA #1522

### APPROVED BY:

  
\_\_\_\_\_  
Project Manager, PCA

Jan 25, 2019  
\_\_\_\_\_  
Date

\_\_\_\_\_  
Construction Safety Coordinator

\_\_\_\_\_  
Date

### TENDER:

\_\_\_\_\_  
Project Manager

\_\_\_\_\_  
Date



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# PCA

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Trail, Road, and Bridge Works  
Pacific Rim National Park Reserve, BC  
Project No. R .081570.001

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# PCA

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Trail, Road, and Bridge Works  
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# PCA

ʔapsčiiik ʔašii - Going in the Right Direction on the Trail  
Trail, Road, and Bridge Works  
Pacific Rim National Park Reserve, BC  
Project No. R .081570.001

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## APPENDICES

### Appendix A:

#### Geotechnical Reports

- Final Geotechnical Site Assessment Report – Phase 3, Pacific Traverse Trail, Pacific Rim National Park Reserve, Vancouver Island, BC. By Wood Plc. Dated December, 2018.
- Geotechnical Assessment, Highway No. 4 – Pacific Rim National Park, Levelton, March 12, 2014.
- Geotechnical Assessment, Tofino Water Supply Upgrades – Phase 3, Levelton, July 10, 2015.

**END OF SECTION**

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**PART 1 – GENERAL**

- 1.1 Precedence .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Specifications document.
- 1.2 Definitions .1 “Parks Canada Agency”, abbreviated as “PCA” and “Parks Canada, abbreviated as “PC” shall mean one and the same.
- .2 “Department” shall mean Parks Canada and is abbreviated as “PC”.
- .3 “Departmental Representative”, abbreviated as “DR” shall mean the person designated by written notice at time of award of contract from PC to the Contractor, to be recognized as the Departmental Representative and shall perform the following:
- .1 Is responsible for all matters concerning the technical content of the work under the contract
- .2 Authorized to issue notices, instructions, and changes within the scope of the Work, relevant to the contract
- .3 Accept on behalf of Canada any notice, order or other communication from the contractor relating to the Work
- .4 Within a reasonable time, review and respond to submissions made by the Contractor in accordance with the requirements of the Contract.
- The DR has no authority to authorize changes to the Contract terms and conditions of the Contract.
- The DR may appoint additional persons to act on their behalf in inspecting and monitoring the Work.
- .4 "Contracting Authority" shall be recognized as the authority delegated by PC to enter into contracts, amend the contracts and is responsible for all matters concerning and interpretation of the terms and conditions of the Contract. The Contracting Authority is responsible for the management of the Contract and any changes to the Contract terms and conditions must be authorized in writing by the Contracting Authority.
- .5 “Owner” shall mean Parks Canada, Coastal BC Field Unit, Pacific Rim National Park Reserve.
- .6 “Contractor” shall mean the person, firm, or corporation identified as such in the *Agreement* and includes the *Contractors* authorized representative.
- .7 “Owners Archaeological Monitor” (OAM) is an individual retained by PCA to assess and monitor for the presence/absence of cultural resource sites and recommend and implement mitigations if Chance Finds are encountered.
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- .8 “Owner’s Environmental Monitor” (OEM) shall mean a representative appointed by PCA for the purpose of execution of the contract.
- .9 “First Nations Monitor” (FNM) shall mean a representative appointed by the local First Nations governments to monitor various aspects of the contract and will work through the OAM, the OEM, and the DR to address concerns, observations, and directives that are of interest to the First Nations People.
- .10 “Elevated Trail” shall mean that portion of the trail the underside of which is elevated above the ground on average approximately 0.4 metres, except directly under stringers, or as agreed by the OEM through ephemeral ponds and bog area. This portion of the trail consists of timber decking supported on helical piles.
- 1.3. Hierarchy of Documents
- .1 In the event of discrepancies or conflict in the contents of the contract documents, the hierarchy of such documents shall be as specified in the General Conditions of the Contract, GC1.2.2 - Order of Precedence.
- .2 In the event of any discrepancy or conflict in the information contained in the drawings and specifications, the rules as specified in the General Conditions of the Contract, GC1.2.2 - Order of Precedence shall apply.
- .3 In the event of discrepancies between the technical specifications, the order of hierarchy shall be as follows, in descending order:
- .1 These Specifications.
- .2 BC MoTI Specifications.
- .4 In the event of a difference between scaled dimensions on Plans and the figures written thereon, the figures shall govern. In the event that two or more plans show conflicting information, the information on the most recently dated plan shall govern. When both plans were issued on the same date, the drawings of larger scale govern over those of smaller scale.
- .5 Any technical and manufacturer’s standard, Government Act, Regulation or Code of Practice referred to in the Contract documents shall be the version current at the time the Contract is awarded.
- .6 If conflict arises between an item in the main body of these Specifications (Division 1 – Division 34) and an item found in one of the Appendices or Reference Documents, the main body of the Specifications (Division 1 – Division 34) shall govern.
- .7 All such conflicts as noted above shall immediately be brought to the attention of the DR for confirmation of dimensions, specifications, and conditions.
- 1.4 Codes, Bylaws, Standards
- .1 Perform work to CURRENT Codes, Construction Standards and Bylaws, including Amendments.
- .2 The Contractor shall abide by the ordinances, laws, rules, and regulations set
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out in the Canada National Parks Act and Regulations. Refer to Clause 1.17.4 of this specification for additional information.

- .3 Perform work in accordance with the Canadian Standards Association, the American Society for Testing of Materials, British Columbia Building Code, Highway Bridge design code CAN/CSA S6-14, TAC Geometric Guidelines, BC supplement to TAC, BC supplement to CHBDC and other indicated Codes, MOTI Pavement Structure Design Guidelines Technical Circular T-01/15, Master Municipal Construction Documents MMCD, Construction Standards and/or any other Code or Bylaw of local application.
- .4 Comply with applicable local bylaws, rules and regulations enforced at the location concerned.
- .5 Comply with environmental regulations including Fisheries Act, SARA, and Water Act.
- .6 Meet or exceed requirements of Contract documents, specified standards, codes, and referenced documents.
- .7 In any case of conflict or discrepancy, the most stringent requirements shall apply.

#### 1.5 Contract Documents

- .1 The Contract Documents, drawings and specifications, are intended to complement each other, and to provide for and include everything necessary for the completion of the Work.
- .2 Drawings are, in general, diagrammatic and are intended to indicate the scope and general arrangement of the Work.
- .3 If anything is found by the Contractor to be missing from the Contract Documents immediately inform the DR.

#### 1.6 Other Contracts

- .1 Further Contracts may be awarded while this contract is in progress.
  - .2 Cooperate with other Contractors in carrying out their respective works and carry out instructions from DR.
  - .3 Coordinate 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 DR, in writing, any defects which may interfere with proper execution of this Work.
  - .4 BC Ministry of Transportation is reconstructing a 1.5 km section of Highway #4 at Kennedy Hill between Port Alberni and Pacific Rim National Park. The project will continue from early 2019 until mid-2020. Traffic delays of up to 30 minutes during the day and full closures at night are expected. Additional details for this project, and traffic impacts are available at: <https://www2.gov.bc.ca/gov/content/transportation/transportation-infrastructure/projects/highway4kennedyhill/traffic-advisories>
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Updated current traffic restrictions for this project are available at:  
[www.drivebc.ca](http://www.drivebc.ca)

As part of the highway work, BC Hydro power lines require relocation and it is anticipated that there will be some power disruptions to Pacific Rim National Park and area.

The Bidders shall take this information into consideration when preparing their bids and work schedules.

- 1.7 Division of Specifications .1 The specifications are subdivided in accordance with the current 6-digit National Master Specifications System.
- .2 A division may consist of the work of more than 1 subcontractor. Responsibility for determining which subcontractor provides the labour, material, equipment and services required to complete the work rests solely with the Contractor.
- 1.8 Project Location .1 The project is located near Highway 4, in the Long Beach Unit of Pacific Rim National Park Reserve, British Columbia between the south park boundary and the north park boundary and paralleling Wick Road from Highway 4 to Ocean Terrace Road. This project is part of a plan to create a multiuse pathway between Tofino, BC and Ucluelet, BC.
- 1.9 Time of Completion .1 Substantial completion of the work shall be achieved by November 1, 2020.
- 1.10 Contract Method .1 Construct Work under a Unit Price Contract.
- 1.11 Section Includes .1 In general, Work under this Contract covers the:
- .1 Fabrication, delivery to site, and erection site of precast concrete girders, steel girders, timber decking, abutment materials, railings, structural steel, steel pipe piles, helical piles, and other required components and materials for the bridges and elevated trail.
- .2 Delivery to site of all required components and materials for the bridges and boardwalks and their erection and installation.
- .3 Graveled or paved trail construction including retaining walls, hand rails, gates, signs, barriers and existing culvert extensions and new culvert installations.
- .4 Roadworks along Highway 4 including widening at the Esowista Curve and widening for and installation of concrete barriers where the trail is immediately adjacent to the highway.
- .5 Extending and rebuilding the Incinerator Rock parking lot.
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- .6 Preparing gravel base, barrier curbs and gates for the new Radar Hill Road parking lot for paving by others.
  - .7 Modification to the trails at Schooner Cove parking lot.
  - .8 Control of invasive plant species.
  - .9 Filling of four existing abandoned wells/cisterns.
- 1.12 Work Included .1 Work includes, but is not limited to:
- 1. General works:
    - .1 Coordination and co-operation with environmental, archeology, and First Nations Monitors to protect features within the Park.
    - .2 Protection and preservation of watercourses.
    - .3 Provision of the Traffic Control Plan and all traffic control and site security throughout the duration of the Works. Provision of other work plans as detailed in the project specifications.
    - .4 Supply and install six project signs (1,2 m X 2.4 m) along Highway 4 and variable message boards at each end of the Park.
    - .5 Perform invasive species control measures for a period of 24 months after the project has substantial completion.
  - .2 Bridge Works:
    - .1 Fabrication, delivery, and installation of two precast concrete girder bridge structures.
    - .2 Fabrication, delivery, and installation of one steel girder with timber deck bridge structure.
    - .3 Supply of all required components and materials to complete the Bridge Work.
    - .4 Driving of steel pipe piles, complete with construction of abutments for the three bridge structures.
  - .3 Elevated Boardwalk Works:
    - .1 Fabrication, delivery and installation of elevated wooden boardwalk structures including screw pile foundations and steel beam supports.
    - .2 Fabrication of handrails for boardwalks where required. Milling of free issue timber for handrails.
    - .3 Supply of all required components and materials to complete the boardwalk Work.
    - .4 Clearing for the elevated boardwalk shall follow strict environmental guidelines and procedures. Refer to Section 01 35 43 – Environmental
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Procedures for further details.

- .4 Trail Construction:
- .1 Constructing, maintaining, and removal of temporary access points for trail construction at locations cleared for this purpose by previous work and approved by the DR. Thirteen of the temporary access points required by the Contractor shall be permanent and shall be left in place and permanent forestry access gates shall be provided where specified.
  - .2 Clearing of local areas not cleared by the previous clearing contract and clearing where additional room is needed and pre-approved by DR to complete the Work.
  - .3 Side cast organics and topsoil to the edges of the 5.2m cleared alignment for use as shoulder dressing and fill material after the granular trail materials have been placed.
  - .4 Grubbing and removal from site roots, organics, and woody debris not required for shoulder dressing from the cleared trail alignment. Grinding of some larger stumps will be required instead of removal. The organic surface material in archeological sites shall remain at the site and shall be spread in the forest adjacent to the trail.
  - .5 Excavation, disposal of surplus material at designated locations within the Park, and grading of trail subgrade. Disposal sites within the Park are provided at no cost to the Contractor. Contractor shall leave spoil sites leveled with erosion protection as required.
  - .6 Placing root barrier on both sides of the excavation and geotextile over the prepared in areas where the interruption of shallow ground water flow is acceptable by the OEM.
  - .7 Construction of retaining walls and fill slopes.
  - .8 Installation of precast concrete box culverts, pipe culverts, and placing spawning gravels on the invert for watercourse culverts.
  - .9 Installation of precast concrete box culverts, pipe culverts, and placing native soils and organics on the invert for amphibian crossing culverts.
  - .10 Extend existing culverts that are under roadways and driveways.
  - .11 HDPE drainage culverts under the trail.
  - .12 Placing and compacting granular sub grade fill and subbase to a uniform cross fall and profile for the trail.
  - .13 Placing, shaping, and compacting 100mm to 150 mm granular base for the trail.
  - .14 Installing log railing (using debarked timber) and safety railing (using milled timber), metal gates, metal bike baffles, and signs.
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- .15 Restoring and shaping the trail shoulder with salvaged native soils.
  - .16 Installing riprap where indicated on the drawings.
  - .17 Placing wood chip along the edges of the trail only for sections of trail paved by the Contractor. Wood chip to be produced by the Contractor using free issue brush provided free of charge at the designated Tofino Airport and Reservoir sites.
  - .18 Asphalt paving of the trail only specified sections immediately adjacent to Highway 4 and through Long Beach and Incinerator Rock parking lots.
  - .5 Roadway and Parking Lot Construction:
    - .1 Widen road structure and asphalt pavement and replace lane lines for an approximate 600 m section of Highway 4.
    - .2 Localized widening of Highway 4 to accommodate concrete roadside barriers.
    - .3 Supply and install precast concrete and steel roadside barriers c/w steel rails.
    - .4 Supply and install new road signs and relocate existing signs.
    - .5 At Incinerator Rock parking lot, remove existing asphalt, expand and regrade lot, pave, and install pavement markings.
    - .6 At Radar Hill Road parking lot install cast in place concrete barrier curb, regrade the lot, and place additional crushed base in preparation for paving by others.
    - .7 At south Park boundary construct three amphibian crossings under Highway 4, and construct amphibian fencing.
  - 1.13 Contractor's Responsibility
    - .1 Coordination and communication with other Contractors, OEM, OAM, DR, and agencies involved with Project, if applicable.
    - .2 Give all required Notices and comply with all local, provincial, and federal laws, bylaws, ordinances, rules, regulations, codes, and orders relating to the Work which are or become in force during the Performance of the Work.
    - .3 As Prime Contractor, coordinate all the Work and provide all labour, materials, equipment, and services necessary for delivery, storage, handling, protection, installation, removal, inspection, and replacement or maintenance as required to provide a complete Project.
    - .4 All persons working for the Prime Contractor, including all sub-contractors, are required to attend a tailgate meeting with Park Administration personnel at the Pacific Rim National Park Administration Building regarding procedures for working within the Park. More than one meeting can be arranged to accommodate the Contractor's schedule and work forces.
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- .5 All persons working for the Prime Contractor, including all sub-contractors and equipment operators, are required to attend an Environmental/Cultural Resources training meeting to review and discuss the Environmental Procedures (Section 01 35 43), the Cultural Resource Procedures (Section 01 35 44), and the role the OEM has during the Work. Only information which would have an effect on prices tendered has been brought into the Environmental Procedures and Cultural Resource Procedures to reduce the volume of information prospective Contractors need to process. Additional background information will be presented following tender award and the training meeting will require about 4 hours to complete. A Power Point presentation, or equivalent, will be available and mandatory for new employees to the Project. An additional one day meeting will be scheduled for the project manager, superintendent and senior foremen to cover these procedures and restrictions and working within a National Park in more depth.
- .6 The Prime Contractor shall have senior personnel attend a start-up meeting with both the Tla-o-qui-aht First Nation and Ucluelet First Nation Communities. This meeting provides an opportunity to present to the Nations the Contractor's schedule and work methodology, as well as an opportunity for the Nations to share with the Contractor available labour and service opportunities.
- .7 The Contractor shall also allow for senior personnel to attend a meeting before starting any works with the Elders Working Group. The purpose of this meeting is to provide the Contractor with an understanding of the protocol/teachings of working respectfully within the Nations Hahoulthee (traditional territories).
- .8 All persons working for the Prime Contractor, including all sub-contractors and their employees shall adhere to the restrictions and requirements set out in these specifications.
- 1.14 Conforming and Alternative Details .1 All details shall conform to the Contract Documents and Drawings. The Contractor may propose alternative details to the DR. Any request proposing a change to the Contract must be submitted in writing to the DR, in accordance with 01 33 00 - Submittal Procedures, clearly identifying the reason for the change and any cost savings or extra cost.
- .2 The submission shall include, where appropriate, drawings or technical letter of the alternative detail prepared and sealed by a professional engineer registered with EGBC.
- .3 If the alternative detail represents a clear improvement, it may be accepted without any price adjustment.
- .4 If the alternative detail is accepted in whole or in part, the Contractor shall be responsible for all additional costs related to other parts of the work which arise due the alternative detail.
- .5 The Contractor shall be responsible for all costs related to drawing and design changes required as a result of the substitution.
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- .6 The DR reserve the right to reject any proposed alternative details.
- 1.15 Work Schedule
- .1 Carry on work as follows:
    - .1 Within 10 working days after Contract award, provide a "phasing bar chart" and a schedule showing anticipated progress stages and final completion of the Work within the time required by the Contract documents. Indicate the following:
      - .1 Submission of shop drawings, product data, MSDS sheets, and samples.
      - .2 Extent of environmental windows such as bird nesting season (March 12<sup>th</sup> to August 17<sup>th</sup>), fisheries restriction windows (June 15<sup>th</sup> or August 15<sup>th</sup>, depending upon the stream and fish species, to September 15<sup>th</sup>), and work in amphibian zones in August under dry conditions.
      - .3 Restrictions for traffic lane closures. No closures are permitted on long weekends from May through September.
      - .4 Commencement and completion of Work of each section of the specifications or drawings as outlined.
      - .5 Take into consideration heavy rainfall delays based upon historical average rainfall events.
      - .6 Final completion date within the time required by the Contract documents.
    - .2 Do not change approved Schedule without notifying DR.
    - .3 Interim reviews of work progress based on work schedule will be conducted as decided by DR and schedule updated by Contractor in conjunction with and to approval of DR.
    - .4 No work will be permitted within existing parking lots and no storage of materials or equipment will be permitted in public parking lots between the Victoria Day long weekend and the Labour Day long weekend, inclusive, except with the written permission of the DR.
- 1.16 Documents Required
- .1 Maintain 1 copy each of the following at the job site:
    - .1 Contract drawings.
    - .2 Contract specifications.
    - .3 Addenda to Contract documents.
    - .4 Copy of approved work schedule.
    - .5 Reviewed/approved shop drawings.
    - .6 Change orders.
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- .7 Other modifications to Contract.
  - .8 Field test reports.
  - .9 Reviewed/approved samples.
  - .10 Manufacturers' installation and application instructions.
  - .11 One set of record drawings and specifications for "as-built" purposes.
  - .12 Current construction standards of workmanship listed in technical Sections.
  - .13 Project Safety Plan / reviewed Traffic Control Plan.
  - .14 Copy of approved Work schedule.
  - .15 Labour conditions and wage schedules.
  - .16 Pacific Rim National Park Business License.
  - .17 Environmental and Cultural Resources Procedures.
  - .18 Environmental Report & Drawings (To be issued at award - Confidential, to be secured.)
  - .19 Archeological Report and Drawings (To be issued at award - Confidential, to be secured.)
  - .20 Owner's Environmental Management Plan (EMP) (To be issued at Award.)
  - .21 Owner's Cultural Resources Protection Plan (CRPP) (To be issued at Award.)
  - .22 All applicable work plans.
- 
- 1.17 Regulatory Requirements
    - .1 While all projects on lands managed by Parks Canada must adhere to Federal laws and regulations, it is considered best practice to meet or exceed provincial or municipal laws, regulations and standards related to the environment if it can reduce the overall impact of the project.
    - .2 Obtain and pay for Building Permit, Certificates, Licenses, and other permits required by regulatory municipal, provincial or federal authorities to complete the work.
    - .3 The Prime Contractor and every sub-contractor is required to obtain and pay for a Pacific Rim National Park Business License. Business licenses are available from the Pacific Rim Park Administration building. Application for licenses shall apply a minimum of 4 weeks prior to arriving on site.
    - .4 The Owner will issue a Restricted Activity Permit (RAP) to permit the Contractor to undertake required activities that normally violate the Canada National Parks Act and Regulations Act, such as tree removal, excavation, etc. No works shall proceed until the Contractor is in possession of the RAP.
    - .5 Provide inspection authorities with plans and information required for issue of
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acceptance certificates.

- .6 Furnish inspection certificates in evidence that the work conforms to the requirements of the authority having jurisdiction.
- .7 Critical habitat, as defined and protected by the Species at Risk Act, is located within the Project area and the Project has a Species Act Risk Act-Compliant Authorization to work within the critical habitat buffers of the Dromedary Jumping-slug. Contractor will need to coordinate with and follow advice from the OEM to avoid impacts to species at risk and their habitat. Refer to Section 01 35 43 – Environmental Procedures for further details.
- .8 Instream works will only proceed following a review of the proposed Works by Fisheries and Oceans Canada to confirm that all plans, designs and mitigation measures are compliant with the Fisheries Act. This request for review will be completed by others but the Contractor will not be allowed to complete instream works until they receive written notice from the OEM that this review has been completed by Fisheries and Oceans Canada. Refer to Section 01 35 43 – Environmental Procedures for further details.

#### 1.18 Contractor's Use of Site .1

Use of site:

- .1 Exclusive and complete for execution of Trail Work within the forest areas and for Radar Hill parking lot.
  - .2 Highway, road crossings, trail crossings and parking areas: Works shall be coordinated to accommodate public access and use to these sites with minimum disruption.
  - .3 Assume responsibilities for assigned premises for performance of this Work.
  - .4 Be responsible for coordination of all Work activities on site, including the Work of other contractors engaged by the DR.
- .2 Perform Work in accordance with Contract documents. Ensure work is carried out in accordance with indicated phasing.
  - .3 Do not unreasonably encumber site with material or equipment.
  - .4 The Contractor shall park employee vehicles and equipment in existing parking areas or in those areas designated and approved by the DR. Vehicle parking within the highway ROW or any other road ROW is prohibited unless required to undertake the work and approved in advance by the DR. Where the Contractor requires vehicles or equipment to be parked within any road or highway ROW, the Contractor shall submit a parking plan request a minimum of ten days prior to the required parking for review and approval by the DR. The DR may request changes to any plan to ensure that proposed locations for parking are satisfactory for each Project site.

#### 1.19 Traffic Control .1 Do not close any lanes of any adjacent roads, including access roads or highway

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- 4 without consulting DR. Contractor to keep one lane open all the time for alternating traffic. Contractor to submit a road closure plan to review by DR, Parks and Public works three weeks before the planned lane closures. Before impacting traffic erect suitable signs and devices in accordance with instructions contained in the Ministry of Transportation "Traffic Control Manual for Work on Roadways".
- .2 The Contractor shall have prepared a Traffic Management Plan (TMP) by a person or company certified in this work. All lanes of traffic shall remain open during long weekends in June, July, August, and September due to heavy traffic usage in the Park.
- .3 During lane closures the number of certified flag control personnel described in the TMP shall be used to direct traffic. Under normal operations and procedures vehicles shall not be delayed by more than 10 minutes by the work.
- 1.20 Examination .1 Examine the site and be familiar and conversant with existing conditions likely to affect work. It is strongly recommended that the Contractor becomes familiar with the terrain, access, weather, wetlands and expected ground conditions along the trail alignment prior to bidding the work.
- .2 Provide photographs of surrounding properties, objects and structures liable to be damaged or be the subject of subsequent claims.
- 1.21 Existing Services .1 Where work involves breaking into or connecting to existing services, carry out work at times directed by the authorities having jurisdiction.
- .2 Location of utilities shown on the drawing are to be considered as approximate and the Contractor shall employ standard methods to locate and protect existing utilities.
- 1.22 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 DR of impending installation and obtain his approval for actual location.
- .4 Submit field drawings or shop drawings to indicate the relative position of various services and equipment when required by the DR and/or as specified.
- .5 For storing the construction equipment at night, Parks Canada may provide a location to create a secure compound upon discussion with them.
- 1.23 Cutting and .1 Cut existing surfaces only as required to accommodate new work and as
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- Patching directed by the DR.
- .2 Remove items so shown or specified.
  - .3 Do not cut, bore, or sleeve load-bearing members unless instructed to do so by the drawings and/or specifications.
  - .4 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.
  - .5 Fit work airtight to pipes, sleeves, ducts and conduits.
  - .6 Patch and make good surfaces cut, damaged or disturbed, to DR's approval. Match existing material, colour, finish and texture.
  - .7 Making good is defined as matching construction and finishing materials and the adjacent surfaces such that there is no visible difference between existing and new surfaces when viewed from 1.5 metres in ambient light, and includes painting the whole surface to the next change in plane.
- 1.24 Setting Out Work
- .1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated. Due to the nature of the work precise alignments and elevations cannot be supplied for the majority of the trail work. The Contractor, with assistance of the DR, shall lay out the work in the field to conform with the project specifications, the cleared trail right of way, and blend to the existing topography with a minimum amount of earth works and granular fill materials.
  - .2 In the wetland areas the final trail surface shall be established at an elevation above the highwater line. The Contractor will work with the DR and OEM to establish this elevation.
  - .3 Assume full responsibility for dimensions, spacings, overall fit with field components, and exact locations of bolt holes and their spacings.
  - .4 Provide devices needed to lay out and construct work and supply such devices as templates required to facilitate DR's inspection of work.
  - .5 The final alignment of the elevated trail shall be proposed by the Contractor who shall conduct a survey. The Contractor's proposed alignment shall be documented by the Contractor in plan showing pile locations, foundations, and elevated trail segments. This document shall be submitted to the DR for review and approval by DR, OEM, and OAM two weeks before commencing work in the field.
- 1.25 Quality of Work
- .1 Ensure that quality workmanship is performed through use of skilled tradesmen, under supervision of qualified journeyman.
  - .2 The workmanship, erection methods, and procedures to meet minimum standards set out in the applicable codes and standards.
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- .3 In cases of dispute, decisions as to standard or quality of work rest solely with the DR, whose decision is final.
- 1.26 Work  
Coordination
- .1 Coordination of work with other Contractors:
- .1 The Contractor shall coordinate the work of their crews and the crews of subtrades with other Contracts that are proceeding in the Park as to not delay or interfere with the work of other contractors. Where the work of another Contract is to match into this Contract work, the Contractor shall perform the Work such that it matches to other work. If it appears a conflict will arise between Contractors, notify the DR immediately. Work by others is as follows.
- .2 Reconstruction of new washroom facilities is beginning in the fall of 2018 and continuing until the spring of 2019. Washrooms are being reconstructed, two at Greenpoint Campground (2018 / 2019), one at Long Beach south parking lot (2018 / 2019), and possibly one at the Radar Hill Road parking lot (2018 / 2019).
- .3 Reconstruction of the new washroom at Incinerator Rock and Long Beach North parking lots has already been completed by others. The Contractor shall tie into the new plaza construction and make good temporary connection to the existing parking lot grades and beach access. The Contractor shall complete the Incinerator Rock and Long Beach North parking lot and trail works before May 17<sup>th</sup>, 2019 or between September 4<sup>th</sup>, 2019 and May 17<sup>th</sup>, 2020.
- .4 Reconstruction of the new washroom at Long Beach South parking lot. The Contractor shall coordinate with the washroom contractor and provide reasonable access through the parking lot for construction of the new washroom between September 5<sup>th</sup>, 2018 and May 17<sup>th</sup>, 2019. The washroom contractor is responsible for the washroom construction, plaza construction including the curb to the parking lot and temporary connection to the beach access. The Contractor shall complete the trail through the length of Long Beach parking lot and the connection to the Long Beach south plaza between September 4<sup>th</sup>, 2019 and May 17<sup>th</sup>, 2020.
- .5 Installation of pedestrian activated traffic signals at the Highway 4 crossing immediately south of Radar Hill Road, on Wick Road 80 m east of the Sandhill Creek bridge, and on Wick Road at the Shorepine Bog parking lot by others will be carried out in the winter/spring of 2020/2021.
- .2 Coordinate work of subtrades:
- .1 Designate one person to be responsible for review of contract documents and shop drawings and managing coordination of Work.
- .3 Coordinate work with Environmental, Archeology, and First Nations Monitors:
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- .1 This project is being carried out in a National Park which has strict requirements for the protection and preservation of environmental and archeological assets within the Park.
  - .2 The Owner shall employ and pay for the Owner's Environmental Monitor (OEM), an Archeological Monitor (AM), and First Nations Monitors at no cost to the Contractor. They will protect the assets of the Park during construction and will also provide information to the Contractor to assist with the Work. The OEM and AM will have the authority to stop the work if, in their opinion, continuing the Work will result in unacceptable damage to the Park assets.
  - .3 Attend regular (most likely daily) morning start up tailgate meetings with the Archeology and OEM(s) to plan the day's work.
  - .4 The OEM will discuss with the Contractor of any concerns or special environmental measures that need to be taken within the area of work for the period covered.
  - .5 The Archeological Monitor will discuss with the Contractor of any concerns or special measures that need to be taken within the area of work for the period covered. The Contractor will be provided with confidential maps and plans of archeological assets in the Park that require special treatment or avoidance.
  - .6 The Park is home to several Species at Risk (Dromedary Jumping Slug and others) which will require additional diligence on the part of the Contractor. The OEM and/or Qualified Environmental Professional will arrange for advance surveys depending on location, timing and type of work and salvage and removal of several species of amphibians from the alignment prior to the Contractor doing work in the area. The Contractor will need to coordinate their work to provide sufficient time for the survey and salvage operations to occur.
- .4 Convene meetings between subcontractors whose work interfaces and ensure awareness of areas and extent of interface required.
- .1 Provide each subcontractor with complete plans and specifications for Contract, to assist them in planning and carrying out their respective work.
  - .2 Develop coordination drawings when required, illustrating potential interference between works of various trades and distribute to affected parties.
    - .1 Identify on coordination drawings, structural elements, services lines, rough-in points, and indicate location of services entrance to site.
  - .3 Facilitate meeting and review coordination drawings. Ensure subcontractors agree and sign-off on drawings.
  - .4 Publish minutes of each meeting.
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- .5 Plan and coordinate work in such a way to minimize quantity of service line offsets.
  - .6 Submit copy of coordination drawings and meeting minutes to the DR for information purposes.
  - .7 Coordinate and plan for all necessary lane closures in advance.
  - .5 Submit shop drawings and order prefabricated equipment or rebuilt components only after coordination meeting for these have taken place.
  - .6 Work cooperation:
    - .1 Ensure cooperation between trades in order to facilitate general progress of Work and avoid situations of spatial interference.
    - .2 Ensure that each trade provides all other trades reasonable opportunity for completion of Work and in such a way as to prevent unnecessary delays, cutting, patching, and removal or replacement of completed work.
    - .3 Ensure disputes between subcontractors are resolved.
  - .7 DR is not responsible for, or accountable for extra costs incurred as a result of Contractor's failure to coordinate Work.
  - .8 Maintain efficient and continuous supervision.
- 1.27 Approval of Shop Drawings, Product Data and Samples
- .1 In accordance with Section 01 33 00 – Submittal Procedures, submit the requested shop drawings, product data, MSDS sheets, and samples indicated in each of the technical Sections.
  - .2 Allow sufficient time for the following:
    - .1 Review of product data.
    - .2 Approval of shop drawings.
    - .3 Review of re-submission.
    - .4 Ordering of approved material and/or products.
- 1.28 Archeological, Relics, Antiques, and Items of Cultural Significance
- .1 Pacific Rim National Park is home to a significant number of archeological sites and other sites of cultural interest. All works shall be carried out in accordance with Section 01 35 44 – Cultural Resource Procedures.
  - .2 The successful Contractor shall be provided with confidential plans and drawings showing locations of areas of archeological and cultural interest. These plans shall remain the property of the Parks and be returned upon completion of the project. The Contractor will maintain confidentiality of these plans to protect the resources of the Park.
- 1.29 Species at Risk
- 1. Pacific Rim National Park Reserve is home to several listed species at risk and areas of critical habitat. The Contractor shall avoid contact or damage to at risk
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- species or critical habitat to all reasonable extents possible. All works shall be carried out in accordance with Section 01 35 43 – Environmental Procedures.
2. The successful Contractor shall be provided with confidential plans and drawings showing locations of areas of species at risk. These plans shall remain the property of the Parks and be returned upon completion of the project. The Contractor will maintain confidentiality of these plans to protect the resources of the Park.
- 1.30 Owner's Environmental Monitor (OEM)
- .1 While the Contractor is responsible for supervising and coordinating their work, the Contractor will receive directions and instructions from the OEM with respect to all environmental issues. The OEM will be employed by the Owner. The OEM shall review and approve the Contractor's work plans and provide direction as to acceptable working methods and the mitigation measures require to comply with Section 01 35 43 - Environmental Procedures. The Owner is responsible for providing additional environmental monitors to support the OEM as deemed necessary by the OEM. The additional environmental monitors will work under the direction of the OEM to ensure sufficient monitoring is provided for each worksite. The Contractor will conduct their operations in an efficient manner to minimize the need for and time required by additional OEM's.
- 1.31 Project Meetings
- .1 DR will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.
- 1.32 Testing and Inspections
- .1 Particular requirements for inspection and testing to be carried out by testing service or laboratory approved by the DR are specified in Section 01 45 00 – Quality Control.
  - .2 The Contractor will appoint and pay for the services of testing agencies and/or testing laboratories to meet the requirements specified in the Contract documents and where required for the following:
    - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
    - .2 Inspection and testing performed for Contractor's convenience.
    - .3 Tests specified to be carried out under the DR's supervision.
  - .3 Where tests or inspections by designated testing laboratory reveal work is not in accordance with the Contract requirements, Contractor shall pay costs for additional tests or inspections as the DR may require to verify acceptability of corrected work.
  - .4 Contractor shall notify DR in advance of planned testing.
  - .5 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
  - .6 Pay costs for uncovering and making good work that is covered before required
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- inspection or testing is completed and approved by DR.
- .7 The DR may require, and pay for, additional inspection and testing services not included here.
- .8 Provide DR with 2 copies of testing laboratory reports and mill tests and certificates of compliance as soon as they are available.
- 1.33 As-Built Documents
- .1 The DR in coordination with the Contractor will provide 2 sets of drawings, 2 sets of specifications, and 2 copies of the original AutoCAD files for "as-built" purposes.
- .2 As work progresses, Contractor is to maintain accurate records to show all deviations from the Contract documents. Note on as-built specifications, drawings, and shop drawings as changes occur. At the end of the work Contractor is to supply the DR the records of the changes in the drawings and specifications to prepare as-built drawings. Upon completion of the Trail the contractor shall conduct a survey (NAD 83 coordinates) to produce a centerline alignment of the trail to within an accuracy of 0.5 metres and include culverts and amphibian crossings (inlet, outlet, diameter), bridge, walls, railings, gates, road widening, concrete barriers, and other installed work. Survey data obtained using GPS equipment is acceptable. This information shall be in a format that can be imported into an AutoCAD based drawing.
- 1.34 Cleaning
- .1 Conduct daily cleaning and disposal operations. Comply with local ordinances and anti-pollution laws.
- .2 Ensure cleanup of the work areas each day after completion of work.
- .3 In preparation for final inspections:
- .1 Gravel trail shall be shaped to the cross section specified, compacted, and clear of debris and extraneous materials.
- .2 Remove and dispose of surplus construction materials. Small quantities of native materials may be spread and leveled in place at the discretion of the DR.
- .3 All new road and parking surfaces, and existing road surfaces that were soiled by the Contractors activities, shall be broom clean.
- .4 Ensure all attachments on bridges, railings, gates, signs, and baffles are tightened to industry standards.
- .4 Use cleaning materials and methods in accordance with instructions of the manufacturer of the surface to be cleaned.
- 1.35 Invasive Species .1 The Contractor shall be diligent to avoid the introduction of invasive species of plants into the park and avoid moving invasive species already within the park to new locations. All works shall be carried out in accordance with Section 01
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- 35 43 – Environmental Procedures and Section 31 93 02 – Invasive Species Control.
- .2 The Contractor shall be responsible for a period of 24 months from the date of issue of the Certificate of Substantial Completion of the work for eradication of any invasive species identified by the DR, acting reasonably, as being brought into the Park by the Contractor’s equipment, materials or labour.
- 1.36 Environmental Protection .1 The Project is within the boundaries of the Pacific Rim National Park Reserve, an area of significant ecological importance. As a result, stringent environmental controls will be placed on the works as described in Section 01 35 43 - Environmental Procedures. The Contractor shall be in full compliance with the contract environmental procedures, all regulatory approval terms and conditions and all applicable environmental legislation at all times throughout the duration of the contract, including during any shutdown periods.
- 1.37 Additional Drawings .1 The DR may furnish additional drawings for clarification. These additional drawings have the same meaning and intent as if they were included with plans referred to in the Contract documents.
- .2 Upon request, the DR may furnish up to a maximum of 2 sets of Contract documents for use by the Contractor at no additional cost. Should more than 2 sets of documents be required the DR will provide them at additional cost. An electronic copy will be provided at time of Award.
- 1.38 Additional Information .1 Following Geotechnical reports are included in the contract Document as Appendices:
- .1 Geotechnical Assessment, Highway No. 4 – Pacific Rim National Park, Levelton, March 12, 2014.
- .2 Geotechnical Assessment, Tofino Water Supply Upgrades – Phase 3, Levelton, July 10, 2015.
- .3 Final Geotechnical Site Assessment Report – Phase 3, Pacific Traverse Trail, Pacific Rim National Park Reserve, Vancouver Island, BC. Wood PLC Dated December 2018.
- .2 The information contained in these reports, by its nature, cannot reveal all conditions which exist or can occur at the site. These reports are included for the Contractor’s general information only, and no guarantee is given as to the completeness and accuracy of this information. Any actions or assumptions based on the information, recommendations or suggestions contained in this report are entirely the Contractor’s responsibility
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- 1.39 System of Measurement .1 The metric system of measurement (SI) will be employed on this Contract. All survey and co-ordination data is in the NAD 83 coordinate system except where local survey coordinates and elevations were used for detail plans of isolated areas of the project.
- 1.40 Measurement for Payment .1 The Contractor shall make and record all measurements for payment. Methods for measurement shall be reviewed and accepted by the DR before the start of work for each item and area. The measured quantities are not final until accepted by the DR. The DR reserves the right to make independent measurements and calculations to verify or use in place of the Contractor's measurements for purposes of payment.
- 1.41 Familiarization with Site .1 Before submitting tender, it is recommended to visit the site to become familiar with all conditions likely to affect the cost of the Work. It should be noted that the location of the Work site has high annual rainfall, exceeding 3,000 mm with most precipitation between October and April. This will significantly impact the Contractor's work efficiency during those months. The environmental mitigation measures required for working in a National Park are stringent and the Contractor should review Section 01 35 43 - Environmental Procedures, in detail to understand the impact these measures may have on the cost of the Work. Weather shutdowns are determined based on the potential environmental impact and are at the discretion of the OEM irrespective of precipitation amount. Additional weather-related information can be found on the Government of Canada web site at:
- [http://climate.weather.gc.ca/climate\\_normals/results\\_1981\\_2010\\_e.html?searchType=stnName&txtStationName=tofino&searchMethod=contains&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=277&dispBack=1](http://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnName&txtStationName=tofino&searchMethod=contains&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=277&dispBack=1)
- 1.42 Submission of Bid .1 Submission of a bid is deemed to be confirmation of the fact that the Bidder has analyzed the Contract documents and is fully conversant with all conditions therein.
- .2 The environmental and archeology requirements for successfully working in Pacific Rim National Park are extensive and may have a considerable impact on the costs to complete the tendered works successfully. It is strongly recommended that prospective Bidders seek input from a Qualified Environmental Professional (QEP) to provide assistance by way of reviewing specifications. A QEP can provide help and guidance in understanding the environmental/archaeological implications of work planning, methods, scheduling, and coordination with Government Representatives for the bid.

**PART 1 - GENERAL**

- 1.1 Related Sections .1 All Divisions 01 – General Requirements, 02 – Existing Conditions, 03 – Concrete Works, 05 – Metal Works, 31 - Earthworks, 32 - Roadway, 33 – Utilities, and 34 - Transportation.
- 1.2 Description .1 Mobilization and Demobilization consists of those items not specifically defined and paid for at the unit rates contained in the Unit Price Table.
- .2 Included within this item are the insurance, bonding, and permits, the necessary Work and operations to complete the project including, but not limited to, the movement to and from the project site of personnel, equipment, supplies, and incidentals to the Site, the establishment of offices, camps, temporary utilities, barriers, and enclosures, and other facilities necessary to undertake the Work, project management, reporting, health and safety, cleaning, waste management, closeout procedures, and all other Work Items and operations which must be initiated and finished as part of completion of the Work.
- 1.3 Measurement for Payment .1 The lump sum price tendered for Mobilization and Demobilization shall be full compensation for those items not included within other payment items.
- .2 The lump sum price tendered for Mobilization and Demobilization shall not exceed 10% of the total price tendered for the Work. Costs in excess of 10% of the total tendered price shall be included in other contract items.
- .3 Payment for Mobilization and Demobilization shall be made at the lump sum price tendered. Payment shall be distributed as follows: 50% in the first Progress Payment and 50% when this portion of the Work is completed.
- .4 For the Contractor's first Progress Payment, it is a condition precedent to the Owner's obligation (paragraph 3 of GC5.4) that the Contractor has provided all necessary documentation required by the Contract for the first Progress Payment.
- .5 The payments from the Lump Sum Price, as set out above, will be full compensation for mobilization, demobilization and re-mobilization, regardless of the number of times the Contractor mobilizes.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Section Includes .1 Coordination of Work with work by others under administration of DR.  
.2 Scheduled preconstruction and progress meetings.
- 1.2 Description .1 Coordination of progress schedules, submittals, use of sites, temporary utilities, construction facilities, and construction Work, with progress of work by others under instructions of DR.
- 1.3 Construction Progress Meetings and Project Meetings .1 The DR will schedule and administer project meetings as deemed necessary throughout progress of the Work.  
.2 Agenda to include, but not limited to, the following:  
.1 Review and approval of minutes of previous meeting.  
.2 Review of site safety and security issues.  
.3 Review of Work progress since previous meeting.  
.4 Field observations, problems, conflicts.  
.5 Problems that impede construction schedule.  
.6 Review of off-site fabrication delivery schedules.  
.7 Review of environmental measures, incidences, near misses, and performance.  
.8 Review of archeological issues.  
.9 Corrective measures and procedures to regain projected schedule.  
.10 Revision to construction schedule if required.  
.11 Progress schedule, during succeeding work period.  
.12 Review submittal schedules: expedite as required.  
.13 Proposed list of suppliers and any sub-contractors.  
.14 Maintenance of quality standards.  
.15 Review proposed changes for affect on construction schedule and on completion date.  
.16 Other business.  
.17 Schedule next meeting.  
.3 The Contractor shall provide physical space and make arrangements for meetings.
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- .4 The DR will record minutes, including significant proceedings and decisions, identify action by parties, and set time and date for next progress meeting.
  - .5 The DR will reproduce and distribute copies of minutes within three days after each meeting and transmit to meeting participants, affected parties not in attendance, and Contractor.
- 1.4 Construction Organization and Start-up
- .1 Within 5 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
  - .2 DR and senior representatives of the Contractor, major Subcontractors (if applicable), environmental and archeological monitors, 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 Agenda to include, but not limited to, the following:
    - .1 Appointment of official representative of participants in Work.
    - .2 Schedule of Work, progress scheduling in accordance with Section 01 32 17 - Construction Progress and Reporting.
    - .3 Requirements for and Schedule of submission of shop drawings, samples, etc. in accordance with Section 01 33 00 - Submittal Procedures.
    - .4 Requirements for temporary facilities, storage sheds, utilities, etc. in accordance with Section 01 51 00 - Temporary Utilities.
    - .5 Delivery schedule of specified equipment in accordance with Section 01 32 17 - Construction Progress and Reporting.
    - .6 Site security in accordance with Section 01 52 00 - Construction Facilities.
    - .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
    - .8 Take-over procedures, acceptance, and warranties in accordance with Section 01 78 00 - Closeout Procedures and Submittals.
    - .9 Monthly progress claims, administrative procedures, photographs, and holdbacks.
    - .10 Appointment of inspection and testing agencies or firms in accordance with Section 01 45 00 - Quality Control.
    - .11 Insurances and transcript of policies.
    - .12 Environmental concerns, environmental windows for work, cast-in-place concrete in parks, amphibian protection, wildlife issues, etc.
    - .13 Other business.
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- .5 Comply with DR's allocation of mobilization areas of sites; for field offices and sheds, construction camp(s) and camp utilities, access, traffic, and parking facilities.
  - .6 During construction, coordinate use of sites and facilities with DR.
  - .7 Comply with instructions of DR for use of temporary utilities and construction facilities.
- 1.5 Steel Pre-Fabrication Meeting
- .1 Prior to commencement of steel fabrication, the welders' and welding operators' qualifications, shop drawings, welding procedures, mill certificates and welding consumable certificates shall be submitted for the DR's review.
  - .2 In advance of steel fabrication, the Contractor will convene a prefabrication meeting with the DR, the Designer and the QA Inspector to review issues such as, but not limited to, quality control, welding procedures, procedures for non-destructive testing, mill certificates and heat numbers, splices, coatings, shop trial assembly, and schedule.
- 1.6 Precast Concrete Pre-Fabrication Meeting
- .1 Prior to commencement of precast girder fabrication, the Fabricator's shop and personnel qualifications, shop drawings, shall be submitted to the Contractor and QA Inspector for review.
  - .2 The Contractor shall convene a precast concrete prefabrication meeting with the Fabricator and DR presentative to review and agree on contract requirements, quality control, quality assurance and schedule.
- 1.7 Elevated Trail Pre-Construction Meeting
- .1 Prior to commencement elevated trail construction, personnel qualifications, shop drawings, and procedure shall be submitted to the Contractor and QA Inspector for review.
  - .2 The Contractor shall convene an elevated trail meeting with the piling contractor, elevated trail contractor, OEM, and DR presentative to review and agree on environmental protection procedures, contract requirements, quality control, quality assurance and schedule.
- 1.8 On-Site Documents .1
- Maintain one (1) copy each of the following at the job site:
- .1 Contract drawings.
  - .2 Contract specifications.
  - .3 Addenda to Contract documents.
  - .4 Copy of approved work schedule.
  - .5 Reviewed/approved shop drawings.
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- .6 Change orders.
  - .7 Other modifications to Contract.
  - .8 Field test reports.
  - .9 Reviewed/approved samples.
  - .10 Manufacturers' installation and application instructions.
  - .11 One set of record drawings and specifications for "as-built" purposes.
  - .13 Current construction standards of workmanship listed in technical sections.
  - .14 Project Safety Plan / Traffic Control Plan.
  - .15 Copy of approved Work schedule.
  - .16 Labour conditions and wage schedules.
  - .17 Pacific Rim National Park Business License.
  - .18 Section 01 35 43- Environmental Procedures.
  - .19 Environmental Management Plan (To be issued upon award).
  - .20 Environmental Report and Drawings (Confidential, to be secured).
  - .21 Section 01 35 44- Cultural Resources Procedures.
  - .22 Archeological Report and Drawings (Confidential, to be secured).
  - .23 Cultural Resources Protection Plan (CRPP) (To be issued upon award).
- 1.9 Schedules
- .1 Submit preliminary construction progress schedule in accordance with Section 01 32 17 - Construction Progress and Reporting to DR coordinated with DR's project schedule.
  - .2 After review, revise and resubmit schedule to comply with revised project schedule.
  - .3 During progress of Work revise and resubmit as directed by DR.
- 1.10 Submittals
- .1 Submit preliminary shop drawings and product data and samples in accordance with Section 01 33 00 – Submittal Procedures, for review for compliance with Contract Documents; for field dimensions and clearances, for relation to available space, and for relation to Work of other contracts. After review, revise and resubmit for transmittal to DR.
  - .2 Submit requests for payment for review, and for transmittal to DR.
  - .3 Submit requests for interpretation of Contract Documents, and obtain instructions through DR.
  - .4 Process substitutions through DR.
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- .5 Process change orders through DR.
  - .6 Deliver closeout submittals for review and preliminary inspections in accordance with 01 78 00 - Closeout Procedures and Submittals, for transmittal to DR.
- 1.10 Closeout Procedures
- .1 Notify DR in accordance with Section 01 78 00 – Closeout Procedures and Submittals.
  - .2 Accompany DR on preliminary inspection to determine items listed for completion or correction.
  - .3 Comply with DR's instructions for correction of items of Work listed in executed certificate of Substantial Performance.
  - .4 Notify DR of instructions for completion of items of Work determined in DR's final inspection.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Section Includes
- .1 Schedule, form, and content.
  - .2 Staged construction.
  - .3 Scheduled revisions.
  - .4 Critical path scheduling.
- 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 Actual Finish Date (AF): point in time that Work actually ended on activity.
  - .3 Actual Start Date (AS): point in time that Work actually started on activity.
  - .4 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.
  - .5 Baseline: original approved plan (for Project, work package, or activity), plus or minus approved scope changes.
  - .6 Completion Milestones: they are firstly Substantial Completion and secondly Final Certificate.
  - .7 Constraint: applicable restriction that will affect performance of Project. Factors that affect activities can be scheduled.
  - .8 Control: process of comparing actual performance with planned performance, analyzing variances, evaluating possible alternatives, and taking appropriate corrective action as needed.
  - .9 Critical Activity: any activity on a critical path. Most commonly determined by using critical path method.
  - .10 Critical Path: series of activities that determines duration of Project. In deterministic model, critical path is usually defined as those activities with float less than or equal to specified value, often zero. It is longest path through Project.
  - .11 Critical Path Method (CPM): network analysis technique used to predict Project duration by analyzing which sequence of activities (which path) has least amount of scheduling flexibility (least amount of float).
  - .12 Data Date (DD): date at which, or up to which, Project's reporting system has provided actual status and accomplishments.
  - .13 Duration (DU): number of work periods (not including holidays or other non-working periods) required to complete activity or another Project element. Usually expressed as workdays or work weeks.
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- .14 Early Finish Date (EF): in critical path method, earliest possible point in time on which uncompleted portions of activity (or Project) can finish, based on network logic and schedule constraints. Early finish dates can change as Project progresses and changes are made to Project plan.
  - .15 Early Start Date (ES): in critical path method, earliest possible point in time on which uncompleted portions of activity (or Project) can start, based on network logic and schedule constraints. Early start dates can change as Project progresses and changes are made to Project Plan.
  - .16 Finish Date: point in time associated with activity's completion. Usually qualified by one of following: actual, planned, estimated, scheduled, early, late, baseline, target, or current.
  - .17 Float: amount of time that activity may be delayed from its early start without delaying Project finish date. Float is mathematical calculation and can change as Project progresses and changes are made to Project plan. This resource is available to both Parks Canada and Contractor.
  - .18 Lag: modification of logical relationship that directs delay in successor task.
  - .19 Late Finish Date (LF): in critical path method, latest possible point in time that activity may be completed without delaying specified milestone (usually Project finish date).
  - .20 Late Start Date (LS): in critical path method, latest possible point in time that activity may begin without delaying specified milestone (usually Project finish date).
  - .21 Lead: modification of logical relationship that allows acceleration of successor task.
  - .22 Logic Diagram: see Project network diagram.
  - .23 Master Plan: summary-level schedule that identifies major activities and key milestones.
  - .24 Milestone: significant event in Project, usually completion of major deliverable.
  - .25 Monitoring: capture, analysis, and reporting of Project performance, usually as compared to plan.
  - .26 Near-Critical Activity: activity that has low total float.
  - .27 Non-Critical Activities: activities which when delayed, do not affect specified Contract duration.
  - .28 Project Control System: fully computerized system utilizing commercially available software packages.
  - .29 Project Network Diagram: schematic display of logical relationships of Project activities. Always drawn from left to right to reflect Project chronology.
  - .30 Project Plan: formal, approved document used to guide both Project execution and Project control. Primary uses of Project plan are to document planning
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assumptions and decisions, facilitate communication among stakeholders, and document approved scope, cost, and schedule baselines. Project plan may be summary or detailed.

- .31 Project Planning: development and maintenance of Project Plan.
- .32 Project Planning, Monitoring, and Control System: overall system operated by Departmental Representative to enable monitoring of Project Work in relation to established milestones.
- .33 Project Schedule: planned dates for performing activities and 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.
- .34 Quantified Days Duration: working days based on 5-day work week, discounting statutory holidays.
- .35 Risk: uncertain event or condition that, if it occurs, has positive or negative effect on Project's objectives.
- .36 Scheduled Finish Date (SF): point in time that Work was scheduled to finish on activity. Scheduled finish date is normally within range of dates delimited by early finish date and late finish date.
- .37 Scheduled Start Date (SS): point in time that Work was scheduled to start on activity. Scheduled start date is normally within range of dates delimited by early start date and late start date.
- .38 Start Date: point in time associated with activity's start, usually qualified by one of following: actual, planned, estimated, scheduled, early, late, target, baseline, or current.
- .39 Work Breakdown Structure (WBS): deliverable-oriented grouping of project elements that organizes and defines total Work scope of Project. Each descending level represents increasingly detailed definition of Project Work.

### 1.3 System Description

- .1 Construction Progress Schedule (Project Time Management): describes processes required to ensure timely completion of Project. These processes ensure that various elements of Project are properly coordinated. It consists of planning, time estimating, scheduling, progress monitoring, and control.
  - .2 Planning: this is most basic function of management, that of determining presentation of action, and is essential.
    - .1 It involves focusing on objective consideration of future, and integrating forward thinking with analysis; therefore, in planning, implicit assumptions are made about future so that action can be taken today.
    - .2 Planning and scheduling facilitates accomplishment of objectives and should be considered continuous interactive process involving planning, review, scheduling, analysis, monitoring and reporting.
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- .3 Ensure that planning process is iterative and results in generally top-down processing with more detail being developed as planning progresses, and decisions concerning options and alternatives are made. This implies progressively more reliability of scheduling data. Detail Project schedule is used for analysis and progress monitoring.
  - .4 Ensure project schedule efficiencies through monitoring.
    - .1 When activities begin on time and are performed according to estimated durations without interruptions, original Critical Path will remain accurate. Changes and delays will however, create an essential need for continual monitoring of Project activities.
    - .2 Monitor progress of Project in detail to ensure integrity of Critical Path by comparing actual completions of individual activities with their scheduled completions, and review progress of activities that has started but are not yet completed.
    - .3 Monitoring should be done sufficiently often so that causes of delays are immediately identified and removed if possible.
  - .5 Project monitoring and reporting: as Project progresses, keep team aware of changes to schedule, and possible consequences. In addition to Bar Charts and CPM networks, use narrative reports to provide advice on seriousness of difficulties and measures to overcome them.
  - .6 Narrative reporting begins with statement on general status of Project followed by summarization of delays, potential problems, corrective measures and Project status criticality.
- 1.4 CPM Requirements
- .1 Ensure Master Plan and Detail Schedule are practical and remain within specified Contract duration.
  - .2 Extent of environmental windows shall be shown on the schedule and accounted for. Restrictive windows include the bird nesting season (March 12<sup>th</sup> to August 17<sup>th</sup>), fisheries restriction windows (June 15<sup>th</sup> or August 15<sup>th</sup>, depending upon the stream and fish species, to September 15<sup>th</sup>), and amphibian windows (variable with dry weather (August), migrations, etc.) Refer to Section 01 35 43 – Environmental Procedures for full details of environmental windows.
  - .3 Green Point Campground is open from the first week of March to about November 15. The Contractor shall schedule the work adjacent to Green Point Campground to occur between November 15 and the first Monday in March.
  - .4 Requirements for coordination with the washroom contractor at Incinerator Rock parking lot and Long Beach North and South Parking lots and requirements for completion of the trail in these locations are included in Section 01 11 00 - General Instructions, 1.26 Work Coordination.
  - .5 Master Plan and Detail Schedule deemed impractical by DR are revised and resubmitted for approval.
-

- .6 Acceptance of Master Plan and Detail Schedule showing scheduled Contract duration shorter than specified Contract duration does not constitute change to Contract. Duration of Contract may only be changed through bilateral Agreement.
  - .7 Consider Master Plan and Detail Schedule deemed practical by DR, showing Work completed in less than specified Contract duration, to have float & rain days.
  - .8 First Milestone on Master Plan and Detail Schedule will identify start Milestone with an "ES" constraint date equal to Award of Contract date.
  - .9 Calculate dates for completion milestones from Plan and Schedule using specified time periods for Contract.
  - .10 Substantial Completion with "LF" constraint equal to calculated date.
  - .11 Calculations on updates to be such that if early finish of Interim Certificate falls later than specified Contract duration then float calculation to reflect negative float.
  - .12 Delays to non-critical activities, those with float may not be basis for time extension.
  - .13 Do not use float suppression techniques such as software constraints, preferential sequencing, special lead/lag logic restraints, extended activity times or imposed dates other than required by Contract.
  - .14 Allow for and show Master Plan and Detail Schedule adverse weather conditions normally anticipated. Specified Contract duration has been predicated assuming normal amount of adverse weather conditions. Refer to Section 01 35 43- Environmental Procedures for further information on the extreme weather conditions encountered in the Park, which need to be considered by the Contractor when developing the Master Plan and Detail Schedule.
  - .15 Allow for traffic lane closure restrictions, no lane closures on long weekends from May through September.
  - .16 Provide necessary crews and manpower to meet schedule requirements for performing Work within specified Contract duration. Simultaneous use of multiple crews on multiple fronts on multiple critical paths may be required.
  - .17 Arrange participation on and off site of subcontractors and suppliers, as required by DR, for purpose of network planning, scheduling, updating and progress monitoring. Approvals by DR of original networks and revisions do not relieve Contractor from duties and responsibilities required by Contract.
  - .18 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.
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- 1.5 Submittals .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
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- .2 Submit to DR Project Control System for planning, scheduling, monitoring, and reporting of project progress.
- .3 Submit Project Control System to DR for approval; failure to comply with each required submission, may result in payment being withheld.
- .4 Include costs for execution, preparation, and reproduction of schedule submittals in bid documents.
- .5 Submit letter ensuring that schedule has been prepared in coordination with major Subcontractors, if applicable.
- .6 Submit Project planning, monitoring, and control system data as required by DR in following form:
  - .1 CD files in original scheduling software and PDF formats containing schedule and cash flow information, labelled with data date, specific update, and person responsible for update.
  - .2 Master Plan Bar Chart.
  - .3 Construction Detail Schedule Bar Chart.
  - .4 Listing of project activities including milestones and logical connectors, networks (sub-networks) from Project start to end. Sort activities by activity identification number and accompany with descriptions. List early and late start and finish dates together with durations, codes and float.
  - .5 Criticality report listing activities and milestones with up to 5 days total float used as first sort for ready identification of critical or near critical paths through entire project. List early and late starts and finishes dates, together with durations, codes and float for critical activities.
  - .6 Progress report in early start sequence, listing for each trade, activities due to start, underway, or finished. List activity identification number, description and duration. Provide columns for entry of actual start and finish dates, duration remaining and remarks concerning action required.
  - .7 Within 2 weeks after Contract award, every 2 weeks thereafter during performance of the Contract, and within 2 weeks after final completion of the Work, provide to DR:
    - .1 Statement of total person days of labour used on site in performance of Contract, including labour provided under subcontracts.
    - .2 Estimate of total value in dollars of material delivered to site and installed, including material provided and installed under subcontracts.

- 1.6 Quality Assurance .1 Use experienced personnel, fully qualified in planning and scheduling, to provide services from start of construction to Final Certificate, including Commissioning.
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- 1.7 Project Meeting .1 Request to meet with DR within 5 working days of Award of Contract date, to establish Work requirements and approach to project construction operations.
- 1.8 Work Breakdown Structure .1 Prepare construction WBS within 15 working days of Award of Contract date. Develop WBS through at least five levels: project, stage, element, sub-element and work package.
- 1.9 Project Milestones .1 Project milestones form targets for both Master Plan and Detail Schedule of CPM construction network system. Include:
- .1 Setup of site and utility relocation.
  - .2 Crushing of granular materials.
  - .3 Excavation and fill work.
  - .4 Installation of structures such as retaining wall, culverts, elevated trail and bridges.
- .2 For bridges and elevated structures:
- .1 Production and delivery of steel, precast concrete, and timber materials for bridge and elevated trail sections.
  - .2 Driving of pipe piles and helical piles.
  - .3 Abutments.
  - .4 Installation of girders, decks and handrails.
  - .5 Paving of widened sections of Highway 4.
  - .6 Completion of Incinerator Rock Parking lot and trail through this section.
  - .7 Completion of work at Long Beach Parking lot and trail through this section.
  - .8 Installation of barriers, signs and pavement marking.
  - .9 Completion of each 2km section of trail divided approximately to suit location of access points.
  - .10 Substantial Completion Certificate.
- 1.10 Master Plan .1 Structure and base CPM construction networks system on WBS coding to ensure consistency throughout Project.
- .2 Prepare comprehensive construction Master Plan (CPM logic diagram) and dependent Cash Flow Projection within 15 working days of finalizing Agreement to confirm validity or alternates of identified milestones.
- .1 Master Plan will be used as baseline.
-

- .1 Revise baseline as conditions dictate and as required by DR.
  - .2 DR will review and return revised baseline within 10 work days.
  - .3 Reconcile revisions to Master Plan and Cash Flow Projections with previous baseline to provide continuous audit trail.
  - .4 Initial and subsequent Master Plans will include:
    - .1 CD containing schedule and cash flow information, clearly labelled with data date, specific update, and person responsible for update.
    - .2 Bar chart identifying coding, activity durations, early/late and start/finish dates, total float, completion as percentile, current status and budget amounts.
    - .3 Network diagram showing coding, activity sequencing (logic), total float, early/late dates, current status and durations.
    - .4 Actual/projected monthly cash flow: expressed monthly and shown in both graphical and numerical form.
- 1.11 Detail Schedule
- .1 Structure and base CPM construction networks system on WBS coding to ensure consistency throughout Project.
  - .2 Prepare comprehensive construction Master Plan (CPM logic diagram) and dependent Cash Flow Projection within 15 working days of finalizing Agreement to confirm validity or alternates of identified milestones.
    - .1 Master Plan will be used as baseline.
      - .1 Revise baseline as conditions dictate and as required by DR.
      - .2 DR will review and return revised baseline within 10 work days.
  - .3 Reconcile revisions to Master Plan and Cash Flow Projections with previous baseline to provide continuous audit trail.
  - .4 Initial and subsequent Master Plans will include:
    - .1 CD containing schedule and cash flow information, clearly labelled with data date, specific update, and person responsible for update.
    - .2 Bar chart identifying coding, activity durations, early/late and start/finish dates, total float, completion as percentile, current status and budget amounts.
    - .3 Network diagram showing coding, activity sequencing (logic), total float, early/late dates, current status and durations.
    - .4 Actual/projected cash flow: expressed monthly and shown in both graphical and numerical form.
  - .5 Provide detailed project schedule (CPM logic diagram) within 15 working days of Award of Contract date showing activity sequencing, interdependencies and duration estimates. Include listed activities as follows:
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- .1 Shop drawings.
  - .2 Samples.
  - .3 Approvals.
  - .4 Procurement.
  - .5 Construction.
  - .6 Installation.
  - .7 Site works.
  - .8 Testing.
  - .9 Shutdown or closure activity.
  - .10 Commissioning and acceptance.
- .6 Detail CPM schedule to cover in detail minimum period of 6 months beginning from Award of Contract date with each activity duration about 3 to 15 days.
- .1 Show remaining activities for CPM construction network system up to Final Certificate and develop complete detail as project progresses.
  - .2 Detail activities completely and comprehensively throughout duration of project.
- .7 Relate Detail Schedule activities to basic activities and milestones developed and approved in Master Plan.
- .8 Clearly show sequence and interdependence of construction activities and indicate:
- .1 Start and completion of all items of Work, their major components, and interim milestone completion dates.
  - .2 Activities for procurement, delivery, installation and completion of each major piece of equipment, materials and other supplies, including:
    - .1 Time for submittals, resubmittals and review.
    - .2 Time for fabrication and delivery of manufactured products for Work.
    - .3 Interdependence of procurement and construction activities.
  - .3 Include sufficient detail to assure adequate planning and execution of Work. Activities should generally range in duration from 3 to 15 workdays each.
- .9 Provide level of detail for project activities such that sequence and interdependency of Contract tasks are demonstrated and allow co-ordination and control of project activities. Show continuous flow from left to right.
- .10 Ensure activities with no float are calculated and clearly indicated on logical CPM construction network system as being, whenever possible, continuous series of activities throughout length of Project to form "Critical Path". Increased number of critical activities is seen as indication of increased risk.
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- .11 Insert Change Orders in appropriate and logical location of Detail Schedule. After analysis, clearly state and report to DR for review effects created by insertion of new Change Order.
  
  - 1.12 Review of the Construction Detail Schedule
    - .1 Allow 10 work days for review by DR of proposed construction Detail Schedule.
    - .2 Upon receipt of reviewed Detail Schedule make necessary revisions and resubmit to DR for review within 5 work days.
    - .3 Promptly provide additional information to validate practicability of Detail Schedule as required by DR.
    - .4 Submittal of Detail Schedule indicates that it meets Contract requirements and will be executed generally in sequence.
  
  - 1.13 Compliance with Detail Schedule
    - .1 Comply with reviewed Detail Schedule.
    - .2 Proceed with significant changes and deviations from scheduled sequence of activities that cause delay, only after receipt of approval by DR.
    - .3 Identify activities that are behind schedule and causing delay. Provide measures to regain slippage.
      - .1 Corrective measures may include:
        - .1 Increase of personnel on site for effected activities or work package.
        - .2 Increase in materials and equipment.
        - .3 Overtime work and additional work shifts.
    - .4 Submit to DR, justification, project schedule data, and supporting evidence for approval of extension to Contract completion date or interim milestone date when required. Include as part of supporting evidence:
      - .1 Written submission of proof of delay based on revised activity logic, duration and costs, showing time impact analysis illustrating influence of each change or delay relative to approved contract schedule.
      - .2 Prepared schedule indicating how change will be incorporated into the overall logic diagram. Demonstrate perceived impact based on date of occurrence of change and include status of construction at that time.
      - .3 Other supporting evidence requested by DR.
      - .4 Do not assume approval of Contract extension prior to receipt of written approval from DR.
    - .5 In event of Contract extension, display in Detail Schedule that scheduled float time available for work involved has been used in full without jeopardizing earned float.
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- .1 DR will determine and advise Contractor number of allowable days for extension of Contract based on project schedule updates for period in question, and other factual information.
  - .2 Construction delays affecting project schedule will not constitute justification for extension of contract completion date.
- 1.14 Process Monitoring and Reporting
- .1 On ongoing basis, Detail Schedule on job site must show "Progress to Date". Arrange participation on and off site of subcontractors and suppliers, as, and when necessary, for purpose of network planning, scheduling, updating, and progress monitoring. Inspect Work with DR at least once per Project to establish progress on each current activity shown on applicable networks.
  - .2 Update and reissue project Work Breakdown Structure and relevant coding structures as project develops and changes.
  - .3 Perform Detail Schedule update at least once per Project with status dated (Data Date). Update to reflect activities completed to date, activities in progress, logic and duration changes.
  - .4 Do not automatically update actual start and finish dates by using default mechanisms found in project management software.
  - .5 Submit to DR copies of updated Detail Schedule.
  - .6 Requirements for progress monitoring and reporting are basis for progress payment request.
  - .7 Submit written report at least once per Project based on Detail Schedule, showing Work to date performed, comparing Work progress to planned, and presenting current forecasts. Report must summarize progress, defining problem areas and anticipated delays with respect to Work schedule, and critical paths. Explain alternatives for possible schedule recovery to mitigate any potential delay. Include in report:
    - .1 Description of progress made.
    - .2 Pending items and status of: permits, shop drawings, Change Orders, possible time extensions.
    - .3 Status of Contract completion date and milestones.
    - .4 Current and anticipated problem areas, potential delays and corrective measures.
    - .5 Review of progress and status of Critical Path activities.
- 1.15 Progress Photographs
- .1 Provide digital photos with dates and descriptions on CD disk with progress reports. Relate dates and descriptions to photo file names in separate text file CD.
  - .2 Number of photographs: minimum of 25 photos per work at each major work site and typical photos of each phase of work.
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- .3 Viewpoints: determined by DR.
- .4 Frequency: with progress statement, at completion of each construction stage, and as directed by DR.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Section Includes .1 This section includes but is not limited to the following:
- .1 Shop drawings.
  - .2 Product data.
  - .3 Samples.
  - .4 Waste Management Work Plan.
  - .5 Various Work Plans identified in the Environmental Procedures and other specifications.
  - .6 Traffic Management Plan.
  - .7 Health and Safety Plan.
  - .8 Certificates and Transcripts.
  - .9 Survey and Quality Testing Reports.
  - .10 Pile Driving Records.
  - .11 Warranties.
  - .12 Quality Control Plan.
  - .13 Temporary shoring and support to complete Work where and when required.
- 1.2 Administrative .1 Submit to DR submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Work affected by submittal shall not proceed 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 may be acceptable upon DR's approval.
  - .5 Review submittals prior to submission to DR. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated 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 shall be considered rejected.
  - .6 Notify DR, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
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- .7 Verify field measurements and affected adjacent Work are coordinated. It is recommended that Contractor become familiar with all site conditions likely to affect the cost of the Work before submission of their Tender documents.
  - .8 Contractor's responsibility for errors and omissions in submission is not relieved by DR's review of submittals.
  - .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by DR 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 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 coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
  - .3 Each shop drawing submitted that involves the provision of engineering design to bear signature and stamp of qualified professional engineer registered or licensed in province of British Columbia, Canada. These include but are not limited to:
    - .1 Falsework and/or shoring. It is the Contractor's responsibility to ensure that the structure is adequately braced at all times during the performance of the Contract, if and when necessary, especially during transporting and erection.
  - .4 Allow 10 working days for DR's review of each submission. For environmental submissions refer to clause 1.9 – Environmental Procedures, of this specification.
  - .5 Adjustments made on shop drawings by DR are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to DR prior to proceeding with Work.
  - .6 Make changes in shop drawings as DR may require, consistent with Contract Documents. When resubmitting, notify DR in writing of any 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.
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- .4 Identification and quantity of each shop drawing, product data, sample, etc.
  - .5 Other pertinent data.
  - .8 Submissions shall 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 DR's review, distribute copies.
  - .10 Submit originals and an electronic copy on CD of shop drawings for each requirement in specification Sections and as DR may reasonably request.
  - .11 Submit electronic copies of product data sheets or brochures for requirements requested in specification sections and as requested by DR where shop drawings will not be prepared due to standardized manufacture of product.
  - .12 Delete information not applicable to project.
  - .13 Supplement standard information to provide details applicable to project.
  - .14 If upon review by DR, no errors or omissions are discovered or if only minor corrections are made, copies will be returned, and fabrication and installation of
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- 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.
- .15 The review of shop drawings by DR is for sole purpose of ascertaining conformance with general concept. This review shall not mean that DR approves 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 all requirements of construction and Contract Documents. 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 coordination of Work of all sub-trades.
- 1.4 Progress Photographs .1 Submit progress photographs in accordance with Section 01 32 17 - Construction Progress and Reporting.
- 1.5 Survey and Quality Testing Reports .1 Submit certified survey and quality testing reports with progress reports.
- 1.6 Quality Control Plan .1 Prepare and submit to DR for review and approval a Quality Control Plan including but not limited to:
- .1 Quality control processes and procedures.
  - .2 Quality control reporting and frequency.
  - .3 Testing agencies employed to provide materials testing.
  - .4 Frequency and types of testing.
  - .5 Verification of materials and installation procedures, including but not limited to structural steel, bolts, welds, paint.
  - .6 Coating inspections.
  - .7 Dimension checks of pre-fabricated and site-fabricated elements.
- 1.7 Welding Procedures .1 Welding procedures shall be in accordance with the requirements of CSA W47.1-09. Prequalified joint geometry and parameters shall be accepted as specified by CSA Standard W59-18.
- .2 Welding procedures shall be submitted for each type of weld used in the structure. The procedures shall bear the approval of the CWB and shall be accompanied by documentary proof that the procedures have been qualified by the CWB at the plant where the Work is to be carried out.
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- .3 Welding procedures shall be reviewed by DR prior to use on the structure.
- .4 The procedures shall include the following information: joint type, surface preparation, welding process, welding position, base metal specification, welding consumable specification and size, preheat requirements, amperage and voltage requirements, speed, polarity, and welding equipment, including a description of travel for automatic welding. Additional information, as described in CSA W47.1-09, Appendix C, shall also be included in the procedures.
- 1.8 Structural Concrete Procedures .1 The mix design shall indicate the design strength, proportions of the constituent materials, type and brand of cement, type, origin of aggregates and brand names of all admixtures. The submission shall also include historical performance records for the proposed mix design, including compressive strength testing in accordance with CSA A23.2-9C and permeability testing in accordance with ASTM C1202. The acceptance criteria for permeability shall be a coulomb rating not exceeding 1500 coulombs.”
- 1.9 Environmental Procedures .1 Due to the complexity of the review for environmental procedures and the need for approvals and permits the review time required for these procedures is provided in the appropriate sections in these specifications.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Section Includes .1 Informational and Warning Devices.  
.2 Protection and Control of Public Traffic.  
.3 Operational Requirements.
- 1.2 Description .1 Provide a detailed Traffic Management Plan (TMP) with a dedicated traffic control and pedestrian delineation for safety of motorists, pedestrians, and bicycle traffic for all locations where roadways and parking lots are affected by construction activities. Transportation of oversize material such as bridge components and oversize equipment outside of the Park boundary will require permits from the BC Ministry of Transportation and Infrastructure. Obtaining and costs for permits shall be the Contractors responsibility.  
.2 The TMP shall be prepared in accordance with the BC Ministry of Transportation and Infrastructure “Management Manual for Work on Roadways” latest edition, and the “Standard Specifications for Highway Construction” latest edition.  
.3 Provide all traffic delay and traffic control signage for the project.  
.4 The plan shall be submitted to the DR and Parks Administration for approval.  
.5 The Contractor shall notify the DR and Parks Administration 14 days in advance of any lane or road closures.  
.6 The transportation of oversize structural components for the bridge structures may require special permits from the Ministry of Transportation and Infrastructure. It is the responsibility of the Contractor to make arrangements for all permits and associated costs and include these in the prices tendered for these items.
- 1.3 Special Provisions .1 One lane of traffic shall be maintained at all times.  
.2 Delays to traffic shall not exceed ten minutes in duration.
- 1.4 Measurement for Payment .1 The lump sum price tendered for this item shall be full compensation for developing and implementing the TMP including flagging personnel, signs, cones, flashers, control vehicles, temporary markings and associated work.  
.2 Payment for special procedures for traffic control and accommodation shall be made at the lump sum price tendered. Payment shall be distributed as follows: 25% in the first Progress Payment, 50% equal distribution in intermediate Progress Payments, and 25% when this portion of the Work is completed.
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- .3 For the Contractor's first Progress Payment, it is a condition precedent to the Owner's obligation (paragraph 3 of GC5.4) that the Contractor has provided all necessary documentation required by the Contract for the first Progress Payment.
- 1.5 References
- .1 "Traffic Control Manual for Work on Roadways" (Province of British Columbia, Ministry of Transportation and Infrastructure).
- .2 "Standard Specifications for Highway Construction" latest edition. (Province of British Columbia, Ministry of Transportation and Infrastructure).
- 1.6 Protection of Public Traffic
- .1 Comply with current requirements of Acts, Regulations, and By-Laws 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 traveled way:
- .1 Position equipment to present minimum of interference and hazard to traveling public.
- .2 Keep equipment units as close together as working conditions permit and preferably on same side of traveled way.
- .3 Do not leave equipment on traveled way overnight.
- .3 Do not close any lanes of road or highway without consulting DR. Before re-routing traffic erect suitable signs and devices in accordance with instructions contained in "Traffic Control Manual for Work on Roadways".
- .4 Keep traveled way graded, free of pot-holes, and of sufficient width for required number of lanes of traffic.
- .5 Contractor shall be required to control traffic if required to fall timber within distances of roads, parking areas, or paths as specified by WorkSafe BC. A previous contract has cleared the trail right of way of trees and vegetation, if additional clearing and traffic control to accommodate clearing is required it will be paid as additional work.
- 1.7 Informational and Warning Devices
- .1 Provide, erect, and maintain signs, flashing warning lights, delineators, barricades, traffic cones, and other devices required to indicate construction activities and other temporary and unusual conditions resulting from Project Work that requires road user response as specified in "Traffic Control Manual for Work on Roadways".
- .2 All traffic and warning signs shall be bilingual with English and French of equal size and elevation, English on the left and French on the right. Assistance in translation of signs may be obtained through the DR.
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- .3 Place signs and other devices in locations recommended in “Traffic Control Manual for Work on Roadways”.
  - .4 Meet with DR prior to commencement of Work to prepare list of signs and other devices required for project.
  - .5 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.
  - .6 Provide 70 cm to 90 cm high traffic cones as specified in “Traffic Control Manual for Work on Roadways”. Provide minimum 100 cones for site use.
  - .7 Ensure that necessary traffic cones and signs are in place prior to interference with traffic on existing roadways.
- 1.8 Control of Public Traffic
- .1 Provide traffic control in accordance with “Traffic Control Manual for Work on Roadways”. Ensure a current copy of manual is always available on site.
  - .2 Flagpersons:
    - .1 Provide trained, competent flagpersons with proof of certification from recognized training program on traffic control procedures through construction zones.
    - .2 Ensure flagpersons have proper equipment and clothing as specified in “Traffic Control Manual for Work on Roadways”.
    - .3 Flagpersons are required in the following (but not limited to) situations:
      - .1 When public traffic is required to pass working vehicles or equipment that block all or part of traveled 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 on traveled way over brow of hills, around sharp curves, or at other locations where oncoming traffic would not otherwise have adequate warning.
      - .4 When 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.
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- .6 In situations where complete protection for workers, working equipment, and public traffic is not provided by other traffic control devices.
  - .7 When construction traffic is crossing a roadway.
  - .3 Maximum delays to public traffic due to Contractor's operators: ten minutes at any one time during day-time operations.
  - .4 Changes to traffic control operation are to be reviewed by DR and Parks Administration.
  - .5 Safely control traffic through unique or varied construction situations.
- 1.9 Operational Requirements
- .1 Maintain existing conditions for traffic throughout period of Contract except when required for construction under Contract and when measures have been taken as specified herein and reviewed by DR to protect and control public traffic.
  - .2 At the discretion of the DR the Contractor may be required to modify the TMP to accommodate irregularities of excessive congestion of traffic flow.
  - .3 Traffic and volume of park visitors is particularly heavy during summer month long weekends. The Contractor shall take this into account when scheduling work on Highway 4. Lane closures shall not be permitted during long weekends between the months of May and September.
  - .4 Parking vehicles along Highway 4 is not permitted except during lane closures.
  - .5 Remove signs and barriers upon completion of the work.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 References .1 Government of Canada:
- .1 Canada Labour Code - Part II.
  - .2 Canada Occupational Health and Safety Regulations.
- .2 National Building Code of Canada (NBC):
- .1 Part 8, Safety Measures at Construction and Demolition Sites.
- .3 Canadian Electrical Code (as amended).
- .4 Canadian Standards Association (CSA):
- .1 CSA S269.1, Falsework for Construction Purposes.
  - .2 CSA S269.2, Access Scaffolding for Construction Purposes.
  - .3 CSA-S350, Code of Practice for Safety in Demolition of Structures.
  - .4 CSA-Z1006 – 10 Management of Work in Confined Space.
  - .5 CSA-Z462, Workplace Electrical Safety Standard.
- .5 National Fire Code of Canada 2010 (as amended):
- .1 Part 5 – Hazardous Processes and Operations Division B as applicable and required.
- .6 American National Standards Institute (ANSI):
- .1 ANSI A10.3, Operations – Safety Requirements for Powder-Actuated Fastening Systems.
- .7 Province of British Columbia:
- .1 Workers Compensation Act, Part 3, Occupational Health and Safety.
  - .2 Occupational Health and Safety Regulation.
- 1.2 Related Sections .1 Refer to the following current Specification sections as required:
- .1 Section 01 31 19 - Project Management.
  - .2 Section 01 32 17 - Construction Progress and Reporting.
  - .3 Section 01 33 00 - Submittal Procedures.
  - .4 Section 01 35 00 - Special Procedures for Traffic Control.
  - .5 Section 01 51 00 - Temporary Utilities.
  - .6 Section 01 52 00 - Construction Facilities.
  - .7 Section 01 56 00 - Temporary Barriers and Enclosures.
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- 1.3 Workers Compensation Board Coverage
- .1 Comply fully with the Workers' Compensation Act, regulations, and orders made pursuant thereto, and any amendments up to the completion of the work.
  - .2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.
- 1.4 Compliance with Regulations
- .1 PC may terminate the Contract without liability to PC where the Contractor, in the opinion of PC, refuses to comply with a requirement of the Workers' Compensation Act or the Occupational Health and Safety Regulations.
  - .2 It is the Contractor's responsibility to ensure that all workers are qualified, competent, and certified to perform the work as required by the Workers' Compensation Act or the Occupational Health and Safety Regulations.
- 1.5 Submittals
- .1 Submit to DR for review all submittals listed.
  - .2 Work affected by submittals shall not proceed until review(s) by DR is/are complete.
  - .3 Submit the following:
    - .1 Health and Safety Plan within 7 days after date of Notice to Proceed and prior to commencement of Work.
    - .2 Copies of reports or directions issued by federal and provincial Health and Safety inspectors.
    - .3 Copies of incident and accident reports.
    - .4 Complete set of Material Safety Data Sheets (MSDS) and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
    - .5 On site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.
  - .4 The DR will review the Contractor's site-specific project Health and Safety Plan and emergency procedures and provide comments to the Contractor within 7 days after receipt of the plan. Revise the plan as appropriate and resubmit to DR for review upon request.
  - .5 Medical surveillance: where prescribed by legislation, regulation, or safety program, submit certification of medical surveillance for site personnel prior to commencement of work, and submit additional certifications for any new site personnel to DR.
  - .6 Submission of the Health and Safety Plan, and any revised version, to the DR is for information and reference purposes only. It shall not:
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- .1 Be construed to imply approval by the DR.
  - .2 Be interpreted as a warranty of being complete, accurate, and legislatively compliant.
  - .3 Relieve the Contractor of his legal obligations for the provision of Health and Safety on the project.
- 1.6 Responsibility
- .1 Assume responsibility as the Prime Contractor for Work under this Contract.
  - .2 Be responsible for Health and Safety of persons on site, safety of property on site, and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
  - .3 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.
  - .4 Contractor to complete a danger tree assessment prior to trail construction and to address danger trees as necessary to ensure safety of workers. All danger tree works subject to prior written approval by the EM.
- 1.7 Health and Safety Coordinator
- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Coordinator. The Health and Safety Coordinator must:
    - .1 Have site-related working experience.
    - .2 Have working knowledge of occupational Health and Safety regulations.
    - .3 Be responsible for completing all Health and Safety training and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform Work.
    - .4 Be responsible for implementing, daily enforcing, and monitoring the site-specific Health and Safety Plan.
    - .5 Be on site during execution of work.
- 1.8 General Conditions
- .1 Provide safety barricades and lights around Work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.
  - .2 Secure Work site before leaving each day as deemed necessary to protect site against entry from non-authorized persons / entry by animals overnight.
  - .3 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the Work site.
    - .1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.
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- 1.9 Project/Site Conditions .1 Potential work hazards onsite include: overhead and buried electrical utilities, branch and tree falls particularly in high winds, working in remote locations, highway traffic, bears, and extreme weather.
- .2 The Contractor is solely responsible for all utility detection and clearances prior to starting work.
- .3 Contract Drawings are based upon record information and shall not be relied on as the sole source of utility information.
- 1.10 Regulatory Requirements .1 Comply with specified codes, acts, bylaws, standards, and regulations to ensure safe operations at site.
- .2 In event of conflict between any provision of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the DR will advise on the course of action to be followed.
- 1.11 Work Permits .1 Obtain permit(s) related to project before start of work.
- 1.12 Filing of Notice .1 The Contractor is to file Notice of Project with Provincial authorities prior to beginning of Work.
- .2 Provide copies of all notices to the DR.
- 1.13 Health and Safety Plan .1 Conduct a site-specific hazard assessment based on review of Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.
- .2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:
- .1 Primary requirements:
- .1 Contractor's safety policy.
- .2 Identification of applicable compliance obligations.
- .3 Definition of responsibilities for project safety/organization chart for project.
- .4 General safety rules for project.
- .5 Job-specific safe work procedures.
- .6 Inspection policy and procedures.
- .7 Incident reporting and investigation policy and procedures.
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- .8 Occupational Health and Safety Committee/Representative procedures.
  - .9 Occupational Health and Safety meetings.
  - .10 Occupational Health and Safety communications and record keeping procedures.
  - .2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.
  - .3 List hazardous materials to be brought on site as required by work.
  - .4 Indicate engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.
  - .5 Identify personal protective equipment to be used by workers.
  - .6 Identify personnel and alternates responsible for site Safety and Health.
  - .7 Identify personnel training requirements and training plan, including site orientation for new workers.
  - .3 Develop the plan in collaboration with all Subcontractors. Ensure that work/activities of Subcontractors are included in the hazard assessment and are reflected in the plan.
  - .4 Revise and update Health and Safety Plan as required, and re-submit to the DR.
  - .5 DR's review: the review of Health and Safety Plan by PC shall not relieve the Contractor of responsibility for errors or omissions in final Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.
  - 1.14 Emergency Procedures
    - .1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:
      - .1 Designated personnel from own company.
      - .2 Regulatory agencies applicable to work and as per legislated regulations.
      - .3 Local emergency resources.
      - .4 DR.
    - .2 Include the following provisions in the emergency procedures:
      - .1 Notify workers and the first-aid attendant, of the nature and location of the emergency.
      - .2 Evacuate all workers safely.
      - .3 Check and confirm the safe evacuation of all workers.
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- .4 Notify the fire department or other emergency responders.
  - .5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.
  - .6 Notify DR.
  - .3 Provide written rescue/evacuation procedures as required for, but not limited to:
    - .1 Work at high angles.
    - .2 Work in confined spaces or where there is a risk of entrapment.
    - .3 Work with hazardous substances.
    - .4 Underground work.
    - .5 Work on, over, under, and adjacent to water.
    - .6 Workplaces where there are persons who require physical assistance to be moved.
  - .4 Design and mark emergency exit routes to provide quick and unimpeded exit.
  - .5 Revise and update emergency procedures as required, and re-submit to the DR.
  - 1.15 Hazardous Products
    - .1 Comply with requirements of WHMIS regarding use, handling, storage, and disposal of hazardous materials, and regarding labelling and provision of MSDSs acceptable to the Departmental Representative and in accordance with the Canada Labour Code.
    - .2 Where use of hazardous and toxic products cannot be avoided:
      - .1 Advise DR beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 01 33 00 – Submittal Procedures.
  - 1.16 Overloading .1 Ensure no part of work is subjected to a load which will endanger its safety or will cause permanent deformation.
  - 1.17 Falsework .1 Design and construct falsework in accordance with CSA-S269.1.
  - 1.18 Scaffolding .1 Design, construct, and maintain scaffolding in a rigid, secure, and safe manner, in accordance with CAN/CSA-S269.2 and the British Columbia Occupational Health and Safety Regulations.
  - 1.19 Confined Spaces .1 Carry out work in confined spaces in compliance with provincial regulations.
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- 1.20 Blasting .1 Blasting or other use of explosives is not permitted.
- 1.21 Powder Actuated Devices .1 Use powder-actuated devices in accordance with ANSI A10.3 only after receipt of written permission from the DR.
- 1.22 Fire Safety and Hot Work .1 Obtain DR's authorization before any welding, cutting, straightening, or any other hot work operations can be carried out onsite.
- .2 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.
- 1.23 Fire Safety Requirements .1 Store oily/paint-soaked rags, waste products, empty containers, and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site daily.
- .2 Handle, store, use, and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.
- 1.24 Unforeseen Hazards .1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of the work, immediately stop work and advise the DR verbally and in writing.
- 1.25 Posted Documents .1 Post legible versions of the following documents on site:
- .1 Health and Safety Plan.
  - .2 Sequence of work.
  - .3 Emergency procedures.
  - .4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshalling station, and the emergency transportation provisions.
  - .5 Notice of Project.
  - .6 Notice as to where a copy of the Workers' Compensation Act and Regulations are available on the work site for review by employees and workers.
  - .7 WHMIS documents.
  - .8 MSDSs.
  - .9 List of names of Joint Health and Safety Committee members, or Health and Safety Representative.
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- .2 Post all MSDSs onsite, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.
  - .3 Postings should be protected from the weather and visible from the street or the exterior of the principal construction site shelter provided for workers and equipment, or as approved by the DR.
- 1.26 Meetings
- .1 Schedule and administer a Health and Safety meeting with DR prior to commencement of Work.
  - .2 Attend the Health and Safety pre-construction meeting and all subsequent meetings called by the DR.
  - .3 Contractor to hold regular Health and Safety meetings onsite as required by applicable legislation.
  - .4 All Health and Safety documentation / meeting minutes completed by the Contractor are to forward to the DR.
- 1.27 Correction of Non-Compliance
- .1 Immediately address Health and Safety non-compliance issues identified by the DR.
  - .2 Provide DR with written report of action taken to correct non-compliance with issues identified.
  - .3 The DR may issue a "stop work order" if non-compliance with Health and Safety regulations is not corrected immediately or within posted time. The General Contractor/Subcontractors will be responsible for any costs arising from such a "stop work order".

**END OF SECTION**

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**PART 1 - GENERAL**

1.1 Measurement for .1 Payment for temporary environmental procedures:  
Payment

- .1 Payment for the Contractor to implement Temporary Environmental Procedures as directed by the Owner's Environmental Monitor (OEM) and the Departmental Representative (DR) will be at the unit rates tendered in the unit price table and shall include full compensation for all labour, material, and equipment necessary and incidental for the supply, installation, maintenance, and removal for each Temporary Environmental Procedure.
- .2 Measurement for payment for each Temporary Environmental Procedure shall be made by the "unit of measurement" detailed in Table 1 below, measured in place, and accepted by the DR. Overlap to be considered incidental in the payment item.

Table 1 – Temporary Environmental Procedures

<b>Environmental Procedure</b>	<b>Unit of Measurement</b>
Light Duty Silt Fence Barrier	Per linear metre supplied, installed and removed
Heavy Duty Silt Fence Barrier	Per linear metre supplied, installed and removed
Erosion Control Blanket (all natural & bio-degradable)	Per square metre supplied, installed and removed
Poly or Nylon Sandbags	Per sand bag supplied, installed and removed
Poly Sheeting 6 mm, 3 metres by 50 metres	Per square metre
Rock Check Dams	Per check dam supplied, installed and removed
Orange Safety Fencing, 1.4 metres height	Per linear metre supplied, installed and removed
Small Wetland Filter Bag	Per filter bag supplied, installed and removed
Large Wetland Filter Bag	Per filter bag supplied, installed and removed
50 mm Diameter Trash Pump and 61 m Discharge Hose	Per day supplied, installed and removed
75 mm Diameter Trash Pump and 61 m Discharge Hose	Per day supplied, installed and removed

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- .3 The Contractor shall note that the quantities for erosion control blanket in the Temporary Environmental Procedures is in addition to the quantities for permanent erosion control blanket in the Pricing Schedule.
  - .4 Additional payment for this item for quantities exceeding the Contract Quantities in Table 1 above shall be at the unit price provided by the Contractor in the Pricing Schedule for each Temporary Environmental Procedure, supplied, installed, maintained, and removed as measured and accepted by the DR.
  - .5 There will be no consideration for any other additional payment or extension of contract time, for events including but not limited to shut downs due to heavy rain events, breeding bird timing restrictions, amphibian timing restrictions, or other wildlife encounters, for the Contractor other than Items 1.1.1.1 and 1.1.1.3 to implement the Temporary Environmental Procedures or as specified elsewhere in the Contract.
- .2 Payment for invasive species control:
    - .1 Payment for this item shall be as described in Section 31 93 02 – Invasive Species Control, Clause 1.2.
  - .3 Payment for Standby Equipment and Materials:
    - .1 The Contractor is required to provide, store on-site, and maintain the specified quantities for the duration of the contract, the mandatory standby equipment and materials detailed in Table 2 below. Measurement for payment for this item shall be at the Lump Sum price tendered for standby equipment and material. If the equipment and/or materials are required to be implemented, The cost of replacement equipment shall be included in the unit prices tendered for the Temporary Environmental Procedures. Quantities of standby equipment and materials are subject to verification by the DR.
    - .2 The Contractor shall immediately replace, not later than 48 hours, any standby equipment and/or material implemented to maintain the required quantities of mandatory standby equipment and materials stored on-site.

Table 2 – Mandatory Standby Equipment and Materials

<b>Standby Equipment and Materials</b>	<b>Standby Quantity</b>
50 mm Diameter Trash Pump and 61 m Discharge Hose	2
75 mm Diameter Trash Pump and 61 m Discharge Hose	2
Poly or Nylon Sandbags	500
Poly Sheeting 6 mm, 3 metres by 50 metres	150 square metres
Coconut Erosion Control Blanket 3 metres by 50 metres (all natural & bio-degradable)	150 square metres

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Standby Equipment and Materials	Standby Quantity
Wooden Stakes, between 0.7 metres and 1.0 metre in length	150
Light Duty Silt Fence Barrier	500 metres
Heavy Duty Silt Fence Barrier	100 metres
Crushed Rock, d115 cm	5 cubic metres
Pea Gravel	2 cubic metres
Orange Safety Fencing, 1.4 metres height	200 metres
Floating Sorbent Booms 100mm diameter	60 metres
Large Spill Kit capable of containing 110% of the Volume of Fuel and Fluids in the Contractor's Largest Machinery on-site	2

**1.2 Environmental  
Significance**

- .1 The Project is contained within the boundaries of the Pacific Rim National Park Reserve, an area of significant ecological importance. The area is a coastal temperate rainforest, and a protected area of the Clayoquot Sound UNESCO World Biosphere Reserve. The reserve is home to old growth rainforest, dozens of protected species at risk, and highly sensitive ecosystems. Critical habitat, as defined and protected by the Species at Risk Act, is located within the Project area and the Project has a Species at Risk Act-Compliant Authorization to work within the critical habitat buffers of the Dromedary Jumping-slug.
  - .2 Within the reserve, the precipitation is high, 400 to 500mm per month on average, with the potential for heavy rainfall events, 50 to 100mm in 24 hours. The schedule of works needs to be considered very carefully. The water table is high for the entire length of the trail and >1/3 of the proposed trail has standing water present during the winter months. As noted in trail drawings, many wetland zones occur within the area where works will occur and they require specialized construction techniques and mitigation measures
  - .3 Watercourses and Riparian Areas occur in the area where works will occur and are protected under the *Fisheries Act*. While the roadside ditches and small Watercourses involved in the Project do not likely support fish during the summer months, all of these areas have the potential to support fish (especially rearing Coho Salmon) during the winter months (October to May) when the water levels are higher. Instream and riparian works will only proceed following a review of the proposed Works by Fisheries and Oceans Canada to confirm that all plans, designs and mitigation measures are compliant with the *Fisheries Act*. This request for review will be completed by others but the Contractor will not be allowed to complete instream works until they receive written notice from the OEM that this review has been completed by Fisheries and Oceans Canada.
  - .4 Due to the complicated and extreme environmental conditions of the Project area, the Contractor will need to factor environmental issues and requirements into all components of the approach to work and schedule and coordinate extensively with the OEM in order to successfully complete this Project.
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- .5 The Contractor shall be in full compliance with the contract environmental procedures, all regulatory approval terms and conditions and all applicable environmental legislation at all times throughout the duration of the contract, including during any shutdown periods.
- .6 Where, in the sole discretion of the DR or the OEM, the Contractor is not in full compliance with the contract environmental procedures, legislation or regulatory approval terms and conditions or fails to implement any environmental procedures direction from the DR or the OEM, and the Contractor, following notification from the DR or the OEM of any event of non-compliance, verbally or in writing, fails to immediately without any delay remedy any event of non-compliance, the Owner may terminate this contract upon written notice and the Contractor shall not be entitled to any claim for compensation from any loss or damages including, but not limited to, business losses or loss of profit. This right of the Owner to terminate the contract is in addition to any other Owner rights stipulated elsewhere in the contract.
- .7 Additional to the roadside ditches, the trail alignment crosses 39 watercourses that are either confirmed fish bearing or are connected to fish bearing habitat downstream. These watercourses range in size and significance from 1-2 m wide streams that provide potential winter rearing habitat for juvenile salmonids, to 10-15 m wide streams that flow year-round and support both spawning and rearing salmon immediately adjacent/under the trail alignment. Trail crossing structures have been carefully designed for these watercourses, and construction of these crossings need to be done during the least risk fisheries window of June 15th or August 15th (depending on the watercourse) until September 15th. These watercourses shall not be crossed by machinery unless permitted by DR & OEM.
- 1.3 Definitions
- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare, and/or the ecosystem health and functioning; unfavorable alterations ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally, and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy, and radioactive material as well as other pollutants.
- .3 Invasive plants: are any alien plant species that have the potential to pose undesirable or detrimental impacts on humans, animals or ecosystems. Invasive plants have the capacity to establish quickly and easily on both disturbed and undisturbed sites, and can cause widespread negative economic, social, and environmental impacts.
- .4 Wetland: is a swamp, marsh, or other similar area that supports natural vegetation that is distinct from the adjacent upland areas. More specifically, a Wetland is an area where a water table is at, near, or above the surface or where
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soils are water-saturated for a sufficient length of time that excess water and resulting low oxygen levels are principal determinants of vegetation and soil development. The Contractor shall rely on the Contract Drawings which delineate Wetland zones and the additional direction of the OEM for the determination of whether any other area is defined as a Wetland.

- .5 Watercourse: a Watercourse shall be defined as a natural or man-made channel from a permanent or periodical natural source, flowing in a particular direction and in a defined channel having a bed and banks or sides and discharging into another stream or body of water. It may sometimes be dry and may also include all highway ditches. The Contractor shall rely on the additional direction of the OEM for the determination of whether any natural or man-made channel or ditch is defined as a Watercourse.
- .6 Temporary Environmental Procedures: Temporary environmental procedures are limited to those environmental procedures specifically directed by the OEM or the DR for which the Contractor shall be paid on a time and materials basis. Temporary environmental procedures do not include any procedures for which this contract specifies as being incidental to the Work.
- .7 Riparian Areas: A Riparian Area is the area immediately adjacent to a watercourse, ditch, stream, creek, river, lake or wetland that is connected to fish bearing habitat downstream. Riparian Areas are 30 metres on either side of the Watercourse, ditch, stream, creek, river, lake, or Wetland or 15 metres from the top of a ravine bank on larger ravines. Riparian Areas that have been cleared of vegetation, either fully or partially, under previous contracts are considered to be Riparian Areas. For greater clarity, all culvert sites and proposed bridges listed on the Contract Drawing Sheets shall be treated as having Riparian Areas in addition to those identified to the Contractor by the OEM.
- .8 High water line: The maximum limit of a Watercourse as defined by the location of the terrestrial rooted vegetation as detailed in Figure 7 of the “Fish-stream Crossing Guidebook” revised September 2012, published by the BC Ministry of Forests, Lands, and Natural Resource Operations and Ministry of Environment.
- .9 “Owner’s Environmental Monitor” (OEM) shall mean a representative appointed by PCA for the purpose of execution of the contract.
- .10 “Environmental Management Plan” (EMP) shall mean the “Environmental Management Plan for ʔapsčiiik ʔašii - Going in the Right Direction on the Trail Construction” Draft 1, prepared by Wood PCL and Dated July 2017. Items contained in the EMP with cost implications are included in these Specifications. The EMP provides background information and details that will explain the Contractor the importance and rational of the environmental works.
- 1.4 Regulatory Overview .1 The Contractor shall comply with all applicable environmental laws, regulations and requirements of Federal authorities, and acquire and comply with such permits, approvals and authorizations as may be required.
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- 1.5 General
- .1 Due to the significant environmental requirements of this project, the environmental monitoring component will be provided directly by the Owner in the form of an Owner's Environmental Monitor (OEM). The OEM will be onsite at all times during construction and will have the authority under the DR to direct the Contractor with regards to installing, maintaining and removing temporary environmental procedures and ensuring that appropriate installation and maintenance measures are followed. The OEM will also have the authority to shut down construction, especially during heavy rainfall events, or other events that preclude effective environmental mitigation.
  - .2 The Contractor will therefore NOT be required to hire a separate Environmental Monitor for this project, however, they will still be responsible for purchasing and effectively implementing all the mitigation measures described in these Environmental Procedures under the direction of the OEM.
  - .3 It is imperative that the Contractor understands that the environmental procedures are a cooperative effort between the Contractor, the DR and the OEM. Refer to Section 01 11 00, General Instructions, Clause 1.41.2, Submission of Tender, for additional information.
  - .4 Environmental Procedures shall be a component of the initial contractor orientations for all persons working for the Contractor including sub-contractor's personnel and all daily tailgate meetings.
- 1.6 Wildlife Habitat
- .1 The Contractor will ensure that all staff and all sub-contractors are familiar with the wildlife protection and mitigation requirements and shall receive prior to the start of construction activities wildlife encounter training from a Parks representative in order to develop protocols for dealing with large carnivores (ie., cougars, wolves and bears) encountered within the work site during construction activities.
  - .2 The Environment Canada migratory bird nesting window for the Northern Pacific Rainforest (Pacific Rim National Park) is between March 12<sup>th</sup> and August 17<sup>th</sup> inclusive. No tree clearing shall be conducted within this bird nesting window except under the direction of the DR and the OEM. Other construction activities (e.g., removal of slash/log piles, grubbing, etc.) during this window will require a breeding bird activity survey.
  - .3 The Contractor shall include in their schedule 10 days advance notice to the OEM to permit the OEM to coordinate bird activity surveys prior to starting the construction activities in each segment of the work, including for any clearing work. In the event a nest is located, construction activities may be delayed, modified or restricted in the vicinity of the nest.
  - .4 The Contractor shall not destroy, remove or clear any active bird nests in accordance with the Migratory Bird Convention Act.
  - .5 The Contractor shall conduct all construction activities in a manner that is sensitive to wildlife and wildlife habitat. No feeding, disturbing or harassing of wildlife will occur. If wildlife is encountered, allow birds, mammals, reptiles,
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- and amphibians to passively disperse and contact the OEM for further advice. Do not physically handle wildlife.
- .6 The Contractor shall notify the OEM and DR of any observations of wildlife or specific wildlife habitats (ie., nests, denning sites, or burrows).
- .7 Domestic pets (ie., dogs) are not permitted on site.
- 1.7 Watercourses and Wetlands .1 No instream or riparian works are permitted unless defined within in the Contract Drawings, and until the OEM confirms that all fish and amphibian isolation and salvage activities have been completed for a specific location. Where construction machinery is required to be used in or near Watercourses, Riparian Areas and Wetlands, machinery operators shall have a minimum of 5 years of direct experience operating machinery in fish bearing Watercourses, Wetlands, Riparian Areas and constructing fish habitat restoration projects.
- .2 The Contractor shall abide by all conditions of permits obtained from Federal Government environmental agencies and maintain copies of all permits at the construction site office and at each location that any permit is applicable to while construction is active.
- .3 Unless identified in Table 3 below, all instream or riparian work (39 identified so far) is restricted to the fish timing window of June 15 to September 15, inclusive, in any year.

Table 3 – Adjustments to Fish Timing Window

<b>Culvert &amp; Bridge and Watercourse Identification</b>	<b>Revised Timing Window for All years</b>
10.0 (W11)	August 15 to September 15, inclusive
18.0 (W12)	August 15 to September 15, inclusive
57 (W35)	August 15 to September 15, inclusive
51 (W39)	August 15 to September 15, inclusive
49 (W41)	August 15 to September 15, inclusive
41 (W49)	August 15 to September 15, inclusive
42	August 15 to September 15, inclusive
39a (W52)	August 15 to September 15, inclusive
Bridge 20 (W48, Sandhill Cr)	August 15 to September 15, inclusive
Bridge 19 (W53 Lost Shoe Cr)	August 15 to September 15, inclusive

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- .4 The Contractor shall build all Project bridge structures (including bridge approaches, abutments, footings and riprap) outside of the channel and above the high water mark such that no altering the stream bed, channel or bank is required unless detailed otherwise within the contract drawings.
  - .5 The Contractor shall retain as much Riparian Area vegetation as possible at each bridge structure, retaining wall, fill slope, and culvert site to prevent erosion and minimize disturbance to fish habitat. Remove only the vegetation required to accommodate the footprint of the bridge, retaining wall, fill slope, or culvert structure. All vegetation or soil disturbances within Riparian Areas shall be stabilized and restored as quickly as possible in consultation with the DR and the OEM.
  - .6 The Contractor shall only operate construction equipment within Watercourses, Wetlands and Riparian Areas to the extent necessary to complete the construction works and only under the inspection of the OEM. No fording of Watercourses is allowable.
  - 7 The Contractor shall not dump excavated fill, waste material, or debris in any Watercourse, Wetland or Riparian Areas.
  - .8 The Contractor shall not skid logs or construction materials across any Watercourse or through any Wetland or Riparian Area.
  - .9 The Contractor shall not store construction materials, debris, waste, etc. within 50 metres of any Watercourse or Wetland or in areas where erosion will wash sediment into Watercourses or Wetlands. The Contractor shall not fuel any equipment within 50 metres of any Watercourse, Wetland or Riparian Area.
  - .10 The Contractor shall not excavate below the underside of organic material around the edges of Wetlands, without prior approval of the DR, to prevent drainage of the Wetlands.
  - .11 Equipment, labour and materials shall not be placed in the Wetlands for construction of the elevated trail. Unless approved otherwise, the elevated trail foundations and deck shall be constructed sequentially span by span with equipment, labour and materials only located on the previously constructed spans. This is required to prevent damage to the sensitive Wetlands below. Work can only proceed with the OEM present. The Contractor should note that some areas of the Wetlands are permanently wet for 12 months of the year and unsuitable for operating equipment, access by labour and storing materials. All environmental protection measures required to undertake work within Wetlands shall be incidental to the works and at the Contractor's expense.
  - .12 Cement-based products including grouts and concrete are lethal to fish and many other aquatic organisms. One litre of concrete wash water or leachate in 1000L of water will kill fish. Raw product or leachate entering a Watercourse will alter water chemistry, making it more basic or alkaline. Environmental mitigation while using concrete materials shall be in compliance with Section 03 30 00 – Cast-in-Place Concrete of the Contract & environmental notes on drawing S-1.2.
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- .13 The Contractor, its staff and any sub-consultants and their staff are prohibited from using Project construction access and areas for the purposes of sport angling or harvest.
  - .14 When approved by the OEM & DR & required for vertical trail alignment, some local excavations may be permitted for some sections of elevated trail. In these cases, hand excavation will be required with monitoring by OEM. Allowance must be made to amphibian salvage ahead of excavation/grading works. Where possible, grading should be avoided in wetlands by increasing the clearance below sections of elevated trail, or micro-routing around local elevations.
- 1.8 Fish Isolation and Salvage
- .1 It is anticipated that all culvert work will need to be preceded with fish isolation measures if there is flowing water at the time of construction.
  - .2 The OEM will implement all fish salvage operations including setting up stop nets and actively removing fish from the work area ahead of the construction for any culvert work occurring on site. Fish isolation measures may also need to be applied for other project activities if there is any risk of encroaching into any of the ditches or Watercourses surrounding the project site.
  - .3 The fish isolation effort should begin a minimum of three days prior to instream work occurring, and the Contractor shall notify the DR and the OEM of the schedule no less than ten days prior to work occurring so that fish salvage can be properly coordinated. The Contractor will need to account for the potential of delays or lost days of work to accommodate fish salvage. No additional costs for delays will be considered if the OEM completes the fish isolation work within ten days of notification, however if the Contractor does not commence operations within three days of the fish isolation work being completed, further fish isolation work may need to be undertaken by the OEM and such further work will be at the cost of the Contractor.
  - .4 Flow isolation will be required with all culvert work and any additional Project activities that have the potential to encroach into any of the ditches or Watercourses surrounding the Project site. Costs for flow isolation are not Temporary Environmental Procedures and will be considered incidental to the Work.
  - .5 Flow isolation may involve setting up coffer dams and pumping clean water around the worksite and is the responsibility of the Contractor and will be monitored by the OEM. Flow diversion activities will need to be coordinated with the fish isolation activities, however there will be a clear division of responsibility in that the OEM will perform the fish salvage and the Contractor will perform the flow isolation once the fish salvage is complete. Flow isolation shall be set up by the Contractor. The Contractor shall submit a flow isolation and in-stream work plan for each project site requiring flow isolation and/or instream work a minimum of ten days prior to work occurring for review by the DR and the OEM. The DR and OEM may request changes to any plan to ensure that proposed methods for establishing flow isolation are satisfactory for each Project site.
  - .6 Only clean water shall be diverted directly to downstream aquatic habitat. Sediment-laden water must be first treated through release to well-vegetated
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location outside the Riparian Area and discharge must be either lined with poly sheeting or directed into a wetland filter bag to prevent erosion and sedimentation.

- .7 Events beyond the Contractors control such as weather that result in areas requiring additional fish salvage work and costs shall not be the responsibility of the Contractor.

1.9 Amphibian  
Habitat Protection and  
Salvage

- .1 Amphibians and their habitat are widespread within PRNPR and could be present throughout the entire area of the trail, road ditch and bridge works. There are 7 amphibian species that may breed or migrating in the Project area including 3 that are Species At Risk. The timing of amphibian breeding and migrations are known in a broad sense, but the exact onset and ending of each breeding and migratory period varies from year to year (i.e., can be difficult to predict) as they are largely weather dependent. Pulses of migrating amphibians could come into direct conflict with machinery and crews during trail construction, putting a relatively large proportion of amphibians at risk. Work is restricted to the month of August when weather is forecast to be dry at the locations listed in Table 4 to help safeguard amphibians. All works, including the placement of any barrier, are prohibited in months other than August for locations listed in Table 4, inclusive in all years. At the discretion and authorization of the DR and OEM, the Contractor may undertake works at other times of the year in some or all of the areas listed in Table 4 if amphibian migration or breeding is not active, however such authorization may be rescinded without advance notice and the Contractor shall stop all work immediately in these areas and remove all equipment and materials. No consideration for additional payment or claims will be considered for rescinding such authorization.
- .2 The Contractor shall include in their schedule time to permit the OEM to conduct amphibian survey and salvage prior to starting the construction in each segment of the work.
- .3 The Contractor and OEM shall coordinate their efforts to avoid conflicts with the work and to ensure these requirements are met within a timely manner.
- .4 The Contractor shall provide a minimum of ten working days' notice for each 1 km section of trail and work in each environmentally sensitive area (e.g. each Watercourse, Riparian Area and Wetlands) or Amphibian Breeding Habitat and Migration area
- .5 The Contractor shall make allowances (ie., reduced work speed) during construction activities for the OEM to visually monitor for amphibians during the removal of stumps and large woody debris (LWD). This is anticipated to require approximately 10 minutes per stump or LWD.
- .6 After an area is cleared of amphibians, the Contractor shall commence work within three days and work diligently to complete the construction activities in a timely manner. Costs of salvage rework will be charged to the Contractor if work
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- is not begun within three days following the completion of amphibian salvage and/or work does not continue at a reasonable rate to complete the work.
- .7 Events beyond the Contractors control such as weather delays that result in areas requiring additional salvage work shall not be charged to the Contractor.
  - .8 Construction activities within or near amphibian habitat listed in Table 4 shall be restricted to daylight hours. Artificial lighting shall not be used within or near amphibian habitat listed in Table 4.
  - .9 The OEM may direct the Contractor to set aside excavated materials from any excavations in areas listed in Table 4 for up to 3 hours prior to moving material to the final disposal location to allow for amphibian salvage.

**Table 4. Breeding Habitat and Migration Areas - All Work to be Complete in August Under Dry Conditions**

Highway Location	Trail Location & Impact	Feature
21+680 to 21+720 East Side	On fill slope 2 m from road edge, construction will potentially affect ditch pond	NW Salamander Breeding Site in ditch on East side of highway (same side as trail)
21+350 East Side	Immediately adjacent to road edge, ditch pond will be filled to construct trail	NW Salamander Breeding Site in ditch on East side of highway (same side as trail)
20+420 to 20+620 East and West Sides	Set back from road, trail crosses migration path; trail could change hydroperiod of ditch ponds	Amphibian Crossing Zone and NW Salamander and RL Frog Breeding Sites in ditches on both sides of highway
20+300 to 20+030 East and West Sides	Set back from road; trail over wetland area; trail could change hydroperiod of ditch ponds	Wetlands adjacent to trail used by Pacific Treefrogs; NW Salamander and Treefrogs breeding in ditches on both sides of highway
18+210 to 18+250	Immediately adjacent to road edge at W9; ditch to be filled, concrete barrier along road will impede amphibian movements to & away from pond	NW Salamander Breeding Site in ditch on west side of highway (same side as trail)
16+900 to 18+010	Set back from road most of the way, but close to road at 17+70 (W12) retaining wall, and close to road at 17+830 to 17+980, trail crosses migration path; not sure if breeding ditch will be filled	Amphibian Crossing Zone; Pacific Treefrog Breeding site in ditch on north side of highway (opposite side from trail); RL Frogs breed at golf course & airport and cross highway
15+000 to 15+100 South Side	Immediately adjacent to road edge, ditch will be partly filled, hydrology may be altered by extension of culvert W21	NW Salamander Breeding Site on west side of highway (same side as trail) - exceptionally high abundance
11+950 to 11+980 West Side	Close to road, forest side of ditch near W28, <b>wetland area</b> extends beyond this small section toward Greenpoint Rd	NW Salamander Breeding Site on west side of highway (same side as trail)

# PCA

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Trail, Road, and Bridge Works  
Pacific Rim National Park Reserve, BC  
Project No. PCA #1522

# 01 35 43

ENVIRONMENTAL  
PROCEDURES

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Highway Location	Trail Location & Impact	Feature
11+450 to 11+480	Close to road, forest side of ditch, Between Culvert ID 61 and 62, (between W30 and W29); wet area - trail construction could alter hydroperiod at wetland on opposite side of highway	RL Frog & NW Salamander Breeding Sites on both sides of highway (some on same side as trail, most on east side opposite of trail)
11+200	Deep rut on trail south of Greenpoint Rd; trail breeding pond will be filled; also trail construction could alter hydroperiod at wetland and breeding sites on opposite side of highway	breeding NW Salamander - hatched egg mass found Nov 2018 in rut along trail
10+500	Set back from road; Deep ravine with wetland area and non-fish bearing creek will be crossed by trail, culverts will connect wet areas	Potential breeding habitat for NW Salamander, and moist habitat for all species along trail
10+210 to 10+400 Both Sides	Set back from road except at start where it is on Forest Side of Ditch; trail has deep pools in some ruts; trail crosses migration path	RL Frog & NW Salamander Breeding Sites on both sides of highway & Amphibian Crossing Zone
9+530 to 9+920 Both Sides Nav Can	Forest Side of Ditch and between ditch and Nav Can pond; ensure excavating trail does not drain Nav Can pond	RL Frog & NW Salamander Breeding Sites at Nav Can and in ditches on both sides of highway
7+660 to 7+ 700 South Side	Forest Side of Ditch - retaining wall; seems likely ditch will be filled	Northwestern Salamander Breeding Site on south side of highway (same as trail)
6+650 to 6+800	Forest side of Ditch through <b>wetland area</b> , a small portion will be elevated trail; ensure no change to hydroperiods in ditches	NW Salamander Breeding Sites on both sides of highway
5+550 to 5+800	Forest side of ditch and set back from road, Culvert ID 52, especially concerned about area near 5+700, W38; pools formed along trail; ensure trail doesn't alter hydrology where RL Frogs breed in ditch adjacent to trail	Amphibian Crossing Area and RL Frog & NW Salamander Breeding Site on west side of highway, same side as trail
5+370 to 5+470 Both Sides	Forest Side of Ditch through <b>wetland area</b> ; ensure trail doesn't alter hydrology in ditches on each side of highway	NW Salamander Breeding Sites in ditches on both sides of highway
3+200 to 3+300	Set back from road at W50 or W49, trail crosses watercourse	NW Salamander Breeding Site on E side of road, opposite side of trail and there may be breeding in/near watercourse where trail is being built

Highway Location	Trail Location & Impact	Feature
0+200 to 1+400, especially the southernmost section closest to Swan Lake	Set back from road, crosses migration path and high quality forest habitat	Critical Amphibian Crossing Area near Swan Lake
0+000 to 0+200	Immediately adjacent to highway; trail will fill ditches where amphibians stage before migrating across highway & where larval NW salamanders occur when wet; ensure culvert extensions and trail do not alter hydrology where NW Salamanders breed in ditch ponds on opposite side of highway at 0+120 and 0+190	Most Critical Amphibian Crossing Area nearest Swan Lake and NW Salamander breeding pond on East side of highway

- .10 In addition to any ditch with standing water, several confirmed aquatic breeding sites (ponds) have been identified that fall along the trail alignment. These include: Pond at the NavCanada site (Hwy 9+850 to 9+900); Pond near Incinerator Rock (15+000 to 15+050); Other small, temporary ponds - Ponds by the Bomber trail (20+300), Sedge/wetland pond located adjacent to Culvert 9 (18+100); and Deep rut pond south of Green Point Road (11+200). Contractor will need to work extremely closely with OEM to ensure that these areas are not impacted during construction and that activities do not drain/disturb ponds containing amphibians. As noted above, work in these areas is restricted to August under dry conditions. OEM may request additional mitigation measures in these areas such as installation of amphibian exclusion fencing, more time for amphibian survey and salvage, and flow isolation.

1.10 Invasive Plant Management

- .1 Invasive plants are known to occur in the area where the construction works will occur and preventative measures are needed to limit their spread.
- .2 All construction vehicles, equipment, machinery, and hand tools shall be inspected and cleaned prior to every entry into the Park, prior to every exit from the Park, and prior to every travel to another section (ie., between each access point) of the Project area while in the Park.
- .3 All construction staff clothing shall be free of soil and vegetation debris prior to entering the Park each work day, prior to exiting the Park each day, and prior to every travel to another section of the Project area while in the Park. Boots shall be washed of all soil materials.
- .4 All construction materials brought into the Park must be free of invasive species. Sources of all materials shall be inspected by the Contractor and OEM and/or DR prior to supply of material to determine if invasive species are present and to formulate a protocol to avoid introducing these into the Park. This may include washing material prior to use, avoiding contaminated areas, constructing clean haul routes, and finding new, clean sources of materials.

- .5 Invasive plant removal shall be conducted in every area where construction operations have taken place for 2 years on a monthly basis, both during and after construction should invasive plants be identified by the DR, OEM, or PCA staff. See Section 31 93 02 - Invasive Species Control for details.
- 1.11 Precipitation
- .1 The Contractor is notified that, within the geographical area of the work, the precipitation is high, 400 to 500mm per month on average between October and April, with the potential for heavy rainfall events, 50 to 100mm in 24 hours, which can occur at any time of the year.
- .2 For rainfall events, the OEM and the DR may shut down all work activities. No consideration for additional payment will be considered for rainfall event shut downs. The Contractor shall maintain and repair if necessary all environmental protection measures including Temporary Environmental Procedures and those incidental to construction, in addition to any new Temporary Environmental Procedures as directed by the OEM during shut downs. All environmental protection measures will be inspected by the Contractor and the OEM after each rainfall event of more than 15 mm of rain and in areas prone to flooding or excessive run-off as directed by the OEM. The OEM may direct that additional inspections be conducted where rainfall exceeds 25 mm in any 24-hour period
- .3 The Contractor shall ensure that the required number and size of mandatory standby equipment and materials specified in Table 2 are readily accessible on-site to deal with construction activities during high precipitation events.
- 1.12 Soil and Sediment Erosion Control
- .1 Temporary Environmental Procedures must be in compliance with Federal legislation and regulations and direction from the OEM where required. Notwithstanding, Contractors shall reference the provincial MOE “Standards and Best Practices for Instream Works (2004)” for best practices for instream sediment and the provincial Ministry of Forests “Best Management Practices Handbook: Hillslope Restoration in BC (Nov 2001)”. These erosion and sediment control procedures are considered incidental to the Work.
- .2 The Contractor shall create a sediment and erosion control plan for each of the 39 stream crossings and the wetland areas (Project Sites) where environmental protection is incidental to the work and one sediment and erosion control plan outlining procedures for typical trail construction and typical events (eg., heavy rainfall event). These plans shall be submitted a minimum of ten days prior to work occurring for review by the DR and the OEM. The DR and OEM may request changes to any plan to ensure that proposed methods for sediment and erosion control are satisfactory for each Project site. No additional payment shall be made for environmental protection measures that are incidental to the work.
- .3 The Contractor shall install, maintain and remove all Temporary Environmental Procedures as directed by the OEM and the DR.
- .4 Temporary Environmental Procedures, where required by the contract or as directed by the DR and OEM, are to be installed prior to starting any
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construction activities to prevent sediment from entering any waterway, within the vicinity of the construction site.

- 1.13 Drainage and Wastewater Discharge .1 The Contractor shall provide temporary drainage as necessary to keep excavations and site free from water. The Contractor shall submit a dewatering plan for each project site where dewatering is incidental to the work a minimum of ten days prior to work occurring for review by the DR and the OEM. The DR and OEM may request changes to any plan to ensure that proposed methods for dewatering are satisfactory for each Project site. No additional payment shall be made for dewatering that is incidental to the work.
- .2 The Contractor shall not discharge water containing suspended materials into Watercourses, Riparian Areas, Wetlands, amphibian habitat, sanitary sewer or drainage systems.
- 1.14 Pollution Control .1 The Contractor shall prevent any deleterious and objectionable materials from entering streams, rivers, Wetlands, water bodies or Watercourses that would result in damage to aquatic and Riparian Areas. Hazardous or toxic products shall be stored no closer than 100 metres to any surface water.
- .2 The Contractor shall prevent blowing dust and debris by providing dust suppression for on-site work. Water is the only allowable dust suppression measure. -
- .3 The Contractor shall provide industry standard spill kits, to the satisfaction of the DR and OEM, at all work sites refueling, lubrication and repair locations that are capable of containing 110% of the largest potential spill and shall be maintained in good working order on the construction site. All mobile equipment shall carry a smaller spill kit at all times. The Contractor and site staff shall be informed of the location of the spill response kit(s) and be trained in its use.
- .4 The Contractor shall take timely and effective actions to stop, contain and clean-up all spills until the spill site is deemed to be remediated and safe to re-enter by the DR. The Owner, OEM and DR shall be notified immediately of any spill.
- .5 In the event of a spill, the Contractor shall prioritize the clean-up and all other work shall be stopped, where appropriate, and Contractor personnel shall be devoted to spill containment and clean up.
- .6 The costs involved in a spill incident (control, wildlife salvage, clean up, disposal of contaminants, and site remediation to pre-spill conditions), shall be the responsibility of the Contractor. The site will be inspected to ensure completion to the pre-spill condition to the satisfaction of the DR.
- 1.15 Equipment, Maintenance, Fueling and Operation .1 The Contractor shall ensure that equipment and machinery are in good operating condition, clean (power washed), free of leaks, excess oil, and grease. Ensure that all equipment is inspected daily for fluid/fuel leaks and maintained in good working condition.
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- .2 Hydraulic machinery shall use environmentally sensitive hydraulic fluids that are non-toxic to aquatic life and that are readily or inherently biodegradable.
  - .3 Equipment fueling sites will be identified by the Contractor to the satisfaction of the DR. On site storage of fuel shall not be allowed in any area other than those areas approved by the DR.
  - .4 Mobile fuel containers (ie., slip tanks, small fuel carboys) shall remain in the service vehicle at all times. Where fuel or other fluid containers are out of the service vehicle for use, all containers must be situated on drip trays and returned to the service vehicle immediately following use.
  - .5 The Contractor shall not refuel or service equipment within 50m of any watercourse, riparian area, wetland, or surface water drainage.
  - .6 Equipment used on the Project shall be fueled with E10, and low sulphur diesel fuels where available, and shall conform to local emission requirements. The Contractor is to ensure that unnecessary idling of the vehicles is avoided.
  - .7 Oil changes, lubricant changes, greasing and machinery repairs shall be performed at only those locations satisfactory to the DR. Waste lubrication product (e.g. oil filters, used containers, used oil, etc.) shall be secured in spill-proof containers and properly recycled or disposed of at an approved facility. No waste petroleum, lubricant products or related materials are to be discarded, buried or disposed of in borrow pits, turnouts, picnic areas, viewpoints, etc. or anywhere within the work area.
  - .8 Fuel containers and lubricant products shall be stored only in secure locations to the satisfaction of the DR. Fuel tanks or other potential deleterious substance containers shall be secured to ensure they are tamperproof and cannot be drained by vandals when left overnight. Alternatively, the Contractor may hire a security person employed to prevent vandalism.
- 1.16 Operation of Equipment
- .1 Equipment movements shall be restricted to the “footprint” of the construction area, generally within the 5.2 m cleared width of the trail unless otherwise noted in the Contract Drawings or approved by the DR.
  - .2 When, in the opinion of the DR, negligence on the part of the Contractor results in damage or destruction of vegetation, natural hydrology (e.g., altering direction or rate of flow, ponding, etc.) or other environmental or aesthetic features beyond the designated work area, the Contractor shall be responsible for all costs to complete restoration work including the replacement of trees, shrubs, topsoil, grass, etc. to the satisfaction of the DR.
  - .3 The Contractor shall restrict vehicle movements to the work limits.
  - .4 Within the elevated trail (boardwalk) sections, equipment is confined to working from the completed sections of the elevated trail.
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| 1.17 Fire Prevention and Control         | .1 | A fire extinguisher shall be carried and available for use on every piece of construction equipment and in every Contractor vehicle.  |
|  | .2 | Construction equipment shall be operated in a manner and with all original manufacturers' safety devices to prevent ignition of flammable materials in the area.  |
|  | .3 | In case of fire, the Contractor or worker shall take immediate action to extinguish the fire provided it is safe to do so. The DR shall be notified of any fire immediately as well as the applicable Provincial and Federal Authorities and the local municipal Fire Department. Basic instruction and phone numbers will be provided on-site by the Contractor and will be discussed in the Project start-up meeting. |
|  | .4 | Fires or burning of waste materials is not permitted.   |
|  | .5 | Smoking within the construction area is not permitted.  |
|  | .6 | The Contractor shall obey all Parks Canada Fire Restrictions in effect throughout the duration of the contract.   |
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| 1.18 Waste Materials Storage and Removal | .1 | The Contractor and workers shall dispose of hazardous wastes in conformance with the applicable federal and provincial regulations.   |
|  | .2 | All wastes originating from construction, trade, hazardous and domestic sources, shall not be mixed, but will be kept separate.   |
|  | .3 | Do not pile waste that is to be removed in those areas listed in Clause 1.9.1 – Table 4 as they will rapidly become inhabited by amphibians and other wildlife.   |
|  | .4 | All food wastes shall be deposited in bear-proof containers and removed daily.  |
|  | .5 | Construction, trade, hazardous waste and domestic waste materials shall be contained and removed and disposed of at an appropriate off-site waste landfill.   |
|  | .6 | A concerted effort shall be made by the Contractor and workers to reduce, reuse and recycle materials where possible.   |
|  | .7 | Sanitary facilities, such as portable container toilets, shall be provided by the Contractor and maintained in a clean condition.   |
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| 1.19 Wastewater Discharge Criteria       | .1 | When possible, it is preferred to isolate the work area from any flowing water and divert the clean water around the worksite so that no silt-laden or wash water is generated.   |
|  | .2 | Wash water and sediment-laden discharge water will be released onto the ground at a location that is outside Wetlands, Watercourses and Riparian Areas and only with the approval of the OEM.   |
|  | .3 | Any water discharged, water used for dust control, or rainfall runoff from the Project area that flows into the environment (e.g., waterbody, Watercourse, Wetland, drain, ditch, or ground) must comply with BC Working Water Quality Guidelines and the BC Approved Water Quality Guidelines. The OEM is responsible for conducting all water quality sampling and analysis to determine                              |
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- its chemical composition. Contractor will be responsible for any corrective action deemed necessary by OEM.
- .4 Water contaminated in the placing of cement and curing of concrete (see Section 03 30 00 – Cast-in-place concrete, of this specification) shall be contained and removed from the site to an approved disposal facility.
- 1.20 Environment Protection Supplies
- .1 The Contractor shall supply, transport, install and maintain all equipment and supplies relating to erosion, sediment and drainage controls necessary to complete the Work as directed by the OEM, the DR.
- .2 The Contractor shall provide an inventory of environmental protection supplies, listed in Tables 1 and 2, prior to mobilization and in each weekly report to be submitted to the DR.
- 1.21 Access Points
1. The Contractor shall be responsible for access points required to construct the Works as identified on the Contract Drawings. Access points requested by the Contractor that are not identified on the Contract Drawings shall be considered and approved at the sole discretion of the DR. Environmental protection measures at access points are not considered temporary environmental procedures and all costs for environmental protection at access points are incidental to the Work.
2. The Contractor shall submit a detailed design plan for each access point to the DR for review and approval not less than thirty (30) days in advance of construction of each access point. As access points have the potential to remain active for the duration of the contract, each access point design shall incorporate culverts as detailed on the Contract Drawings and permanent environmental procedures that ensure that no sediment is allowed to enter any ditch, water flow in the ditches is maintained including periods of high flows during high precipitation months, water quality in ditch flows is maintained, and designs shall not create any obstruction to fish passage in the ditches.
3. Prior to the completion of the contract, temporary access points shall be surveyed by OEM for amphibians and salvaged if found. The Contractor shall then completely remove the access point complete the environmental restoration to the satisfaction of the DR and the OEM in accordance with Section 31 14 13 - Trail Work, Soil Stripping, Stockpiling and Respreading and other applicable sections. The DR shall notify the Contractor if the Owner requests that any access point be left in place at the completion of the contract.

PART 2 –  
PRODUCTS

- 2.1 Material
- .1 Erosion Control Blanket (ECB):  
Refer to Section 31 32 19 – Geotextiles, Clause 2.1.8 – Erosion Control Blanket.
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- .2 Light Duty Silt Fence Barrier:
  - .1 Refer to Section 31 32 19 – Geotextiles, Clause 2.1.9 – Light Duty Silt Fence Barrier.
- .3 Heavy Duty Silt Fence Barrier:
  - .1 Refer to Section 31 32 19 – Geotextiles, Clause 2.1.10 – Heavy Duty Silt Fence Barrier.

PART 3 –  
 EXECUTION

- 3.1 Installation of Erosion Control Blankets .1 Refer to Section 31 32 19 – Geotextiles, Clause 3.3 – Installation of Erosion Control Blankets.
- 3.2 Installation of Light Duty Silt Fence Barrier .1 Refer to Section 31 32 19 – Geotextiles, Clause 3.3 – Installation of Light Duty Silt Fence Barrier.
- 3.3 Installation of Heavy Duty Silt Fence Barrier .1 Refer to Section 31 32 19 – Geotextiles, Clause 3.4 – Installation of Heavy Duty Silt Fence Barrier.
- 3.4 Maintenance .1 Items installed as a part of the Temporary Environmental Procedures shall be inspected by the Contractor on a weekly basis, during each significant rainfall event, or as directed by the OEM or DR and make repairs to the installations to bring them to a ‘like new’ condition.
- .2 Those items installed as a part of the Temporary Environmental Procedures that require regular cleaning shall be cleaned at intervals as directed by the OEM or DR.
- .3 Items installed as Temporary Environmental Procedures shall be removed upon completion of the project or as directed by the OEM or DR. Obtain approval of OEM prior to removal

**END OF SECTION**

**PART 1 - GENERAL**

- 1.1 Measurement for Payment
- .1 Payment for additional costs resulting from the cultural resource protection procedures shall be included in the relevant items in the table of unit prices for this Contract. Items of additional work for cultural resource protection not specifically included in the unit rate items shall be considered incidental to the work.
  - .2 Payment for “Organic Soils Excavation and Spreading in a Cultural Resource Sites” shall be full compensation for all work necessary and incidental for excavation using a smooth bucket in accordance with clause 3.0 *Controlled Excavation Methodology* at a rate to permit monitoring of the material by the OAM (or their representative), and the re-spreading of the material up to six metres into the adjacent forest area by sprinkling and hand work in accordance with clause 1.8 *Cultural Resource Sites*. Material used to dress the sides of the trail shall be paid as a separate item. Also included in the unit rates tendered is standby time as described in clause 1.6.5 of this section.
  - .3 Payment for “Organic Soils Excavation from Cultural Resource Sites – Storage and Recording - Grice Bay Parking Lot” in Cultural Resource Sites shall be full compensation for all work necessary and incidental for excavation using a smooth bucket in accordance with clause 3.0 *Controlled Excavation Methodology* at a rate to permit monitoring of the material by the OAM (or their representative), loading, hauling the material to the Grice Bay Parking Lot, stockpiling and recording source and deposit locations of the material. Also included in the unit rates tendered is standby time as described in clause 1.6.5 of this section.
  - .4 Payment for “Mineral Soil Excavation and Fill in Cultural Resource Sites” shall be full compensation for all work necessary and incidental for excavation using a smooth bucket in accordance with clause 3.0 *Controlled Excavation Methodology* at a rate to permit monitoring of the material by the OAM (or their representative), hauling the material to a fill area within the archaeology site, and spreading and compacting the material. Not included in this unit rate is standby time.
  - .5 Payment for “Mineral Soil Excavation from Cultural Resource Sites – Storage and Recording - Grice Bay Parking Lot” shall be full compensation for all work necessary and incidental for excavation using a smooth bucket in accordance with clause 3.0 *Controlled Excavation Methodology* at a rate to permit monitoring of the material by the OAM (or their representative), hauling the material to a fill area within the archaeology site, and spreading and compacting the material. Not included in this unit rate is standby time.
  - .6 Payment for “Mineral Soil Excavation from Cultural Resource Sites – Disposal at Tofino Airport” shall be full compensation for all work necessary and incidental for excavation using a smooth bucket in accordance with clause 3.0 *Controlled Excavation Methodology* at a rate to permit monitoring of the material by the OAM (or their representative),
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loading, hauling the material to the Tofino Airport, re-spreading and compacting the material. Not included in this unit rate is standby time.

- .7 Measurement for payment for excavation of these excavated materials shall be by the cubic metre of excavated void (length X width X depth) or surveyed cross sections as accepted by the DR.

#### 1.2 References

- .1 The Parks Canada Guidelines for the Management of Archaeological Resources (Parks Canada, 2005).
- .2 Canada National Parks Act (S.C. 2000, c. 32).
- .3 Cultural Resource Management Policy (2013).

#### 1.3 Cultural Significance

- .1 Parks Canada ensures that cultural resources are protected and managed appropriately in accordance with its mandate, Cultural Resource Management Policy, Guidelines for the Management of Archaeological Resources and management directives. Ensuring adequate management of cultural resources consists of preventing, reducing or mitigating impacts to cultural resource sites, artifacts and collections.
- .2 Due to the sensitivity of the cultural resources, information regarding cultural resource sites, materials, artifacts, and locations is confidential. The extent of cultural resource sites that reside within the trail work zone is identified in the Contract by linear metre, however, the Contractor will be notified of their exact locations once the Contract has been awarded. No photographs or information about cultural sites and/or resources will be made public by the contractor or sub-contractors. All materials on cultural resources provided to the Contractor must be returned to the Owner at the completion of the project.

#### 1.4 Definitions

- .1 Archaeological Site (AS): a location that contains physical remains of past human activity. Controlled excavation methodology must be followed within an AS. The OAM will be on site observing excavation in these designated areas.
- .2 Cultural Deposits (CD): sediments and materials laid down by, or heavily modified by, human activity.
- .3 Cultural Resource Management Zone (CRMZ): a location where there is an increased potential of cultural deposits that were not identified during the cultural resource site impact assessments and inventories. The OAM will be on site observing excavation in these designated areas. The controlled excavation methodology will be followed in these areas under the direction of the OAM.
- .4 Chance Find Discovery: An unanticipated discovery of cultural resource site or material (artifacts/features) during construction in areas with no previously identified cultural resources.
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- .5 Culturally Modified Tree (CMT): a term which describes the modification of a tree by indigenous people as part of their traditional use.
  - .6 Cultural Resource (CR): a human work, an object or a place that is determined, on a basis of its heritage value, to be directly associated with an important aspect or aspects of human history or culture.
  - .7 Cultural Resource Site (CRS): a location that contains a human work, object, or a place that is defined to be of heritage value. This includes archaeological, historical and traditional use sites, and culturally modified trees (CMTs). The OAM must be on-site during construction in these designated areas. The OAM has the authority to stop work in regards to cultural resource requirements.
  - .8 Historical site (HS): Within the Parks Canada framework, historic is used in its broadest meaning to define the value of a cultural resource based on having heritage value. Within this framework, cultural materials 40 years or older may be considered as a historical site or historical object.
  - .9 Mineral Subsoil: Boulders, cobbles, gravel, sand, clay, and silts.
  - .10 Organic Soils: Litter-fibric-humic (LFH) layer and upper mineral A horizon, topsoil.
  - .11 Owners Archaeological Monitor (OAM): an individual retained by Parks Canada to assess and monitor for the presence/absence of cultural resource sites and recommend and implement mitigations if Chance Finds are encountered.
  - .12 Owners Environmental Monitor (OEM): an individual retained by Parks Canada to be onsite at all times during construction and will have the authority under the DR to direct the Contractor with regards to installing, maintaining and removing temporary environmental procedures and ensuring that appropriate installation and maintenance measures are followed. The OEM will also have the authority to shut down construction, especially during heavy rainfall events, or other events that preclude effective environmental mitigation. The Contractor will therefore NOT be required to hire a separate Environmental Monitor.
  - 13 Owners First Nations Monitor (OFNM): an individual retained by Parks Canada to monitor during construction. The OFNM may work directly with the OEM and OAM, and /or independently.
  - .14 Surveillance Areas (SA): locations identified during the archaeological impact assessments and inventories where cultural deposits are considered to have a moderate to high probability of occurring but are not likely to be identified during an inventory study (e.g., wet sites, deeply buried sites, isolated finds). The SAs will require surveillance in the form of field check-ins, the frequency and duration of which will be determined by the OAM in consultation with First Nations, Parks Canada, and Pacific Rim National Park Reserve. The controlled excavation methodology will only be followed in SAs if the OAM determines it is necessary to sample a selection of the
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- organic soils or mineral subsoils for cultural materials and/or if cultural deposits are encountered.
- .15 Traditional Use site (TUS): Landforms, natural features, cultural features or other locations of spiritual, cultural or other significance to an Indigenous community.
- .16 Grice Bay Parking Lot site – Is the existing parking lot on Grice Bay approximately 4 km north of Highway 4 and west of the Tofino Airport.
- 1.5 Regulatory Overview .1 Comply with all applicable laws, regulations and requirements of Federal, Provincial, and other regional authorities, and acquire and comply with such permits, approvals and authorizations as may be required.
- 1.6 General .1 The Owners Archaeological Monitor(s) (OAM) and Owners First Nation Monitors (OFNM) will be retained directly by the Owner. The OAM will have the authority to stop work in regards to cultural resource requirements.
- .2 Contractor will provide a minimum of 10 working days' notice for scheduling information to the OAM to enable monitoring coordination.
- .3 For all persons working for the contractor and subcontractors, cultural resource awareness training shall be a component of the initial contractor orientations and of the daily tailgate meetings. This will include training on the Chance Find Procedures.
- .4 Contractor shall coordinate and permit the OAM time to monitor the excavated material. Contractor will not be compensated for any loss of production time where the site can be bypassed and the work continued. A delay claim shall only be considered if the Contractor is not able to continue work at a productive rate and for delays in excess of those defined in clause 1.6.5 below.
- .5 In known Cultural Resource Site areas, the contractor should anticipate delays and include the cost of these delays in the unit prices tendered for excavation of materials in the CRS areas. The following duration of delay at each site shall be included in the rates: 2 hours per 8 hour working day shall be accumulated for each site. Upon completing work at each CRS, if the accrued delay time averages over 2 hours per 8-hour work day averaged per working week, an additional payment shall be made at a time and materials rate for the time in excess of the average of 2 hours. The contractor must record the duration and location of each delay and agree to delays with the DR on a daily basis.
- .6 Due to the significance of cultural resources within Pacific Rim National Park Reserve, Chance Find Procedures will apply for the whole length of the Trail.
- .7 All cultural resources regardless of age and condition are protected under the Canada National Parks Act. The Contractor and workers shall stop work and protect any artifacts and/or features found and request direction from
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the DR and OAM before proceeding with their work. No archaeological or historical artifacts shall be intentionally moved. It is illegal to remove archaeological or historical artifacts from the Pacific Rim National Park Reserve.

- .8 Within CRS, CRMZ, and SA sites, the contractor shall avoid repeated traversing of heavy equipment over the unexcavated site to avoid damage to cultural deposits. The contractor shall grub and excavate organic soils and mineral subsoils sequentially along the trail and remove from site without traversing over the organic soils and mineral subsoils, except where approved by the DR using low impact methods.

#### 1.7 Archaeological Monitor

- .1 The OAM must be present during any construction within cultural resource sites identified prior to contract award and any other cultural resource sites identified during construction to record and collect any observed cultural resource. The OFNM, as available, may be present during any construction within cultural resource sites identified prior to contract award and any other cultural resource sites identified during construction to record and collect observed cultural resource deposits, as appropriate.
- .2 The DR and OAM will conduct a walk-through of each site ahead of any ground disturbance with the successful contractor to discuss the best approach for construction. Cultural resource concerns at each site will be identified. Where more sensitive features/ materials are present and to be avoided, the OAM will advise the most appropriate approach and flag any additional limitations/ constraints for the site. Any special considerations, such as lack of space for spreading of cultural sediments from within the site, or any contractor concerns will be highlighted for review by the DR and the Owner.

#### 1.8 Cultural Resource Sites

- .1 Several cultural resource sites reside within the trail work zone, which are designated as cultural resource sites (CRS), cultural resource management zones (CRMZ), and surveillance areas (SA), and account for approximately 6590 linear metres of trail which comprises CRS: 1991m, CRMZ: 2063m, and SA: 2536m. Work within these sites shall be in accordance with this specification, under the direction of the OAM and the DR.
  - .2 Method of excavation shall be coordinated with the DR and OAM and is outlined in Clause 3.0 *Controlled Excavation Methodology* below.
  - .3 All excavated organic soils shall stay within the defined cultural resource site unless otherwise approved by the OAM and DR. Organic soils shall be spread within the site under the direction of and to the satisfaction of the DR, OAM and OEM. Organic soils and mineral subsoils from cultural resource sites will be transported to a designated location at Grice Bay Road parking lot in separate loads (e.g., not mixed with organic soils or mineral subsoils from other areas or non-cultural deposits) under the direction of the OAM. The piles of mineral subsoils from the CRSs will be stockpiled at the
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Grice Bay parking lot location and will be kept in discrete piles, with a record and on-site marker kept of the location of each stockpile and which CRS it was removed from. This will facilitate the cultural resources assessment and management of these materials by the OAM. In cases where no cultural deposits are found within the excavated mineral subsoils, they shall be removed from the site and may be disposed at the designated Grice Bay parking lot or the disposal site on Tofino airport lands with the approval of the OAM. The contractor shall receive payment for this excavation, hauling, placing, and disposal per clause 1.1.3 above.

- .4 The upper organic soils being stripped for trail construction from known cultural resource sites shall remain on site, as per clause 1.8.3 above, and shall be distributed evenly back into the forest up to six (metres on either side of the trail clearing where appropriate, with a maximum depth of 150mm, and under the direction of the OAM, DR, and OEM. Spreading of organic soils can be aided by excavation equipment 'sprinkling' the organic soils while depositing it and re-spreading it after deposit. The equipment tracks must remain within the cleared trail limits. Where the equipment arm can reach into the forest without scarring or damaging trees, machine spreading is permitted. Manual spreading by trail contractor shall be used if necessary to obtain a uniform thickness as directed by the OEM, OAM, and DR.
- .5 Excess material from the organic soils being stripped for trail construction may be removed from a CRS at the discretion of the OAM and OEM and disposed at the designated Grice Bay parking lot location in separately identified piles, as per clause 1.8.3. It is anticipated that up to 1.8 cubic metres of organic material per linear metre of trail in CRS zones will be cast into the forest and the remainder will be disposed of at the designated Grice Bay site, as directed by the OAM.

#### 1.9 Culturally Modified Tree Sites

- .1 Due to the sensitivity of the culturally modified tree (CMT) sites, the Contractor will be notified of their locations once the Contract has been awarded.
  - .2 Several areas along the trail work zone contain CMT's. These sites have been avoided by trail routing but the Contractor and all sub-contractors are required to be aware of the site locations and to avoid them.
  - .3 It is not anticipated that the Contractor shall be required to remove CMT's. However, should CMT's be identified by the contractor within the areas to be cleared, the DR shall be notified immediately.
  - .4 Hand falling and hand sectioning of selected CMT's will be determined by the OAM and DR and completed under the guidance of the OAM. Costs associated with this work will be considered incidental to clearing and grubbing.
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- 1.10 Related Sections .1 Section 01 35 43 – Environmental Procedures.  
.2 Section 31 11 00 – Clearing and Grubbing.  
.3 Section 31 14 13 – Trail Work, Soil Stripping, Stockpiling and Re-spreading.  
.4 Section 31 23 33 – Excavation, Trenching, and Backfilling.  
.5 Section 31 93 02 – Invasive Species Control.

PART 2 - PRODUCTS Not used.

PART 3 - EXECUTION

- 3.0 Controlled Excavation Methodology .1 In CRS, CRMZ and SA sites, machine excavation will proceed in incremental depths between 10 - 30cm maximum. At the discretion of the OAM, the Contractor shall allow time for a sample of machine excavated materials to be raked and/or screened through 1/4" mesh to find artifacts, faunal material, and other potential diagnostic items, which will be collected for analysis. Contractor will be compensated for any loss of production time only as defined in Clause 1.6.5 above.  
.2 All machine excavation in CRS and CRMZ will be conducted with a smooth edged/finishing bucket under the direction of the OAM. The OAM may require a sampling of areas in the SAs to be excavated with a similar technology to assess sediments for cultural materials. This methodology may also be applied in the event of Chance Finds (Clause 3.1 below) at the discretion of the OAM.  
.3 In cases where no cultural deposits are found within the excavated organic soils, some of the organic soils may be removed from a CRS at the discretion of the OAM and OEM and disposed at the designated Grice Bay parking lot site only, with the approval of the OAM, as per Clause 1.8.3 above.  
.4 In cases where no cultural materials are found within the excavated minerals subsoils, sediments shall be removed from the site and disposed at the designated disposal site at Grice Bay parking lot or on Tofino Airport lands with the approval of the OAM.
- 3.1 Chance Finds Procedure .1 The Chance Finds Procedure will be implemented to minimise the risk of inadvertent impact to cultural resource sites, particularly in the case where potential cultural deposits or features are identified in the absence of the OAM. It is crucial in implementing this Procedure that construction personnel understand that they are not expected to interpret the origin, integrity or significance of potential cultural deposits.
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- .2 'Cultural Resource Awareness' training shall be a component of the initial contractor orientations for all persons working for the contractor and all daily tailgate meetings. The training program includes a review of this Procedure.
  - .3 The most common chance finds site types which may be encountered are:
    - .1 Pre-Contact Archeological Sites – These sites can include artifact scatters, shell middens, shell-less middens, rock art, culturally modified trees (CMTs), waterlogged organic materials, and trails.
    - .2 Found or suspected Human Remains.
    - .3 Historical Sites – These sites can include historical artifacts and structures, and historical refuse such as crockery, metal and glass-ware indicating presence of historical camp sites, shipwrecks, cabins, temporary shelters, or sites associated with early logging and mining.
  - .4 If potential cultural deposits artifacts, human remains or suspected human remains, or features are identified, the following procedures WILL be immediately implemented:
    - .1 STOP ground disturbance work immediately that could cause additional damage to cultural deposits and retain potentially cultural deposits on-site so it may be inspected by the OAM (i.e., do not release dump truck if loaded with fill from the suspected location).
    - .2 Immediately inform DR and OAM.
    - .3 Record location of the find:
      - .1 Date (when the find was encountered).
      - .2 Observer (name of the person recording information about the find).
      - .3 Location of Find (Labelled flagging so that it may be relocated, GPS coordinates if possible).
      - .4 Type of find (e.g., archaeological, historical, suspected human remains).
      - .5 Description of the obvious disturbance to the find (by equipment, work, erosion etc.).
      - .6 Photograph of find, with scale in photograph if possible. In the case of suspected human remains photographs are only be permitted to be taken by the OAM, DR or PCA delegate for the purpose of confirming if the remains are human, and document and maintain chain of custody.
  - .5 Be prepared to initiate work at another location under direction of the DR while archaeological testing and/or mitigation is conducted. Work may only continue in the location of the Chance Find under the direction of the OAM or DR.
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- .6 In the event that a chance find is confirmed to be of found human remains, local law enforcement police will be informed by the DR or OAM. The human remains must be accorded full dignity and respect by prohibiting public access and photography. A cover will be placed over any exposed bones with plastic sheeting, blanket, or other clean covering (not back fill). If the affected location is busy or has high public visibility, a delegate of the contractor will be assigned to stand watch and secure the location until the DR is able to have a representative of the Owner relieve the contractor employee. The secured watch will continue until the OAM and local policing authorities are on site.

**3.2 Monitoring**

- .1 Monitoring may be required where Chance Finds are identified.
- .2 Site visits and/or monitoring outside of CRS, CRMZ's and SA locations may occur by the OAM and/or FNM.
- .3 Monitoring within CRS, CRMZ and SA locations will be conducted under the direction of the OAM. Prior to ground disturbance, the ground surface will be inspected by the OAM for cultural deposits or features. The ground alteration activities will be inspected while in progress. If organic soils or mineral subsoils with potential for cultural deposits are to be excavated, then a sample of those soils will be visually examined for cultural deposits. The size of the sample of soils to be inspected through raking and/or screening will be determined in the field by the OAM.
- .4 Cultural deposits identified during monitoring will be documented, photographed, and georeferenced in the field by the OAM.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Quality Control Plan .1 Prepare and submit to DR for review and approval a Quality Control Plan in accordance with Section 01 33 00 – Submittal Procedures, prior to project startup.
- 1.2 Measurement for Payment .1 Payment for quality assurance and testing shall be made at the lump sum price tendered. Payment shall be distributed as follows: 25% in the first Progress Payment, 50% equal distribution in intermediate Progress Payments, and 25% when this portion of the Work is completed.
- .2 For the Contractor's first Progress Payment, it is a condition precedent to the Owner's obligation (paragraph 3 of GC5.4) that the Contractor has provided all necessary documentation required by the Contract for the first Progress Payment.
- 1.3 Inspection .1 Allow DR 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 DR 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 DR may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, DR shall arrange to pay cost of examination and replacement.
- 1.4 Independent Inspection Agencies .1 Appoint and pay for services of third-party Independent Quality Assurance testing laboratory and field staff including 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 Mill tests and certificates of compliance.
- .4 Tests specified to be carried out by Contractor under supervision of DR.
- .5 Additional tests at rates specified as follows:
1. Granular Base:
- Compaction: 1 test / 150m of trail / Lift.
- Sieve: 1 test / material source / 1,000 cu.m.
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## 2. Granular Sub - Base:

Compaction: 1 test / 150m of trail / Lift.

Sieve: 1 test / material source / 1,000 cu.m.

## 3. Culvert Trench Backfill:

Compaction: 1 test / trench.

## 4. Hot Mix Asphalt:

Asphalt Mix: Mix design for each type of hot mix asphalt.

Marshall Test: 1 test / day.

Compaction: Nuclear density tests sufficient to establish effective rolling pattern.

Cores: 1 core 750 sq.m

## 5. Cast in Place Concrete:

Air/slump/cylinders: minimum of 1 set per day when placing concrete and minimum of per 50 cubic metres of concrete placed.

- .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 DR to verify acceptability of corrected work.
  - .3 Provide equipment required for executing inspection and testing by appointed agencies.
  - .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
  - .5 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 DR at no cost to DR. Pay costs for retesting and reinspection.
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- 1.5 Access to Work
    - .1 Allow inspection/testing agencies access to Work and off-site manufacturing and fabrication plants.
    - .2 Cooperate to provide reasonable facilities for such access.
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- 1.6 Procedures
    - .1 Notify appropriate agency and DR 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 an orderly sequence so as not to cause delay in Work.
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- .3 Provide labour and facilities to obtain and handle samples and materials onsite. Provide sufficient space to store test samples.
  
- 1.7 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 DR as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
  - .2 Make good on Contractor's work damaged by such removals or replacements promptly.
  - .3 If in opinion of DR it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, the Owner may deduct from otherwise due to the Contractor the difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by DR.
  
- 1.8 Reports
  - .1 Submit 4 copies of inspection and test reports to DR with all progress reports or, generally, as reports become available.
  - .2 Provide copies to Subcontractor of Work being inspected or tested and to manufacturer or fabricator of material being inspected or tested.
  
- 1.9 Mill Tests
  - .1 Submit mill test certificates as required of specification sections.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Section Includes .1 Temporary utilities.
- 1.2 Installation and Removal .1 Provide temporary utilities in order to execute Work expeditiously.  
.2 Remove from site all such work after use.
- 1.3 Measurement for Payment .1 The Costs for Temporary Utilities shall be fully included in the rates tendered for Section 01 25 20 - Mobilization and Demobilization.  
.2 Payment shall be made in the amounts and at the timing as described in Section 01 25 20 - Mobilization and Demobilization.
- 1.4 Water Supply .1 Provide continuous temporary supply of potable water for construction use, if applicable.  
.2 Remove or decommission temporary water supply facilities upon completion of project.
- 1.5 Sanitary Facilities .1 Provide sanitary facilities for construction use.  
.2 Remove or decommission temporary sanitary facilities upon completion of project.
- 1.6 Temporary Heating and Ventilation of Work .1 Provide temporary heating required during construction period, including attendance, maintenance, and fuel.  
.2 Construction heaters used inside buildings must be vented to outside or be flameless type. Solid fuel salamanders are not permitted.  
.3 Provide temporary heat and ventilation in enclosed areas as required to:  
.1 Facilitate progress of Work.  
.2 Protect Work and products against dampness and cold.  
.3 Prevent moisture condensation on surfaces.  
.4 Provide ambient temperatures and humidity levels for storage and installation of materials.  
.5 Provide adequate ventilation to meet health regulations for safe working environments.  
.4 Ventilating:  
.1 Prevent accumulations of dust, fumes, mists, vapours, or gases in areas occupied during construction.
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- .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied area.
  - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons or the environment.
  - .4 Ventilate storage spaces containing hazardous or volatile materials.
  - .5 Ventilate temporary sanitary facilities.
  - .6 Continue operation of ventilation and exhaust system for time after cessation of Work process to assure removal of harmful contaminants.
  - .5 Be responsible for damage to Work due to failure in providing adequate heat, ventilation, and protection during construction.
- 1.7 Temporary Power and Light
- .1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools and for construction use.
  - .2 Arrange for connection with appropriate utility company. Pay all costs for installation maintenance and removal.
  - .3 Provide and maintain temporary lighting throughout project, if applicable.
- 1.8 Temporary Communication Facilities
- .1 Provide and pay for temporary telephone necessary for own use.
- 1.9 Fire Protection
- .1 Provide and maintain temporary fire protection equipment during performance of Work required by governing codes, regulations, and bylaws.
  - .2 Burning rubbish and construction waste materials is not permitted onsite.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Section Includes .1 Construction aids.  
.2 Office and sheds.  
.3 Parking.  
.4 Project signs, static and changeable.
- 1.2 Installation and Removal .1 Provide construction facilities in order to execute work expeditiously.  
.2 Remove from all sites all such facilities after use.
- 1.3 Measurement for Payment .1 Payment for items in this section shall be included in the lump sum price bid for Mobilization and Demobilization, except for project signs.  
.2 The unit price bid for project identification signs shall be full compensation for all work necessary and incidental for supply, installation, maintenance, and removal of the static project signs.  
.3 The unit prices bid for changeable message signs shall include, but not be limited to shall be full compensation for all work necessary and incidental for supply, installation, maintenance, changing messages, and removal of the signs.  
.4 Payment for the project identification signs shall be made at the lump sum price bid for this item and paid at time of installation of the signs and accepted by the DR.  
.5 Measure for Payment for the changeable message signs shall be per month (counted as day of installation to same date, following month) for each changeable message sign supplied to the project and accepted by the DR.
- 1.4 Scaffolding .1 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms, and temporary stairs as necessary to carry out Work.
- 1.5 Hoisting .1 Provide, operate, and maintain hoists and cranes required for moving of workers, materials, and equipment. Make financial arrangements with Subcontractors for use thereof.  
.2 Hoists and cranes shall be operated by qualified operators.  
.3 Hoists and cranes shall be used only outside of wetted perimeters, outside riparian zones and beyond top of bank for bridge locations.
- 1.6 Site Storage/Loading .1 Confine Work and operations of employees to only that which is required by the Contract Documents.
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- .2 Do not unreasonably encumber premises with products.
  - .3 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.
  - .4 Locations of heavy machinery with respect to loadings on the existing structures are the responsibility of the Contractor.
- 1.7 Construction Access and Parking
- .1 Parking is permitted onsite provided it does not disrupt the Work.
  - .2 Provide and maintain adequate access to project site.
  - .3 Build and maintain temporary roads where indicated or directed by DR and provide snow removal during period of Work.
  - .4 If authorized to use existing roads for access to project sites, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.
  - .5 Provide road cleaning to ensure highway 4 and all other roads are kept clean from mud, dust or other debris.
- 1.8 Sanitary Facilities
- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
  - .2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.
- 1.9 Offices
- .1 Provide office heated to 22 degrees C, lighted to 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
  - .2 The Contractor shall provide a site office for the exclusive use of the DR with the following:
    - .1 The temporary office for the DR may be separate from the Contractors site office or in the same building or portable provided it can be secured from the Contractor's area by a lockable door.
    - .2 Inside dimensions minimum 3.6 m long x 3 m wide x 2.4 m high, with floor 0.3 m above grade, complete with minimum of two 50% opening windows and one lockable door.
    - .3 Insulate building and provide heating system to maintain 22 degrees C inside temperature at -20 degrees C outside temperature.
    - .4 Finish inside walls and ceiling with plywood, hardboard or wallboard and paint in selected colours. Finish floor with 19 mm thick plywood or other suitable floor finish.
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- .5 Install electrical lighting system to provide min 750 lx using surface mounted, shielded commercial fixtures with 10 % upward light component.
  - .6 Provide color printer capable of printing 11" X 17" prints and cables for connection to a computer system (provided by DR) located in the DR's office.
  - .7 Equip office with .9 x 1.5 m table, 4 chairs, desk, 6 m of shelving 300 mm wide, and one 3 drawer legal size filing cabinet.
- 1.10 Construction Signage and Security
- .1 Locate project identification signs as directed by DR. See clause 1.10, below.
  - .2 Direct requests for approval to erect a Consultant/Contractor signboard to DR. Wording shall be in both official languages.
  - .3 Signs and notices for health, safety, traffic control, instruction, etc. shall be in both official languages. See Sections 01 35 33 - Health and Safety Requirements, and 01 35 00 - Special Procedures for Traffic Control, of these Specifications for more information.
  - .4 Maintain approved signs and notices in good condition for duration of project, and dispose of on completion of project, or as directed by DR.
  - .5 Provide signage and barriers at all access points to prevent public access to the work site. Where the Contractor has completed surfaced or unsurfaced sections of trail, immovable barriers and signage shall be provided at all access points to prevent access to the trail by pedestrians and cyclists.
  - .6 Ensure safe access to the beach is maintained at times for all existing beach accesses. Install signage and barriers to facilitate this and where necessary provide safe alternative routes and security to prevent unauthorized access into the worksite during periods of peak pedestrian access.
- 1.11 Project Signs
- .1 The contractor shall supply and install six project signs on Highway 4 informing the public of this project. The Owner, through the DR shall provide the layout and bilingual message information for these signs.
  - .2 Signs shall be color printed on white 12 mm Coroplast or weatherproof plywood sheets 1220mm X 2440mm, mounted on two 100mm X 100mm X 3.6m long pressure treated posts with 50mmX100mm framework.
  - .3 Install signs true and level at the locations designated by the DR. Depth of bury shall be a minimum of 0.7 m.
  - .4 Maintain approved signs and notices in good condition for duration of project. Signs shall be removed by others on completion of future projects or earlier if directed by DR.
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- .5 The contractor shall supply and install two variable message signs, to be located at the north and south Park boundaries on Highway 4 to inform the public of the current projects works. The Owner, through the DR shall work with the Contractor to provide news bulletins to be posted on these signs.
- 1.12 Laydown Areas .1 The Contractor shall be permitted to use the following areas for offices, storage and parking, subject to approval of proposed use by the DR.
1. Radar Hill Parking Lot (unsurfaced lot, to be shared with timber stored for project use).
  2. Wood lot area at Parks Canada compound near the airport.
  3. Long Beach Parking Lot (south of the entrance only) excluding the period from Victoria Day long weekend to Thanksgiving long weekend inclusive.
  4. Green Point Campground Parking Lot excluding March to October.
  5. Combers parking lot excluding the period from May to October.
  6. Ocean Terrace Road lot.
  7. Lost Shoe Creek water reservoir lot.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Section Includes .1 Barriers.  
.2 Traffic Controls.
- 1.2 Measurement for Payment .1 The Costs for Temporary Barriers and Enclosures shall be full included in the items requiring temporary barriers and enclosures. No separate payment shall be made.
- 1.3 Protection for Trees .1 Protect from damage by equipment and construction procedures. Refer to Section 01 35 43 - Environmental Procedures for further details.  
.2 Protect from damage by equipment and construction procedures tree roots necessary for the health and survival of trees designate as protected by the DR. Refer to Section 01 35 43 - Environmental Procedures for additional information.
- 1.4 Guard Rails and Barricades .1 Provide as required by governing authorities.  
.2 Confirm with DR locations and installation schedule 3 days before installation.
- 1.5 Access to Site .1 Provide and maintain access roads as may be required for access to Work.
- 1.6 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 the public.
- 1.7 Fire Routes .1 Maintain access to property for use by emergency response vehicles.
- 1.9 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.
- 1.10 Protection of Structure Finishes .1 Provide protection for existing, finished and, partially finished structure finishes during performance of Work with screens, covers, and hoardings.  
.2 Confirm with DR locations and installation schedule 3 days prior to installation.  
.3 Be responsible for damage incurred due to lack of or improper protection.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Products/Material and Equipment
- .1 Use new products/material and equipment unless otherwise specified.
  - .2 Use products of one manufacturer for material and equipment of the same type or classification unless otherwise specified.
  - .3 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.
  - .4 Notify DR in writing of any conflict between these specifications and manufacturer's instructions DR will designate which document is to be followed.
  - .5 Metal fastenings:
    - .1 Prevent electrolytic action between dissimilar metals.
    - .2 Use non-corrosive fasteners, anchors, and spacers for securing exterior work.
    - .3 Fastenings which cause spalling or cracking are not acceptable.
  - .6 Bolts may not project more than 1 diameter beyond nuts.
  - .7 Deliver, store and maintain packaged material and equipment with manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in Work. Store products in accordance with suppliers' instructions.
  - .8 Prevent damage, adulteration, and soiling of products during delivery, handling, and storage. Immediately remove rejected products from site.
  - .9 Store products subject to damage from weather in weatherproof enclosures.
  - .10 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
  - .11 Touch-up damaged finished surfaces to DR's satisfaction.
  - .12 Remove and replace damaged products at own expense and to satisfaction of DR.
- 1.2 Quality of Products
- .1 Products, materials, equipment, and articles (referred to as products throughout Specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source, and quality of Products provided.
  - .2 Defective products will be rejected regardless of previous inspections.
    - .1 Inspection does not relieve responsibility but is precaution against oversight or error.
-

- .2 Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
      - .3 Retain purchase orders, invoices, and other documents to prove that all products utilized in this Contract meet the requirements of the specifications. Produce documents when requested by the DR.
      - .4 Should any dispute arise as to quality or fitness of products, decision rests strictly with DR based upon requirements of Contract Documents.
      - .5 Unless otherwise indicated in the Specifications, maintain uniformity of manufacture for any particular or like item throughout the site.
  - 1.3 Availability of Products
    - .1 Immediately upon signing the Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify DR of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
    - .2 If delays in supply of products are foreseeable, notify DR of such in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of the work.
    - .3 In event of failure to notify DR at commencement of Work and should it subsequently appear that Work may be delayed for such reason, DR reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.
  - 1.4 Manufacturer's Instructions
    - .1 Unless otherwise indicated in Specifications, install or erect products in accordance with manufacturer's instructions.
      - .1 Do not rely on labels or enclosures provided with products.
      - .2 Obtain written instructions directly from manufacturers.
    - .2 Notify DR in writing, of conflicts between Specifications and manufacturer's instructions, so that DR may establish course of action.
    - .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes DR to require removal and re-installation at no increase in Contract Price or Contract Time.
    - .4 Provide Manufacturer's instructions and specifications to DR for review prior to any installations.
  - 1.5 Contractor's Options for Selection of Products for Tendering
    - .1 Products are specified by "Prescriptive" specifications: select any product meeting or exceeding specifications.
    - .2 Products specified under "Acceptable Products": select any one of the indicated manufacturers, or any other manufacturer meeting or exceeding the Prescriptive specifications and indicated Products.
-



- .3 Products specified by performance and referenced standard: select any product meeting or exceeding the referenced standard.
  - .4 Products specified to meet particular design requirements or to match existing materials: use only material specified Approved Products. Alternative products may be considered provided full technical data is received in writing by DR.
  - .5 When products are specified by a referenced standard or by Performance specifications, upon request of DR obtain from manufacturer an independent laboratory report showing that the product meets or exceeds the specified requirements.
- 1.6 Substitution After Contract Award
- .1 No substitutions are permitted without prior written approval of the DR.
  - .2 Proposals for substitution may only be submitted after Contract award. Such request must include statements of respective costs of items originally specified and the proposed substitution.
  - .3 Proposals will be considered by the DR if:
    - .1 products selected by tenderer from those specified are not available.
    - .2 delivery date of products selected from those specified would unduly delay completion of Contract.
    - .3 alternative product to that specified, which is brought to the attention of and considered by DR as equivalent to the product specified.
  - .4 Should the proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on the Project. Pay for design or drawing changes required as result of substitution.
- 1.7 Transportation
- .1 Pay costs of transportation of products required in performance of Work.
- 1.8 Quality of Work
- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify DR if required Work is such as to make it impractical to produce required results.
  - .2 Do not employ anyone unskilled in their required duties. DR reserves right to require dismissal from site, workers deemed incompetent or careless.
  - .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with DR, whose decision is final.
- 1.9 Coordination
- .1 Ensure cooperation of workers during Work. Maintain efficient and continuous supervision.
  - .2 Be responsible for coordination and placement of openings, sleeves, and accessories.
-

- 1.10 Remedial Work .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

**PART 2 - PRODUCTS**

- 2.1 Acceptable Products .1 Submit product data sheets for all manufactured products used in the Work to DR for review in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Use best quality products.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Section Includes .1 Progressive cleaning.  
.2 Final cleaning.
- 1.2 Project Cleanliness .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.  
.2 Remove waste materials from sites at regularly scheduled times or dispose of as directed by DR. Do not burn waste materials onsite.  
.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.  
.4 Ensure no invasive plant species, vegetation, or seeds are brought into the Park or transported between locations within the Park. Provide only uncontaminated products for incorporation into the work. This may include using washed materials or using only clean blast rock. Machinery and equipment shall be thoroughly cleaned before delivery to the Park or between movements within the Park. Refer to Section 31 93 02 – Invasive Species Control.  
.5 Ensure that no food waste, peelings, or wrappers are discarded on site as this may attract animals and lead to wildlife / human conflicts.
- 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 all waste products and debris.  
.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Section Includes .1 Waste Management Workplan.
- 1.2 Definitions .1 Waste Management Coordinator (WMC): Designate individual who is in attendance onsite full-time. Designate, or have designated individuals from each Subcontractor to be responsible for waste management related to their trade and for coordinating activities with WMC.
- .2 Waste Audit (WA): Relates to projected waste generation. Involves measuring and estimating quantity and composition of waste, reasons for waste generation, and operational factors that contribute to waste.
- .3 Waste Reduction Workplan (WRW): Written report that addresses opportunities for reduction, reuse, or recycling of materials.
- .4 Materials Source Separation Program (MSSP): consists of a series of ongoing activities to separate reusable and recyclable waste materials into material categories from other types of waste at point of generation.
- 1.3 Documents .1 Maintain at the job site one copy of following documents:
- .1 Waste Management Workplan (WMW).
- 1.4 Measurement for Payment .1 The Costs for Waste Management and Disposal shall be fully included in the rates tendered for Section 01 25 20 - Mobilization and Demobilization.
- .2 Payment shall be made in the amounts and at the timing as described in Section 01 25 20 - Mobilization and Demobilization.
- 1.5 Use of Site and Facilities .1 Locate waste, refuse, recycling, etc. containers in locations to facilitate deposit of materials without hindering daily operations.
- .2 Locate separated materials in areas which minimize material damage.
- 1.6 Submittal .1 Submit requested submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare and submit the following submittals within 15 days of the Award of Contract:
- .1 Submit 1 hard copy of completed WMW.
- .2 Submit 1 electronic copy (PDF) of completed WMW.
- .3 Provide DR with receipts indicating quantity of material delivered to landfill.
- .4 Provide DR with receipts indicating quantity and type of materials sent for recycling.
-

- 1.7 Waste Management Workplan .1 Structure WMW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .2 Describe management of waste.
- .3 Identify opportunities for reduction, reuse, and/or recycling (3Rs) of materials.
- .4 Post workplan or summary where workers at site can review its content.
- 1.8 Waste Processing Sites .1 Provide waste processing sites as applicable within the Province of British Columbia to DR within 15 days of the Award of Contract.
- .2 Materials and vegetation removed as part of the invasive species control program shall be disposed of outside of the Park boundary.
- 1.9 Disposal of Wastes .1 Burying of rubbish and waste materials is prohibited unless approved by DR at off-site locations obtained by the Contractor.
- .2 Burning of rubbish and waste materials is prohibited within the Park boundary. Outside of the Park burning may be restricted except as permitted by British Columbia Ministry of Forests. Permit to be obtained by the Contractor.
- .3 Disposal of waste volatile materials, mineral spirits, oil, paint thinner, etc. into waterways or by dumping onsite is prohibited.
- 1.10 Storage and Handling .1 Store, materials to be reused, recycled, and salvaged in locations obtained by the Contractor and accepted by DR.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- 1.11 Scheduling .1 Coordinate work with other activities at site to ensure timely and orderly progress of the Work.

## PART 2 – EXECUTION

- 2.1 Application .1 Do work in compliance with the WMW.
- .2 Implement MSSP for waste generated on Project in compliance with approved methods and as approved by DR.
- .3 Materials must be immediately separated into required categories for reuse or recycling.
- .4 Materials in separated condition: collect, handle, store onsite, and transport off-site to an approved and authorized recycling facility.
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- .5 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.
  
- 2.2 Cleaning
  - .1 Remove tools and waste materials on completion of work and leave work area in clean and orderly condition.
  - .2 Cleanup work area as work progresses.
  - .3 Source separate materials to be reused/recycled into specified sort areas.
  
- 2.3 Diversion of Materials
  - .1 Create a list of materials to be separated from the general waste stream and stockpiled in separate containers, to the approval of the DR and consistent with applicable fire regulations.
    - .1 Mark containers.
    - .2 Provide instruction on disposal practices.
  - .2 Onsite sale of salvaged, recovered, reusable, recyclable, etc. materials are not permitted.
  
- 2.4 Food and Food Waste
  - .1 Protection and management of wildlife is a primary function of Parks Canada within the National Parks (and Park Reserves) system.
  - .2 To minimize conflicts between wildlife and people interaction must be restricted to all possible extents.
  - .3 So that wildlife does not associate people as a possible food source all food must be stored in closed vehicles and not left unattended.
  - .4 All waste food, peelings, bones, scraps, empty containers, wrappers and the like shall be returned to closed vehicles and removed from the Park every day so that wildlife does not become accustomed to food sources near people. Where food waste containers are temporarily used they shall be made wildlife proof and secured.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Section Includes .1 Administrative procedures preceding preliminary and final reviews of Work.
- 1.2 Inspection and Declaration .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
- .1 Notify DR in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
- .2 Request DR's Inspection.
- .2 DR's Review: DR and Contractor will perform review of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
- .3 Engineer's Review: Engineer, DR, and Contractor will perform review of Work to identify if Work has been completed according to the requirements of the Contract Documents. Contractor shall correct Work accordingly.
- .4 Certificate of Substantial Performance: when DR considers the Contract Work and the requirements of Contract have been substantially performed, make application for Certificate of Substantial Performance.
- 1.3 Final Completion .1 Once the Contractor has completed all Work and correction of deficiencies, he shall submit written certification to the DR that:
- .1 Contract Documents have been reviewed.
- .2 The Work shall be deemed to have reached Completion when all labour, Plant and Material required have been performed, used or supplied, and the Contractor has complied with the Contract and all orders and directions made pursuant thereto, all to the satisfaction of the Owner.
- .3 Defects are corrected and deficiencies are completed.
- .4 Work is complete and ready for Final Review.
- .1 Final Review: when items noted above are completed, request final review of Work by DR. If Work is deemed incomplete by DR, complete outstanding items and request another review.
- .2 Certificate of Completion: when DR considers deficiencies and defects have been corrected and all the requirements of Contract have been met, the Contractor shall make application for Certificate of Completion.
- 1.4 Close-Out Submittals .1 Project Record Documents specified in Section 01 33 00 – Submittal Procedures.
- .2 As-Built Documents as specified in Section 01 11 00 – General Instructions.
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- .3 Guarantees and Warranties:
  - .1 In addition to guarantee requirements contained elsewhere in the Contract Documents to which all Work of this Contract is to be guaranteed for 12 months after the date of issue of the Certificate of Completion by the DR.
  - .2 Upon completion of the Work, furnish to the PSPC a guarantee in writing, stating that the Contractor will make good, at their expense, and to the satisfaction of the DR, all defects that may develop in materials and equipment used on the Work for a period of 12 months from date of Certificate of Completion, upon PSPC assuming custody, that are in the opinion of the DR due to the use of improper workmanship and faulty materials and equipment.
  - .3 The Contractor is to, in the case of Work Performed by their Subcontractors and when guarantees are required, secure such guarantees from the Subcontractor and furnish them to PSPC on or before the final completion of the Work.
  - .4 The guarantees are to provide that all Work furnished and installed by the guarantors are to remain in like new condition and working order for the period of 12 months and that the guarantors will replace same with new and like materials at no expense to PSPC unless it can be proven that the defects are caused by abuse and negligence on the part of PSPC or its employees.
  - .5 It is to be understood that in effecting the replacement, the Contractor or Subcontractor responsible is to also bear all Costs involved in removing or replacing adjacent affected materials.
  - .6 One month prior to expiry of guarantee period, the DR will carry out a detailed inspection of the Project.
  - .7 Any defect apparent will be noted and forwarded to the Contractor in writing for correction under the terms of the Contract with no additional cost to PSPC.
- .4 Commencement of Guarantee and Warranty Periods: date of DR's issuing the Certificate of Completion shall be date of commencement for warranty periods.
- 1.5 Final Payment .1 Final Payment: When DR considers final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. If Work is deemed incomplete by DR, complete outstanding items and request final review.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Section Includes .1 Methods and procedures for cutting back and demolition of culverts.
- 1.2 Measurement for Payment .1 Cutting back or removal of culverts will be included in the unit rate prices tendered for culvert installations for this contract. Measurement shall be as described in section 33 42 13 – Pipe and Box Culverts.
- 1.3 References .1 Canadian Standards Association (CSA International).
- .1 CSA S350-M1980(R1998), Code of Practice for Safety in Demolition of Structures.
- .2 Comply with National Building code of Canada, Part 8, “Safety Measures at Construction and Demolition Sites”, and Provincial requirements.
- 1.4 Storage and Protection .1 Perform all work in accordance with Section 01 35 43 – Environmental Procedures.
- .2 Protect in accordance with Section 31 23 33 – Excavating, Trenching and Backfilling, and Section 31 24 13 – Highway & Trail Excavation Embankment and Compaction.
- .3 Protect existing items designated to remain. In event of damage to such items, immediately replace or make repairs to approval of DR and at no cost to the Contract.
- .4 In all circumstances, ensure that demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .5 Do not dispose of waste of volatile materials such as, mineral spirits, oil, petroleum-based lubricants, or toxic cleaning solutions into watercourses. Ensure disposal procedures are in accordance with the Waste Management Workplan and to the satisfaction of the DR.
- .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 local authorities, and Section 01 35 43 - Environmental Procedures.
- .8 Protect trees, plants and foliage on site and adjacent properties.
- 1.5 Regulatory Requirements .1 Ensure all work is performed in compliance with the requirements of Section 01 35 43 – Environmental Procedures and where applicable, CEPA, TDGA, MVSA, and all applicable provincial regulations.
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**PART 2 - PRODUCTS**

- 2.1 Equipment .1 Equipment and heavy machinery used to meet or exceed all applicable emission requirements.
- .2 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

**PART 3 -  
EXECUTION**

- 3.1 Preparation .1 Review site with DR and verify extent and location of items designated for removal, disposal, and items to remain.
- 3.2 Sequences of Operation .1 Cut back and removal:
- .1 Remove items as indicated.
  - .2 Where an existing culvert to be extended has a damaged end the damaged material shall be neatly cut off to permit a coupling to be attached to extend the culvert.
  - .3 Do not disturb items designated to remain in place.
- .2 Backfill:
- .1 Backfill in areas as indicated and in accordance with Section 31 23 33 – Excavating, Trenching and Backfilling.
- 3.3 Restoration .1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.
- .2 Use only soil treatments and procedures that are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent watercourses or ground water.
- 3.4 Cleanup .1 Upon completion of work, remove debris, trim surfaces and leave work site clean, neat and tidy.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement for Payment .1 Include all materials, labour, equipment, and services necessary for any toxic waste removal. Payments for such Work shall be paid as a Change Order to this Contract.
- 1.2 References .1 Canadian Environmental Protection Act, CEPA.  
.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).  
.1 Material Safety Data Sheets (MSDS)  
.3 National Fire Code of Canada latest edition.  
.4 Transportation of Dangerous Goods Act (TDG Act).  
.5 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2003-400).
- 1.3 Definitions .1 Toxic: For the purposes of this specification, a substance is considered toxic if it is listed on the Toxic Substances List found in Schedule 1 of CEPA.  
.2 List of Toxic Substances: found in Schedule 1 of CEPA, lists all substances that have been assessed as toxic. The federal government can make regulations with respect to a substance specified on the List of Toxic Substances. Column II of this List identifies the type of regulation applicable to each substance.
- 1.4 Submittals .1 Product Data:  
.1 Submit photocopies of shipping documents and waste manifests to DR when shipping toxic wastes off-site.  
.2 Maintain 1 copy of product data in a readily accessible file onsite.  
.2 Submission Requirements:  
.1 Submit product data to DR in accordance with Section 01 33 00 - Submittal Procedures.  
.2 Express all weights and volumes in SI Metric units.  
.3 Accompany submissions with a transmittal letter containing:  
.1 Date.  
.2 Project title and number.  
.3 Contractor's name and address.  
.4 Identification and quantity of attached product data.  
.5 Other pertinent data.
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- |                                   |    |   |
|-----------------------------------|----|---|
| 1.5 Storage and Handling          | .1 | Store and handle toxic wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.  |
|                                   | .2 | Store and handle flammable and combustible wastes in accordance with current National Fire Code of Canada requirements.   |
|                                   | .3 | Coordinate storage of toxic wastes with DR and abide by internal requirements for labeling and storage of wastes.   |
|                                   | .4 | Observe smoking regulations at all times. Smoking is prohibited in any area where toxic wastes are stored, used, or handled.  |
|                                   | .5 | Report spills or accidents involving toxic wastes immediately to DR and to appropriate regulatory authorities within 24 hours of incident. Take all reasonable measures to contain the release while ensuring health and safety is protected. |
|                                   | .6 | Transport toxic wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.  |
|                                   | .7 | Use only an authorized/licensed carrier to transport toxic waste.   |
|                                   | .8 | Coordinate transportation and disposal of toxic wastes with DR.   |
|                                   |    |   |
| 1.6 Waste Management and Disposal | .1 | Dispose of toxic wastes generated onsite in accordance with applicable federal and provincial acts, regulations, and guidelines.  |
|                                   | .2 | Ensure toxic waste is shipped to an authorized/licensed treatment or disposal facility and that all liability insurance requirements are met.   |

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 References .1 Canadian Environmental Protection Act, CEPA.
- .1 Export and Import of Hazardous Waste Regulations (ETHW Regulations), SOR/2002-200.
- .2 Health Canada / Workplace Hazardous Materials Information System (WHMIS).
- .1 Material Safety Data Sheets (MSDS).
- .3 National Fire Code of Canada.
- .4 Transportation of Dangerous Goods Act (TDG Act) 1999, (c.34).
- .5 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2003-400).
- 1.2 Definitions .1 Dangerous Goods: Product, substance, or organism that is specifically listed or meets the hazard criteria established in Transportation of Dangerous Goods Regulations.
- .2 Hazardous Material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.
- .3 Hazardous Waste: Any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment, or disposal.
- 1.3 Submittals .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to DR current MSDSs for each hazardous material required prior to bringing it/them onsite.
- .3 Submit a hazardous materials management plan to DR that identifies all hazardous materials, their use, their location, personal protective equipment requirements, and disposal arrangements.
- 1.4 Storage and Handling .1 Coordinate storage of hazardous materials with DR and abide by internal requirements for labeling and storage of materials and wastes.
- .2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
- .3 Store and handle flammable and combustible materials in accordance with current National Fire Code of Canada requirements.
- .4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene, and naphtha for ready use. Store all flammable and combustible liquids in approved safety cans bearing the Underwriter's Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable
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and combustible liquids exceeding 45 litres for work purposes requires the written approval of the DR.

- .5 Transfer of flammable and combustible liquids will not be carried near open flames or any type of heat-producing devices.
  - .6 Flammable liquids having a flash point below 38 degrees Celsius, such as naphtha or gasoline will not be used as solvents or cleaning agents.
  - .7 Store flammable and combustible waste liquids for disposal in approved containers located in a safe, ventilated area. Keep quantities to a minimum.
  - .8 Observe smoking regulations at all times. Smoking is prohibited in any area where hazardous materials are stored, used, or handled. Cigarette butts shall be disposed of in vehicles and removed from the Park for proper disposal.
  - .9 Abide by the following storage requirements for quantities of hazardous materials and wastes more than 5 kg for solids and 5 litres for liquids:
    - .1 Store hazardous materials and wastes in closed and sealed containers which are in good condition.
    - .2 Label containers of hazardous materials and wastes in accordance with WHMIS.
    - .3 Store hazardous materials and wastes in containers compatible with that material or waste.
    - .4 Segregate incompatible materials and wastes.
    - .5 Ensure that different hazardous materials or hazardous wastes are not mixed.
    - .6 Store hazardous materials and wastes in a secure storage area with controlled access.
    - .7 Maintain a clear egress from storage area.
    - .8 Store hazardous materials and wastes in a manner and location which will prevent them from spilling into the environment.
    - .9 Have appropriate emergency spill response equipment available near the storage area, including personal protective equipment.
    - .10 Maintain an inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.
  - .10 Ensure personnel have been trained in accordance with WHMIS requirements.
  - .11 Report spills or accidents involving toxic wastes immediately to DR and OEM, and to appropriate regulatory authorities within 24 hours of incident. Take all reasonable measures to contain the release while ensuring health and safety is protected.
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- 1.5 Transportation .1 Transport hazardous materials and wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
- .2 If exporting hazardous waste to another country, ensure compliance with federal Export and Import of Hazardous Waste Regulations.
- .3 If hazardous waste is generated onsite:
- .1 Coordinate transportation and disposal with DR.
  - .2 Ensure compliance with applicable federal, provincial, and municipal laws and regulations for generators of hazardous waste.
  - .3 Use licensed carrier authorized by provincial authorities to accept subject material.
  - .4 Prior to shipping material obtain written notice from intended hazardous waste treatment or disposal facility that it will accept material and that it is licensed to accept this material.
  - .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.
  - .6 Ensure that trained personnel handle, offer for transport, or transport dangerous goods.
  - .7 Provide photocopy of shipping documents and waste manifests to DR.
  - .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide a photocopy of completed manifest to DR.
  - .9 Report discharge, emission, or escape of hazardous materials immediately to DR and appropriate provincial authority. Take reasonable measures to control release.

## PART 2 - PRODUCTS

- 2.1 Materials .1 Only bring onsite the quantity of hazardous materials required to perform Work.
- .2 Maintain MSDSs in proximity to where the materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

## PART 3 - EXECUTION

- 3.1 Disposal .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
-

- .2 Recycle hazardous wastes for which there is an approved, cost-effective recycling process available.
- .3 Send hazardous wastes only to authorized hazardous waste disposal or treatment facilities.
- .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
- .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, the environment in general, or in municipal solid waste landfills is prohibited.
- .6 Dispose of hazardous wastes in a timely fashion in accordance with applicable provincial regulations.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement and Payment .1 The costs to supply, fabricate, and place reinforcing steel for various precast concrete sections shall be included in unit prices tendered for appropriate pay items in this Contract. No measurement will be made under this Section.
- 1.2 References .1 American Concrete Institute (ACI):
- .1 ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.
  - .2 American National Standards Institute/American Concrete Institute (ANSI/ACI):
    - .1 ANSI/ACI 315, Details and Detailing of Concrete Reinforcement.
    - .2 SP-66-04, ACI Detailing Manual 2004.
  - .3 American Society for Testing and Materials (ASTM):
    - .1 ASTM A143/A143M, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
    - .2 ASTM A 185/A 185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
    - .3 ASTM D 1751-[04], Standard Specification for Preformed Expansion Joint Filler for Concrete paving and structural Construction (Non extruding and Resilient Bituminous Types).
    - .4 ASTM A82/A82M-07, Wire ties for reinforcing steel, shall be 1.6mm diameter. Cold drawn, annealed steel wire.
  - .4 Canadian Standards Association (CSA):
    - .1 CAN/CSA-A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/ Methods of Test and Standards Practice for Concrete
    - .2 CSA A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .3 CAN3-A23.3-14, Design of Concrete Structures.4 CAN/CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement.
    - .4 CAN/CSA-G40.21-13, General Requirements for Rolled Welded Structural Quality Steels.
    - .5 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
    - .6 CSA A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .7 CAN/SGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.

- .8 CAN/CSA-S6-14, Canadian Highway Bridge Design Code (CHBDC).
- .5 Reinforcing Steel Institute of Canada:
  - .1 RSIC, Reinforcing Steel Manual of Standard Practice.
- 1.3 Shop Drawings
  - .1 Submit shop drawings including placing of reinforcement in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by DR, with identifying code marks to permit correct placement without reference to the Contract Drawings. Indicate sizes, spacings, lengths, and locations of chairs, spacers and hangers. Prepare reinforcement shop drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada (RSIC).
  - .3 Detail bar hook, lap lengths and bar development lengths in accordance with the Contract Drawings and RISC, unless otherwise indicated.
- 1.4 Waste Management and Disposal .1 Refer to Section 01 35 43 - Environmental Procedures.
- 1.5 Material Storage
  - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements and with manufacturer's written instructions.
  - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .3 Storage and Handling Requirements:
    - .1 Store materials in accordance with manufacturer's recommendations on platforms, skids or other suitable supports clear of the ground and shall be protected as practicable from mechanical injury and surface deterioration caused by exposure to conditions producing rust. When placed in the Work, reinforcement shall be free from dirt, loose rust or scale, mortar, paint, grease, oil, or other materials that would reduce bond.
    - .2 Replace defective or damaged materials with new.
  - .4 Do not store material so as to interfere with site operation and drainage.

**PART 2- PRODUCTS**

- 2.1 Materials
  - .1 All Materials shall be new.
  - .2 Reinforcing steel: grade 400W, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
  - .3 Substitute different size bars only if permitted in writing by DR.

- .4 Tie Wire: minimum 1.6 mm annealed type or patented system approved by DR.
  - .5 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
  - .6 Mechanical splices: subject to approval of DR.
  - .7 Low carbon/chromium reinforcing steel: to ASTM A1035/A1035M alloy type CS with a minimum yield strength of 690MPa and a design strength of 500MPa.
- 2.2 Fabrication
- .1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, ANSI/ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada unless indicated otherwise.
  - .2 Obtain DR's approval for locations of reinforcement splices other than those shown on shop drawings.
  - .3 welding of reinforcing rebar for splice is not permitted
  - .4 Ship bundles of bar reinforcement clearly identified in accordance with bar bending details and lists.
- 2.3 Source Quality Control
- .1 Provide DR with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 2 weeks prior to commencing reinforcing work.
  - .2 Inform DR of proposed source of material to be supplied.

### **PART 3 - EXECUTION**

- 3.1 Field Bending
- .1 Do not field bend or field weld reinforcement except where indicated or authorized by DR.
  - .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
  - .3 Replace bars that develop cracks or splits.
- 3.2 Placing Reinforcement
- .1 Place reinforcing steel as indicated on reviewed shop drawings and in accordance with CAN/CSA-A23.1.
  - .2 Prior to placing concrete, obtain DR's approval of work of reinforcing material and placement.
  - .3 Ensure cover to reinforcement is maintained during concrete pour.
  - .4 Secure all reinforcement steel with ties, spacers, and supports as required.
  - .5 Dowels and anchor bolts/rods shall be secured in position by means of templates prior to concrete pour.
  - .6 Mechanical couplers for rebar extension are permitted, if required, upon approval of DR.

- .7 Chairs: where concrete is exposed to view, exposed to elements or where rust is possible, use plastic or non-corrosive material, or precast concrete made from concrete of equal strength and durability of concrete to be placed. Chairs used are not to result in voids or unacceptable appearance in exposed concrete surfaces.
- 3.3 Field Touch-up .1 Touch up damaged and cut ends of galvanized reinforcing steel with compatible finish to provide continuous coating.
- 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.  
Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: Refer to Section 01 74 21 – Waste Management and Disposal.

**END OF SECTION**

**PART 1 - GENERAL**

- 1.1 Measurement and Payment .1 The costs for cast-in-place concrete work shall be included in unit prices tendered for appropriate pay items in this Contract. No measurement will be made under this Section.
- 1.2 References .1 American Society for Testing and Materials (ASTM)
- .1 ASTM C 109/C109M, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50-mm Cube Specimens).
  - .2 ASTM C 260, Specification for Air-Entraining Admixtures for Concrete.
  - .3 ASTM C309-07, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - .4 ASTM C 494, Specification for Chemical Admixtures for Concrete.
  - .5 ASTM C 827, Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures. .6 ASTM C1017/C1017M-[07], Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
  - .7 ASTM D 1751, Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural construction (Nonextuding and Resilient Bituminous Types).
  - .8 ASTM D 1752, Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .2 Canadian Standards Association (CSA)
- .1 CAN/CSA-A23.1-14, Concrete Materials and Methods of Concrete Construction.
  - .2 CAN/CSA-A23.2-14, Methods of Test for Concrete and Standard Practices for Concrete
  - .3 CAN/CSA A283-06, Qualification Code for Concrete Testing Laboratories.
  - .4 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .3 Certificates .1 Submit concrete mix design, sealed by a Professional Engineer registered in the Province of British Columbia in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Minimum four (4) weeks prior to starting concrete work submit to DR manufacturer's test data and certification by qualified independent inspection
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- 1.6 Environment, Waste Management and Disposal
- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management and Disposal.
  - .2 Designate a location for using excess concrete and cleaning out concrete equipment. Prior to concrete pours, obtain approval from the DR for the proposed location.
  - .3 Use trigger operated spray nozzles for water hoses.
  - .4 Designate a cleaning area for tools to limit water use and runoff.
  - . Ensure emptied containers are sealed and stored in a secure area for disposal.
  - . Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, noncombustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.
  - . Choose least harmful, appropriate cleaning method that will perform adequately.
  - .10 Refer to clause 3.5 of this specification for truck washout.
- 1.7 Protection
- .1 Works to be carried out in accordance with Section 01 35 43 – Environmental Procedures. Protection of water bodies and riparian areas is critical.
  - .2 Cast-in-place concrete for decks on the Sandhill Creek bridge and the Lost Shoe Creek bridge are restricted to the low risk fisheries window from June 15-Sept 15.
  - .3 All pours taking place in wetlands, near creeks, and in riparian areas must be approved by DR and OEM in advance & must not coincide with rain events.
  - .4 Carefully coordinate the specified concrete work with weather conditions. Concrete shall not be placed during significant rain events or if such events are forecast within the next 24 hours.
  - .5 Prevent concrete, curing water, plasticizers, water-reducing agents and air-entraining agents from entering the environment or streams.
  - .6 Prevent storm water from coming into contact with fresh concrete and producing runoff with unacceptable pH levels. Contractor to have OEM approved emergency containment plan in place & equipment on site.
  - .7 Refer to Environmental Consideration notes on sheet S-1.2 of the Contract Drawings.
- 2.1 Materials
- .1 Portland cement Type GU with fly ash replacement to CAN/CSA-A3000.
  - .2 Blended hydraulic cement: Type 10 to CAN/CSA-A3000.
  - .3 Supplementary cementing materials: to CAN/CSA-A3000.
  - .4 Cementitious hydraulic slag: to CAN/CSA-A3000.
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- .5 Water: to CAN/CSA-A23.1-14.
  - .6 Aggregates: to CAN/CSA-A23.1-14. Coarse aggregates to be normal density.
  - .7 Air entraining admixture: to ASTM C 260.
  - .8 Chemical admixtures: to ASTM C 494. DR to approve accelerating or set retarding admixtures during cold and hot weather placing.
  - .9 Concrete retarders: to ASTM C 494 water based, low VOC, solvent free. Do not allow moisture of any kind to come in contact with the retarder film.
  - .10 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents.
    - .1 Compressive strength: Min. 45 MPa at 28 days for bridge concrete deck and approach slabs; Min. 35 MPa at 28 days for all other applications.
    - .2 Consistency:
      - .1 Fluid: to ASTM C 827. Time of efflux through flow cone (ASTM C939), under 30s.
      - .2 Flowable: to ASTM C 827. Flow table, 5 drops in 3s, (ASTM C109, applicable portion) 125 to 145%.
      - .3 Plastic: to ASTM C 827. Flow table, 5 drops in 3 s, (ASTM C109, applicable portions) 100 to 125 %.
      - .4 Dry pack to manufacturer's requirements.
    - .3 Net shrinkage at 28 days: maximum 0%.
  - .11 Do not use calcium chloride.
  - .12 No chemical substances other than specified herein shall be added to concrete mix or applied to the surface of concrete without Approval by the DR.
- 2.2 Mixes
- .1 Design and proportion concrete mix to meet design strength requirements. Include consideration of weather, temperature, curing, shrinkage and methods of concrete placement.
  - .2 Proportion Type GU normal density concrete in accordance with CAN/CSA-A23.1-14, Clause 14 to give the following, unless specified otherwise:
    - .1 Minimum compressive strength at 28 days: Min. 45 MPa at 28 days for bridge concrete deck and approach slabs; Min. 35 MPa at 28 days for all other applications.
    - .2 Maximum water-cement ratio: 0.40 for all bridge structural components applications; 0.50 for steel pipe concrete infill.
    - .3 Calcium chloride or admixtures containing calcium chloride are not to be used in concrete.
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- .4 Supplementary cementing materials by weight of Portland cement: fly ash up to 20% for bridge concrete deck and approach slab; 25% for precast box girder; up to 40% for all other applications.
  - .5 Minimum cementing materials content: 355 kg/cubic metre.
  - .6 Class of exposure: C-XL for bridge precast prestressed concrete box girder; C1 for bridge CIP deck and approach slabs and all substructure elements; F1 for steel pipe pile concrete infill.
  - .7 Nominal maximum size of coarse aggregate: 20 mm.
  - .8 Slump at time and point of discharge: 80 mm plus or minus 20 mm.
  - .9 Air content: 5% to 8 %.
  - .10 Air-dry Specific Gravity of minimum of 2.3.
  - .11 Corrosion inhibitor: Cathodic corrosion inhibitor, to ASTM C1582/C1582M, at 20L per cubic metre of concrete (in accordance with manufacturers specifications).
  - .12 Chemical admixtures: to ASTM C494. DR to approve accelerating or set retarding admixtures during cold and hot weather placing. Corrosion-inhibiting admixtures to slow the rate at which chlorides and moisture enter the concrete may be required to reduce the rate of chlorides reacting with reinforcing steel. Super plasticizers require DR's approval.
  - .3 Maintain the temperature at discharge between 10 degrees and 18 degrees Celsius unless approved otherwise by the DR.
  - .4 Certify that the plant, equipment and all materials to be used in concrete comply with the requirements of CAN/CSA A23.1.
  - .5 Certify that mix proportions selected will provide concrete of specified quality and yield and that strength will comply with CAN/CSA A23.1.
  - .6 Chemical admixtures other than those specified are to be reviewed by the DR prior to their use.
  - .7 All concrete shall be normal weight of 2400 kg/m<sup>3</sup> unless noted otherwise.
  - .8 Concrete cover for principle reinforcing bar shall be as follows, unless specified otherwise:
    - .1 Surfaces places in contact with ground: 100mm
    - .2 Formed surfaces exposed to ground or weather: 70mm.
    - .3 Bridge deck top surfaces: 60mm.
    - .4 Precast concrete girder:
      - .1 Reinforcing steel: 30mm.
      - .2 Prestressing strands: 40mm.
    - .5 Other applications not mentioned above: 50mm.
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**PART 3 -**  
**EXECUTION**

- 3.1 Preparation
- .1 Provide 24 hours' notice to DR for approval prior to placing of concrete. In riparian areas and areas of watercourses, 24 hours' notice to, and approval by OEM is also required.
  - .2 Pumping of concrete is permitted only after approval of equipment and mix.
  - .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
  - .4 Prior to placing of concrete obtain DR's and EOM's approval of proposed method for protection of concrete during placing and curing in adverse weather.
  - .5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
  - .6 Do not place load upon new concrete until authorized by DR.
- 3.2 Construction
- .1 Do cast-in-place concrete work in accordance with CAN/CSA-A23.1/A23.2 and RSIC reinforcing steel manual of standard practice.
  - .2 Do not place concrete older than 2 hours from batch time.
  - .3 Formwork shall be approved by the DR prior to placing concrete.
  - .4 Finishing.
    - .1 Finish concrete in accordance with CAN/CSA-A23.1.
    - .2 Use procedures acceptable to DR or those noted in CAN/CSA-A23.1 to remove excess bleed water. Ensure surface is not damaged.
    - .3 Provide broomed or troweled smooth non-slip finish as appropriate unless otherwise indicated.
- 3.3 Curing Protection
- .1 Protect fresh concrete from adverse weather.
  - .2 Cure and protect concrete in accordance with CSA-A23.1. Existing concrete shall have a minimum temperature of 10 degrees Celsius when new concrete is being placed against it.
  - .3 Curing compounds will be permitted.
  - .4 Protect freshly placed and consolidated concrete against damage or defacement from curing methods or adverse weather conditions.
- 3.4 Field Quality Control
- 1 Site tests: conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit report DR:
    - .1 Concrete pours.
    - .2 Slump.
-

- .3 Air content.
  - .4 Compressive strength at 7 and 28 days.
  - .5 Air and concrete temperature.
  - .2 Appoint and pay for services of a CCIL certified testing agency(s), to provide full testing services of sampling and testing of concrete in accordance with CAN/CSA-A23.1 and Section 01 45 00 – Quality Control.
  - .3 Frequency of testing: Sufficient number of tests shall be made to ensure a uniform slump of concrete.
    - .1 Minimum of one set of cylinders per day or per 50 cubic metres.
    - .2 Minimum one slump test shall be made with every strength test and every second air test.
    - .3 An air content determination shall be made with every strength test.
  - .4 Take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete that they represent.
  - .5 Inspection and testing by DR will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.
- 3.5 Cleaning
- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
  - .2 Concrete truck washout: For washing out concrete trucks within the Park boundaries the following procedures shall be followed: unless all cement waste including wash water is captured and treated prior to release into an area approved by the DR.
  - .3 Concrete truck washout: For washing out concrete trucks within the Park boundaries the following procedures shall be followed:
    - .1 Onsite Temporary Concrete Washout Facility
      - .1 Temporary concrete washout facilities shall be located a minimum of 30m from storm drain inlets, open drainage facilities, and Watercourses.
      - .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.
      - .3 Straw bales, wood stakes, and sandbag materials can be used to construct temporary containment walls or “barriers”.
      - .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.
      - .5 The soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.
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- .6 Perform washout of concrete mixer trucks in designated areas only.
  - .7 Wash concrete from mixer truck chutes into approved concrete washout facility or collect in an impermeable bag for disposal.
  - .8 Pump excess concrete in concrete pump bin back into concrete mixer truck.
  - .9 Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed offsite.
  - .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 applicable regulations.
- .2 Maintenance and Inspection of Temporary Concrete Washout Facilities
- .1 Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 100 mm for above grade facilities and 300 mm for below grade facilities.
  - .2 Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition.
  - .3 Existing facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.
  - .4 Temporary concrete washout facilities shall be inspected for damage (i.e. tears in PVC liner, missing sand bags, etc.)
  - .5 Onsite concrete waste storage and disposal procedures should be monitored at least weekly or as directed by the DR or OEM.
- .3 Removal of Temporary Concrete Washout Facilities
- .1 Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled and restored.
- .4 Onsite Concrete Management
- .1 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 DR in areas that drain well away from Watercourses. Surplus amounts in excess of one cubic metre are to be returned to the batching yard.
  - .2 Water contaminated in the placing of cement and curing of concrete shall be contained and removed from the site to an approved disposal facility.
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- .3 The concrete batching plant must be operated pursuant to applicable dust, air emission, and water quality control regulations.
- .4 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 DR.
- .4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
  - .1 Divert unused concrete materials from landfill to local gravel pit after receipt of written approval from the DR.
  - .2 Provide appropriate area on job site where concrete trucks and be safely washed.
  - .3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by the DR.
  - .4 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
  - .5 Prevent admixtures and additive materials from entering drinking water supplies or streams.
  - .6 Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial and National regulations.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement and Payment
- .1 The unit price bid for cast in place concrete wall curb shall be full compensation for all work necessary and incidental and include, but not be limited to preparing the sub-base, forming, concrete supply, placing, stripping of forms, finishing, and materials testing to the dimensions and grades indicated on Drawings and as directed by the DR.
  - .2 Include heating of water and aggregates and providing cold weather protection.
  - .3 Include cooling of concrete and providing hot weather protection.
  - .4 Include on-site and laboratory testing of concrete by third-party field staff.
    - .1 Frequency of testing: at least once every 10 m<sup>3</sup> of concrete and in accordance with approved Quality Control Plan.
  - .5 Measure for payment for wall curb shall be per linear metre measured along the front face of the curb and accepted by the DR.
- 1.2 References
- .1 Master Municipal Specifications, Platinum Edition (2009):
    - .1 Section 03 30 20 - Concrete Walks, Curbs and Gutters. Delete clause 1.4, Measurement and Payment, and Clause 2.0, Products.
  - .2 Section 03 30 00 – Cast-in-place Concrete

**PART 2 - PRODUCTS**

- 2.1 Materials
- .1 Concrete to Section 03 30 00 – Cast-in-place Concrete:
    - .1 Compressive strength: 32 MPa at 28 days.
    - .2 Air content: 5 to 8 %.
    - .3 Slump at time and point of discharge: 80 mm plus or minus 20 mm. Nominal maximum size of coarse aggregate: 20 mm. .4 Concrete exposure class: C1

**PART 3 - EXECUTION**

- 3.1 Work
- .1 All work shall be in accordance with Master Municipal Specifications, Platinum Edition (2009) Section 03 30 20 - Concrete Walks, Curbs and Gutters.
  - .2 All work shall conform to the environmental conditions and restrictions stated in Section 03 30 00 – Cast-in-place Concrete, Clauses 1.6 and 1.7

**END OF SECTION**

**PART 1 – GENERAL**

- 1.1 Measurement and Payment
- .1 Measurement for payment for precast prestressed concrete bridge girders shall be at the unit price for each girder by count and as accepted by the DR.
  - .2 Payment for precast concrete bridge girders, as described above, shall be made when the individual units are delivered to Pacific Rim National Park and accepted by the DR.
- 1.2 References
- .1 American Society for Testing and Materials International (ASTM)
    - .1 ASTM A143/A143M, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
    - .2 ASTM A955 Standard Specification for Deformed and Plain Stainless Steel Bars.
    - .3 ASTM C260-[10a(2016)], Standard Specification for Air-Entraining Admixtures for Concrete.
    - .4 ASTM C 494, Standard Specification for Chemical Admixtures for Concrete.
    - .5 ASTM C 1602, Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
    - .6 ASTM D412-[15a], Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
    - .7 ASTM D2240-[15], Standard Test Method for Rubber Property - Durometer Hardness.
  - .2 Canadian Construction Documents Committee (CCDC)
    - .1 CCDC 2-[2008], Stipulated Price Contract.
  - .3 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.
  - .4 Canadian Standards Association (CSA International)
    - .1 CSA-A23.1/A23.2-[2014], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
    - .2 CSA-A23.3-[14], Design of Concrete Structures.
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- .3 CSA-A23.4-[16], Precast Concrete - Materials and Construction.
  - .4 CAN/CSA-A3000-[13], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
  - .5 CSA-A3001-[13], Cementitious Materials for Use in Concrete.
  - .6 CAN/CSA-G30.18-[09(R2014)], Billet-Steel Bars for Concrete Reinforcement.
  - .7 CAN/CSA-G30.14, Deformed Steel Wire for Concrete Reinforcement.
  - .8 CAN/CSA-G40.20/G40.21-[2013], General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .9 CAN/CSA-G164-[M92(R2003)], Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .10 CAN/CSA-S6-[2014], Canadian Highway Bridge Design Code.
  - .11 CSA-W47.1-[09(R2014)], Certification of Companies for Fusion Welding for Steel.
  - .12 CAN/CSA W48-[2014], Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
  - .13 CSA-W59-[13], Welded Steel Construction (Metal Arc Welding) (Metric version).
  - .14 CSA-W186-[M1990(R2012)], Welding of Reinforcing Bars in Reinforced Concrete Construction.
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- 1.3 Design Requirements .1 Design precast prestressed concrete elements to CSA-A23.3 and CSA-A23.4 to carry handling stresses.
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- 1.4 Qualifications .1 Fabricate precast prestressed concrete girder by manufacturing plant certified in appropriate category 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 bid and to specifically verify as part of tender that plant is currently certified in appropriate category.
  - .3 Only precast elements fabricated in such certified plants to be acceptable to the DR and plant certification to be maintained for duration of fabrication, erection and until warranty expires.
  - .4 Welding companies certified to CSA-W47.1.
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- 1.5 Delivery, Storage and Handling
- .1 Deliver, handle and store precast units according to manufacturer's instructions.
  - .2 During storage and hauling, the precast concrete girders shall be maintained in an upright position and shall be supported within 50 mm on the inside of the bearing area. Where girders are to be erected within 6 months of the fabrication date short blocking may be required from the date of manufacture to facilitate desired camber as required by the DR. Extreme care shall be exercised during the handling and storage of the precast girders to avoid twisting, cracking or other distortion that may result in damage to the concrete girder.
  - .3 The lifting devices shall be of such a nature as to avoid twisting, racking or other distortions while handling, storing, moving and erecting the girders. The devices shall be anchored fully to the main body of concrete. It is the Fabricator responsibility to design devices for girder lifting and shipping. Those device locations and details shall be clearly indicated on the girder shop drawings which to be provided to the DR for approval.
  - .4 The Fabricator shall be responsible for the design, supply, installation and removal of lateral stability bracing for girders as may be required during the Contractor's handling and transporting of the girders.
  - .5 No loose timber blocking will be permitted for use a temporary works for any aspect of girder handling and hauling.

## PART 2 - PRODUCTS

- 2.1 Materials
- .1 Portland cement Type GU with 25% fly ash replacement to CAN/CSA-A3000.
  - .2 Concrete minimum compressive strengths: 40MPa at transfer; 60 MPa at 28 days.
  - .3 Concrete exposure: Class C-XL.
  - .4 Max Aggregate size as per CSA A23.1: 20mm.
  - .5 Fly ash: up to 25% by mass of cement material.
  - .6 Admixtures upon Approval of DR:
    - .1 Air-entraining admixtures shall conform to the requirements of ASTM C 260.
    - .2 Chemical admixtures shall conform to the requirements of ASTM C 494 or ASTM C 1017 for flowing concrete. All chemical admixtures shall be suitable for use in precast concrete, be supplied by the same manufacturer as the air entrainment agent and be compatible with each other.
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- .3 Acceptable admixtures are air entraining agents, superplasticizers, and water reducing agents. The addition of calcium chloride, accelerators, retarders or set controlling admixtures and air reducing agents will not be permitted.
  - .7 Blended hydraulic cement: Type GU (formerly Type 10) to CAN/CSA-A3000.
  - .8 Supplementary cementing materials: to CAN/CSA A3001.
  - .9 Water: to CSA-A23.1/A23.1.
  - .10 Hardware and miscellaneous materials: to CSA-A23.1/A23.2.
  - .11 Forms: to CSA-A23.4.
  - .12 Reinforcing steel: to CAN/CSA-G30.18M Grade 400 W and as specified on the Contract Drawings.
  - .13 Deformed steel wire: A497-01 or equivalent, with a minimum yield strength of 485MPa.
  - .14 The prestressing strength strand for precast concrete girder shall be in accordance with the size and ultimate strength as shown on the Drawings, ASTM 416/416M and the followings:
    - .1 Tagging: Size of strand, coil number, heat number and the mark of the Manufacturer shall be recorded on a tag attached securely to each reel. The tag shall also identify the strand with its own stress-strain curve.
    - .2 Stress-Strain Curves: One stress-strain curve shall be provided by the Manufacturer for each reel
  - .15 Testing: Should DR consider it necessary, approval of the prestressing strand, in addition to the requirements of ASTM 416/416M, shall be based on tests carried out by the Fabricator at his expense in a testing laboratory satisfactory to the DR. The Fabricator shall test a minimum of three representative specimens of the DR to be used in the girders. The results of these tests shall be supplied to the DR. The DR may also require the Fabricator to supply additional representative specimens for independent testing if the results are deemed unsatisfactory or inconclusive. Concrete girder stirrup projections and CIP deck rebar: Low carbon/chromium reinforcing steel: to ASTM A1035/A1035M alloy type CS with a minimum yield strength of 690MPa and a design strength of 500MPa.
  - .16 Anchors and supports steel: to CAN/CSA-G40.21 Type 300W.
  - .17 Welding materials: to CSA W48.
  - .18 Welding electrodes: to CSA W48 certified by Canadian Welding Bureau.
  - .19 Galvanizing: hot dipped galvanizing with minimum zinc coating of 610 g/m<sup>2</sup> to CAN/CSA-G164.
  - .20 Steel primer: to CAN/CGSB-1.40 MPI #23.
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- .21 Zinc-rich primer: to CAN/CGSB-1.181 MPI #18.

All material supplied by the Fabricator that in the opinion of the DR has been damaged or otherwise rendered unusable by improper storage or handling by the Fabricator shall be replaced by the Fabricator at his expense.

- 2.2 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 after fabrication and touch up primer on anchors after welding. Do not apply primer to embedded portion of anchor or inserts.
  - .5 Galvanize anchors after fabrication and touch up with zinc-rich primer after welding.
  - .6 Minimum age before placement shall be 30 days.
- 2.3 Finishes
- .1 Finish units to standard grade to CSA-A23.4.
  - .2 The top surfaces of precast concrete box girders shall be finished to produce even indentations at right angles to the longitudinal centreline of the girders. The indentations shall be 6 mm (minimum), full amplitude and spaced not greater than 15 mm apart.
  - .3 Immediately after the removal of the forms, all defects in the concrete shall be repaired as per approved methodology and notify the Engineer, provided the defects are not extensive enough to cause rejection of the girder. Should the top surface exhibit excessive laitance or “frothing” or any other deleterious effects, the Fabricator shall repair the concrete to the satisfaction of the DR.
  - .4 Honeycomb, if any, shall be repaired as soon as the forms are taken off. When approved by the DR, repairs shall be accomplished by: saw cutting a regular pattern around the damaged area to a minimum depth of 2/3 the depth of concrete cover (keeping clear of any reinforcing steel); chipping concrete back for a constant depth along the edges; removing all concrete that is loose or that is not bonded thoroughly to the surrounding concrete; washing the sound concrete with clean water; using a wire brush to remove any loose particles; applying an approved epoxy bonding agent to the patch area after the surface has thoroughly dried; and patching with a high strength non-shrink grout. Patched areas shall be ground flush and true with the surrounding surface after the cementitious grout has hardened and gained sufficient strength.
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- .5 All objectionable fins, projections, offsets, streaks and other surface imperfections shall be removed totally to the DR's acceptance.
- 2.4 Curing
- .1 Concrete shall be either moist cured for a minimum of 72 hours from the time of casting or steam cured until the concrete has reached a strength (40MPa) as shown on the Contract Drawings. The accelerated curing cycle for the precast concrete shall be as specified for moisture category damp in CSA A23.4, Table 2 – Accelerated Curing Cycle.
- .2 If steam curing is used, it shall not be applied until after the initial set has taken place. Initial set shall be considered to have taken place 4 hours after the completion of concrete placing. The cylinders used to determine the concrete strength shall be cured under the same conditions as the girder in question.
- .3 From the time of pre-tensioning to the time of initial set, the ambient air temperature of the girder shall not vary by more than 3°C. During steam curing, the rise in ambient air temperature shall not exceed 15°C per hour to a maximum temperature of 60°C.
- .4 Once curing has been completed, the temperature of the concrete shall not be allowed to fall at a rate exceeding 20°C per hour.
- .5 The girder, including any patched areas, shall be properly cured and stored within the plant a minimum of three (3) days. The Fabricator shall monitor the rate of cooling of the girder and avoid thermal shock from prematurely subjecting the girder to freezing temperatures. The Fabricator shall not subject any girder to freezing temperatures before the girder has reached 85 percent of the design strength (60MPa) as shown on the Contract Drawings.
- 2.5 Quality Control
- .1 The Fabricator shall be responsible for all quality control testing identified in this Specification. All testing shall be completed by qualified personnel who are certified at the time of testing as ACI/ CSA-based Concrete Field Testing Technicians, Grade 1.
- .2 The Fabricator shall be responsible for maintaining an up-to-date record of "Record of Concrete Strength" form shall be prepared for each girder and the strengths of the test cylinders, as well as the pertinent data, including concrete compressive strengths at release, yarding and 28 days, shall be listed in the same order as the batches of concrete were placed in the forms. A complete set of test results shall be submitted to the DR within 7 days after the date that the 28-day cylinders from the last girder were tested.
- .3 All costs involved in performing and recording the previously mentioned tests shall be the responsibility of the Fabricator.
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- .4 The Fabricator/ Contractor to provide the DR with certified copies of quality control tests related to this project as specified in CSA-A23.4.
  - .5 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and provide to the DR for review upon request.
- 2.6 Quality Assurance
- .1 Each unit shall be certified as acceptable by the DR before it is shipped to the Project site from the shop.

**PART 3 - EXECUTION**

Not Applicable

**END OF SECTION**

**PART 1 – GENERAL**

- 1.1 Measurement and Payment
- .1 Payment for erection and installation of bridges and elevated trail components shall be included in unit prices tendered for site preparation and miscellaneous work of each type and length of bridge structure or elevated trail as accepted by the DR.
- .2 Payment for site preparation and installation of each type and length of bridge and elevated trail shall also include preparing the site, delivering all materials and equipment to each site, erection and installation of the various components of the structure, and all other materials, labour, and equipment required to complete the structure and not specified elsewhere for payment.
- .3 Measurement for payment for each type of bridge and length will be made by count. Payment will be made at the end of each payment period for the portion of structure completed and accepted by the DR. The percentage of the payment shall be determined by the DR.
- .4 Measurement for payment for the elevated trail will be made by the linear metre measured along the center line of the elevated trail. Payment will be made at the end of each payment period for the portion of elevated trail completed and accepted by the DR.
- .5 Measurement for payment for the railings on the elevated trail will be made by the linear metre measured along the center line of each railing installed. Payment will be made at the end of each payment period for the portion of railing completed and accepted by the DR.
- 1.2 References
- .1 CSA-A23.1/A23.2-[2014], Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.
- .2 CSA-A23.3-[14], Design of Concrete Structures.
- .3 CSA-A23.4-[16], Precast Concrete - Materials and Construction.
- .4 CAN/CSA-G40.20/G40.21-[2013], General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .5 CAN/CSA-S6-[2014], Canadian Highway Bridge Design Code.
- .6 Section 03 30 00 – Cast-in-place Concrete, Clauses 1.6 – Environment, Waste Management and Disposal and 1.7 – Protection.
- 1.3 Materials Supplied by PCA
- .1 P A will supply to the Contractor without charge the following timber for use in the bridges and elevated trail. The Contractor shall be responsible for pick up of the material and delivery to the construction site. Wood required that is not listed is the responsibility of the Contractor to supply.
- .1 2,241 pieces of 200mm X 75mm X 4300mm deck planking for elevated trail.
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- .2 640 pieces of 40mm X 175mm X 1215mm long rounded wood rails for bridge #3 railings
- 1.4 Pre-Erection Meeting .1 Contractor is to arrange a meeting between the erection engineer and the DR to go over the erection procedures. Erection procedures are only to be carried out once approval has been given by the DR.
- 1.5 Erection Requirements .1 For the purpose of this specification, bridge components refer to foundation piles, elevated trail supports, elevated boardwalk, precast concrete girder, railings and structural steel and timber components.
- .2 The Contractor shall install the bridge components in accordance with the Contract Specifications and Drawings.
  - .3 The Contractor is at liberty to develop the methods and procedures for erection based on the Contractor's preferred mean, amount and type of equipment, while meeting all the requirements of the Contract. The Contractor shall ensure that erection equipment is suitable and of appropriate size to access the bridge sites from both sides of the bridge without further clearing of trees. The contractor shall be responsible for the design, supply and installation of temporary works to facilitate moving cranes and supporting equipment and related vehicles, including materials deliveries to the abutment locations from the access points on Highway 4 and Wick Road.
  - .4 An Erection Engineer, registered in Province of British Columbia, shall perform the following for erection of the bridge components:
    - .1 Ensure the strength and stability of all structural components under erection loading, during all stages of erection, and including service level stresses during erection.
    - .2 Make calculations for strength requirements based on the erection method, erection materials, equipment, sequences and temporary structures.
    - .3 Make erection drawings for each type of structure. The drawings shall include details of the bridge component installation sequence, grouting operation sequence, required falsework or temporary supports, bracing, guys, deadmen, lifting equipment and members, and location of lifting points on members.
      - .1 Erection drawings will show in detail or shall clearly describe temporary structures, falsework, and general features and capacities of erection equipment and how they are attached to the permanent structure.
      - .2 The erection calculations and drawings shall be based on the Contract Documents and the design criteria stated in the Contract Drawings.
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- .3 Revised erection drawings shall be submitted should the erection method change for any structure type.
- .4 Submit erection drawings and calculations to the DR two weeks prior to starting erection of the specified structure and in accordance with 01 33 00 - Submittal Procedures.
- .5 The Erection Engineer shall assume responsibility for correctness, strength and sufficiency of the permanent structure during erection, and falsework, equipment and other construction of temporary work.
- .6 Erection of the elevated boardwalk sections shall utilize a method that will avoid damage to the native ground. Equipment will be required to work from already installed elevated boardwalk spans or from outside of the wetland areas.
- .7 Contractor shall use light construction vehicle and equipment- less than 40 kN to erect boardwalk and install helical pile.
- .8 Contractor shall monitor elevated boardwalk and helical pile deflection during equipment movement and pile installation operation. Temporary shoring or strengthening may be required to ensure structure stability. No separate payment will be made for these temporary shoring to complete the Works.
- .9 Any damage bridge and elevated boardwalk timber decking on structural components such as girder chips, cracks and pile damage resulting from the Contractor's erection and or operations shall be cause for rejection of the structural component. If the component is damaged, a repair procedure sealed by a Professional Engineer shall be submitted to the DR for review and acceptance. If a component is damaged to an extent which the DR deems to be beyond repair, the component shall be rejected and a new component shall be fabricated at the Contractor's expense to replace it.
- .10 Any bridge and elevated boardwalk structural components installed out of acceptable tolerance resulting from the Contractor's erection and or operations shall be cause for rejection of the component. If the component is out of tolerance, a repair procedure sealed by a Professional Engineer shall be submitted to the DR for review and acceptance. If a component is deviated to an extent which the DR deems to be beyond repair, the component shall be rejected and a new component shall be fabricated at the Contractor's expense to replace it.
- 1.6 Qualifications
- .1 The Erection Engineer shall be a register Professional Engineer with the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC).
- .2 The Checking Engineer shall be a register Professional Engineer with the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC).
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- .3 Erection engineers must have at least 2 years of experience on similar projects.
  - .4 The qualifications of the Erection Engineer and Checking Engineer shall be submitted to the Departmental Representative for review and approval. The DR reserves the right to reject any Erection Engineer at anytime during construction should they have reasonable doubt as to the ability of the Erection Engineer to successfully perform or complete the erecting engineering services in accordance with the Contract.
- 1.7 Erection Drawings .1 The erection drawings shall show in detail the method of erection including, but not limited to, the following:
- .1 Erection procedures.
  - .2 Equipment to be used.
  - .3 Layout or general arrangement drawings showing the layout of the members, equipment positing, and access roads.
  - .4 Crane make, model, and capacity charts, boom length(s), crane placement, and access for transporting of members to crane(s).
  - .5 Radii and loads for crane lifts.
  - .6 Rigging details.
  - .7 Mass of members, rigging and installation equipment.

**PART 2 – PRODUCTS** Not Applicable

**PART 3 – EXECUTION**

- 3.1 Lifting and Protection .1 Lifting and handling methods shall be such as to prevent damage to the bridge components. When appropriate, special slings or lifting points shall be utilized erection.
- 3.2 Field Assembly .1 A professional engineer registered with APEGBC shall be responsible for any field designs and any changes made to the erection procedures. Field designs and changes to the erection procedures must be documented and sealed by the responsible professional engineer and must be available the Site prior to the affected erection work being carried out. Reissued erection drawings shall be in accordance with 1.6.1 of this specification.
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- 3.3 Elevated Trail Installation .1 The elevated trail passes through bog and wetlands that are sensitive to ground disturbances and changes to the existing conditions which may cause future water levels to fluctuate beyond normal levels. Methods for construction shall be employed by the Contractor to minimize ground disturbance and changes in future water levels.
- .2 Work to construct the elevated trail shall take place from the end of the previously installed elevated section. This will require that the equipment installing the helical piles work from the end of the previously installed section and complete the installation of the next set of helical piles and steel supports. This equipment shall then make way for, or be utilized as, equipment to install the timber panel. The process will be repeated until the section of elevated trail is complete with neither equipment, materials, or personnel disturbing the natural ground.
- 3.4 Structural Steel Erection .1 The Contractor shall erect the structural steel, remove any temporary construction and do all work required to complete the erection in accordance with the drawings and these specifications. No drilling of additional holes or any other modifications including field welding shall be made to steel elements other than deck joints. Lifting devices shall not be welded to the girders. The Contractor shall not erect the structural steel until the substructure concrete has been cured a minimum of three days and achieved 80% of the 28-day specified concrete strength requirement. Without restricting generality, erection includes:
- .1 Erecting of temporary supporting structures.
  - .2 Removing anchor bolt grout can lid.
  - .3 Erecting of structural steel.
  - .4 Placing of expansion assemblies.
  - .5 Touching up painting as required.
- .2 Transportation, Handling and Storing Materials
- .1 Girders and beams shall be transported in the vertical position. However, these elements may be transported in other positions provided:
    - .1 A Professional Engineer registered in the Province of British Columbia shall determine static and dynamic forces during handling, transportation, and storage using a dynamic load allowance of 100%. Computed stresses shall be according to CAN/CSA-S6-14, Clause 10.10 and the maximum cyclic stress range shall not exceed the constant amplitude fatigue threshold for the appropriate fatigue categories specified in CAN/CSA-S6, Table 10.4. All the calculations and associated sketches, including reasons why the girders cannot be shipped with the webs in the vertical plane, shall be submitted by the Contractor to the DR for review two weeks prior to shipping. The calculations and sketches shall be signed and sealed by the Engineer who
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performed the analysis and includes a written statement that the proposed method will not damage the elements.

- .2 Upon arrival at the site and prior to erection, the elements shall be checked by the Contractor in the presence of the DR to ensure all tolerances are met. The Contractor shall provide an adequate flat storage area for the inspection.
- .3 Any structural steel member damaged during transportation, handling, storing or erection shall be immediately reported to the DR. The Contractor shall provide an engineering assessment report prepared by a Professional Engineer experienced in evaluation and inspection of damaged steel members.
- .4 The DR will also arrange to have an independent inspection and assessment performed on the damaged member. The Contractor shall provide at least three working day notice for the inspection and facilitate all the activities associated with the inspection. All costs associated with the independent inspection will be the responsibility of the Contractor.
- .5 Material to be stored shall be placed on timber blocking. It shall be kept clean and stored in a properly drained area. Girders and beams shall be placed upright and shored. Long members, such as deck joint assemblies, buffer angles, columns and chords, shall be supported on timber blocking to prevent damage from deflection.

### .3 Bridge Girders

#### .1 Temporary Supporting Structures and Berms

- .1 The temporary supporting structures and berms shall be designed, constructed and maintained.
  - .2 To safely support all loads. Berms shall be constructed in a manner and of such materials that they will not be eroded by stream flow nor introduce silt into the water. The Contractor shall prepare and submit drawings for the DR's review for temporary supporting structures and berms where applicable. Review of the Contractor's drawings shall not be considered as relieving the Contractor of any responsibility. All drawings submitted shall bear the seal of a Professional Engineer registered in BC.
  - .3 Temporary supporting structures and/or berms will not be permitted to remain in any stream channel during spring break-up or runoff periods, unless all necessary approvals have been obtained from pertinent agencies and prior written acceptance obtained from the DR.
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- .4 Repair to any damage to property, such as earth fills and stream banks, resulting from the existence of berms, shall be the responsibility of the Contractor.
- .2 Review of Erection Procedure
  - .1 The Contractor shall submit to the DR, for record purposes and for examination four copies of the detailed erection procedure four weeks in advance of the scheduled start of erection. The erection procedure shall include all drawings and documents necessary to describe the following:
    - .1 Traffic Accommodation Strategy (TAS), as applicable.
    - .2 Access to work, earth berms and work bridges.
    - .3 Type and capacity of equipment. Cranes shall be used for handling and erecting structural steel girders.
    - .4 Sequence of operation including position of cranes, trucks with members.
    - .5 Position of cranes relative to substructure elements such as abutment backwalls, with details of load distribution of wheels and outriggers.
    - .6 Lifting devices and lifting points.
    - .7 Details of temporary works, supporting structures drawings including proposed methods to be used to ensure the required splice elevations and structure shape prior to bolt torquing, method of providing temporary supports for stability, top of girder elevations at each bearing and each splice location where appropriate.
    - .8 Bolt tightening sequence.
    - .9 Grout Pad Construction. Refer to section 6.3.2.10 of these Specifications.
    - .10 Details of release of temporary supporting structures.
    - .11 Provide an “As-Constructed” detailed survey of the substructure showing the following:
      - .1 Location and elevation of all bearing grout pad recesses including anchor bolt voids.
      - .2 Shim height at each bearing location,
      - .3 Top of girder elevations at each bearing and each splice location where appropriate.

- .4 Longitudinal measurements between centre line of bearings of all substructure elements.
- .2 The erection procedure shall bear the Seal of a Professional Engineer registered in BC, who shall assume full responsibility to ensure that his erection procedure is being followed. Safety and compliance with the Occupational Health and Safety Act and Regulations thereunder, shall be an integral part of the design.
- .3 The Contractor shall continue to be fully responsible for the results obtained by the use of these sealed drawings, with the Professional Engineer also assuming responsibility, as the Contractor's Agent, for the results obtained.
- .4 Site work shall not commence until review of the proposal by the DR has been obtained. The Contractor's project manager and field superintendent may be required to attend a pre-job meeting at a location determined by the DR prior to commencement of any field work.
- .5 The DR's review shall not be considered as relieving the Contractor of the responsibility for the safety of his methods or equipment, nor from carrying out the work in full accordance with the drawings and specifications.
- .6 Before erection begins the Contractor shall do a complete superstructure layout by means of chalk lines and markings applied to all substructure units, showing bearing and girder positions in accordance with the Contractor's reviewed layout plan.
- .3 Fall Protection for Girder Erection and Deck Forming
  - .1 In order to provide a safe working area for girder erection and deck formwork, the Contractor shall provide 100% fall protection and a safe work procedure.
- .4 Straightening Bent Material
  - .1 Straightening of plates, angles or other shapes will not be permitted without the acceptance of the DR. In all cases a detailed procedure in writing must be submitted by the Contractor and reviewed prior to any straightening being undertaken.
  - .2 Following the accepted straightening of a bend or buckle, the surface of the metal shall be carefully inspected for evidence of fractures, which may include non-destructive testing. All costs shall be the responsibility of the Contractor.

.5 Assembly

- .1 The parts shall be accurately assembled as shown on the drawings and all match-marks shall be followed. The material shall be carefully handled to avoid damage. Hammering, which will injure or distort the members, shall not be permitted.
- .2 Splices and field connections shall have one half of the holes filled with bolts and cylindrical erection pins (half bolts and half pins evenly distributed throughout the splice or connection) before bolting. Splices and connections carrying traffic during erection shall have three-fourths of the holes filled.
- .3 Fitting-up bolts shall be of the same nominal diameter as the bolts, and cylindrical erection pins shall be sized to accurately fit the holes.
- .4 Should adjustments in elevation of the girder splices become necessary, to allow free rotation of the joint, only enough pins or bolts shall be removed.

.6 High-Tensile-Strength Bolted Connections

.1 General

Bolted parts shall fit solidly together when assembled. Contact surfaces, including those adjacent to the washers, shall be de-scaled or carry the normal tight mill scale. Contact surfaces shall be free of dirt, paint, oil, loose scale, burrs, pits and other defects that would prevent solid seating of the parts. Bolts in exterior girders shall be installed with the heads on the outside face of the girder web and on the bottom faces of lower flanges unless otherwise noted. Nuts for bolts that will be partially embedded in concrete shall be located on the side of the member that will be encased in concrete.

Connections shall be assembled with a hardened washer under the bolt head or nut, whichever is the element turned in tightening. Surfaces of bolted parts in contact with the bolt head and nut shall be parallel.

For sloped surfaces, bevelled washers shall be used. The bevelled washers shall be designed to produce a bearing surface normal to the bolt axis.

Bolts shall be of new quality and stored in weatherproof containers to prevent loss of lubrication or accumulation of dirt.

All girders shall be erected with elevations and alignments checked by the DR, prior to any bolt tightening unless otherwise accepted by the DR.

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.2 Turn-of-nut tightening

Tightening of all high strength bolts shall be by the turn-of-nut method. Before final tightening there shall be a sufficient number of bolts brought to a “snug tight” condition to ensure that the parts of the joint are brought into full contact with each other. Snug tight is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. Following this initial operation, bolts shall be placed in any remaining holes in the connection and brought to snug tightness. After all bolts have been taken to the snug tight condition, the Contractor shall match mark the outer face of each nut and protruding end of bolt to have a common reference line to determine the relative rotation. All bolts in the joint shall then be tightened additionally by the applicable amount of nut rotation specified below, with tightening progressing systematically from the most rigid part of the joint to its free edges. During this operation there shall be no rotation of the part not turned by the wrench.

Amount of rotation of nut relative to bolt, regardless of which is turned:

- .1 1/3 turn where bolt length is 4 bolt diameters or less
- .2 1/2 turn where bolt length is over 4 bolt diameters and not exceeding 8 bolt diameters
- .3 2/3 turn where bolt length exceeds 8 bolt diameters

Notes:

- .1 Tolerance 1/6 turn (60°) over, nothing under.
- .2 Length of bolt measured from underside of head.

.3 Reuse of Fasteners

High strength bolts shall be tensioned only once and shall not be reused. Retightening previously tightened bolts, which may have been loosened by tightening of adjacent bolts shall not be considered as reuse.

.4 Inspection

The Contractor shall provide safe and adequate access meeting Occupational Health and Safety requirements to all working areas, including all necessary scaffolding to enable the DR to carry out his inspection. The Contractor shall provide a competent workman to assist the DR in the checking of bolt tightening work.

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- .5 Misfits
  - .1 The correction of minor misfits involving any reaming, cold cutting and chipping for secondary members may be allowed. However, if reaming is considered required, it shall be immediately reported to the DR. The Contractor shall submit a repair procedure to the DR for review. If accepted, the repairs shall be made in the DR's presence.
- .6 Girder Adjustment
  - .1 It is essential that the girders are erected with utmost attention being given to girder positioning, alignment, and elevation. Adjustment to girder position, bearing location and bearing elevation shall be done in order to achieve as closely as possible the lines and grades shown on the Drawings.
- .7 Removal of Temporary Supporting Structures, Berms, and Clean-Up
  - .1 Upon completion of the erection and before final acceptance, the Contractor shall remove all earth material or temporary supporting structures placed in the stream channel or elsewhere during construction. Contractor shall remove all piling, excavated or surplus materials, rubbish and temporary buildings, replace or renew any damaged fences, and restore in an acceptable manner all property damaged during the execution of his work. Disposal of surplus materials shall be in a manner and location satisfactory to the DR.
  - .2 The Contractor shall leave the bridge site, roadway and adjacent property in a neatly restored and presentable condition, satisfactory to the DR. When required, he shall provide written evidence that affected property owners or regulatory agencies have been satisfied.
  - .3 All steel shall be left clean and free of oil, grease, mud, dust, road spray or other foreign matter.

**END OF SECTION**

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**PART 1 -  
GENERAL**

- 1.1 Section Includes .1 Materials and installation for precast concrete fences.  
.2 Materials and installation for precast concrete roadside barriers.  
.3 Materials and installation for precast concrete parking curbs.
- 1.2 Measurement for Payment .1 The unit prices bid for these items shall be full compensation for all work necessary and incidental for the supply, delivery, and installation of all precast concrete specialty items, indicated in the Contract Drawings and as directed by the DR.  
.2 Payment for precast concrete roadside barriers shall be at the unit price tendered for each type of barrier supplied, installed and accepted by the DR. Measurement shall be by count for each type.  
.3 Payment for relocation of existing precast concrete roadside barriers shall be at the unit price tendered for each section of barrier relocated and accepted by the DR. Measurement shall be by count for each type of relocation, Relocate within distance of boom truck; or relocation from storage area to roadside.  
.4 Payment for each height of concrete fence shall be at the unit price tendered for each linear metre of fence of each height installed and accepted by the DR. Payment shall include bush and tree clearing to accommodate the fence, excavation, ground levelling, setting bracing the posts in concrete, setting the panels and all associated work to complete the installation. Measurement shall be by the linear metre along the face of the concrete fence.  
.5 Payment for precast parking curbs shall be at the unit price tendered for each curb supplied and installed including supply and setting of the steel pins. Measurement shall be by count for each parking curb installed and accepted by the DR.  
.6 Payment for precast concrete sign and railing bases shall be included in the unit rates tendered for those items and not paid for as separate items.  
.7 Payment for precast concrete retaining wall components (LockBlock or equal and Segmental Blocks) shall be included in the unit rates tendered for retaining walls and not paid for as separate items.
- 1.3 Related Sections .1 Section 03 30 00 – Cast-in-place Concrete.  
.2 Section 01 74 21 – Waste Management and Disposal.  
.3 Section 01 35 00 – Special Procedures for Traffic Control.
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- 1.4 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 products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.
  - .3 Shop Drawings:
    - .1 Submit shop drawings produced specifically for the project for review.
- 1.5 References
- American Society for Testing and Materials International, (ASTM)
- .1 ASTM C109/C109M, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50 mm Cube Specimens).
  - .2 ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.
  - .3 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.
  - .4 ASTM C827, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
  - .5 ASTM C939, Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
- Canadian Standards Association (CSA)/CSA International
- .1 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A5-98, A8-98, A23.5-98, A362-98, A363-98, A456.1-98, A456.2-98, A456.3-98).
    - .1 CAN/CSA-A5-98, Portland Cement.
    - .2 CAN/CSA-A23.5-98, Supplementary Cementing Materials.
  - .2 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
  - .3 CAN/CSA-A23.4/A251, Precast Concrete - Materials and Construction/Qualification Code for Architectural and Structural Precast Concrete Products.
  - .4 CAN/CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement.
  - .5 CSA G30.5, Welded steel wire fabric.
- 1.6 Delivery Storage and Handling
- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements and with manufacturers' 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 dry location and in accordance with manufacturer's recommendation in clean, dry, well-ventilated area.
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- .2 Store and protect steel from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Exercise care during fabrication, transportation, and erection of steel products.
- .4 Develop Construction Waste Management Plan related to Work of this section and in accordance with Section 01 35 33 – Health and Safety Requirements, and Section 01 74 21 – Waste Management and Disposal.
- .5 Packaging Waste Management: Return for recycling pallets, crates, padding, and packaging in accordance with Sections 01 35 33 – Health and Safety Requirements, 01 35 43 – Environmental Procedures, and 01 74 21 – Waste Management and Disposal.

PART 2 -  
PRODUCTS

- 2.1 Materials
    - .1 Concrete mixes and materials to Section 03 30 00 – Cast-in-place Concrete.
    - .2 Curb anchors: steel dowels or pins to CAN/CSA-G30.18, minimum 15 mm diameter x 600 mm length.
  - 2.2 Parking Curbs
    - .1 Fabricate: to CAN/CSA-A23.4/A251, 280 mm wide x 150 mm high x 2134 mm long.
    - .2 Minor adjustments to the above dimensions shall be considered for acceptance.
    - .3 Finish: Commercial grade finish.
    - .4 Fabricate 2 holes per unit, to permit securing with curb anchors.
    - .5 Curb anchors: steel dowels or pins to CAN/CSA-G30.18, minimum 15 mm diameter x 600 mm length.
  - 2.3 Concrete Roadside Barriers
    - .1 Fabricate: to CAN/CSA-A23.4/A251.
    - .2 Concrete roadside barriers shall be manufactured to the specifications and dimensions of the Ministry of Transportation and Infrastructure Standard Specifications for Highway Construction, 2016, Section 924 - Precast Reinforced Concrete Barriers.
    - .3 Approximately 95 sections of concrete barriers are located at the Parks Canada storage yard at the Airport. The Contractor shall relocate these for use as roadside barriers along Highway 4.
    - .4 Approximately 24 sections of concrete roadside barriers are located as an existing barrier at the Esowista curve. The Contractor shall relocate these barriers approximately 3 metres to a new alignment for use as roadside barriers.
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- 2.4 Concrete Fence .1 Fabricate: to CAN/CSA-A23.4/A251.
- .2 Concrete fence panels shall be nominally 1460 mm X 305 mm X 45 mm thick with wood texture finish to both sides.
- .3 Alternate dimensions shall be considered to produce a fence with a finished height of 2.13 metres nominal height.
- 2.5 Concrete Blocks for Retaining Walls .1 Fabricate: to CAN/CSA-A23.4/A251.
- .2 Concrete LockBlocks (or approved equal) shall be nominally 750 mm X 750 mm X 1500 mm with smooth finish to the exposed side. All corners shall be chamfered.
- .3 Walls shall have a stepped top block (for LockBlock walls) or cap blocks affixed to the top to manufacturers recommendations.
- .4 Segmental block walls shall have a split face finish on the exposed surface.

### PART 3 – EXECUTION

- 3.1 Installation of Roadside Concrete Barriers .1 Concrete roadside barriers shall be installed as described in the specifications and dimensions of the BC Ministry of Transportation and Infrastructure Standard Specifications for Highway Construction, 2016, Section 924 - Precast Reinforced Concrete Barriers.
- .2 Steel rails shall be installed on the barriers that are not separated from the trail by over 2.0 m horizontally or one metre vertically where the trail is below the shoulder of the road.
- .3 Replace damaged and defective units as directed by the DR.
- 3.2 Installation of Concrete Fences .1 Verification of Conditions: verify conditions of ground surface to determine acceptability for product installation in accordance with manufacturers' written instructions.
- .2 Inform the DR of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation after unacceptable conditions have been remedied and after receipt of written approval to proceed from the DR.
- .4 Remove debris and correct ground undulations along construction line to obtain a smooth uniform gradient.
- .5 Excavate post hole to a depth of 900 mm and diameter of 400 mm.
- .6 Install members true to line, levels and elevations, square and plumb.
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- .7 Space line posts a maximum of 2400 mm apart, measured parallel to the ground surface, as indicated on the drawings, or as specified by the Manufacturer.
  - .8 Place posts in post holes, plumb and level for fence and brace in place.
  - .9 Place concrete in post holes, extending concrete 40 mm above ground level and slope to drain away from post.
  - .10 Allow concrete in post holes to cure a minimum of 48 hours before installing the fence panels.
  - .11 Fence panels shall step down to a height of 900mm at intersections to provide clean sight lines for vehicles.
- 3.3 Installation of Parking Curbs
- .1 Position precast concrete curb to the location and alignment shown on the Contract Drawings or as directed by the DR.
  - .2 Secure each parking curb into place by driving two steel pins into the ground and flush with the top of the parking curb.
  - .3 Replace any curbs damaged during delivery or installation.

**END OF SECTION**

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**PART 1 - GENERAL** This specification is for the supply, fabrication, delivery and erection of structural steel and associated materials. Structural steel shall include steel girders, trusses, diaphragms, bracing, splice plates, deck drains, anchor bolts, dowels, deck joint assemblies, buffer angles, connector angles, anchor bolt sleeves, curb and median cover, trough plates, pier nose plates, steel caps, capitals pier bracing and miscellaneous components.

- 1.1 Measurement and Payment .1 Payment for the Supply of Structural Steel Girders and Associated Material will be made on the basis of the lump sum price bid. Items to be included in Supply of Structural Steel and Associated Material shall be as indicated on the Contract Drawings.
- .2 Payment for the Delivery of Girders shall be included in the costs for installation and shall include full compensation for the costs to deliver all structural steel and associated materials to the bridge site including necessary approvals and permits from the Motor Transport Board and/or the appropriate local road authorities. Cleaning of girders to remove any foreign material will be considered incidental to the work and no separate payment will be made.
- .3 Payment for the Erection of Girders shall be included in the costs for installation and shall include full compensation for the cost of furnishing all materials, labour, tools, equipment, and incidentals necessary to acceptably erect the structural steel girders and associated material and complete site clean-up.
- 1.2 References .1 ASTM International
- .1 ASTM A325M-14, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength.
- .2 ASTM A123 Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .3 ASTM A153M-16a Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .4 ASTM A490M-04a, Standard Specification for High-Strength Steel Structural Bolts, Classes 10.9 and 109.3, For Structural Steel Joints.
- .2 American Association of State Highway and Transportation Office
- .1 AASHTO- LRFD bridge design specification.
- .2 AASHTO- LRFD bridge construction specifications.
- .3 AASHTO-Steel bridge erection guide specification.
- .4 the American Welding Society (AWS) -Bridge Welding Code, D.1.5.
- .3 Canadian Standards Association (CSA International)
- .1 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
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- .2 CSA S6-14, Canadian Highway Bridge Design Code.
- .3 CSA G164-92 (R2003) Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 CAN/CSA-S16, Limit States Design of Steel Structures.
- .5 CSA W47.1, Certification of Companies for Fusion Welding of Steel.
- .6 CSA W59 Welded Steel Construction (Metal Arc Welding).
- .4 Canadian Institute of Steel Construction (CISC)
  - .1 Handbook of Steel Construction.
- .5 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International
  - .1 NACE No. 3/SSPCE SP-6, Commercial Blast Cleaning.

## PART 2 - EXECUTION

- 2.1 Supply and Fabrication
    - .1 A pre-fabrication meeting is required prior to commencement of fabrication of structural steel girders, trusses, finger plate deck joint assemblies or when any other specialized construction is included in the Contract. The meeting will be held at fabricator's plant and the Contractor shall ensure the plant superintendent and plant manager responsible for the work and any manufacturer's representatives directly involved in the specialized work are in attendance. The DR will conduct this meeting after the shop drawings and welding procedures have been reviewed. The Contractor shall provide two weeks notice to the DR prior to the meeting.
    - .2 Standards
      - .1 Fabrication of structural steel shall conform to "AASHTO LRFD Bridge Construction Specifications" and the American Welding Society (AWS) - Bridge Welding Code D1.5.
      - .2 Where imperial/metric conversions are necessary, The National Standard of Canada, CAN3- Z234.1-79 shall be used as the basis of conversion.
      - .3 All welding, cutting and preparation shall be in accordance with the AWS - Bridge Welding Code, D1.5. The fabrication of steel structures composed of structural tubing shall be in accordance with the American Welding Society (AWS) – Structural Welding Code D1.1.
    - .3 Qualification
      - .1 The Contractor shall notify the DR weeks prior to fabrication of any subcontractors in his employ. The Contractor shall remain responsible for the work of the subcontractors. All terms of the contract, such as Canadian Welding Bureau (CWB) approval and Canadian Institute of Steel Construction (CISC) certification and right of access shall apply to
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- the subcontractor.
- .2 The fabricator shall operate a recognized steel fabricating shop by the Consultant.
  - .3 The fabricator shall be fully approved by the CWB as per Canadian Standards Association (CSA) Standard W47.1 in the following Divisions:
    - .1 Fabrication of steel girders, girder components and welded steel trusses Division 1
    - .2 All other bridge components Division 1 or Division 2
    - .3 Field welding / repairs Division 1 or Division 2
  - .4 In addition fabricators of steel girders, girder components and welded steel trusses shall be certified by the Canadian Institute of Steel Construction (CISC) as meeting the quality compliance requirements in the category of steel bridges.
  - .5 Only welders, welding operators and tackers approved by the CWB in the particular category shall be permitted to perform weldments. Their qualifications shall be current and available for examination by the DR.
- .4 Engineering Data
- .1 Review of Plate Arrangement for Welded Plate Girders
    - .1 Prior to the placing of material orders, the Contractor shall submit to the DR for review, three copies of sketch drawings showing the general description of the proposed fabrication scheme. This shall include the general arrangement of plates or shapes, the location of all shop and field splices and such other information as may be requested by the DR to permit an assessment of the acceptability of the proposal.
  - .2 Welding Procedures
    - .1 Welding procedures, including Welding Procedure Datasheets shall be submitted for each type of weld used in the structure. The procedures shall bear the approval of the CWB and shall also be reviewed by the DR prior to use on the structure.
  - .3 Shop Drawings
    - .1 Five copies of the shop drawings showing all details shall be prepared by the Contractor and submitted to the DR for review prior to fabrication. The shop drawings shall be legible and of adequate quality to be reproduced and microfilmed. Each drawing shall have a sufficient blank space for the DR's review
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stamp. The DR's review of the shop drawings shall not be construed as relieving the Contractor from his responsibility for errors or omissions. All shop drawings will be stamped as follows: "This review applies to general arrangements and details of design but not to dimensions or details of fabrication and is subject to the requirements of specifications and to such corrections as may be marked here on".

- .2 Fabrication shall not commence prior to the review of the shop drawings.
  - .3 In addition to specific details, the shop drawings shall include the following:
    - .1 Drawings showing details of connections designed by the Contractor shall bear the signature and stamp of a Professional Engineer registered in the Province of British Columbia.
    - .2 All dimensions shall be correct at 20°C unless otherwise noted.
    - .3 Weld procedure identification shall be shown on the shop drawings in the tail of the weld symbols.
    - .4 All material splice locations shall be shown on the drawings.
    - .5 Shop assembly drawings shall indicate camber and splice joint offsets measured to the top of top flange at a maximum spacing of 4 m.
  - .4 Proposed Fabrication Sequence and Equipment
    - .1 Prior to commencement of fabrication, the Contractor shall present for review an outline of the fabrication sequence and details of equipment which will be used for the fabrication. The fabrication scheme shall include the order of make-up and assembly of all the component parts, as well as shop assembly, inspection stations, and surface preparation. If any equipment causes repeated defective work as determined by the DR, it shall be substituted with a suitable alternative.
  - .5 Mill Certificates
    - .1 Mill certificates shall be provided for all material before fabrication commences.
  - .6 Schedules
    - .1 The Contractor shall provide and keep current and complete fabrication schedule in a form satisfactory to the DR.
  - .5 Materials
    - .1 Structural Steel
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- .1 Structural Steel shall conform to the standard noted on the drawings. Interpretation of equivalent steels will be as per Appendix “A” of the CSA Standard G40.21 (1976 only). Mill certificate data and results of impact tests shall be provided to the DR for review and acceptance prior to shipment of material from the mill to provide sufficient time for replacement or for heat treating of material that does not meet the specification.
  - .2 Repair of steel plates or rolled shapes by welding at the producing mill is not permitted.
  - .3 Where mill test certificates originate from a mill outside Canada or the United States of America, the Contractor shall have the material tested and the mill test certificate verified by a Canadian laboratory. This laboratory shall be certified by an organization accredited by the Standards Council of Canada to comply with the requirements of ISO/IEC 17025 for the specific tests or type of tests required by the material standard specified on the mill test certificate. The mill test certificates shall be stamped with the name of the Canadian laboratory and the signature of an authorized officer. It shall state that the material is in conformance with the specified Contract requirements.
- .2 Bolts
- .1 All bolts shall conform to American Society for Testing and Materials (ASTM) Standard A325 or shall meet property class 8.8 of the Industrial Fasteners Institute for metric high strength structural bolts. The nuts shall be conformed to ASTM A563 and harden washers shall conform to ASTM F436. Metric bolts shall be marked with the symbol A325M and those of “weathering” steel shall have the A325M symbol underlined. Weathering steel nuts shall be marked with three circumferential lines or shall be marked with a symbol “3”. Weathering steel washers shall be identified by a symbol “3”. Certified mill test reports for the fastener material shall be provided.
  - .2 For bolts supplied from a manufacturer outside Canada or the United States of America, the above information shall be verified by a Canadian testing laboratory as outlined in clause 6.2.4.1.
  - .3 Stud Shear Connectors
    - .1 All stud shear connectors shall conform to the chemical requirements of ASTM Standard A108, Grades 1015, 1018 or 1020. In addition, they shall meet the mechanical properties specified in AWS D1.5, Table 7.1 for Type B studs. Certified mill test reports for the stud material shall be provided.
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**.6 Welding****.1 Filler Metals & Welding Processes**

Low hydrogen filler, fluxes and low hydrogen welding practices shall be used throughout. The deposited weld metal shall provide strength, durability, impact toughness and corrosion resistance equivalent to base metal. The low hydrogen covering and flux shall be protected and stored as specified by AWS Standard D1.5. Flux cored welding or use of cored filler wires in the submerged arc process or shielding gas process are not considered as conforming to low hydrogen practice. These methods will not be permitted.

**.1 Submerged Arc Welding (SAW)**

.1 Submerged arc welding process is allowed for all flat and horizontal position welds. All flange and web butt joints shall be made by an approved semi or fully automatic submerged arc process. All web to flange fillet welds and all longitudinal stiffener to web fillet welds shall be made by an approved fully automatic submerged arc process.

**.2 Shielded Metal Arc Welding (SMAW)**

.1 Shielded metal arc welding is allowed for girder vertical stiffener to flange fillet welds and for miscellaneous components such as deck drains, bridge bearings, deck joint assemblies, pier nose plates and buffer angles.

**.3 Metal Core Arc Welding (MCAW)**

.1 Metal core welding process utilizing low hydrogen consumables with AWS designation of H4 is allowed for vertical stiffeners and horizontal gussets of the girders and miscellaneous components such as deck drains, bridge bearings, deck joint assemblies, pier nose plates and buffer angles.

.2 Field application of metal core arc welding is not allowed.

**.2 Cleaning Prior to Welding**

.1 Weld areas must be clean, free of mill scale, dirt, grease, and other contaminants prior to welding.

**.3 Tack and Temporary Welds**

.1 Tack and temporary welds shall not be allowed unless they are to be incorporated in the final weld. Tack welds, where allowed, shall be of a minimum length of four times the nominal size of the weld and length shall not exceed 15 times the weld size, and shall be subject to the same quality requirements as the final welds. Tack welds shall be sufficiently ground-out prior to final

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weld in order to obtain a uniform weld bead. Cracked tack welds shall be completely removed prior to re-welding.

**.4 Run-off Tabs**

- .1 Run-off tabs shall be used at the ends of all welds that terminate at the edge of a member. The tab shall be a minimum of 100 mm long unless greater length is required for satisfactory work. They shall be tack welded only to that portion of the material that will not remain a part of the structure, or where the tack will be welded over and fused into the final joint. After welding, the tabs are to be removed by flame cutting, not by breaking off.

**.5 Preheat**

- .1 Preheat requirements shall be performed and maintained as per AWS D1.5, except that all welds on girder flanges shall be preheated to a minimum temperature of 100°C unless a higher temperature is required by AWS D1.5 for the flange thickness. The preheat temperature of the web to flange joint shall be measured 75 mm from the point of welding on the side of the flange opposite to the side where the weld is being applied.

**.6 Welding at Stiffener Ends**

- .1 To prevent notching effects, stiffeners and attachments fillet welded to structural members shall have the fillet welds terminate 10 mm short of edges.

**.7 Submission for Repair Procedures**

- .1 The Contractor shall submit repair procedures for damaged base metal and unsatisfactory weldments, prepared by a Professional Engineer registered in the Province of British Columbia for review by the DR prior to repair work commencing.

**.8 Arc Strikes**

- .1 Arc strikes will not be permitted. In the event of accidental arc strikes, the Contractor shall submit to the DR for review a proposed repair procedure. The repair procedure shall include the complete grinding out of the crater produced by the arc strike. These areas will be examined by the DR to ensure complete removal of the metal in the affected area.

**.9 Grinding of Welds**

- .1 Flange butt welds shall be ground flush or to a specified slope on both sides. Web butt welds which are sufficiently smooth with a neat appearance and uniform profile as determined by the DR will not require grinding. Fillet welds shall be continuous with uniform size and profile. At locations which are not conforming to acceptable profile shall be ground to the proper profile without
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substantial removal of the base metal. Grinding shall be smooth and parallel to the line of stress. Caution shall be exercised to prevent over grinding. Acceptability of the welds without grinding will be determined by the DR.

.10 Plug and Slot Welds

- .1 Plug welds or slot welds shall not be permitted.

.11 Welding of Girder Flanges and Webs

- .1 With the exception of longitudinal web to flange welds, all stiffeners, gusset plates, or any other detail material welded to girder flanges shall be a minimum of 300 mm from the flange butt welds.
- .2 With the exception of longitudinal web to flange welds and longitudinal stiffeners to web welds, all stiffeners, gusset plate, or any other detail material welded to girder webs shall be a minimum of 300 mm from the web butt welds.

.7 Fabrication

- .1 Fabrication shall be performed in a fully enclosed area which is adequately heated. The shop temperature shall be at least 10°C.

.1 Heat Number Transfer

As the plate is subdivided for webs and flanges, all heat numbers shall be transferred to each individual section. The numbers shall remain legible until such time as the material location in the final assembly has been recorded. Mill identification numbers stamped into the material shall be removed by grinding at an appropriate time.

.2 Cutting of Plate

- .1 All plate material for main members, splice plates and any plate material welded to the main member shall be flame cut using an automatic cutting machine.

.3 Flange Stripping

- .1 All flange material shall be cut so that the direction of the applied stress will be parallel to the direction of the plate rolling.

.4 Flame Cut Edges

- .1 The flame cut edges of girder flanges shall have a maximum Brinell hardness as stated by section 6.2.8.10. The surface roughness of the flame cut edge shall not be greater than ANSI B46.1 500 inch. (12.7m) and be such that as to allow Brinell hardness testing without spot grinding. The Consultant will perform Brinell hardness
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tests at random on the as is flame cut edge. If the hardness exceeds the requirements, the Contractor shall submit for review, his procedures for repairing the edges to meet the requirements. The surface of flame cut apertures shall be finished by grinding and shall be free of nicks and gouges.

- .2 The Contractor shall report all blow backs or signs of lamination observed during the cutting of the material. In case of plate lamination, the Contractor at his expense shall arrange for a CAN/CSA 178.1 certified NDT company to determine the extent. The ultrasonic testing technician shall be certified to Level II of CGSB. The report shall be prepared by a Professional Engineer registered in the Province of British Columbia indicating the material is suitable for the girder fabrication and shall be forwarded to the DR for review and acceptance of the material.

- .5 Additional Material Splices

- .1 Additional splices, other than those shown on the shop drawings, will require review and acceptance of the DR. The Contractor shall bear the cost of inspection of these splices.

- .6 Vertical Alignment

- .1 The structure shall be fabricated to conform to the requirements of the deflection and vertical curve, as noted on the drawings. For rolled shapes, advantage shall be taken of mill camber that may be inherent in the material.

- .7 Shop Assembly

- .1 Plate Girders

Shop assembly of girders shall be by the progressive assembly method according to AASHTO LRFD Bridge Construction Specifications, except that only two, instead of three, sections need to be assembled. The detailed method of assembly, including points of support, dimensional checks, method of trimming to length, drilling and marking of splices, shall be to the procedure submitted for review by the DR. Each individual girder section shall meet the camber requirements for that particular length, with the splices between these sections falling on the theoretical camber line for the entire span. Correction for variation in flange thickness must be considered. When the camber of the

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girder fails to meet the required tolerance, the Contractor shall submit a proposed method of repair for review by the DR. The adjustment for camber will not be allowed without the prior review of the procedure and supervision of the repairs by the DR. The camber of each individual girder section must be known for the next two girder sections in the girder line prior to shop assembly of any particular girder section. This is to allow the Consultant to call for the best fit line to reduce the effect of any camber differences should it be deemed necessary. Camber for plate girders will be measured on the top of the top flange. The camber of plate girders shall be measured in the “no load” condition.

.2 Drilling

All splices where applicable shall be drilled from solid material while assembled or shall be sub-punched or sub-drilled and then reamed to full size while in the shop assembly position. No reaming shall take place until acceptance of the assembly has been obtained from the DR.

.8 Splice Plates

- .1 After shop assembly, splice plates and girders shall be clearly match marked to assure proper orientation and location of splice material for erection. All holes shall align with holes in the attached member. Splice plates shall then be removed, de-burred, solvent cleaned to remove all oil and sandblasted to remove all mill scale, in order to provide a suitable faying surface. These plates shall then be securely ship-bolted to the girders. The match marking system shall be shown on the drawings.

.9 Bolt Holes

- .1 Clause 11.4.8 of AASHTO LRFD Bridge Construction Specifications shall apply except that all bolt holes in load carrying segments of main members and any material welded to main members shall be drilled full size or sub-punched 5 mm smaller and reamed to full size. Punching of full-size holes for secondary members such as bracings which are not welded to main member is allowed for material less than 16 mm thick. All holes in girder shall be circular and perpendicular to the member and shall be deburred inside and outside to ensure a proper faying surface.
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.10 Dimensional Tolerances

.1 Normal tolerance for structural steel fabrication and fitting between hole groups will be  $\pm 3$  mm unless specified otherwise. The dimensional tolerances for structural members shall be within the AWS Standard D1.5, Section 3.5, except as otherwise noted below:

.1 Combined Warpage & Tilt

Combined warpage and tilt of flange at any cross section of welded I-shape beams or girders shall be determined by measuring the offset at the toe of the flange from a line normal to the plane of the web through the intersection of the centerline of the web with the outside surface of the flange plate. This offset shall not exceed  $1/200$  of the total width of the flange or 3 mm whichever is greater at bolted splice location. Bolted splices of main stress carrying members shall have parallel planes and the surfaces shall be in full contact without any gap.

.2 Girder Camber

Camber of beams and girders shall be uniform, true and accurate to the centreline of the top flange. Permissible variation in camber shall be within  $\pm (0.2Lt + 3)$  mm; where  $Lt$  is the test length in metres. This applies to fabricated pieces only, prior to shop assembly. During shop assembly, splice points shall be located on the theoretical camber line or at a specified amount from the line should the DR choose to correct for shop camber deviations.

Where field splices are eliminated by combining girder segments into longer girder lengths, the cambers of the girders at the eliminated splice points shall be within  $\pm 3$  mm.

.3 Splices

Fill plates shall not be permitted at main girder field splices unless specified. The tolerance for girder depth shall be as specified by AWS D1.5, except that the difference between similar dimensions of the adjoining sections being spliced shall not exceed  $\pm 3$  mm.

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**.4 Fitted Stiffeners**

The Bearing ends of bearing stiffeners shall be flush and square with the web and shall have at least 75% of this area in contact with the flanges whereas fitted stiffeners may have a gap of up to 1 mm between stiffener and flange.

**.5 Facing of Flanges**

Surfaces of flanges which are in contact with bearing sole plates shall have a flatness tolerance of 0.001 x bearing dimension.

**.6 Bearing to Bearing Dimension**

Bearing to bearing distance is a set dimension and therefore has no tolerance.

**.11 Flange Corner Chamfer**

.1 Corners of all flanges shall be ground to a 2 mm chamfer. Corners of stiffeners, structural sections and plates shall be ground to a 1 mm chamfer.

**.12 Milling Tolerances**

.1 Tolerance for milled to bear stiffeners shall be 0.05 mm with at least 75% of the area in bearing.

**.13 Web Panning**

.1 The maximum variation from flatness for webs shall be 0.01d where d is the least dimension of the panel formed by the girder flanges and/or stiffeners. Should the panning in one panel convex and the panning in the adjacent panel concave then the sum of the panning in the two adjacent sections shall not exceed that allowed for one panel. Localized deformation in the web shall not exceed 3 mm in 1 m.

**.14 Field Weld Preparation**

.1 All material to be field welded shall be prepared in the shop.

**.15 Flame Straightening**

.1 Flame straightening shall not be performed on any material or member without a written request to the DR. The Contractor shall submit a procedure stating location, temperatures and cooling rates, to the DR for review. Straightening shall only be performed in the presence of the DR.

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- Nuts, and Special Threaded Fasteners with additions and exceptions as described in this specification.
- .2 The fabricator shall provide a smooth finish on all edges and surfaces and remove all weld spatter and all welding flux residue from the steel components prior to galvanizing.
  - .3 Repair of galvanizing shall only be done if bare areas are infrequent, small, and suitable for repair. A detailed repair procedure shall be submitted for review prior to its use. It should be noted that repairs may require complete removal of the galvanized coating and re-galvanizing.
  - .4 Repair shall be in compliance with ASTM A780, Method A3 “Metallizing”. However repair for areas not exceeding 100 mm<sup>2</sup> may be done in accordance with ASTM Method A1 “Repair Using Zinc-Based Alloy”. The thickness of the coating for both methods shall be 180 µm, and the repair tested for adhesion. The finished appearance shall be similar to the adjacent galvanizing. The DR will determine the acceptability of repaired areas.
- .9 Testing and Inspection
- .1 Access
    - .1 The Contractor shall provide full facilities for the inspection of material and workmanship. Free access shall be allowed to the DR to all parts of the works. When required by the DR, the Contractor shall provide needed manpower for assistance in checking layout and performing inspection duties.
  - .2 Responsibility
    - .1 The Contractor shall provide full facilities for the inspection of material and workmanship. Free access shall be allowed to the DR to all parts of the works. When required by the DR, the Contractor shall provide needed manpower for assistance in checking layout and performing inspection duties.
  - .3 Testing by the Contractor
    - .1 The exception to section 6.2.8.3 is that additional inspection required by the DR shall be paid by the Contractor for the following conditions:
      - .1 Any repair work during the course of cutting, welding, fabrication or handling.
      - .2 Evaluation of any defective material by the DR.
      - .3 Additional unspecified material splices
      - .4 Any test records made by the fabricating shop in the course of normal quality control shall be open to the DR for inspection.
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- .4 If defects are found during testing, additional areas will be tested to ensure the quality of welds.
  - .7 Radiographic Inspection of Miscellaneous Material
    - .1 Unless otherwise noted, radiographic inspection of miscellaneous material will be performed by the Contractor in accordance with the following schedule:
      - .1 100% of all tension members.
      - .2 100% of all tension members.
    - .2 The radiographic inspection report and the film shall be provided to the DR within 48 hours of the completion of inspection.
  - .8 Magnetic Particle Inspection Schedule
    - .1 Unless otherwise noted, magnetic particle inspection of welded plate girders will be performed in accordance with the following schedule:
      - .1 50% of the web to flange welds or any fillet welds placed on flange plates.
      - .2 10% of the web to stiffener welds.
      - .3 100% of the stiffener to flange welds.
      - .4 100% of the bearing sole plate to flange welds.
      - .5 20% of the diaphragm connector plate welds.
      - .6 100% of all manual (SMAW) welds.
  - .9 Dye Penetrant Inspection
    - .1 Dye penetrant inspection will be performed in areas of the structure deemed necessary by the DR. In particular, the ends of the weld metal of all flange butt welds after the removal of runoff tabs will be inspected using this method. Defects discovered by this inspection shall be repaired by the Contractor, and the suspect area re-inspected.
  - .10 Hardness Tests
    - .1 Hardness tests will be performed on the flame cut edges of the girder flange prior to assembly. Unless otherwise noted, the hardness of the flame cut edges shall not exceed a maximum Brinell as noted below:
      - .1 For carbon steels with a yield strength less than and including 300 MPa, the maximum Brinell shall be 200 BHN.
      - .2 For carbon steels with yield strengths greater than 300 MPa, the maximum Brinell shall be 220 BHN.
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- .2 Remedial work to the edges which exceed the specified hardness shall be performed and re- inspected prior to assembly.
  - .11 Testing Stud Shear Connectors
    - .1 Stud shear connectors shall meet all requirements as outlined by AWS D1.5. When bend testing, the studs shall be bent towards the centre of the girder. All the remaining studs shall be tested by striking with a hammer. A dull sound indicates incomplete fusion and a bend test will then be required for a potentially defective stud to ensure the integrity.
  - .12 Inspection Schedules
    - .1 The Contractor shall ensure that adequate notice of scheduled inspection requirements be given to the DR and inspection agencies, and that access to the work is provided at all times. The Contractor shall provide the DR with his sequence of fabrication in order that the inspection program can be properly integrated and agreed to, prior to commencement of fabrication.
- 2.2 Structural Steel Erection .1 Refer to Section 03 41 01 – Erection and Installation of Bridge and Boardwalk.

**END OF SECTION**

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**PART 1 -  
GENERAL**

- 1.1 Measurement .1 and Payment      The unit prices bid for metal work this item shall be full compensation for all work necessary and incidental for the fabrication, delivery, and installing of the various items to the lines and grades shown on the Drawings and as directed by the DR.
- .2      Payment for metal railing shall be at the unit price bid for each type of railing. Measurement shall be by the linear metre measured along the top rail or by count for each section of railing as specific in the Table of Unit Prices. Payment will be made after the rail is accepted by the DR.
- .3      Payment for bridge railings shall be at the lump sum price bid for each type of bridge. Measurement shall be by count for each bridge length as specific in the Table of Unit Prices. Included are all metal components, wood rails, steel cable, and miscellaneous materials to complete and attach the rails as detailed in the structural drawings. Payment will be made after the rail is accepted by the DR.
- .4      Payment for each pair of bicycle baffles shall be at the unit price bid for each type of baffle supplied and installed. Measurement shall be by count of each pair. Payment will be made on the number of pairs of baffles installed and accepted by the DR.
- .5      Payment for each individual parking lot driveway gate and permanent access point gate shall be at the unit price bid for each width of gate supplied and installed. Measurement shall be by count. Included in the price of the driveway gate are two steel resting posts, one for the open position and one for the closed position and two reflective signs (200mm X 400mm) mounted on the arm. Payment will be made on the number of individual gates installed and accepted by the DR.
- 1.2 References    .1      ASTM International
- .1      ASTM A325M-14, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength Metric.
- .2      ASTM A123 Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .3      ASTM A153M-16a Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .4      ASTM A269 – 2A, Standard Specification for Seamless and welded Austenitic Stainless Steel Tubing for General Service.
- .5      ASTM A53/A 53M 53M-02 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded, and Seamless.
- .6      ASTM B26 – Standard Specifications for Aluminum Alloys or ASTM B108 - Standard Specifications for Aluminum Alloy Permanent Mold Castings.
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- .2 Canadian Standards Association (CSA International)
    - .1 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
    - .2 CAN/CSA G164-M92 (R1998) Hot Dip Galvanizing of Irregularly Shaped Articles.
  
  - 1.3 Related Sections
    - .1 Section 03 30 00 – Cast-in-place Concrete.
    - .2 Section 01 74 21 – Waste Management and Disposal.
  
  - 1.4 Action and Informational Submittals
    - .1 Submit shop drawings for baffles and gates in accordance with Section 01 33 00 - Submittal Procedures.
    - .2 Product Data:
      - .1 Submit manufacturer's instructions, printed product literature and data sheets for products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.
    - .3 Shop Drawings:
      - .1 Submit shop drawings for those items produced specifically for the project for review.
  
  - 1.5 Delivery Storage and Handling
    - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements and with manufacturers' 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 dry location and in accordance with manufacturer's recommendation in clean, dry, well-ventilated area.
      - .2 Store and protect steel from nicks, scratches, and blemishes.
      - .3 Replace defective or damaged materials with new.
      - .4 Exercise care during fabrication, transportation, and erection of steel products.
    - .4 Develop Construction Waste Management Plan related to Work of this section and in accordance with Section 01 35 33 – Health and Safety Requirements and Section 01 11 00 – General Instructions.
    - .5 Packaging Waste Management: remove for and return of pallets, crates, padding, packaging materials in accordance with Sections 01 11 00 – General Instructions, 01 35 33 – Health and Safety Requirements and 01 35 43 – Environmental Procedures.
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**PART 2 -  
PRODUCTS**

- 2.1 Materials .1 Structural steel: to CSA G40.20/G40.21, grade types 350W – Structural Steel. All steel galvanized to 600 g/m2 to CSA-G164.
- .2 Hollow sections: to CSA G40.20/G40.21 grade 350W class C.3
- .3 Miscellaneous steel to CSA G40.20/G40.21 grade 300W.  
All miscellaneous steel and connection material including threaded rods, wire ropes, lag screws, bolts, nuts and washers to be galvanized to 600 g/m2 to CSA-G164.
- .4 High strength bolts, nuts and washers: to ASTM A325M approved by DR.
- .5 Anchor bolts, lag screws, threaded rods, washers and nuts: to CSA 040.20/040.21, grade 300W or grade A36 to ASTM F1554.
- .6 Concrete mixes and materials to Section 03 30 00 – Cast-in-place Concrete.
- .7 Parking lot gates shall be fabricated from schedule 40 steel components, and to a standard forestry gate design. Minimum dimensions on components are 125 mm diameter pipe for posts, 100 mm diameter for resting posts, and 60 mm diameter for cross members. A mechanism for locking the gates in both the open and closed position by paddle lock (lock supplied by owner) shall be incorporated into the design. Reflective signs (200mm X 400mm) shall be attached to both sides of the gate arm.

**PART 3 -  
EXECUTION**

- 3.1 Examination .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturers' written instructions.
- .2 Inform DR of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation after unacceptable conditions have been remedied and after receipt of written approval to proceed from DR.
- 3.2 Grading .1 Remove debris and correct ground undulations along construction line to obtain a smooth uniform gradient.
- 3.3 Installation .1 Install members true to line, levels and elevations, square and plumb.  
on Ground .2 Construct continuous members from pieces of longest practical length.  
Surface .3 Excavate post holes to dimensions shown on drawings.
-

- .4 Space line posts as indicated on the drawings, measured parallel to the ground.
  - .5 Place precast footings or posts in post holes, plumb and level fence and brace in place.
  - .6 When precast footing is not used, place concrete in post holes, extending concrete 40 mm above ground level and slope to drain away from post. Concrete trucks shall not be washed out or surplus concrete disposed of within the Park boundaries.
- 3.4 Installation on Concrete Barrier
- .1 Install metal railing on concrete roadside barrier where shown on the Contract Drawings.
  - .2 Position each barrier centered on the concrete barrier supporting it.
  - .3 Place each railing plumb, using stainless steel washers where needed to plumb and level the rail and using 4 hilti anchors to fix railing in place.
- 3.5 Installation of Baffles and Gates
- .1 Remove debris and correct ground undulations along construction line to obtain a smooth uniform gradient.
  - .2 Excavate post holes for bike baffles to dimensions shown on drawings. For metal vehicle gates use similar dimensions and depths (750 mm diameter by 150 mm depth).
  - .3 Place precast footings or posts in post holes, plumb and level gate or baffle, and brace in place.
  - .4 For the parking lot driveway gate install two 100 mm diameter steel resting posts the concrete base shall be 300 mm diameter X 750 mm deep. The resting posts shall support the end of the swing gate in the open and in the closed positions.
  - .5 When precast footing is not used, place concrete in post holes, extending concrete 40 mm above ground level and slope to drain away from post. Refer to Section 03 30 00 - Cast-in-place Concrete, for requirements to wash out cement trucks within the Park.
  - .6 Adjust swing baffle or gates to ensure correct alignment prior to backfilling around precast footing or placing concrete for footing.
- 3.6 Protection
- .1 Protect installed products and components from damage during construction.
  - .2 Repair damage to adjacent works.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement and Payment .1 The costs for aggregates work shall be included in unit prices tendered for appropriate pay items in this Contract. No measurement will be made under this Section.
- 1.2 References .1 ASTM D4791-99, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.  
.2 CSA A23.1/A23.2 [2014], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- 1.3 Samples .1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.  
.2 Allow sampling by third-party testing agency during production.  
.3 Provide third-party testing agency with access to source and processed material for sampling if requested by DR.  
.4 Install sampling facilities at discharge end of production conveyor, to allow third party testing agency to obtain representative samples of items being produced. Stop conveyor belt when directed by third-party testing agency to permit full cross section sampling.  
.5 Do not stockpile material on site.
- 1.4 Related Sections .1 Section 01 25 20 - Mobilization and Demobilization.  
.2 Section 01 35 00 - Special Procedures for Traffic Control.  
.3 Section 01 35 43 - Environmental Procedures.  
.4 Section 01 56 00 - Temporary Barriers and Enclosures.  
.5 Section 01 74 11 - Cleaning.

**PART 2 - PRODUCTS**

- 2.1 Materials - General .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.  
.2 Aggregates brought into the Park must be free of invasive species plant materials and seeds. Equipment used to deliver and work with aggregates must also be free of invasive species. Washing of aggregates and equipment may be required. Invasive species plant management shall be in accordance with Section 01 35 43 – Environmental Procedures.
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- .3 Flat and elongated particles of coarse aggregate: to ASTM D4791.
  - .1 Greater dimension to exceed 5 times least dimension.
- .4 Fine aggregates satisfying requirements of applicable section to be one or blend of following:
  - .1 Natural sand.
  - .2 Manufactured sand.
  - .3 Screenings produced in crushing of quarried rock, boulders, or gravel.
- .5 Coarse aggregates satisfying requirements of applicable section to be one or blend of following:
  - .1 Crushed rock.
  - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
- .6 All crushed gravel when tested to ASTM C136 and ASTM C117 to conform to the following:
  - .1 Sieve sizes to CAN/CGSB-8.1.
  - .2 Crushed particles: at least 60% of particles by mass retained on 4.75 mm sieve to have at least one freshly fractured face.
- .7 A 50% blend of recycled asphalt product (RAP) will be considered for the Following products:
  - .1 Granular Base.
  - .2 Crushed Granular Sub-Base.
  - .3 Select Granular Sub-Grade Fill.

And the following conditions:

- .1 The RAP must have originated from work in Pacific Rim National Park Reserve.
  - .2 The RAP shall be crushed and blended to meet the specified gradations of the material it is supplementing.
  - .3 The RAP is free of any invasive species of plants.
- .8 The RAP is of sufficient age that the volatile organic compounds have been oxidized from the product.
-

- 2.2 Pit Run Gravel .1 To be well graded granular material, substantially free from clay lumps, organic matter and other extraneous material, screened to remove all stones in excess of maximum diameter specified in material description (300 mm Pit Run Gravel, 200 mm Pit Run Gravel, 100 mm Pit Run Gravel). Material to compact to specified density and conform to following gradations:

<b>Sieve Designation</b>	<b>% Passing</b>
(300mm dia)	(100)
(200mm dia)	(100)
(100mm dia)	(100)
75mm	100
50mm	70-100
25mm	50-100
4.75mm	22-100
2.36mm	10-85
0.075mm	2-8

- 2.3 Drain Rock .1 To consist of clean crushed rock conforming to the following gradations:

<b>Sieve Designation</b>	<b>% Passing</b>	
	<b>Coarse</b>	<b>Fine</b>
25.0mm	100	
19.0mm	0-100	
9.5mm	0-5	100
4.75mm	0	50-100
2.36mm		5-15
1.18mm		15-38
0.600mm		0-8
0.300mm		0-5
0.150mm		0-2
0.075mm		0

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- .2 Drain rock to be used only where specified on Contract Drawings. Use of drain rock other than as specified requires approval of DR after examination of soils against which drain rock will be placed.

- 2.4 Granular Pipe Bedding and Surround .1 Crushed stone or graded gravels to conform to the following gradations:

Sieve Designation	% Passing
25 mm	100
19 mm	90 – 100
12.5 mm	65 – 85
9.5 mm	50 – 70
4.75 mm	25 – 50
2.36 mm	10 – 35
1.18 mm	6 – 26
0.600 mm	3 – 17
0.075 mm	0 – 5

- 2.5 Granular Base .1 Granular base to conform to the following properties and gradations:
- .1 Crushed stone or gravel.
- .2 Gradation to:

Sieve Designation	% Passing
19 mm	100
9.5 mm	50 - 85
4.75 mm	35 – 70
2.36 mm	25 – 50
1.18mm	15 - 35
0.300 mm	5 – 20
0.180 mm	-
0.075 mm	0 - 5

- .3 Crushed particles: 60% of the material passing each sieve must have one or more fractured faces.

2.6 Crushed Granular .1 Crushed Granular Sub-base: to conform to the following:

Sub-Base

- .1 Crushed rock or crushed cobble.
- .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.
- .1 Gradation to:

Sieve Designation	% Passing
75 mm	100
38 mm	60 – 100
19 mm	35 – 80
9.5 mm	26 – 60
4.75 mm	20 – 40
2.36 mm	15 – 30
1.18 mm	10 – 20
0.600 mm	5 – 15
0.300 mm	3 – 10
0.075 mm	0 – 5

- .3 Liquid limit: to ASTM D4318, maximum 25.
- .4 Plasticity index: to ASTM D4318, maximum 6.
- .5 Crushed particles: 60% of the material passing each sieve must have one or more fractured faces.

2.7 Open Graded .1 Open Graded Sub-base: to conform to the following:

Sub-Base

- .1 Crushed rock or crushed cobble that does not affect water pH.
- .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.
-

.1 Gradation to:

<b>Sieve Designation</b>	<b>% Passing</b>
150 mm	100
75 mm	60 - 100
38 mm	50 - 85
19 mm	15 - 55
2.36 mm	0 - 10
0.075 mm	0 - 5

- .3 Crushed particles: 60% of the material passing each sieve must have one or more fractured faces.

2.8 Select Granular  
Sub-grade Fill

- .1 Select Granular Sub-grade Fill: Granular material selected or blended to following requirements:

- .1 Gradations to be within limits specified when tested to ASTM C136-01 and ASTM C117-95 and to exhibit smooth curve when plotted on semi-log gradation chart. Sieve sizes to CAN/CGSB-8.1.

.1 Gradation to:

<b>Sieve Designation</b>	<b>% Passing</b>
75 mm	100
19 mm	15 - 100
9.5 mm	0 - 100
0.600 mm	0 - 100
0.300 mm	0 - 15
0.075 mm	0 - 5

- .2 Placed and compacted material will not rut when loaded tandem truck is passed over it.

2.9 Spawning Gravel

- .1 Spawning Gravel: to conform to the following properties and gradations:

- .1 Smooth rounded stone and gravel, free of fines and organics.  
.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.
-



- .1 50 mm minus spawning gravel gradation to:

Gradation Metric	Percentage
Pit Run	15 %
6mm – 12mm	15 %
12mm-25mm	20%
25mm-38mm	40%
38mm– 50mm	10 %

- .2 75 mm minus spawning gravel gradation to:

Gradation Metric	Percentage
Pit Run	15 %
6mm – 12mm	15 %
12mm-25mm	20%
25mm-38mm	30%
38mm– 50mm	10 %
50mm_75mm	10%

- .3 Larger rounded cobble, up to 300 mm shall be randomly dispersed through the spawning gravel and represent up to 15% of the weight of the spawning gravel.

2.10 Aggregates for Concrete .1

Fine and coarse aggregates shall conform to the current CSA A23.1. Aggregate tests shall be performed and submitted to the DR for review with the concrete mix design.

PART 3 –  
EXECUTION

3.1 Processing

- .1 Process aggregate uniformly using methods that prevent contamination, segregation, and degradation.
- .2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified.
- .3 Wash aggregates, if required to meet specifications for gradation and free of invasive plant species. Invasive species plant management shall be in accordance with Section 01 35 43 – Environmental Procedures.
- .4 Do not manufacture or deliver excessive volumes of Pit Run Gravel, Crushed Granular Sub Base or Open Graded Sub Base without the approval of the DR.

Types of materials and specifications may vary depending on ground conditions encountered. Materials shall not be ordered more than 3 months in advance. Variations in quantities for these materials shall be paid at the contract unit rates irrespective of the quantity variation.

- 3.2 Handling .1 Avoid segregation, contamination, and degradation of aggregate during handling and transporting.
- 3.3 Stockpiling .1 Stockpile aggregates in locations as indicated unless directed otherwise by DR. Do not stockpile on completed pavement surfaces.
- .2 Stockpile aggregates in sufficient quantities to meet project schedules.
- .3 Stockpile sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
- .4 Provide compacted sand or crushed gravel base not less than 300 mm in depth to prevent contamination of aggregate. Do not incorporate compacted base of pile into work.
- .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
- .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials.
- .7 Stockpile aggregates in uniform layers of thickness as follows:
- .1 Max 1.5 m for coarse aggregate and base course materials.
- .2 Max 1.5 m for fine aggregate and sub-base materials.
- .3 Max 1.5 m for other materials.
- .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .9 Do not cone piles or spill material over edges of piles.
- .10 Do not use conveying stackers.
- .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.
- 3.4 Cleaning .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .2 Leave any unused aggregates in neat compact stockpiles.

**END OF SECTION**

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- .5 Provide suitable shelter, enclosures and lighting to allow observation, testing and recording of data to proceed under adverse weather conditions and at night.
  - .6 The contractor to submit all field loading test record and data to the Owner appointed Geotechnical Engineer for review.
- 3.2 Testing
- .1 The contractor shall not subject the pile to any loading prior to starting the test.
  - .2 Pile loading testing be conducted in accordance with ASTM D 4945 (PDA Testing) on initially installed piles. One edge pile from each abutment will be initially installed for testing. It is recommended to load test a single pile at multiple times after driving. The test intervals would need to be coordinated to occur when the pile driving contractor is on site. But the short construction schedule may restrict when the piles can be re-struck for the PDA testing. In that case it is desired to conduct the final PDA test not less than 14 days and preferably 28 days or more after driving.
  - .3 The dynamic monitoring consisting of attaching strain transducers and accelerometers to the pile, usually close to the pile head, and connecting these to a monitoring station on the ground by means of a cable. Care must be taken to ensure that no damage is done to the transducers, cables and equipment.
  - .4 The preparation of the pile head will be done by the testing agency. The preparation consists of drilling and tapping holes in the pile. The transducers are normally attached by bolting them to the holes. Attaching the transducers to the prepared pile head requires installation of a total of seven threaded bolts into the prepared holes.
- 3.3 Test Evaluation
- .1 The DR or the Owner's appointed Geotechnical Engineer will interpret results for pile performance and capacity. The results shall be used to set the driving criteria for the remainder of the piles.
  - .2 Carry out additional load tests as instructed by the DR if pile fails to provide the required capacity.
- 3.4 Test Pile Driving Program
- .1 Include in the Pile Installation Work Method the test pile driving program.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Introduction .1 The majority of the alignment for the trail and parking lot is cleared of trees and vegetation under a previous contract. The clearing work included in this Contract requires additional clearing the trail right of way through some riparian areas, at the south boundary, sections where the alignment had not been finalized, additional clearing to achieve a smooth alignment and to accommodate excavations and fill slopes and widening the clearing to accommodate additional local works such as pull-outs, temporary accesses, additional retaining walls and local trail widening. The clearing work included in this Contract includes clearing of all felled trees, timber, brush and other organics left on the trail alignment by the clearing contractor. The grubbing work included in this Contract is for the full width of the trail right of way width for the entire trail and for other localized construction areas cleared by the Contractor.
- 1.2 Measurement and Payment .1 The unit prices bid for these items shall be full compensation for all work necessary and incidental for grubbing to the limits indicated in the Drawings and as directed by the DR. Payment shall be made at the unit prices tendered in the unit price table of the Contract.
- .2 The price bid for clearing shall include, but not be limited to: falling trees brush and removing from site, and all other work and materials necessary to complete this portion of the Work to the satisfaction of the DR.
- .3 The price bid for grubbing shall include, but not be limited to: excavating and disposing off site stumps and roots to the subgrade elevation, and all other work and materials necessary to complete the Work to the satisfaction of the DR.
- .4 The price bid for stump grinding shall include, but not be limited to: grinding stumps to 250 mm below the final granular base surface, disposing off-site the waste material, and all other work and equipment necessary to complete this portion of the Work to the satisfaction of the DR.
- .5 Measurement for payment for clearing shall be at the per hectare of area cleared, measured in the field, and completed to the satisfaction of the DR. Clearing of felled trees, timber, brush and other organics left on the trail alignment by the clearing contractor shall be included in the cost of the trail work soil stripping.
- .6 Measurement for payment for grubbing shall be at the per hectare of trail grubbed to a 5.2 m width. The pay area shall be calculated by measuring along the centerline of the trail in kilometers and multiplying this distance by 0.52. Payment will be made when the work is completed to the satisfaction of the DR.
- .7 Where grubbing wider than 5.2 m is required to complete the work or at the direction of the DR, the trail is grubbed to a width greater than 5.2 metres measurement for payment shall be made in hectares of the actual grubbing completed to the satisfaction of the DR.
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- .8 Measurement for payment for stump grinding shall be per cubic metre of stump grinding measured prior to grinding and completed to the satisfaction of the DR.
  - .9 Payment for clearing in temporary access roads and pull-offs shall be included in those items.
- 1.3 Definitions
- .1 Clearing: Cutting of trees, brushing vegetative growth to ground level and disposing of felled trees, previously uprooted trees and stumps, limbing of trees on either side of the trail, and surface debris.
  - .2 Grubbing: Excavating and processing of stumps and roots located within 150 mm of the existing ground surface as described in Clause 1.2.3, above.
  - .3 Chipping: Mechanically breaking down of all vegetation up to 120 mm in diameter into chips not over 100 mm long, 25 mm wide and 10 mm thick.
  - .4 License to Cut: License required by Contractor under Province of BC's Forest Act that authorizes a Contractor to salvage and remove timber from Crown Land.
  - .5 Merchantable Timber: Timber greater than 120 mm diameter at breast height and suitable for salvage. This material is the property of Parks Canada and shall be delivered to Radar Hill parking lot.
  - .6 Amphibian Zones: Areas of the Park identified during the environmental studies as having a significant amphibian population and suitable habitat to support the amphibian populations and those areas critical to amphibian migration.
  - .7 Wetland: Refer to section 01 35 43 – Environmental Procedures, Clause 1.2.4..8  
Watercourse: Refer to section 01 35 43 – Environmental Procedures, Clause 1.2.5.
  - .9 Riparian Area: Refer to section 01 35 43 – Environmental Procedures, Clause 1.2.7.
- 1.4 Protection
- .1 Prevent damage to trees, site appurtenances, watercourses, root systems of trees, all natural features and artificial structures that are to remain.
  - .2 Repair any damaged items to satisfaction of DR.
  - .3 Protect nesting birds in accordance with Section 01 35 43 – Environmental Procedures. No clearing shall be permitted between March 12 and August 17.
  - .4 Clear riparian areas in accordance with Section 01 35 43 – Environmental Procedures. Clearing is only allowed in riparian areas between August 17 and September 15 unless approved in writing by the OEM.
  - .5 Clearing and grubbing of archaeological sites shall be in accordance with Section 01 35 44 – Cultural Resource Procedures.
  - .6 Clearing and grubbing within amphibian zones, including but not limited to the uncleared section between the southern park boundary shall only be carried out
-

between July to September and prior to the first heavy rains in September. Clearing is subject to the restrictions on the protect nesting birds in accordance with Section 01 35 43 – Environmental Procedures.

- .7 Clearing and grubbing within wetlands. Clearing within wetland areas will be by hand. Grubbing will not be required and the root systems for the removed trees shall be left in place. Wetlands are generally crossed using the elevated trails and, where equipment is required for clearing, it shall operate from the advancing end of the elevated trail. Where this is not feasible, the material to be cleared shall be cut into sections that can be moved by hand equipment. Wetland areas in amphibian zones, including but not limited to the uncleared section between the southern park boundary shall only be carried out between July to September and prior to the first heavy rains in September. Clearing is subject to the restrictions on the protect nesting birds in accordance with Section 01 35 43 – Environmental Procedures.

- .8 Work Around and Protection of Roots:

- .1 Tree roots less than 5cm diameter of trees to be retained next to the trail exposed during grubbing should be cut cleanly with a sharp axe, tree looper or saw, and the disturbed edge covered with plastic until backfilled, or the root should be sealed with a wound dressing.
- .2 Structural tree roots greater than 5cm diameter of trees to be retained next to the trail exposed during grubbing should be hand excavated to avoid damage to roots and fabric shall be placed over exposed roots.

- 1.5 Related Sections .1 Section 01 35 43 - Environmental Procedures.  
.2 Section 01 35 44 – Cultural Resource Procedures.

- PART 2 -  
PRODUCTS .1 Not Used.

PART 3 –  
EXECUTION

- 3.1 Sequence of Operation .1 To minimize impacts to the existing vegetation the Work shall be performed in a manner to minimize the number of passages of heavy equipment over the sub-grade in any given area. The Work shall proceed sequentially along the trail: clearing (mostly complete) grubbing, then topsoil stripping and side casting or removal, mineral soil excavation to subgrade over a short section immediately followed by placing the geotextile and root barrier, and placing of sub-grade material. Trucks bringing granular fill into the trail shall be used to back haul excess soil from the site. The subgrade not being tracked by machines and not left exposed overnight.
-

- 3.2 Preparation
- .1 Inspect site and verify with DR, items designated to remain.
  - .2 A minimum of 30 days prior to work within a section of trail the Contractor shall review the alignment for danger trees (WorkSafe BC requires trees within 1.5 tree lengths to be reviewed) and report findings to OEM and DR. PCA may require special measures be taken as these trees often have significant wildlife value.
- 3.3 Clearing
- .1 Clear areas of trail not cleared by others, in accordance with Contract Documents, by cutting flush with ground, except in areas where hand clearing is required. Cut hand cleared areas to within 150 mm of ground, including brush clearance. These uncleared areas are frequently within areas with environmental constraints (wetlands and riparian areas in particular) and the timing of such clearings will require approval of the OEM and DR.
  - .2 Cut off branches and cut down trees overhanging cleared area as required for safety and in accordance with the Contract Documents. Trees on either side of trail shall be limbed to a height of 7 m to accommodate unloading asphalt trucks.
  - .3 Small areas of additional clearing to create local widenings of the trail may be identified by the DR.
  - .4 Trunks, branches, and vegetation up to 120 mm in diameter is to be removed and disposed of at the designated Tofino Airport site. Timber over 120 mm diameter shall be cut to manageable lengths not less than 4m and delivered to a stockpile area within the Park identified by the DR.
  - .5 Where coarse woody debris requires removal from the trail right of way and at the direction of the OEM this often partly decayed material shall be moved away from the trail but remain on site adjacent to the trail for amphibian habitat.
- 3.4 Grubbing
- .1 Grub out stumps, roots, and embedded logs to subgrade elevation except where lesser amount is approved by the DR.
  - .2 The OEM may designate nearby specimen trees for special protection of their root systems. The Contractor shall minimize disturbance to the root system by reducing depth of grubbing and organic removal, avoiding stump removals in the immediate area (stump grinding may be required), and avoid driving over the protected roots with large vehicles.
  - .3 The OEM may designate large stumps to be removed and set aside for use within stream enhancement works or placed within the forest adjacent to the trail.
  - .4 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m<sup>3</sup>.
  - .5 Grubbed material shall be disposed of at a designated location at Tofino Airport.
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- .6 Protection of amphibians – The Contractor shall make allowances during removal of stumps and large woody debris for the OEM to visually monitor for amphibians in accordance with Section 01 35 43 – Environmental Procedures.
  - .7 To minimize problems arising from erosion and siltation the work shall be scheduled such that the trail construction, surface finishing, and placing of erosion control blankets follow closely behind the grubbing work.
- 3.5 Stump Grinding
- .1 To avoid excessive damage to root systems of nearby trees the DR or EM may direct that large stumps be left in place. Stumps within wetlands will normally be ground down rather than removed.
  - .2 Generally large stumps mainly from red cedar and yellow cedar (Cypress), but also from pine, hemlock, fir and spruce will be considered for leaving in place to preserve root systems of nearby trees and as directed by the DR or OEM. Stumps from all alder trees shall be removed as part of the grubbing work.
  - .3 Stumps that are left in place shall be ground down to not less than 150mm below the underside of asphalt or 150mm below original ground level, whichever is the lower, or as directed by the DR. In the areas of elevated trails stumps shall be ground down only to existing ground level.
- 3.6 Removal and Disposal
- .1 Cut timber greater than 125 mm diameter to 4.0m to 5.0m lengths and cold-deck as required by British Columbia Ministry of Forests. Transport this material identified by the DR to a storage area within the Park. Stockpiled timber remains the property of Parks Canada.
  - .2 Removal and disposal of other clearing and grubbed material at a designated location at Tofino Airport is the responsibility of the Contractor. All organic material is to be retained within the Pacific Rim National Park.
- 3.7 Burning
- .1 Burning is not allowed within Park boundaries.
- 3.8 Finished Surface
- .1 Leave ground surface in condition suitable for stripping of topsoil.

**END OF SECTION**

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PART 1 - GENERAL

- 1.1 Measurement and Payment .1 The unit prices bid for these items shall be full compensation for all work necessary and incidental for the excavation, stockpiling adjacent to the trail, re-spreading along the trail, shaping, and compaction of organic soils to the cross sections, dimensions and grades on Drawings and as directed by the DR. In archaeological sites an additional payment shall be made for disposal of organic material surplus to that needed to dress the slopes in the adjacent forest.
- .2 Organic materials surplus to the needs of dressing the shoulders of the trail and identified as such at the time of excavation shall be removed and disposed of at the designated Tofino Airport site. This material shall be considered trail organic waste excavation and payment for it shall be made at the unit rate bid for that item.
- .3 The unit prices bid for organic soil stripping, stockpiling, and re-spreading shall include, but not be limited to: excavation of the organic soils, stockpiling it along the edges of the trail without obstructing the trail construction, management of organics in accordance with Section 01 35 44 - Cultural Resource Procedures and spreading within the area adjacent to the trail, maintaining drainage patterns, re-spreading, grading the material to within 50 mm of the lines and grades shown on the drawings to leave a 3.8m width of exposed granular sub-base after the granular sub-base and base have been placed, light compaction, final cleanup of the finished surface, and all other work necessary to complete the Work to the satisfaction of the DR.
- .4 Payment for “Organic Soils Excavation and Spreading in a Cultural Resource Sites” shall be as described in Section 01 35 44 – Cultural Resource Procedures, Clause 1.1.2.
- .5 Payment for “Organic Soils Excavation from Cultural Resource Sites – Storage and Recording - Grice Bay Parking Lot” shall be as described in Section 01 35 44 – Cultural Resource Procedures, Clause 1.1.3.
- .6 Measurement for payment for the stripping, stockpiling, and re-spreading of organic material for shoulder dressing shall be per linear metre for each trail edge where the organic soils are salvaged, stockpiled, and re-spread.
- .7 Measurement for payment for stripping and distributing organic soils which are surplus to the shoulder materials in archaeology shall be as described in Section 01 35 44 – Cultural Resource Procedures, Clause 1.1.7.
- .8 Measurement for payment for stripping and distributing organic soils which are surplus to the shoulder materials and outside of archaeology sites shall be per cubic metre, determined by measurement of the remaining excavation and excluding the material used to dress the shoulders.
- .9 The unit price bid for wood chip production and spreading on the shoulders of the sections of trail paved by the Contractor shall include, but not be limited to: production of wood chip by the Contractor using free issue brush provided free
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of charge at the designated Tofino Airport and Reservoir sites, loading and transporting the wood chips from a location in the Park to the trail, spreading them on both sides of the trail, lightly compacting, and sweeping the trail and all other work necessary to complete the Work to the satisfaction of the DR.

- .10 Measurement for payment for spreading wood chips along the trail shoulders shall be per linear metre for each side of trail as measured in the field
- .11 Ensure no invasive plant species, vegetation, or seeds are brought into the Park or transported between locations within the Park. Provide only uncontaminated products for incorporation into the work. This may include using washed materials or using only clean blast rock. Machinery and equipment shall be thoroughly cleaned before delivery to the Park or between movements within the Park. Costs for this work shall be included in the unit rates tendered. Existing soil that is contaminated with invasive species as determined by the OEM shall be considered waste excavation and disposed of at a separate area to be agreed with the OEM at the designated Tofino Airport site.

**1.2 Related Sections  
and References**

- .1 Section 01 35 43 - Environmental Procedures.
- .2 Section 01 35 44 - Cultural Resources Procedures, for management of organic materials from archeological special management zones.
- .3 Section 01 74 11 - Cleaning.
- .4 Section 31 11 00 - Clearing and Grubbing.
- .5 Section 31 24 13 - Highway & Trail Excavation, Embankment, & Compaction.
- .6 BC Ministry of Environment Standards and Best Practices for Instream Works.

**PART 2 -  
PRODUCTS**

Not Used

**PART 3 -  
EXECUTION****3.1 Sequence of  
Operation**

- .1 To minimize impacts to the existing vegetation the Work shall be performed in a manner to minimize the number of passages of heavy equipment over the sub-grade in any given area. The Work shall proceed sequentially along the trail: clearing (mostly complete) grubbing, then topsoil stripping and side casting or removal, mineral soil excavation to subgrade over a short section immediately followed by placing the geotextile and root barrier and placing of sub-grade material. Trucks bringing granular fill into the trail shall be used to back haul excess soil from the site. The subgrade not being tracked by machines and not left exposed overnight.
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- .2 To minimize problems arising from erosion and siltation the work shall be scheduled such that the trail construction, surface finishing, and placing of erosion control blankets follow closely behind the grubbing work.
  - .3 Temporary environmental procedures must be in compliance with Federal legislation and regulations and direction from the OEM where required. Contractors shall reference the provincial MOE Standards and Best Practices for Instream Works (2004) for best management practices in sediment and erosion control during construction activities.
  - .4 The Contractor shall submit a sediment and erosion control plan for each project site where environmental protection is incidental to the work a minimum of ten days prior to start of work for review by the DR and the OEM.
  - .5 The DR and OEM may request changes to any plan to ensure that proposed methods for sediment and erosion control are satisfactory for each Project site. No additional payment shall be made for environmental protection measures that are incidental to the work.
  - .6 The Contractor shall install, maintain and remove all temporary environmental procedures as directed by the OEM and the DR.
  - .7 Temporary environmental procedures, where required by the contract or as directed by the DR and OEM, are to be installed prior to starting any construction activities to prevent sediment from entering any waterway, within the vicinity of the construction site.
- 3.2 Preparation
- .1 The Contractor shall confirm with DR if the area to be to be stripped falls within a Cultural Resources Management area before starting stripping work.
- 3.3 Temporary Erosion and Sedimentation Control
- .1 Temporary erosion and sedimentation control shall be carried out in accordance with Section 01 35 43 - Environmental Procedures.
  - .2 To reduce problems with silts entering watercourses in the future the topsoil and organics stockpiled for re-spreading shall not be contaminated with underlying silts and clays.
  - .3 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent areas, that complies with EPA 832/R-92-005.
  - .4 Inspect, repair, and maintain erosion and sedimentation control measures during construction until work is complete and accepted by the DR.
  - .5 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- 3.4 Stripping of Organic Soils
- .1 Ensure that procedures are conducted in accordance with applicable environmental requirements of these specifications.
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- .2 Complete clearing and grubbing of the area prior to organic stripping.
  - .3 Do not contaminate organic soils that are going to be reused with mineral subsoils. Organic soils include litter-fibric-humic (LFH) layer and the upper mineral A horizon, topsoil. Mineral subsoil includes gravel, sand, clay, and silts.
  - .4 Pile topsoil and forest organic litter with mechanical hoe alongside the proposed trail as directed by OEM and DR. These piles will generally be in the form of small windrows on both sides of the trail and tight to the excavation to minimize impacts on the adjacent undisturbed ground. This will also facilitate re-spreading the material on the new shoulders of the trail. Approximately 0.1 cu.m to 0.2 cu.m of material is required per linear meter of trail edge for each side of the trail across level ground, but more may be required where cross slopes or significant cuts and fills are encountered. Larger volumes of topsoil and forest organic litter may only be windrowed if approved by the OEM and DR.
  - .5 Situate the stockpiled material such that it does not interfere with local drainage patterns or with trail construction. Excavated soil and subsoil must be stockpiled within an area approved for Project use and at least 15 m away from any drainage features, drains, ditches, and 30 m from any waterbody or water course. If soil must be stockpiled closer than outlined, a plan is to be discussed and approved by OEM and DR before soil is stockpiled. Protect stockpiles from contamination and compaction.
  - .6 Dispose of surplus organic soil at the designated Tofino Airport site as indicated by DR. Topsoil from areas adjacent to roads and highways that is contaminated with invasive species shall be disposed off-site as potential contamination with invasive species is high for this material when directed by the OEM and DR.
  - .7 In archeological special management zones locate stockpiles of stripped organics adjacent to the trail as directed by DR. Accommodate archeological sorting of the materials by others. Spread the organics within the area adjacent to the trail and remove and dispose of surplus organics as directed by OEM and DR.
  - .8 Notify DR and OEM immediately of suspected soil/fill contamination; chemical, petroleum or unusual odour; unusual debris such as metal, plastic, glass or demolition waste; dark or unusual staining. (Typically, stained soils are darker and may have a “wet” appearance but should not be confused with naturally occurring organic soils. Stained soils may have a distinct oily feel and typically are accompanied by odours). Segregate suspect soils and handle separately from other materials.
  - .9 For trees located next to the trail that are to be retained and whose roots are exposed during topsoil stripping, structural tree roots greater than 5cm diameter shall be hand excavated to avoid damage to roots and fabric shall be placed over exposed roots.
- 3.5 Stripping of Organic Soils Within Archeology Sites
- .1 In addition to the requirements of the above clause 3.2 the following shall apply to organic soils within the archeology sites identified by the DR. During the progress of this work the OEM shall be present to observe and assist with placing the material.
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- .2 No organics shall be removed from the archeology site and disposed of at the designated Grice Bay Parking Lot site. This material shall be used to dress the sides of the trail and the surplus material shall be deposited a maximum of about 6 metres into the adjacent forest.
  - .3 The material deposited into the forest shall be spread to a maximum depth of 200 mm. Spreading of this material can be aided by the excavation equipment 'sprinkling' the organics while depositing it and re-spreading it after deposit. The equipment tracks must remain within the trail clearing limits. Where the arm can reach into the forest without damage to trees, machine spreading is permitted. Manual spreading shall be used to obtain the final thickness.
  - .4 Maintain existing drainage patterns. Do not deposit materials into water or bury growing plants. Do not deposit materials in Amphibian areas except as directed by OEM. Refer to Table 4 in section 01 35 43 – Environmental Procedures.
  - .5 Refer to Section 01 35 44 - Cultural Resources Procedures, for additional details regarding working in archeological special management zones and chance finds.
- 3.6 Preparation of Shoulders
- .1 After trail structure is in place (excavation, installation of the geotextile (if required), root guard (if required), subbase, and base) the shoulders shall be prepared.
  - .2 Grade shoulders of trail establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage. The prepared surface shall not deviate by more than 50 mm over a 1.0 m distance.
  - .3 Verify that grades are acceptable. Notify DR and receive acceptance or make corrections to the grades as directed by DR.
- 3.7 Re-spreading of Organic Soils
- .1 Re-spread organics and topsoil after DR has accepted base course. The re-spreading shall take place as soon as practical after the sub-base and base is completed to minimize self-compaction of the topsoil and to minimize damage of areas used for temporary stockpiling of the material. Spread topsoil during dry conditions in a uniform layer over unfrozen subgrade free of standing water.
  - .2 Lightly compact the finished area to minimize future settlement of the surface.
  - .3 After lightly compacting the organic soil, place any required erosion and sedimentation controls needed, including erosion control blankets, and restore and stabilize areas disturbed.
- 3.8 Spreading of Wood Chips
- .1 After paving of the trail, install wood chips on each side of the paved trail.
  - .2 Spread the wood chips to a width of approximately 0.5 m wide, on either side of the trail and to match the surface of the new pavement.
  - .3 Lightly compact the finished area to minimize any tripping hazard between the trail surface and the adjacent ground.
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- .4 Sweep trail clean of any remaining material.
  
- 3.9 Cleaning
  - .1 Proceed in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement and Payment .1 The invert of the proposed culverts shall generally not exceed the diameter of the culvert plus 300 mm below existing ground. Pipe bedding shall be 150 mm below the invert. No separate payment will be made for excavation, trenching, and backfilling within this depth. These items shall be included in the unit priced items incorporating this into their work.
- .2 Where the invert of the culvert exceeds the diameter of the culvert plus 300 mm below existing ground, or pipe bedding exceeding 150 mm is required and authorized by the DR, separate payment will be made for excavation, trenching, and backfilling exceeding this depth. Payment will include the excavation and disposal of the additional material, supply, placement, and compaction of imported granular bedding or backfill material, and all other labor, materials, and equipment to complete the work.
- .3 Measure for payment where culvert inverts exceed the diameter of the culvert plus 300 mm below existing ground will be by the cubic metre as measured in place and agreed by DR.
- .4 Contractor to repair portions of roadway damaged (intentionally or not) during construction to DR's approval.
- .5 No extra payment will be made for excavating unnecessarily beyond lines shown on the drawings.
- 1.2 References .1 American Society for Testing and Materials (ASTM):
- .1 ASTM C 117, Standard Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D 422, Standard Test Method for Particle-Size Analysis of Soils.
- .4 ASTM D 698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ) (600 kN-m/m ).
- .5 ASTM D 1557-02e, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ) (2,700 kN-m/m ).
- .6 ASTM D 4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB):
- .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
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- .3 Canadian Standards Association (CSA):
    - .1 CAN/CSA-A3000, Portland Cement.
    - .2 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
  - .3 Ministry of the Environment (MOE):
    - .1 Standards and Best Practices for In Stream Works, 2004.
- 1.3 Definitions
- .1 Excavation classes: two classes of excavation will be recognized: common excavation and rock excavation.
    - .1 Rock: material from solid masses of igneous, sedimentary or metamorphic rock that, 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. Boulder or rock fragments measuring in volume one cubic metre or more.
    - .2 Common excavation: excavation of materials of whatever nature, that are not included under definitions of rock excavation.
  - .2 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping, and seeding.
  - .3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
  - .4 Borrow material: material obtained from locations outside area to be graded and required for construction of fill areas or for other portions of Work.
  - .5 Unsuitable materials:
    - .1 Weak and compressible materials under excavated areas.
    - .2 Frost susceptible materials under excavated areas.
    - .3 Frost susceptible materials:
      - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136: Sieve sizes to CAN/CGSB-8.2.
      - .2 Table:

<u>Sieve Designation</u>	<u>% Passing</u>
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.

- 1.4 Quality Assurance
  - .1 Engage services of qualified Professional Engineer who is registered or licensed in Province of British Columbia, Canada in which Work is to be carried out to design and inspect shoring and bracing required for Work if required by applicable legislation.
  - .2 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
  - .3 At least 2 weeks prior to performing Excavation, Trenching, or Backfilling Work, Contractor to provide DR with a Construction Sequence for the Work. Do not proceed with the Work until approval has been received from the DR.
  
- 1.5 Waste Management and Disposal
  - .1 Dispose of waste materials in accordance with Section 01 74 21 - Waste Management and Disposal and the Waste Management Work Plan.
  
- 1.6 Protection of Existing Features
  - .1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.
  - .2 Existing surface features:
    - .1 Conduct, with DR, condition survey of existing trees and other plants, survey bench marks and monuments which may be affected by Work.
    - .2 Protect existing surface features from damage while Work is in progress. In event of damage, immediately make repair to approval of DR.
    - .3 Where required for excavation, cut roots or branches as approved by DR.
  
- 1.7 Related Sections
  - .1 Section 01 35 43 - Environmental Procedures.
  - .2 Section 01 35 44 – Cultural Resource Procedures.

## PART 2 - PRODUCTS

- 2.1 Materials
    - .1 Granular bedding to Section 31 05 16 – Aggregates.
    - .2 Trench Backfill to Section 31 05 16 – Aggregates and Section 32 11 16 – Granular Sub-base.
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**PART 3 -  
EXECUTION**

- 3.1 Preparation
- .1 The Contractor shall confirm with DR if the area to be excavated falls within a Cultural Resources Management area before starting excavation work. If so, work will be carried out under the observation of OAM.
  - .2 The Contractor shall confirm with DR if the area to be excavated falls within a sensitive wetland or riparian area before starting excavation work. If so, the work will be carried out under the observation of the OEM.
  - .3 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- 3.2 Stripping of Topsoil
- .1 Commence topsoil stripping of areas as indicated after area has been cleared of brush, weeds, and grasses.
  - .2 Strip topsoil to depths as directed by DR. Do not mix topsoil with subsoil.
  - .3 Stockpile in locations as directed by DR. Stockpile only sufficient material to restore disturbed areas in immediate vicinity.
  - .4 Dispose of unused topsoil and organics to the designated Tofino Airport site as directed by DR.
  - .5 Refer to Section 31 14 13 – Trail Work Soil Stripping, Stockpiling, and Re-spreading for additional information and requirements.
- 3.3 Stockpiling
- .1 Stockpile fill materials in areas designated by DR. Stockpile granular materials in manner to prevent segregation.
  - .2 Stockpile topsoil and subsoil (the non-organic material below the topsoil) materials separately. Protect fill materials from contamination.
- 3.4 Cofferdams, Shoring, Bracing and Underpinning
- .1 Construct temporary Works to depths, heights, and at locations as required to protect existing structures, embankment slopes, roadway embankment fill, etc. If required, temporary are works to be designed and stamped by a Professional Engineer registered in the Province of British Columbia.
  - .2 During backfill operation:
    - .1 Unless otherwise as indicated or as directed by DR, remove sheeting and shoring from excavations.
    - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
    - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at an elevation at least 500mm above toe of sheeting.
  - .3 When sheeting remains in place, cut off tops at elevations as indicated.
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- 3.5 Dewatering and Heave Prevention
- .1 Keep excavations free of water while Work is in progress.
  - .2 Submit a flow isolation and in-stream work plan for each project site requiring flow isolation and/or in-stream works a minimum of ten days prior to the work commencing for the DR and OEM's review. Plan to include, but not be limited to details of proposed dewatering or heave prevention methods, such as dikes, well points, and sheet pile cut-offs, if required.
  - .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur. Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
  - .4 Protect open excavations from flooding and damage due to surface run-off.
  - .5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures and in manner not detrimental to public and private property or any portion of Work completed or under construction.
  - .6 Allow sufficient time for OEM to salvage fish and amphibians in accordance with Section 01 35 43 - Environmental Procedures.
  - .7 Provide silt fences, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to water courses or drainage areas.
- 3.6 Excavation
- .1 Excavate to lines, grades, elevations and dimensions as indicated on the drawings or as required.
  - .2 Culvert inverts shall generally not exceed the diameter of the culvert plus 300 mm below existing ground.
  - .3 Excavation work to be as minimal as possible.
  - .4 Excavation must not interfere with capacities of adjacent foundations and roadway fills. It is the Contractor's responsibility to determine if any temporary works are required to maintain stabilities during construction.
  - .5 Minimize disturbance of soil within branch spread of trees or shrubs that are to remain. If excavating through larger roots, cut roots with sharp axe or saw.
  - .6 Dispose of surplus and unsuitable excavated material in an off-site location.
  - .7 Do not obstruct flow of surface drainage or natural watercourses.
  - .8 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
  - .9 Notify DR when bottom of excavation is reached.
  - .10 Obtain DR approval of completed excavation.
  - .11 Correct unauthorized over-excavation by filling over-excavation with drain rock at Contractors cost.
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- .12 Hand trim, make firm, and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
  - .13 Within areas of wetlands hand excavation of the organic layer is required unless machine excavation is authorized by OEM. Excavate in accordance with Section 01 35 43 - Environmental Procedures.
- 3.7 Backfilling
- .1 Do not proceed with backfilling operations until DR has approved.
  - .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
  - .3 Do not use backfill material that is frozen or contains ice, snow or debris.
  - .4 Place backfill material in uniform layers not exceeding 150mm 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 Place layers simultaneously at both sides of pipe culverts, box culverts and ends of the bridges to equalize loadings. Difference not to exceed 0.3m from one side to the other.
    - .3 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
      - .1 If approved by DR, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by DR.
  - .6 Care must be taken next to existing structures and next to new structures when performing backfilling operations.
- 3.8 Finishing and Protection
- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21 - Waste Management and Disposal, trim slopes, and correct defects as directed by DR. Finishing and Protection shall be in accordance with Section 31 24 13 – Highway & Trail Excavation, Embankment & Compaction.

**END OF SECTION**

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PART 1 - GENERAL

- 1.1 Measurement and Payment .1 Payment for excavation:
- .1 “Trail waste excavation” and “Highway waste excavation” shall be full compensation for all work necessary and incidental for excavation and disposal of surplus, unsuitable and waste materials including site drainage, and all other related surface works within limits of the Work, and as indicated, to the required subgrade elevations for the construction of trail and road works and related facilities.
  - .2 “Highway topsoil stripping” shall be full compensation for all work necessary and incidental for stripping of the topsoil and organic material and disposing of it outside of the Park boundaries including, but not limited to, excavating, loading, hauling, dumping fees, and all other related works within limits of the Work. This material is being removed from the Park to remove invasive species that may be contained within the material.
  - .3 Measurement for payment for trail excavation shall be by the cubic metre (length X width X depth) or surveyed cross section of excavation for trail construction as accepted by the DR.
  - .4 Measurement for payment for highway excavation shall be by the cubic metre (length X width X depth) or surveyed cross section of excavation for highway construction as accepted by the DR.
  - .5 Payment for “Mineral Soil Excavation and Fill in Cultural Resource Sites” shall be as described in Section 01 35 44 – Cultural Resource Procedures, Clause 1.1.4.
  - .6 Payment for “Mineral Soil Excavation from Cultural Resource Sites – Storage and Recording - Grice Bay Parking Lot” shall be as described in Section 01 35 44 – Cultural Resource Procedures, Clause 1.1.5.
  - .7 Payment for “Mineral Soil Excavation from Cultural Resource Sites – Disposal at Tofino Airport” shall be as described in Section 01 35 44 – Cultural Resource Procedures, Clause 1.1.6.
- .2 Payment for embankment fill:
- .1 “Trail embankment (Used on site)” and “highway embankment (Used on side)” shall be full compensation for all work necessary and incidental for excavating, hauling, placing, grading, and compacting approved excavation material from approved subgrade to the underside of granular sub-base within the proposed trail or highway right-of-way, or otherwise indicated, for the construction of roadworks and other related surface works as indicated in the Contract Documents.
  - .2 Subgrade elevations for highway widenings shall be determined by the lines, grades, and cross-sections for finished road surface elevations as
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indicated and measured from existing road surfaces, minus pavement structure in accordance with Contract Document and as directed by DR.

- .3 Subgrade elevation for the trail shall be adjusted in the field to provide a finished trail surface with 2% cross fall and a profile providing vertical curves with deviation from straight of not more than 80 mm over a distance of 2 metres, minus pavement structure in accordance with the Contract Document and as directed by the DR.
- .4 Payment for Contractor supplied select granular subgrade fill shall include, but not limited to: supplying, hauling, placing and compacting of granular material to finished subgrade elevation for construction of all surface works, and protection of the placed material to reasonably prevent such events that may affect the performance of the subgrade.
- .5 Measurement for payment for embankment fill shall be by the cubic metre of compacted embankment placed (length X width X depth) or surveyed cross section to the specified density as accepted by the DR.
- .6 The Contractor shall expose the subgrade and notify the DR in a timely manner in order that the Contractor's survey and layout be verified by the DR prior to placing granular fill. Any materials removed prior to taking profile measurements will not be included in the computation of quantities for payment.
- .7 Measurement for payment of these items will be at the unit price for each cubic metre based on 'in-place' measurements using average end area method as determined, and paid as waste excavation and as fill as and accepted by the DR.

1.2 References .1 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft) (600 kN-m/m).

1.3 Definitions .1 Rock Excavation: excavation of:

- .1 Material from solid masses of igneous, sedimentary or metamorphic rock that, 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 one cubic metre or more.

.2 Common Excavation: excavation of materials that are not Rock Excavation or Stripping Excavation.

.3 Stripping Excavation: excavation of organic material covering original ground.

.4 Embankment: material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.

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- .5 Waste material: material other than Stripping Excavation that is unsuitable for embankment construction or material surplus to requirements.
  - .6 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping, and seeding.
  - .7 Road Reclamation: excavation of existing road bed materials deemed acceptable for use as Embankment.
  - .8 Subgrade Elevation: elevation of undisturbed native material after organics are removed and mineral soil is cut to desired depth prior to placing fill.
  - .9 Mineral Subsoil: Boulders, cobbles, gravel, sand, clay, and silts.
  - .10 Organic Soils: Litter-fibric-humic (LFH) layer and upper mineral A horizon topsoil.
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- 1.4 Requirements of Regulatory Agencies .1 Adhere to Provincial and Federal Environmental requirements if potentially toxic materials are involved.
  
  - 1.5 Waste Management and Disposal .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Waste Management and Disposal.
  
  - 1.6 Related Sections .1 Section 01 35 43 - Environmental Procedures.  
.2 Section 01 35 44 – Cultural Resource Procedures.

## PART 2 – PRODUCTS

- 2.1 Materials .1 Granular materials in accordance with Section 31 05 16 – Aggregates.  
.2 Geosynthetic material in accordance with Section 31 32 19 – Geotextiles.
  
  - 2.2 Specified Materials .1 Embankment materials require approval by the DR.  
.2 Embankment may be:
    - .1 Approved native or imported granular material not to contain more than 3% organic matter by mass, frozen lumps, weeds, sod, roots, logs, stumps, or any other unsuitable material.
    - .2 Pit run gravel.
    - .3 Road reclamation meeting the pit run gravel specification.
    - .4 Select granular sub-grade fill.
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**PART 3 -  
EXECUTION**

- 3.1 General
- .1 The Contractor shall confirm with DR if the area to be excavated falls within a Cultural Resources Management area before starting excavation work.
  - .2 Clear and grub to the limits of excavation and/or embankment fill in accordance with Section 31 11 00 - Clearing and Grubbing.
  - .3 Provide suitable temporary ditches or other suitable means of handling drainage prior to excavation and during construction to protect the construction area
  - .4 Comply with Section 01 35 43 - Environmental Procedures.
  - .5 The subgrade profile for the trail shall be adjusted in the field to provide a finished trail surface with 2% cross fall and a profile providing vertical curves with deviation from straight of not more than 80 mm over a distance of 2 metres. The points of intersection on the profile shall not be less than 10 m apart to avoid a 'roller coaster' effect on the trail.
  - .6 To minimize problems arising from erosion and siltation the work shall be scheduled such that the trail construction, surface finishing, and placing of erosion control blankets follow closely behind the grubbing work.
- 3.2 Sequence of Operation
- .1 To minimize impacts to the existing vegetation the Work shall be performed in a manner to minimize the number of passages of heavy equipment over the subgrade in any given area. The Work shall proceed sequentially along the trail: clearing (mostly complete) grubbing, then topsoil stripping and side casting or removal, mineral soil excavation to subgrade over a short section immediately followed by placing of sub-grade material, followed by the geotextile and root barrier, and sub-base material. Trucks bringing granular fill into the trail shall be used to back haul excess soil from the site. The subgrade not being tracked by machines and not left exposed overnight.
- 3.3 Stripping for Roadworks
- .1 Commence topsoil stripping of areas as indicated after brush, weeds and grasses have been removed from these areas.
  - .2 Strip to depths as indicated or as necessary to remove organic material.
  - .3 Set aside sufficient topsoil to dress the slopes upon completion of the earthworks.
  - .4 Do not mix topsoil with subsoil.
  - .5 Topsoil from areas adjacent to roads and highways is often contaminated with invasive species and shall be disposed off-site when directed by the DR. Non-contaminated topsoil shall be disposed of at the designated Tofino Airport site.
  - .6 Prevent clearing and grubbing debris from mixing with stripped topsoil.
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- .7 Upon completion of excavation and embankment construction spread stripped topsoil on slopes and trimmed to not more than 50 mm deviation over 1.0 m, as directed by the DR.
- 3.4 Stripping for Trail Works .1 Refer to Section 31 14 13 - Trail Work Soil Stripping, Stockpiling, and Re-spreading.
- 3.5 Excavating .1 General:
- .1 Notify DR when unsuitable materials are encountered. Remove to depth and extent directed by DR.
- .2 Where subgrade is on transition from excavation to embankment treat ground slopes at grade points in accordance with typical drawing, or as directed by DR.
- .3 To minimize impacts to the existing subgrade, the Work shall be performed in a manner to minimize the number of passages of heavy equipment over the sub-grade in any given area. The Work shall proceed sequentially along the trail: clearing (mostly complete) grubbing, then topsoil stripping and side casting or removal, mineral soil excavation or filling to subgrade over a short section immediately followed by placing the geotextile, geogrid, and root barrier (where required), and placing of sub-base. Trucks bringing granular fill into the trail shall be used to back haul excess soil from the site. The subgrade not being tracked by machines and not left exposed overnight.
- .4 Equipment must not track on exposed subgrade.
- .5 Subgrade to be not left exposed overnight except with the written permission of the DR.
- .2 Maintain profiles, crowns and cross slopes to provide good surface drainage.
- .3 Road reclamation:
- .1 If the Contractor wishes to use the existing road base material as embankment fill, notify DR. Contractor to confirm material meets the gradations of Pit Run Gravel. Material may be used at discretion of DR.
- .4 Rock Excavation:
- .1 If, during excavation, material appearing to conform to classification for rock is encountered, notify DR and provide sufficient time to take measurements to determine volume of rock.
- .2 Shatter rock to 300mm below subgrade elevation or as indicated on plans, if required.
- .5 Work Around and Protection of Roots:
- .1 Tree roots less than 5cm diameter exposed during excavation should be cut cleanly with a sharp axe, tree looper or saw, and the disturbed edge
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- covered with plastic until backfilled, or the root should be sealed with a wound dressing.
- .2 Structural tree roots greater than 5cm diameter exposed during excavation should be hand excavated to avoid damage to roots and fabric shall be placed over exposed roots.
- .6 Disposal of all unsuitable and/or surplus material shall be outside the limits of Pacific Rim National Park unless approved by the DR.
- 3.6 Inspection of Subgrade
- .1 Prior to placing any fill materials, the subgrade shall be reasonably free of organics to the DR's satisfaction.
- .2 For highway and road subgrades only, prior to placing any fill materials, proof roll graded native surface using a fully loaded single or dual axle dump truck in the presence of the DR. Vehicles shall not be permitted on the trail subgrade.
- .3 DR may authorize the use of other acceptable proof rolling equipment for highway and road subgrades.
- .4 Remove soft or other unsuitable material or mitigate using other techniques as directed by DR.
- .5 Replace and compact with approved embankment fill. The DR may direct the Contractor to replace the soft or unsuitable material with course crushed aggregate and geotextiles. Payment will be made under the appropriate contract items.
- 3.7 Placing
- .1 Place material only on clean unfrozen surfaces, properly shaped and compacted, free from snow and ice and approved by the DR.
- .2 Maintain sloped surface during construction to ensure that surface water runs off the grade as work proceeds.
- .3 Drain low areas before placing materials when approved by the OEM.
- .4 Place materials using methods which do not lead to segregation or degradation to the full width in uniform layers and compacted to specified densities.
- .5 Bench existing slopes in side hills, fill slopes, and sloping sections as shown on the Drawings to ensure proper bond between new materials and existing surfaces.
- .6 On roadways place and compact to full width in layers not exceeding 200 mm loose thickness. DR may authorize thicker lifts if specified compaction can be achieved. On trails place and compact to full width in layers not exceeding 300 mm if specified density can be achieved.
- .7 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 500 mm.
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- .2 Carefully 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 an earth-tight surface.
  - .4 On highway construction, do not place boulders and rock fragments with dimensions exceeding 150mm within 300mm of subgrade elevation.
  - .8 Embankments to be sloped to DR's requirements. Intent is that slopes be as gentle as possible within limitations of site geometry.
- 3.8 Compaction
- .1 Compaction equipment must be capable of obtaining required densities in materials on project. Equipment that does not achieve specified densities must be replaced or supplemented.
  - .2 Break material down to sizes that enable required compaction and mix for uniform moisture to full depth of layer.
  - .3 On highway work, compact each layer to minimum 98% maximum dry density, to ASTM D698 and ASTM D4718 except top 150mm of subgrade. Compact top 150 mm to 100% maximum dry density.
  - .4 On trail work, compact each layer to minimum 95% maximum dry density, to ASTM D698 and ASTM D4718.
  - .5 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is suitable for compaction or remove material.
  - .6 Refer to Wood Geotechnical Report (Appendix A) for comments regarding compaction on sensitive subgrades.
- 3.9 Finishing
- .1 Shape entire trail or roadbed to within 25mm of design elevations and to DR's satisfaction.
  - .2 Finish slopes and ditch bottoms to neat condition, true to lines, grades and drawings where applicable.
  - .3 Remove rocks over 150mm in any 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 on both sides of top of slope.
  - .6 Trim between constructed slopes and edge of clearing to provide drainage and free of humps, sags, ruts, and protruding stones.
  - .7 The Contractor shall be responsible for all labour, equipment and materials costs associated with repairing the roadbed which has been left exposed prior to paving, including but not limited to any roadbed left exposed over the winter
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months or during other periods of heavy rainfall or unauthorized use of the trail by the public.

- 3.10 Protection .1 Maintain finished surfaces in condition conforming to this Section until placement of subsequent materials.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Section Includes .1 Materials and installation of polymeric geotextiles used in revetments, breakwaters, retaining wall structures, filtration, drainage structures, erosion and silt control, roadbeds and trail beds purpose of which is to:
- .1 Separate and prevent mixing of granular materials with the native sub-grade.
  - .2 Act as hydraulic filters permitting passage of water while retaining soil strength of granular structure.
  - .3 Provide additional strength to sub-grade.
  - .4 Prevent the growth of tree roots into the base and sub-base material of the Trail resulting in heaving. Root barrier is only required in areas where alder trees grow adjacent to the trail.
  - .5 Protect tree roots.
  - .6 Prevent the flow of water out of wetland areas,
  - .7 Control erosion and siltation.
- .2 Materials and installation of 100% biodegradable geotextiles used to reduce erosion of the finished landscape surface due to wind and water movement.
- 1.2 Measurement for Payment .1 The unit prices bid for these items shall be full compensation for all work necessary and incidental for the supplying and placing geotextiles to the lines, grades and cross-sections indicated in the Drawings and as directed by the DR.
- .2 The prices bid shall include, but not be limited to: supply and installation of geotextiles, retaining pins, and trenches, if required, overlaps, and all other work and materials necessary to complete this portion of the Work to the satisfaction of the DR.
- .3 The prices bid for erosion control blankets shall include, but not be limited to: supply, cutting blankets to various widths (typically 1 to 1.5 metres), and installation of the blanket over the finished exposed banks and ground surfaces, cutting around obstacles, and maintaining the coverage for the duration of the contract to the satisfaction of the OEM and DR. For the avoidance of doubt, measurement for payment relates only to permanent erosion control blankets. Temporary erosion control blankets are covered by Section 01 35 43 – Environmental Procedures.
- .4 Measurement for payment for the above items shall be at the unit price for each square metre of geotextile installed as measured in place and accepted by the DR. Overlap, as specified by supplier, to be considered incidental in the payment item.
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- .5 The prices bid for root barriers shall include, but not be limited to: supply, cutting the polyethylene rolls with a width of 1.2 metre, and installation of the barrier on each side of the trail excavation prior to placing the granular sub-base to the satisfaction of the DR.
- .6 Measurement for payment for the root barrier shall be at the unit price for each linear metre of polyethylene installed as measured in place and accepted by DR.
- .7 Measurement for payment for check dams made of LLPDE liner within the sub-base material shall be at the unit price for each check dam completed and include liner material, labour, and equipment to install the liner as shown on the drawings and accepted by DR. All granular materials and excavations shall be paid at the rates tendered for those items.
- .8 The prices bid for silt fencing shall include, but not be limited to: supply, cutting blankets to various lengths, and installation of the fencing and digging into the ground surfaces as specified, going around obstacles, and maintaining the fencing for the duration of the contract to the satisfaction of the OEM and DR. Refer to Section 01 35 43 – Environmental Procedures for additional information. Measurement for payment shall be per linear metre for each type of fencing installed and maintained as measured in the field and accepted by DR.

### 1.3 References

- .1 American Society for Testing and Materials International, (ASTM)
    - .1 ASTM D4491-99a, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
    - .2 ASTM D4595-86(2001), Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
    - .3 ASTM D4716-01, Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
    - .4 ASTM D4751-99a, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
  - .2 Canadian General Standards Board (CGSB)
    - .1 CAN/CGSB-4.2 No. 11.2- [M89(April 1997)], Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
    - .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
      - .1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
      - .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
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- .3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
- .4 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
- .5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.
- .3 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
- 1.4 Submittals
  - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Submit to DR following samples at least 4 weeks prior to beginning Work.
    - .1 Minimum length of 2 m of roll width of geotextile.
    - .2 Minimum of 1 m seam with at least 300 mm of geotextile on both sides of seam.
  - .3 Submit to DR copies of mill test data and certificate at least 4 weeks prior to start of Work, and in accordance with Section 01 33 00 - Submittal Procedures.
- 1.5 Delivery and Storage
  - .1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.
- 1.6 Waste Management and Disposal
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
  - .2 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

## PART 2 - PRODUCTS

- 2.1 Material
    - .1 Geotextile: woven and non-woven synthetic fibre fabric, supplied in rolls.
      - .1 Composed of: minimum 85% by mass of polypropylene or polyester.
    - .2 Physical properties of woven geotextile:
      - .1 Composed of: minimum 85% by mass of polypropylene or polyester.
-



Property	Unit	AASHTO Survivability	
		Moderate	High
Minimum Thickness	mm	n/a	n/a
Mass per Unit Area	g/m <sup>2</sup>	150	150
Grab Tensile Strength	N	1100	1400
Grab Tensile Elongation	%	<50	<50
Puncture	N	400	500
Mullen Burst	kPa	950	1300
Trapezoidal Tear	N	400	500
UB Degradation	% / 500 hrs	50	50
Apparent Opening Size	mm	0.6*	0.6*

\*Applies to soil with <50% passing the 0.075mm (#200) Sieve

High Survivability woven geotextiles shall be used where a woven geotextile is specified.

### .3 Physical properties of non-woven geotextile:

Property	Unit	AASHTO Survivability	
		Moderate	High
Minimum Thickness	mm	1.5	1.5
Mass per Unit Area	g/m <sup>2</sup>	150	150
Grab Tensile Strength	N	500	700
Grab Tensile Elongation	%	50	50
Puncture	N	180	275
Mullen Burst	kPa	950	1300

Property	Unit	AASHTO Survivability	
		Moderate	High
Trapezoidal Tear	N	180	250
UB Degradation	% / 500 hrs	50	50
Apparent Opening Size	mm	0.25*	0.25*

\*Applies to soil with 15 to 50% passing the 0.075mm (#200) sieve

High Survivability non-woven geotextiles shall be used where a non-woven geotextile is specified

- .4 Based on general physical properties of non-woven geotextiles outlined above, equivalent geotextiles would be:
  - .1 High Survivability: Nelix 4551 or Geotex 601 or approved equal.
  - .2 Moderate Survivability: Nelix 4550 or Geotex 401 or approved equal.
- .5 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.
- .6 Biaxial Geogrid:
  - .1 Composed of: 100% by polypropylene, open grid, biaxial orientation, free of striations, roughness, pinholes, blisters, undispersed raw materials or any sign of contamination by foreign matter.
  - .2 Supplied in rolls, minimum 4.00 metres in width.
  - .3 Tensile Strength at 2% Strain: 6.0 kN/m (MARV).
  - .4 Flexural Stiffness: 750,000 mg-cm.

Based on general physical properties outlined above, equivalent biaxial geogrids would be Tensar Biaxial Geogrid, Type 2 or approved equal.
- .7 Composite non-woven geotextile and Biaxial Geogrid:
  - .1 Composed of: 100% by polypropylene, Physical properties of geocomposite made of stretched, monolithic, textured polypropylene flat bars (PP) with welded junctions and a mechanical bonded filter geotextile which is welded within the geogrid structure.
  - .2 Supplied in rolls, minimum 4.00 metres in width.
  - .3 Mass per unit area: 150 g/sq.m.
  - .4 Grab Tensile Strength: 30.0 kN/m.

- .5 Grab Tensile Elongation: < 40%.
- .6 Puncture: 1,670 N.
- .7 UV Degradation: 50% / 500 hours.
- .8 Apparent Grid Size: 32mm X 32mm.

Based on general physical properties outlined above, equivalent combination geotextile would be Neau Combigrid 30/30 or approved equal.

- .8 Erosion Control Blanket (ECB):
    - .1 Composed of coconut fibres bound together with natural biodegradable netting.
    - .2 Supplied in rolls.
    - .3 Mass/Unit Area, minimum 322g/m<sup>2</sup>.
    - .4 Tensile strength to ASTM D6818, minimum MD of 4.5kN/m and CD of 3.6kN/m.
    - .5 Elongation to ASTM D6818, 20% / 20%.
    - .6 Based on general physical properties outlined above, the equivalent ECB would be Layfield EG-2C (NN) or approved equal.
  - .9 Light Duty Silt Fence Barrier:
    - .1 Composed of pre-strung filter fabric mounted on wooden stakes.
    - .2 Supplied in rolls.
    - .3 Property – Contractor grade 70 grams minimum.
    - .4 Weave 11 x 11.
    - .5 AOS 40 sieve.
    - .6 Flow Rate 24 gallons/minute/per foot.
    - .7 UV Resistance 80% after 500 hours.
  - .10 Heavy Duty Silt Fence Barrier:
    - .1 Composed of filter fabric mounted to welded wire fencing secured to metal T-Bar stakes.
    - .2 Supplied as separate components – Stakes supplied individually, filter fabric supplied in rolls, welded wire fencing supplied in rolls.
    - .3 Standard steel T-Bar stake with pre-drilled mounting holes, 2 metres length.
    - .4 Minimum 270R woven geotextile, 1.5 metre height.
    - .5 Steel, woven welded wire fencing, 1.5 metre height, 10 cm x 20 cm mesh size.
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- .11 Polyethylene Root Barrier:
  - .1 Composed of: 100% by polyethylene, 40 mil thick rolled material cut to 1.5 metre width with carbon black for UV stabilization.
  
- 2.2 Material Supplied by Owner
  - .1 The Owner has approximately 71 rolls (17ft x 265ft per roll) of Mirafi HP570 geotextile that shall be used prior to using Contractor supplied woven geotextile.
  - .2 Mirafi HP570 rolls are located at the sewage lagoon within the Park. The access road to the sewage lagoon is north of Wick Road off Highway 4.
  - .3 The Owner has approximately 57 rolls (8ft x 100ft per roll) of NAG C125BN erosion control blanket that shall be used prior to using Contractor supplied erosion-controlled blanket.
  - .4 The NAG erosion control blanket rolls are located at the Parks maintenance yard at the Tofino Airport, located within the Park. The access road to the airport is opposite the Long Beach parking lot on Highway 4.
  - .5 These geotextiles will be provided without charge to the Contractor, who shall be responsible for loading and delivery from the storage area to the site. Material usage will be quantified and monitored by the DR.

### PART 3 - EXECUTION

- 3.1 Sequence of Operation
    - .1 To minimize impacts to the existing subgrade the Work shall be performed in a manner to minimize the number of passages of heavy equipment over the sub-grade in any given area. The Work shall proceed sequentially along the trail: clearing (mostly complete) grubbing, then topsoil stripping and side casting or removal, mineral soil excavation to subgrade over a short section immediately followed by placing the geotextile and root barrier and placing of sub-grade material. Trucks bringing granular fill into the trail shall be used to back haul excess soil from the site. The subgrade not being tracked by machines and not left exposed overnight.
  
  - 3.2 Typical Installation of Geotextiles
    - .1 Prepare slope by grading to provide a smooth, uniform surface. Remove all stumps, large rock, brush or other debris that could damage the fabrics and grids. Fill all holes and depressions so that the fabric does not bridge them. Replace loose or unstable soils.
    - .2 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with securing pins.
    - .3 Place geotextile material smooth in a loose fashion and free of tension stress, folds, wrinkles and creases.
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- .4 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
  - .5 Overlap each successive strip of geotextile over previously laid strip. Fabric lap in accordance with manufacturer's recommendations with minimum of 1000 mm overlap for woven and 300 mm for non-woven geotextile.
  - .6 On slopes 4:1 and less - pin successive strips of geotextile with 6 mm diameter steel securing pins fitted with washers at 1.0 m intervals along the overlaps and at mid point of lap or as indicated.
  - .7 On slopes greater than 4:1 - anchor the top edge of the geotextile by digging a 300 mm deep trench, inserting the top edge of the geotextile and backfilling with compacted soil.
  - .8 Take care to prevent puncturing or tearing the geotextile. Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers. Repair all damage by use of patches that extend at least 1.0 m beyond the perimeter of the tear or puncture.
  - .9 After installation, cover with overlying layer within sufficient time so that ultraviolet damage does not occur. In no case shall this time exceed 7 days for ultraviolet susceptible material and 14 days for ultraviolet protected and low ultraviolet susceptible polymer geotextiles.
  - .10 Replace damaged or deteriorated geotextile to approval of DR.
  - .11 Commence rip-rap placement at the base of the blanket area and proceed up the slope. Limit the height of drop of rip-rap to 1.0 m or less. Do not allow the rip-rap to roll down the slope.
  - .12 Root barriers to be placed along the prepared sides of the trail alignment after all material to be excavated is removed and immediately prior to placing the granular sub grade fill and/or granular subbase. Fold root barrier over granular material and hold in place with a thin layer of additional granular.
- 3.3 Installation of Erosion Control Blankets
- .1 Prepare subgrade by grading to provide a smooth, uniform surface. Remove all stumps, large rock, brush or other debris that could damage the fabric. Fill all holes and depressions so that the fabric does not bridge them. Replace loose or unstable soils.
  - .2 Place erosion control blanket on all exposed surfaces.
  - .3 Dig a 150mm x 150mm anchor trench both upslope and downslope of the area to be covered.
  - .4 Secure the blanket with staples or pins into the trench every 300mm and backfill and compact.
  - .5 Roll the blankets vertically down the slope or in the direction of the of flow for channels in a loose fashion and free of tension stress, folds, wrinkles and creases.
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- .6 Overlap blankets a minimum 150mm in accordance with manufacturer's recommendations with downslope blanket underneath upslope blanket to form a shingle pattern.
  - .7 Staple the blanket at 600mm x 600mm spacing in accordance with the manufacturer's recommendations to ensure that the blanket rests tightly against the slope and that water does not flow underneath. Pattern may differ for steeper slopes.
  - .8 Replace damaged or deteriorated blanket to approval of DR.
  - .9 No vehicles or other equipment shall be permitted directly on the erosion control blanket following installation and Contractor personnel shall avoid walking on or working from the erosion control blanket following installation unless absolutely necessary.
- 3.4 Installation of Light Duty Silt Fence Barrier
- .1 For Light Duty Silt Fence Barrier, refer to Section 01 35 43 Environmental Procedures for installation requirements. Prepare fence alignment by removing all stumps, large rock, brush or other debris that could damage the fence. Fill all holes and depressions so that the fence does not bridge them.
  - .2 Dig a 150mm x 150mm anchor trench along the full length of the fence alignment.
  - .3 Install the fence along the full length of the alignment by driving the pre-installed wooden stakes sufficiently deep to ensure that 150 mm of the fence fabric is buried in the trench. Ensure that the silt fencing is pulled taught along the entire alignment to prevent sagging of the silt fence barrier.
  - .4 Backfill the trench to secure the buried fence fabric and tamp the soil.
- 3.5 Installation of Heavy Duty Silt Fence Barrier
- .1 For Heavy Duty Silt Fence Barrier, refer to Section 01 35 43 Environmental Procedures for installation requirements. Prepare fence alignment by removing all stumps, large rock, brush or other debris that could damage the fence. Fill all holes and depressions so that the fence does not bridge them.
  - .2 Dig a 150mm x 150mm anchor trench along the full length of the fence alignment.
  - .3 Install the fence along the full length of the alignment by driving the T-Bar stakes a minimum of 0.6 metres deep at 3 metre increments. Install the page wire fencing to the T-Bar stakes using wire ties, ensuring that the page wire fencing is pulled taught along the entire alignment to prevent sagging of the silt fence barrier. Install the filter fabric to the page wire fencing using wire ties, ensuring that the bottom 150 mm of the filter fabric is buried in the trench.
  - .4 Backfill the trench to secure the buried fence fabric and tamp the soil.
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- 3.6 Protection .1 No vehicles or other equipment shall be permitted directly on the geotextile or erosion control blanket following installation and Contractor personnel shall avoid walking on or working from the erosion control blanket following installation unless absolutely necessary.
- 3.7 Maintenance .1 Items installed as a part of the Temporary Environmental Procedures shall be inspected by the Contractor on a weekly basis, during each significant rainfall event, or as directed by the OEM or DR and make repairs to the installations to bring them to a 'like new' condition.
- .2 Items installed as a part of the Temporary Environmental Procedures that require regular cleaning shall be cleaned at intervals as directed by the OEM or DR.
- .3 Items installed as Temporary Environmental Procedures shall be removed upon completion of the project or as directed by the OEM or DR. Obtain approval of OEM prior to removal.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement for Payment .1 The unit prices bid for this item shall be full compensation for all work necessary and incidental for excavation, geotextiles, and the supply, hauling and placing of riprap to the lines, grades and cross-sections indicated in the Drawings and as directed by the DR.
- .2 Measurement for payment for this item shall be by the square metre (length X width) for riprap placed to each specified thickness, based on the riprap class as measured and accepted by the DR.
- .3 Measurement for payment for riprap placed as a fill material will be per cubic metre of riprap placed (length X width X depth) to the specified dimensions as measured and accepted by the DR.

**PART 2- PRODUCTS**

- 2.1 Stone .1 Hard, dense, durable quarry stone, angular in shape, resistant to weathering and water action, free from overburden, spoil, shale or shale seams, and organic material, care shall be taken to avoid introducing invasive plants into the park by using clean materials. All stones having maximum dimension not greater than three times its least dimension, to meet following size distribution:

Class of Riprap	Nominal Thickness of Riprap	Rock Gradation: Percentage Larger Than Given Rock Mass		
		85%	50%	15%
(kg)	(mm)			
10	350	1 kg	10 kg	30 kg
25	450	2.5 kg	25 kg	75 kg
50	550	5 kg	50 kg	150 kg
100	700	10 kg	100 kg	300 kg
250	1000	25 kg	250 kg	750 kg
500	1200	50 kg	500 kg	1500 kg
1000	2500	100 kg	1000 kg	3000 kg

- .2 The minimum acceptable unit weight of the rock is 2.5 tonnes/cubic metre.
- 2.2 Geotextile Filter .1 Geotextile: in accordance with Section 31 32 19 – Geotextiles. Use a non-woven high survivability geotextile.
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**PART 3 -**  
**EXECUTION**

- 3.1 Processing .1 Process riprap uniformly using methods that prevent contamination, segregation, and degradation.
- 3.2 Handling .1 Handle and transport riprap to avoid segregation, contamination, and degradation.
- 3.3 Placing .1 Where riprap is to be placed on slopes, excavate trench at toe of slope first, if and where instructed by the DR.
- .2 Where riprap is to be placed, fine grade the area first to provide a uniform and even surface, if and where instructed by the DR. Fill any depressions with suitable materials and compact to provide a firm bed.
- .3 Place geotextile on prepared surface in accordance with Section 31 32 19 – Geotextiles and as indicated. Avoid puncturing geotextile. Vehicle Traffic over geotextile is not permitted.
- .4 Place rip-rap to thickness and detailed as indicated on the drawing.
- .5 Place stones to secure the surface of the slope and create a stable mass.
- .6 Place larger stones at the bottom of the slopes.
- .7 Use larger stones for lower courses and as headers for subsequent courses.
- .8 Stagger vertical joints and fill voids with rock spalls or cobbles.
- .9 Finished surface to be reasonably uniform and even, free from bumps, depressions, underlying voids, large openings, or individual stones projecting out above apparent surface. Maximum deviation shall be ½ the diameter of the class or riprap used.
- .10 Place riprap prior to permitting water to pass through slope drains, as applicable.
- .11 Be careful not the damage the structure (new and existing components) in any way during riprap movement. Any damages shall be repaired at the expense of the Contractor.
- .12 Place layers simultaneously at both ends of the bridge to equalize loadings on the structure as a whole. Difference not to exceed 0.3m from one abutment to the other.
- .13 Embankments to be sloped to DR's requirements. Intent is that slopes be as gentle as possible within limitations of site geometry. Intent is that slopes to be reinforced with riprap to prevent future roadway embankment and river slope erosion, scour, migration, etc.

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**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Basis of Payment .1 Measurement for payment for each type of pile foundation shall be made as described in the specification for the type of pile supplied and installed.
- 1.2 Delivery, Storage and Handling .1 Protect piles from damage due to excessive bending stresses, impact, abrasion or other causes during delivery, storage and handling.  
.2 Replace damaged piles to satisfaction of DR.
- 1.3 Existing Conditions .1 Examine geotechnical reports that are included in Appendix A of these specifications.  
.2 Notify DR in writing if subsurface conditions at site differ from those indicated and await further instructions from DR.  
.3 Be aware of the presence of cobbles and boulders that may be present as noted in the geotechnical reports.
- 1.4 Scheduling .1 Submit schedule of planned sequence of driving to DR for review, not less than 2 weeks prior to commencement of pile driving.  
.2 Do not commence pile driving until the Owner's appointed Geotechnical Engineer is on-site.  
.3 The Owner's appointed Geotechnical Engineer is to be on-site prior to commencement of and during pile driving to ensure the work progresses as intended and to verify that site conditions revealed are consistent with design assumptions.
- 1.5 Quality assurance submittals: .1 Certificates: submit certificates signed by the manufacturer certifying that materials comply with specified performance characteristics and physical properties.

**PART 2 – PRODUCTS**

- 2.1 Materials .1 Steel pipe piles, Section 31 62 16  
.2 Helical piles, Section 31 66 13
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**PART 3 – EXECUTION**

- 3.1 Equipment
- .1 Field splicing may be required at bridge #3, #19 and #20.
  - .2 Pile installation equipment shall be capable of installing the pile to the anticipated pile tip elevations and to a factored capacity of three times the maximum unfactored design load.
  - .3 Hammer:
    - .1 Hammers to be selected on basis of drivability analysis using wave equation theory, performed to show that piles can be driven to levels indicated.
    - .2 The drivability analysis shall include, but not be limited to, the following: hammer, cushion, and capblock details; static soil parameters; quake and damping factors, total soil resistance, blow count, pile stresses and energy throughput at representative penetrations.
    - .3 Drivability analysis to be submitted to the DR for approval of the hammer or hammers.
    - .4 When required criteria cannot be achieved with the proposed hammer, use larger hammer and take other measures as required.
  - .4 Leads:
    - .1 Construct pile driver leads to provide free movement of hammer. Hold leads in position at top and bottom, with guys, stiff braces, or other means reviewed by DR, to ensure support to pile while being driven.
    - .2 Length: except for piles driven through water, provide length of leads so that use of a follower is unnecessary.
    - .3 Swing leads not permitted.
- 3.2 Preparation
- .1 Ensure that ground conditions at pile locations are adequate to support pile driving operation and load testing operation. Make provision for access and support of piling equipment during performance of work.
- 3.3 Field 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, position of pile in pile group, location or designation of pile group.
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- .4 Sequence of driving piles in group.
  - .5 Number of blows per metre for entire length of pile and set for last 5 blows.
  - .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.
  - .9 All measurements, observations and calculations associated with pile driving analyzer and wave equation analysis.
  - .10 Contractor's name.
  - .11 Design pile length.
  - .12 Date and time of start and finish of driving.
  - .13 Operator's name and all personnel involved and their function.
  - .2 Provide DR with three copies of records for each pile driven during that day.
- 3.4 Driving
- .1 Use driving caps and cushions to protect piles. Reinforce pile heads as required by DR. Piles with damaged heads as determined by DR will be rejected.
  - .2 Deliver hammer blows along axis of pile.
  - .3 Do not drive piles within 4 m of concrete that has been in place less than 3 days.
  - .4 Re-strike already driven piles heaved during driving of adjacent piles to confirm set and geotechnical capacity.
  - .5 Remove loose and displaced material from around piles after completion of driving, and leave clean, solid surfaces to receive foundation concrete.
  - .6 Use of water jetting is not permitted.
  - .7 Cut off piles neatly and squarely at elevations as indicated to tolerance of plus or minus +2mm/-1mm of top of Foundation Template. Provide sufficient length above cut-off elevation so that part damaged during driving is cut off. Do not cut tendons or other reinforcement that will be used to tie pile caps to pile.
  - .8 Remove cut-off lengths from site on completion of work.
- 3.5 Design Load Capacity
- .1 Pile vertical loads: as shown on drawings.
  - .2 Anticipated pile tips elevations, as shown on drawings.
  - .3 Maximum pile tip elevations to achieve minimum pile length, as shown on the drawings.
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- .4 Installation of each pile shall be subject to review by the Owner's appointed Geotechnical Engineer. The Owner's appointed Geotechnical Engineer shall be responsible for the acceptability of each pile with respect to final driving resistance, depth of penetration or other criteria used to determine load capacity. The Owner's appointed Geotechnical Engineer shall provide a certificate of compliance certifying the acceptability of the piles for the loads shown on the drawings. The certificate shall bear the signature and stamp of qualified professional engineer registered or licensed in Province of British Columbia. DR reserves the right to carry out quality assurance checks on all aspects of pile driving.
- .5 Do not drive pile tips below elevations shown on drawings, unless required to achieve load capacity and with the approval of the DR.
- 3.6 Driving Tolerances
- .1 Pile heads shall be within +/-50 mm of locations.
- .2 Piles installed shall not be more than 20mm out of vertical alignment over 1000mm of length (1:50).
- 3.7 Obstructions
- .1 Where obstruction is encountered that causes sudden unexpected change in penetration resistance or deviation from specified tolerances, remove obstruction or proceed as directed by the Owner's appointed Geotechnical Engineer.
- .2 The Owner's appointed Geotechnical Engineer to provide a solution that ensures piles are driven in locations as indicated on drawings for all piers.
- 3.8 Load Testing
- .1 Carry out High-Strain Dynamic Testing (HSDT) in conformance with Section 31 09 16 – Pipe Pile Tests. As a minimum, one HSDT shall be performed per abutment. Pile driving criteria shall be determined based on the HSDT to achieve the required pile loading.
- 3.9 Repair/Restoration
- .1 No extra compensation will be made for removing and replacing or other work made necessary through rejection of defective piles.
- 3.10 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 such that no damage occurs to adjacent structures. If damaged, remedy damaged items to restore to original or better condition at own expense.

**END OF SECTION**

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PART 1 - GENERAL This section includes design, supply, and driving steel pipe pile for foundation of bridge #3, #19 and # 20.

- .1 The Work shall consist of:
    - .1 Supplying, handling, hauling, storing, aligning and driving steel pipe piles.
    - .2 Cutting off piles at the required elevations.
    - .3 Pre-boring of piles if required.
    - .4 Supplying and placing concrete infill and reinforcement.
    - .5 Splicing pile if required.
    - .6 Supplying and installing pile tip if required.
- 
- 1.1 Measurement Procedures
- .1 The unit prices bid for piles shall be full compensation for all work necessary and incidental including, but not limited to; shop drawings, supply, delivery to site, driving, cutting or splicing, and other work to complete the pile installations as indicated on the Drawings and as directed by the DR.
  - .2 Mobilization and demobilization of labor and equipment necessary for pile driving for bridge structures shall be paid at the lump sum price tendered in the unit rate prices in this contract for each bridge.
  - .3 Mobilization and demobilization of labor and equipment necessary for pile driving for elevated trails shall be included in the price tendered for each pile in the unit rate prices in this contract.
  - .4 Pile tip reinforcement, splices, pile driving shoes and top cover plates and pile casings, as incidental to supply and installation of piles.
  - .5 Include 100% ultrasonic testing of welds by a qualified third-party testing firm as incidental to installation of piles.
  - .6 Include load tests as incidental to installation of piles according to Section 31 09 16 – Pipe Pile Tests.
  - .7 Measure for payment for bridge piles shall be per linear metre of pile installed, measured along the surface of each pile prior to installation as accepted by the DR.
  - .8 Measure for payment for concrete infill (approx. 4.3m) and reinforcing steel (approx. 4.35 m) in the upper section of the pipe piles shall be by count for each pile infill completed and accepted by the DR..9 Measure for payment for elevated trail pipe piles shall be per pile installed, measured by count and as accepted by the DR.
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- 1.2 References
- .1 ASTM A53: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - .2 ASTM A252: Standard Specification for Welded and Seamless Steel Pipe Piles.
  - .3 ASTM A500: Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - .4 ASTM A501: Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
  - .5 ASTM A706: Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
  - .6 CAN/CGSB-1.171-98, Inorganic Zinc Coating.
  - .7 CAN/CGSB-1.184-98, Coal Tar-Epoxy Coating.
  - .8 CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .9 CSA W47.1-03, Certification of Companies for Fusion Welding of Steel Structures.
  - .10 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
  - .11 CSA W59-3, Welded Steel Construction (Metal Arc Welding) (metric version).
  - .12 CSA W186-M1990(R2002), Welding of Reinforcing Bars in Reinforced Concrete Construction.
  - .13 CSA-Z245.1-02, Steel Pipe.
  - .14 AASHTO /Awws D1.5M Bridge Welding Code.

- 1.3 Related Sections
- .1 Section 03 30 00 – Cast in Place Concrete.

1.4 Submittals      The Contractor shall submit the following to the DR:

- .1 Copies of Mill Certificates and mill test reports showing chemical analysis and physical tests for all piling material shall be submitted to the Owner’s appointed Geotechnical Engineer for review prior to commencement of pile driving. Piling material without this certification will be rejected.

Where mill test certificates originate from a mill outside Canada or the United States of America, the Contractor shall have the information on the mill test certificate verified by independent testing by a Canadian laboratory. This laboratory shall be certified by an organization accredited by the Standards Council of Canada to comply with the requirements of ISO/IEC 17025 for the specific tests or type of tests required by the material standard specified on the mill test certificate. The mill test certificates shall be stamped with the name of the Canadian laboratory and appropriate wording stating that the material is in conformance with the specified requirements. The stamp shall include the

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- appropriate material specification number, testing date, and the signature of an authorized officer of the Canadian laboratory.
- .2 Manufacturer's specifications and catalogue for all mechanical hammers to be used.
  - .3 Certificate of mass for gravity. If this certificate is not available, the gravity or drop hammers shall be weighed in the presence of the Owner's appointed Geotechnical Engineer. Hammers so weighed shall have the exact mass marked on them. Gravity hammers shall weigh at least 1.5 ton but in no case shall the mass of the hammer be less than the combined mass of the pile and pile cap.
  - .4 Pile driving procedures to be used for the installation of the driven steel pipe piles.
  - .5 Proposed welding procedures conforming to AWS D1.5 or CAN/CSA W59 and CAN/CSA W47.1 to be used for splicing the piles and installing pile tips, if applicable. The following shall be included in the submitted welding procedures:
    - .1 The welding process, position of weld, filler metal, flux, shielding gas if required, joint configurations, number and size of passes, preheat and inter-pass temperatures if required, sequence of passes, current, rate of pass, electrode size, electrical stick-out and polarity.
    - .2 Methods proposed for edge preparation.
    - .3 Measures proposed to control distortion, shrinkage and residual stresses.
    - .4 Proposed methods and sequence of assembly.
    - .5 Welding equipment to be used.
  - .6 Proof of certification for the welders conducting the Work (if applicable). All welders shall satisfy one of the following requirements:
    - .1 Welders qualified in accordance with the requirements of AASHTO/AWS D1.5M/D1.5.
    - .2 Valid Canadian Welding Bureau (CWB) Welding ticket.
    - .3 Valid "Welder's Licence" as issued by the Mechanical and Engineering Division, Department of Labour and Manpower, Province of Manitoba, with a minimum of five (5) years of experience welding on steel structures.
  - .7 Submittals for the concrete infill in accordance with the Specifications for Reinforced Cast-in-Place Concrete.
- 1.5 Test Reports .1 Prior to fabrication, provide the DR with two copies of steel producer's certificates in accordance with Section 01 33 00 – Submittal Procedures.
- 1.6 Delivery, Storage and Handling .1 Deliver, store and handle materials to meet manufacturer's written instructions.  
.2 Deliver new, undamaged materials to site, accompanied by certified test reports, with manufacturer's logo and mill identification mark provided on pipe piling.
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- .3 Store and handle pipe piling in accordance with manufacturer's written instructions to prevent permanent deflection, distortion or damage to interlocks.
- .4 If piles are damaged due to the Contractor's handling operations, the Contractor shall, at his own expense, replace all damaged piles with piles meeting the requirements of this Specification and as shown on the Drawings.
- 1.7 Related Sections .1 Section 01 35 43 - Environmental Procedures.
- .2 Section 01 35 44 – Cultural Resource Procedures.

**PART 2 -**  
**PRODUCTS**

- 2.1 Materials
- .1 Steel pipe: size and wall thickness as indicated on the Drawings.
- .2 Pipe material: to conform to API specification 5L, Grade X46 or ASTM A252 Grade 3 with minimum yield strength of 317 MPa.
- .3 Pile tip reinforcement: to CAN/CSA-G40.21, Grade 300W.
- .4 Pile driving shoes: to CAN/CSA-G40.21, Grade 300W.
- .5 Steel pile cover plates: to CAN/CSA-G40.21, Grade 300W.
- .6 Welding electrodes: to CSA W48 series.
- .7 Reinforcing steel: to CAN/CSA G30.18 Grade 400W.
- .8 Splice backer rings or bar: to CAN/CSA G40.21M, Grade 300W
- .9 Concrete infill: Concrete infill shall conform to the requirements for cast-in-place concrete piles as identified in the Specifications for Reinforced Cast-in-Place Concrete
- 2.2 Pile Driving Equipment
- .1 Driving equipment shall be of a type generally used in standard pile-driving practice and shall be operated at the manufacturer's specified rate to develop the required rated energy. Drop hammers will not be allowed. Verify the energy required to reach top elevation with the DR.
- .2. Impact hammers shall be steam, air, or diesel driven and shall develop a minimum rated energy of 32.5kNm per blow and no more than 45 kNm per blow or as required to achieve the necessary pile tip penetration. The Contractor shall be responsible for selecting driving equipment that will not cause damage to the piling or adjacent structures during driving.
- .3. Vibratory hammers shall be of sufficient size and energy to install piles to the required tip elevation.
- .4. Driving caps shall be capable of protecting pile head and providing uniform distribution of energy to pile head.
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- .5 Use fixed rigid type pile driver leads that will hold the pile firmly in position and alignment, and in axial alignment with the driving equipment. Free-swinging, flying leads will not be permitted.
- 2.3 Quality Control and Management
- .1 Quality Control
    - .1 The Contractor shall provide a detailed survey of all of the pile locations and provide that to the DR prior to final acceptance of the piles and prior to cutting off any piles for a pile cap (abutment seat).
    - .2 The Contractor shall replace any piles, or add additional pile(s), for piles that do not meet the specified refusal criteria or do not meet the following tolerances:
      - .1 +/-1% out of plumb for vertical piles.
      - .2 75 mm off centre of the specified locations.
    - .3 Any modifications required to the pile cap, due to piles out of tolerance or due to required additional piles to compensate for out of tolerance piles, shall be carried out as specified by the DR at the Contractor's own costs.
    - .4 The Contractor shall be responsible for quality control testing of the concrete infill in accordance with the Specifications for Reinforced Cast-in-Place Concrete.
  - .2 Quality Assurance
    - .1 All welds will be inspected visually by the DR. The Contractor shall allow the Owner's appointed Geotechnical Engineer unhindered access to the piling and shall assist the Owner's appointed Geotechnical Engineer in carrying out any inspection, including suitable access.
    - .2 The DR will undertake quality assurance testing in accordance with the Specifications for Reinforced Cast-in-Place Concrete.
  - .3 Pile Driving Records
    - .1 The Contractor and the DR will keep an independent record of each and every pile driven. The records shall give the date, time, diameter, length, location, type, total depth of penetration, rate of penetration, number of blows per 250 mm for every 1 meter in length, blows per 25mm for a minimum of the last 75mm, steam, air or diesel pressure and the kind and size of hammer used in driving. Any unusual phenomena shall be noted and recorded, especially if they indicate possible damage to the pile.
    - .2 Actual and rated energy output of driving equipment at the time of final set shall be carefully recorded by the Contractor, along with the final penetration readings, and reported immediately to the Owner's appointed Geotechnical Engineer. The required set per blow will be subject to acceptance by the Owner's appointed Geotechnical Engineer, showing regard for the actual and rated energies for the hammer at refusal.
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**PART 3 –**  
**EXECUTION**

- 3.1 Fabrication
- .1 Fabricate full length piles to eliminate splicing during installation wherever possible.
  - .2 Full length piles may be fabricated from piling material with full penetration butt welds. together. When splice required, use complete joint penetration groove welds. Splice pile extensions, to details as indicated on reviewed shop drawings. Align extension with driven pile when splicing.
  - .3 Submit details of planned use of pile material stock to DR for review prior to start of fabrication. Re-use cut-off lengths may be permitted upon DR's approval.
  - .4 Install driving shoes if required.
  - .5 Piles are to be driven open ended.
  - .6 Repair defective welds as approved by DR. Repairs to CSA 259 and CSA W59S1. Unauthorized weld repairs may be rejected.
- 3.2 Installation
- .1 Do not commence pile installation until approval of the Pile Installation Work Method has been obtained from the DR.
  - .2 Ensure the appointed Owner's appointed Geotechnical Engineer is on-site prior to commencement of pile driving.
  - .3 Install HSDT piles and have the Owner's appointed Geotechnical Engineer determine driving criteria for production piles. This shall be submitted to the DR for review and acceptance before driving production piles.
  - .4 Provide steel point reinforcement or driving shoes as directed by the Owner's appointed Geotechnical Engineer.
  - .5 Install pile cover plates if required.
  - .6 Driving shoes may be installed during shop fabrication or as part of field work.
  - .7 Cut off piles squarely at required elevation.
  - .8 Location and Alignment
    - .1 The piles shall be driven in the positions shown on the Drawings or as directed by the DR. Piles shall be driven vertically unless shown otherwise on the Drawings and shall not deviate more than 2 percent out-of-plumb. Piles shall not be more than 75 mm off centre measured at cut- off elevation from the locations as specified on the Drawings.
    - .2 The Contractor shall take adequate precautions to ensure that the piles are in proper alignment, including the use of installation frames, fixed leads or other means as are necessary. The method of maintaining alignment shall be accepted by the DR.
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.3 Piles shall not be jacked or pulled into their final positions.

.9 Driving Steel Pipe Piles

.1 Steel pipe piles shall be driven to the depths and in accordance with the pile set criteria on the Drawings or as directed by the DR. Pile set criteria will be based upon the actual driving energy of the hammer not the rated or theoretical energy. All pile driving equipment, driving methods and procedures shall be reviewed by the Owner's appointed Geotechnical Engineer before any driving is started. Acceptable driving equipment includes hammers, vibratory hammers, driving frames or other equipment as may be required by the DR.

.2 The Contractor shall remove any surface and/or shallow depth obstructions to obtain the required penetration of the piles.

.3 Pile driving equipment to be used by the Contractor shall be of such capacity that the required bearing and penetration shall be obtained without damage being done to the piles. Driving of all piles shall be continuous and without interruption until the pile has been driven to cut-off elevation or the set criteria has been met. The driving of the piles with driving extensions should be avoided if practicable, and shall be done only under written permission of the DR.

If the Contractor can demonstrate conclusively that special methods, other than providing a higher capacity hammer, are necessary to advance the pile to the required penetration, such supplementary methods will be subject to the DR's approval.

.4 Pipe pile driver leads shall be used to support the piles while they are being driven and shall be braced to the supporting crane so as to hold the piles securely and accurately in the required position during driving. Leads shall be of sufficient length to be supported firmly on the ground. The use of hanging or swinging leads will not be allowed unless they can be held in a fixed position during the driving operations.

.5 The heads of steel pipe piles shall be squared and protected by a cap of a design approved by the DR. The cap shall be designed to hold the axis of the pile in line with the axis of the hammer. The top of the cap shall have a timber shock block.

.6 The Contractor shall drive all piling in the sequence as shown on the Drawings or specified by the DR to minimize pile upheaval. If upheaval does occur, the Contractor shall re-drive the lifted piles to the specified elevations. The Contractor shall excavate material that has boiled up during pile driving operations. The elevation of all piles previously driven or re-driven shall be confirmed to detect uplift. If uplift of 5 mm or more occurs in any pile, that pile shall be re-driven to its original elevation and thereafter to the required final driving resistance. If cavities remain around the piles after driving, the cavities shall be filled with sand or other approved material to the satisfaction of the DR.

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- .7 For pile installation monitoring purposes, the Contractor shall paint markings on each pile at 0.25 meter intervals, with a label at each 1.0 meter interval, starting from the toe of the pile.
  - .8 The Contractor shall ensure the safety of all personnel during pile driving operations. In particular, overhead protection shall be provided for all personnel located adjacent to the pile driving lead and under the pile driving hammer. The overhead protection shall be designed and constructed so as to safely withstand forces from falling debris or other matter.
  - .10 Steel Pipe Piles Cut-off
    - .1 The piles shall be cut off level at the required elevations as specified on the Drawings or as directed by the DR.
  - .11 Splicing Piles and Installing Pile Tips
    - .1 The Contractor shall splice pipe piles in accordance with this Specification, the Drawings, welding procedures, and the following:
      - .1 The butting ends of the driven pile and its extension shall be cut square to give reasonable bearing between the mating surfaces.
      - .2 The pipe surface of the extension shall be beveled to facilitate a full penetration V-groove weld. Splice backer rings shall be installed inside the driven pile and shall be tack welded to the pile. The backer rings shall be placed symmetrically about the joint.
      - .3 Before welding over previously deposited metal, the slag shall be removed. This requirement shall apply to successive layers, to successive beads, and to the cratered area when welding is resumed after any interruption.
      - .4 Material to be welded shall be preheated in accordance with CSA W59.
      - .5 The piles shall not have more than one splice per pile unless otherwise approved by the Owner's appointed Geotechnical Engineer. The location of the splice(s) shall be approved by the DR.
  - .12 Defective Piles
    - .1 The pile driving procedures shall not subject the piles to excessive and undue abuse producing deformation of the steel. Manipulation of piles to force them into proper position will not be permitted. Piles damaged by improper driving, or driven out of proper location, or driven below the cut-off elevation, shall be corrected by one of the following methods accepted by the DR:
      - .1 The piles shall be withdrawn and replaced by new, if necessary, longer piles, or
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- .2 Replacement piles shall be driven adjacent to defective or low piles, or
  - .3 The piles shall be spliced or built up, as otherwise provided herein, or a sufficient portion of the footing extended to properly embed the piles. All piles, pushed up by the driving of adjacent piles or by any other cause, shall be driven down again.
- .13 Concrete infill
- .1 Mixing and placing concrete infill shall be done in accordance with the Specifications for Section 03 30 00 Cast-in-Place Concrete.
  - .2 Concrete shall not have a free fall of more than 2.0 metres and shall be placed so that the aggregates do not separate or segregate.
  - .3 Concrete shall be placed to the elevations as shown on the Drawings. Laitance on the top of the pile shall be removed before placing the pile cap. The concrete shall be vibrated throughout the entire length of the pile.
  - .4 The shaft shall be free of water prior to placing of concrete. Concrete shall not be placed in or through water unless authorized by the DR.
  - .5 In the event that tremie concrete is allowed by the DR, the concrete shall be placed as specified herein. The shaft of the pile shall be pumped clear of water so that the bottom can be inspected and cleaned, if required. Pumping shall then be stopped and water shall be allowed to come into the shaft until a state of equilibrium is reached. Concrete shall then be placed by means of a tremie pipe. The tremie pipe shall have a suitable gate in the bottom to prevent water from entering the pipe. The bottom of the pipe shall be maintained below the surface of the freshly placed concrete at all times during placement. The pipe shall be capable of being raised or lowered quickly in order to control the flow of concrete.
  - .6 Heating of the concrete shall be done in accordance with the Specifications for Reinforced Cast-in-Place Concrete.
  - .7 Pre-boring will not be allowed unless it is specified in the Special Provisions, on the Drawings or approved in writing by the Owner's appointed Geotechnical Engineer.
  - .8 Where refusal is required, final set shall be determined by three consecutive readings meeting the set criteria indicated on the Drawings or as directed by the Owner's appointed Geotechnical Engineer. Final set will be measured and recorded in blows per 25mm by the Owner's appointed Geotechnical Engineer.
- 3.3 Welding
- .1 Weld in accordance with CSA W59 and CSA W59S1.
  - .2 Welding certification of companies: in accordance with CSA W47.1 and CSA W47.1S1.
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- .3 Make no more than one field splice and one shop splice per pile unless permitted otherwise by the DR. Splice piles by complete joint penetration weld. Carefully align and hold pieces firm and concentric until welding is complete. Provide backing bar (minimum 6.4mm thick) for all splices or as the Drawings. Underwater welding for pile splicing is prohibited. Splices shall develop the full strength of the pile in tension, bending, and bearing.
- 3.4 Rejected Piles
- .1 The Contractor will not be granted time extensions or additional compensation for work that fails inspection and is rejected.
- .2 Perform associated remedial work necessary to acceptably complete the pile installation as required by the applicable code. Such remedial work may include, but is not limited to, installation of additional piling, construction of additional framing, and removal and reinstallation of piling. No extra payment or time extensions will be made for remedial work required to acceptably complete pile installation.
- .3 No payment or time extension for furnishing, driving, cut-off, or extending will be made for any piling installed by instructions of the DR to correct or replace piles which are out of tolerance, misaligned, broken, incorrectly oriented, or otherwise violate these specifications, or for removing and reinstalling any piling incorrectly installed.

**END OF SECTION**

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- .5 CSA W48-14 Filler Metals and Allied Materials for Metal Arc Welding.
  - .6 CSA W59-13 Welded Steel Construction (Metal Arc Welding).
  - .3 Canadian Geotechnical Society:
    - .1 Canadian Foundation Engineering Manual, 4<sup>th</sup> Edition, 2006.
  - .4 Geotechnical Report
    - .1 Refer to the geotechnical investigation conducted by Wood, entitled Final Geotechnical Site Assessment Report – Pacific Traverse Trail, Pacific Rim National Park Reserve, Vancouver Island, BC. dated December 17, 2018.
    - .2 Ensure that the requirements of the geotechnical report and associated supplements are read and understood prior to commencing with work.
  - 1.4 Qualifications
    - .1 Helical Screw Pile Foundation System
      - .1 Manufacturer shall have at least ten years experience in the design and manufacture of Helical Piles.
      - .2 Current ICC-ES product evaluation report.
      - .3 Current ISO9001 certificate or manufacturing quality assurance program documentation showing methods used to assess and maintain product quality.
    - .2 Helical Screw Pile Designer and Installer
      - .1 Provide evidence of having installed Helical Piles on at least ten projects, including project name, number and type of Helical Piles, project location, and client contact information.
      - .2 Provide resume of Contractor's foreman including experience in the oversight of Helical Pile installation on at least five projects in the last five years, including project name, number and type of Helical Piles installed, project location, and client contact information.
      - .3 Provide list of installation and testing equipment and detailed description of proposed method of installation and load testing for Helical Piles.
    - .3 Contractor's Design Engineer
      - .1 Engage a professional engineer registered and licensed in the Province of British Columbia, fully qualified and experienced in the design of helical screw piles, to be responsible for the design of and supervision of installing these piles. The Contractor's Design Engineer of the helical piles shall have demonstrated approved expertise in designing helical piles of similar nature and scope to the require work.
-

- 1.5 Design
- .1 Pile design to be based on Ultimate Limit States (ULS) approach. Pile capacity and tip elevation are estimated base on the current geotechnical data and soil information. Final Pile tip elevation and length may require change provide that site condition substantially deviates from the available geotechnical parameters.
  - .2 Geotechnical resistance factor: as per geotechnical report by Wood.
  - .3 Piles to be based at the elevation specified or as directed by the Inspection Agency.
  - .4 Submit pile design criteria to the DR for review purposes only.
  - .5 Loads indicated on the foundation plan are for the pile design. Pile type and size are to be designed by the Contractor and by the Contractor's Design Engineer registered in the Province of British Columbia as per recommendations in the soils report.
  - .6 Design Helical Piles to resist all applied loading, including but not limited to:
    - .1 Vertical forces shown on drawings.
    - .2 Uplift forces shown on drawings.
    - .3 Lateral forces shown on drawings.
    - .4 Frost jacking as described in Geotechnical Report.
  - .7 Helical Screw Pile supplier to include the design and the cost of pile cap when more than one pile is required under single pile load indicated on the foundation plan. The design of the pile cap required at each pile group is the responsibility of the Contractor's Design Engineer.
- 1.6 Submittals
- .1 Shop Drawings
    - .1 The Contractor shall submit three copies of Shop Drawings for the proposed proprietary helical piles to the DR at least four weeks prior to intended start of fabrication. These documents shall bear the seal and signature of the Contractor's Design Engineer who shall be a Professional Engineer who is registered in the Province of British Columbia.
    - .2 The Shop Drawings shall provide the following information, at a minimum:
      - .1 Plans, Elevations, and Details, including: size, location and installation depth of helical piles.
      - .2 Design Criteria, including: values of horizontal and vertical loads, design assumptions and parameters, minimum final installation torque.
      - .3 The Contractor shall have a copy of the Working Drawings at the Site during Helical Pile System installation.
-

- .4 Review of the shop drawings by the DR is intended to assist the Contractor and does not relieve the Contractor of responsibility for the completeness and accuracy of the work and its conformance with the contract drawings and specifications.
  - .3 Materials, including: grade of structural steel, coating requirements, grade of nuts, bolts and washers (if applicable).
  - .2 Mill Certificates: Submit three copies of certified mill test reports for the materials used.

Where mill test reports originate from a mill outside of Canada or the United States of America, the Contractor shall have mill test reports verified by a certified laboratory in Canada by testing the material to the specified material standards, including boron content. The testing laboratory shall be certified to ISO/IEC 17025 by an organization accredited by the Standards Council of Canada for the tests required. Samples for testing shall be collected by personnel employed by the certified laboratory. A verification letter shall be provided by the certified laboratory that includes at a minimum, the applicable mill test reports, testing standards, date of verification testing, and declaration of material compliance with Contract requirements. The verification letter shall be signed by an authorized officer of the certified laboratory
  - .3 Installation & Testing Procedure, including: installation sequence and procedure, minimum installation depth, minimum installation torque, installation equipment, method to monitor performance during installation, testing methods and testing equipment.
  - .4 Sub-surface investigation report: when site conditions differ from those indicated, submit written notification to the DR and obtaining further instructions from the DR may be required.
  - .5 Submit schedule of planned sequence of installation to the DR for review, as specified.
  - .6 Design Calculations
    - .1 Three copies of the design calculations shall be submitted to DR at least four weeks prior to start of fabrication. Calculations shall bear the seal and signature of the Contractor's Design Engineer who shall be a Professional Engineer registered in BC.
    - .2 Calculations shall include material properties and design assumptions. The design assumptions shall accurately represent the subsurface conditions reported in the Contract Documents and shall be specific to the Helical Pile System used.
  - .7 Field Record and Drawings:
    - .1 Maintain accurate records of all piles installed. Records are to include the following:
      - .1 Location of piles.
-

- .2 Sequence of placing.
- .3 Final base and head elevations.
- .4 Date and time of drilling.
- .5 Pile Details, including shaft diameter and wall thickness, helix diameter and plate thickness, and number of helices.
- .6 Torque readings at regular increments.
- .7 Details of unusual occurrences.
- .8 Inspector's name.
- .2 Submit three copies of all field records and drawings to the Owner's appointed Geotechnical Engineer.
  - .1 Calibration information certified by an independent testing agency for the torque measurement device and all load testing and monitoring equipment to be used on the project. This shall be no more than one year old.
- .8 Warranty
  - .1 Manufacturer shall provide a one-year warranty against manufacturing defects on Helical Piles.
- 1.7 Related Sections
  - .1 Section 01 35 43 - Environmental Procedures.
  - .2 Section 01 35 44 – Cultural Resource Procedures.

PART 2 -  
PRODUCTS

- 2.1 Materials and Components:
    - .1 Only new materials are to be used for the fabrication of screw piles.
    - .2 Steel pipe shaft: to ASTM A500 or A513 Grade 50.
      - .1 Minimum pipe shaft thickness to be 8.6 mm.
      - .2 Steel pipe shaft diameter 114 mm.
      - .3 Structural steel with boron content exceeding 0.0008% will not be permitted.
      - .4 The silicon content shall be either less than 0.04% or 0.15 to 0.25% inclusive when steel is to be galvanized.
    - .3 Pile cap plates and helical plates: to ASTM A572, minimum yield strength 345MPa.
      - .1 Helix to have minimum thickness of 9.5 mm.
-

- .2 Structural steel with boron content exceeding 0.0008% will not be permitted.
  - .3 The silicon content shall be either less than 0.04% or 0.15 to 0.25% inclusive when steel is to be galvanized.
  - .4 Bolts: to SAE J429 Grade B
  - .5 Welding: to CSA W59.
  - .6 All piles shall be installed open ended and ends shall be cut to 45°.
  - .7 Leading edge of helix shall be sharpened to minimize soil disturbance during installation.
  - .8 Helixes are to be formed to a “True Helix” shape. The helix must be formed such that it remains perpendicular to the pipe shaft (within  $\pm 2^\circ$ ) during the entire distance around the pipe shaft.
  - .9 All edges on piles shall be ground and clear of burrs or sharp edges.
  - .10 Splice piles only with written approval of the Owner’s appointed Geotechnical Engineer.
    - .1 When permitted, provide details for the Owner’s appointed Geotechnical Engineer’s review.
    - .2 Design details of splice to include date, seal and signature of professional engineer registered and licensed in the Province of British Columbia.
    - .3 Show all approved splices on the shop drawings.
  - .11 If required, Hot Dipped Galvanizing shall be completed by a qualified supplier complying with CAN/CSA G164. The pile shall be galvanized inside and out and free from any galvanizing slag.
- 2.2 Welding
- .1 All pipe splicing shall be full strength complete penetration groove welds of the combination of a collar and continuous fillet welds on each end of collar to ensure continuity of pipe.
  - .2 Helix shall be welded to the pipe section using a continuous fillet weld on both sides of the helix to pipe connection.
  - .3 Welding procedure and welder qualification shall conform to CSA W59 and CSA 47.1. Welding electrodes shall conform to CSA W48.1 E7018 for stick welding, E4802C-6-CH for wire feed welding.
- 2.3 Shipping, storage & handling
- .1 All Helical Piles shall be free of structural defects and protected from damage. Store Helical Piles on wood pallets or supports to keep from contacting the ground. Damage to materials shall be cause for rejection.
-

**PART 3 –**  
**EXECUTION**

- 3.1 General
- .1 Allowable design load capacities of helical piles, and both anticipated and minimum driving depth are shown on the drawings.
  - .2 Contractor shall take reasonable effort to locate all utilities and structures above and underground in the Work.
  - .3 Owner's appointed Geotechnical Engineer will observe installation torque tests performed by Contractor.
  - .4 The Contractor shall not allow any equipment, materials or personnel to enter the bog or ponds adjacent to the proposal elevated trail during any stage of construction. When installing piles in bogs, ephemeral ponds, and other sensitive wetlands identified by DR and OEM, all equipment, materials and personnel shall be located on and work from the previously installed elevated trail section. The maximum weight of construction equipment, vehicles plus materials is 4.0 tonne. and maximum uniformed construction load is 2.0kPa. Equipment shall not sit on or damage the native ground. The existing elevated structure shall be protected from damage by the equipment and materials.
  - .5 Where excavation is required, only hand excavation will be permitted unless other methods are approved in writing by the OEM.
  6. Contractor to monitor closely deformation of the previously installed pile and elevated trails during and after new pile installed. Maximum allowable lateral deflection at pile top is 15mm. Contractor shall propose a plan of a temporary shoring, supporting to ensure all previously installed pile movement within the limits specified above. This deformation is due to construction load and operation. There is no permanent lateral deflection expected after construction completed.
- 3.2 Installation
- .1 All pile installation equipment, methods and procedures shall be reviewed by the Owner's appointed Geotechnical Engineer before any pile installation is started.
  - .2 Notify the DR and inspection and testing firm at least 48 hours prior to any installations on site.
  - .3 Ensure the appointed Owner's appointed Geotechnical Engineer is on-site prior to commencement of pile installation.
  - .4 Ensure that site conditions are adequate to support piling equipment and to allow proper performance of drilling operations.
  - .5 Ensure piling equipment is adequate for soil conditions. The Contractor is responsible for maintenance of the site grade and restoring any damages caused by the use of inappropriate equipment.
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- .6 Do not use piling methods that could cause damage to native ground or existing structures.
  - .7 The Contractor will adequately protect all materials and installed piles from the weather or physical abuse which may impair the quality, strength or usefulness of them. Items not so protected and suffering damage due to neglect by the Contractor in this regard will be rejected by the DR.
  - .8 Install piles where indicated on drawings. The Contractor is responsible for survey and layout from designated control point or bench mark.
  - .9 Should any obstruction be encountered in drilling pile which prevents pile from being placed to the expected tip elevation, or if drilled characteristics indicate that the pile is being damaged in drilled to the specified criteria, the pile will be abandoned or the pile will be removed. An abandoned pile will be cut off at ground level. Additional piles will be placed at an adjacent location, to be determined by the DR.
  - .10 Minimum embedment depth is typically considered five times the diameter of the uppermost helix or to the maximum anticipated frost penetration depth or as specified by Contractor's Design Engineer and approved by DR.
  - .11 Depth and torque tolerances: screw-in piles that reach maximum torque rating before reaching minimum indicated depth shall be subject to the following:
    - .1 Terminate at depth obtained with written approval of DR.
    - .2 Modify pile design with approval from Contractor's Design Engineer and DR. Replace screw-in pile with smaller and/or fewer helix pile, installed beyond the termination depth of the original screw-in pile.
  - .12 Piles will be drilled without interruption until the lengths and drilling criteria shown and specified elsewhere in the Contract Documents are met.
  - .13 Construct all piles to the top of pile cut-off elevation.
  - .14 Piles will be cut-off normal to the pile axis at the elevation shown on the drawings. Field weld pile cap plate to conform to layout
  - .15 Discontinue piling operations and immediately notify DR in the event that unusual soil conditions are encountered such that pile load capacities cannot be obtained.
  - .16 Piles may be increased or decreased in length depending on soil conditions only as directed by the Inspection Agency and approved by the DR and in accordance with the stipulated unit price. Ensure that where pile lengths are increased or decreased, adjacent piles are not undermined or capacities are not reduced.
  - .17 The Contractor shall notify the DR immediately of any pile not in compliance with the drawings and these specifications.
  - .18 The Contractor will immediately notify the DR when any movement in an installed pile is detected, giving the reason for movement, such as heave due to adjacent piling, and the measures proposed to correct the movement.
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- .19 Installation Tolerance:
    - .1 Do not deviate from true vertical alignment by more than 2% of pile length.
    - .2 Do not deviate from centre of true location by more than 50 mm.
    - .3 Do not deviate from specified head elevations by more than 25 mm.
  - .20 Non-conforming piles:
    - .1 Non-conforming piles are piles that are placed out of position or are damaged and/or piles not conforming to size, length and material specifications.
    - .2 Provide additional piles or supplement piles with additional pile caps or grade beams to meet specified requirements as directed by the DR at no additional cost to the contract.
- 3.3 Test Evaluation
- .1 Contractor's Design Engineer to interpret installation torque results for predicting pile performance and capacity for approval by the Owner's appointed Geotechnical Engineer.
  - .2 Contractor shall modify the Helical Pile design and/or installation methods and retest the modified pile, as directed by the DR, if a pile fails to provide the required capacity.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Introduction .1 This section is for the control and elimination of invasive species that may be inadvertently introduced into the Park by the Contractors work or invasive species already existing within the Park.
- 1.2 Measurement for Payment .1 The lump sum price bid for this item shall be full compensation for all work necessary and incidental for the implementation of an invasive species control plan and eradication of all invasive species that are present within the limits of the trail construction work to the satisfaction of the DR and which were deemed by the DR or OEM not to be present prior to construction. The invasive species control shall begin as soon as the Contractor starts work in the Park and continue for a 24-month period after the Substantial Completion Certificate is issued. Invasive species control plan and eradication approaches to follow the mitigation measures and other requirements noted in the Environmental Procedures.
- .2 Payment for this item shall be at the lump sum unit price tendered in the Schedule of Prices and Quantities. Release for payment shall be 50% payment release after the first year following Substantial Completion and 50% payment release at the completion of the invasive species control program.
- .3 The costs associated with bringing clean materials into the Park, such as special handling of granular materials and special procedures in gravel pits, shall be included in the prices submitted for those items.
- .4 The costs associated with cleaning equipment and personnel to avoid bringing invasive species into the Park or spreading invasive species that are already within the Park shall be included in the prices submitted for the items using the equipment and personnel.
- .5 If invasive species are identified that the DR or OEM determines, acting reasonably, were not brought into the Park by the Contractors work, the Contractor may be directed to remove these plants. The costs associated with this work will be paid by the Owner as an additional work item.
- 1.3 References .1 Section 01 35 43 - Environmental Procedures.
- 1.4 Definitions .1 Invasive plants: are any alien plant species that have the potential to pose undesirable or detrimental impacts on humans, animals or ecosystems. Invasive plants have the capacity to establish quickly and easily on both disturbed and un-disturbed sites, and can cause widespread negative economic, social, and environmental impacts.
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1.5 Related Sections .1 Section 01 35 43 - Environmental Procedures.

## PART 2 – PRODUCTS

- 2.1 Invasive Species Control Plan .1 This document, the Invasive Species Control Plan, (ISCP) shall be produced by the Contractor to prevent invasive species entering the Park and to lay out the methods, frequency, and procedures for the control and removal of invasive species inadvertently brought into the Park by the Work. The ISCP shall be submitted to the DR for approval prior to commencement of the works on site.
- .2 The ISCP shall include the following preventative requirements:
- .1 Prior to starting work at a new location or site in the Park the Contractor shall advise the OEM 5 working days in advance on starting the new work site. The OEM will inspect the site for invasive species. If invasive species are found the OEM will develop a strategy to minimize or eliminate the spread of the invasive species. The Contractor will cooperate with the OEM to implement the recommended strategy. Additional payment will be made to the Contractor when the request is reasonable, made in advance of the work, and is accepted by the DR.
  - .2 The Contractor shall follow the Best Management Practices for mitigating invasive species, appended to these specifications.
  - .3 Sources of all materials shall be inspected by the Contractor and OEM and/or DR prior to supply of material to determine if invasive species are present and to formulate a protocol to avoid introducing these into the Park. This may include washing material prior to use, avoiding contaminated areas, constructing clean haul routes, and finding new, clean sources of materials.
  - .4 Equipment (including haul trucks) and personnel shall be washed free of soil and dirt that may contain invasive species prior to entering the park and when relocating within the park.
- .3 Herbicides and other chemicals are not permitted within the Park boundary and will not be permitted for use in control and removal of invasive species of plants. All removals shall be manual removal (clipping, pulling by hand, digging roots, etc.)

## PART 3 - EXECUTION

- 3.1 Examination .1 The Contractor must become familiar with the various invasive species and be able to identify them as soon as, or shortly after they appear so action can be taken immediately.
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- 3.2 Duration and Frequency of Removal
- .1 The invasive species control shall begin as soon as the Contractor starts work in the Park and continue for a 24-month period after the Substantial Completion Certificate is issued.
  - .2 When the Contractor is physically working in the Park the removal of the invasive species shall occur within one week of the plants being identified or as agreed with the DR and OEM.
  - .3 When the Contractor is not actively working in the Park but the Certificate of Substantial Completion has not been issued, such as a winter shut down, the area of work shall be monitored at a frequency of twice per month and have any invasive species removed as they are identified.
  - .4 After the Certificate of Substantial Completion has been issued, the area of work shall be monitored at a frequency of twice per month between May 1 and September 30 (summer months) and once per month between October 1 and April 30 (winter months). Any invasive species shall be removed as they are identified during these inspections and a report shall be issued at the same frequency to the DR documenting such monitoring and removals.
- 3.3 Methods for Removal
- .1 Herbicides and other chemicals are not permitted within the Park boundary and will not be permitted for use in control and removal of invasive species of plants.
  - .2 All removals shall be manual removal (clipping, pulling by hand, digging roots, etc.).
  - .3 Gasoline and diesel-powered vehicles will not be permitted on the trails. The personnel performing the inspections and removals will be permitted to use an electric vehicle such as a John Deere Gator model TE 4X2 (or approved equal) electric (maximum speed of 24 km/hr) to perform their duties. Vehicles will be required to meet WorkSafe BC standards for such vehicles. The vehicle shall be kept clean so that it does not spread invasive species during its operation.
  - .4 All plant materials collected shall be removed from the Park at the end of each day.
- 3.4 List of Invasive Species
- .1 PCA shall provide a list of invasive plant species that shall be removed. Additional invasive species may be added if they are discovered within the work site.
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- 3.5 Cleaning
- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning. Invasive species shall be place in plastic bags to contain potential seeds and contaminated soil, sealed for transport and disposed of outside the park at an appropriate facility. Equipment, clothing and gear must be washed after handling invasive species. The approach to cleaning and removal of invasive species shall be included in the ISCP for approval by DR.
  - .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 for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement for Payment .1 The unit prices bid for Removal of Pavement Markings shall be full compensation for all work necessary and incidental to complete the removal of pavement markings as shown on the Drawings and as directed by the DR.
- .3 The prices shall include, but not be limited to: supply of abrasives and water, removal of the markings, and clean-up of the resulting debris and all labour, materials, and equipment incidental and necessary to complete this portion of the Work to the satisfaction of the DR.
- .3 Measurement for payment for this item shall be at the lump sum price bid for pavement marking to be removed on Highway 4 at the Esowista Curve between the limits shown on Drawings HW-4 and HW-5 and accepted by the DR

**PART 2 - PRODUCTS**

- 2.1 Materials .1 Abrasives used to remove paint from the asphalt surface shall be designed for pavement cleaning.

**PART 3 –  
EXECUTION**

- 3.1 Removals .1 In areas designated by the DR or as shown on the Contract Drawings remove paint markings by sand or water blasting, rotary grinding, or other methods approved by the DR.
- .2 Exercise care to avoid dislodging of coarse aggregate particles, excessive removal of fines, damage to bituminous binder, or damage to joint and crack sealers.
- .3 Dispose removed pavement markings as specified in Section 01 74 21 - Waste Management and Disposal.
- .4 Clean the remaining asphalt surface with a power broom vacuum truck to remove any traces of waste material.
- .5 Do not permit any paint material, abrasives, or water to enter waterways or contaminate the surrounding areas.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement for .1 The unit price bid for cold edge milling shall be full compensation for all work  
Payment .2 necessary and incidental for milling the edge of asphalt concrete pavement to  
50 mm deep by 200 mm wide to create a staggered joint for asphalt widening.  
.3 The unit prices bid for this item shall include, but not be limited to: removal and  
disposal outside of the Park boundaries of asphalt millings, cleaning of the  
surface, and all other work and materials necessary to complete this portion of  
the Work to the satisfaction of the DR.  
.3 Measure for payment for cold edge milling shall be per linear metre of asphalt  
edge milled as field measured along the edge line and accepted by the DR.
- 1.2 Related Sections .1 Section 01 25 20 - Mobilization and Demobilization.  
.2 Section 01 35 31 - Special Procedures for Traffic Control.  
.3 Section 01 35 43 - Environmental Procedures.  
.4 Section 01 56 00 - Temporary Barriers and Enclosures.  
.5 Section 01 71 00 - Examination and Preparation.  
.6 Section 01 74 11 - Cleaning.

**PART 2 -  
PRODUCTS**

- 2.1 Equipment .1 Use cold milling equipment capable of removing part of pavement surface to  
depths or grade indicated. The milling machine shall be capable of maintaining a  
constant milling depth and width. There shall be an effective means of removing  
the loosened material from the surface.  
.2 All pavement milling machines shall be equipped with a "kill" switch installed or  
approved by the manufacturer of the milling machine. This "kill" switch shall be  
automatically actuated whenever the operation of the machine is so impeded that  
a hazardous situation, such as "kick back", would result were that operation to  
continue. When so actuated the "kill" switch shall instantly shut down the  
operation of the milling machine.

**PART 3 -  
EXECUTION**

- 3.1 Preparation .1 Prior to beginning milling operations, inspect and verify with DR areas, depths  
and lines of asphalt pavement to be milled.
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- .2 Mark the section to provide a finished surface that is to within tolerances.
  - .3 Protect existing pavement not designated for milling and structures from damage. In event of damage, immediately replace or make repairs to approval of DR at no additional cost.
- 3.2 Pavement Milling
- .1 The existing asphalt concrete pavement shall be milled to the depth and width as specified on the drawings to provide a surface that is free of longitudinal and transverse irregularities.
  - .2 Use equipment and methods of removal and hauling which do not damage or disturb underlying roadway structure.
  - .3 Prevent milling to the underlying gravel or granular material while performing milling. Should any raveling or potholing occur after the milling operation, it shall be replaced using hot mix asphalt without additional payment.
  - .4 The Contractor shall suppress dust generated by removal process.
- 3.3 Site Tolerances
- .1 The milled or cut edge shall have a uniform textured appearance, free from longitudinal and transverse irregularities and capable of allowing a smooth butt joint between the existing and new asphalt. The cut line shall be a minimum of 200 mm from cracked, broken off, or alligatored asphalt.
  - .2 The finished milled asphalt surface shall not to have irregularities exceeding 5 mm when checked with 4.5 m straight edge placed in any direction.
  - .3 The finished edge milling shall be within +/-25 mm of width specified but not uniformly wide or narrow.
- 3.4 Sweeping and Disposal of Millings
- .1 At all times, during the milling operations, the traveled roadway shall be kept clean of all loose materials. Sweep asphalt pavement surfaces clean of debris resulting from milling operations using rotary power brooms and hand brooming.
  - .2 Dispose of millings outside of the Park Boundaries.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement for .1 The unit price bid for asphalt cutting and removal shall be full compensation for  
Payment .2 all work necessary and incidental for saw cutting and removal asphalt concrete  
pavement of all thicknesses. The unit price bid shall include, but not be limited to:  
.3 saw cutting the existing asphalt, cleaning the exposed edge, excavation,  
loading, hauling off-site, and disposal of the old asphalt and all other work and  
materials necessary to complete this portion of the Work to satisfaction of DR.  
.4 The unit price bid for saw cutting and removal of a 200 mm wide strip of  
highway edge shall be full compensation for all work necessary to saw cut the  
edge of asphalt concrete pavement full depth to create a smooth, clean surface to  
butt to for asphalt widening. The unit price bid shall include, but not be limited to:  
saw cutting the existing asphalt, cleaning the exposed edge, excavation,  
loading, hauling off-site, and disposal of the old asphalt and all other work and  
materials necessary to complete this portion of the Work to the satisfaction of the  
DR.  
.3 Measure for payment for asphalt removal shall be per square metre of asphalt  
removed as measured in the field and accepted by the DR.  
.4 Measure for payment for removal of the 200 mm wide asphalt edge strip shall be  
measured along the cut line in the field and accepted by the DR.
- 1.2 Related Sections .1 Section 01 25 20 - Mobilization and Demobilization.  
.2 Section 01 35 00 - Special Procedures for Traffic Control.  
.3 Section 01 35 43 - Environmental Procedures.  
.4 Section 01 56 00 - Temporary Barriers and Enclosures.  
.5 Section 01 74 11 - Cleaning.  
.6 Section 32 12 16 – Asphalt Paving.

**PART 2 -  
PRODUCTS**

- 2.1 Equipment .1 Use an asphalt saw capable of cutting through the full depth of the existing  
asphalt. The saw shall be self- propelled and maintain a constant cutting depth.  
.2 Equipment used to remove and load the asphalt being removed shall be capable  
of completing the work without damage the asphalt concrete being left in place.
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**PART 3 –  
EXECUTION**

- 3.1 Preparation .1 Prior to beginning sawing operations, inspect and verify with DR areas, depths and lines of asphalt pavement to be removed.
- .2 Mark the section to provide a finished edge that is to within tolerances.
- .3 Protect existing pavement not designated for removal and structures from damage. In event of damage, immediately replace or make repairs to approval of DR at no additional cost.
- 3.2 Pavement Cutting and Removal .1 The existing asphalt concrete pavement shall be removed to the depth and width as specified on the drawings to provide a surface that is free of longitudinal and transverse irregularities.
- .2 Use equipment and methods of removal and hauling which do not damage or disturb underlying roadway structure.
- .3 The Contractor may substitute asphalt milling in place of cutting and loading out asphalt removed. Payment will be made at the same rate as asphalt removal.
- .4 The Contractor shall suppress dust generated and contain contaminated water produced by removal process.
- 3.3 Site Tolerances .1 The milled or cut edge shall have a uniform textured appearance, free from longitudinal and transverse irregularities and capable of allowing a smooth butt joint between the existing and new asphalt. The cut line shall be a minimum of 200 mm from cracked, broken off, or alligatored asphalt.
- .2 Finished edges in areas where asphalt pavement has been removed to be within +/-25 mm of alignment specified but not uniformly wide or narrow.
- 3.4 Sweeping .1 At all times, during the sawing operations, the traveled roadway shall be kept clean of all loose materials.
- .2 Sweep remaining asphalt pavement surfaces clean of debris resulting from the operations using rotary power brooms and hand brooming as required.
- 3.5 Disposal of Removed Asphalt Materials .1 The disposal of materials removed under this section shall be recycled outside the Park.
- .2 Where the Contractor elects to cold mill asphalt in place of saw cutting and removal, the cold millings shall be removed and disposed of outside the Park.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement for Payment
- .1 The unit prices bid for this item shall be full compensation for all work necessary and incidental for the supply, hauling, placing, and compaction of granular sub-grade fill to the cross sections, dimensions and grades indicated on Drawings and as directed by the DR.
  - .2 The unit prices bid for this item shall include, but not be limited to: ensuring the material supplied and equipment delivering the materials to site are free of invasive species plant materials, supply and application of water as required to meet the specified density, and all other work and materials necessary to complete this portion of the Work to the satisfaction of the DR.
  - .3 Measure for payment for this item shall be per cubic metre of granular sub-grade fill material supplied and incorporated into the Works. Measurement is made as length X width X depth or survey cross sections measured in place and as accepted by DR.
- 1.2 References
- .1 ASTM C117, Standard Test Method for Materials 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 D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - .4 ASTM D4718, Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.
  - .5 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
  - .6 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- 1.3 Definitions
- .1 Select Granular Sub-grade Fill: Material excavated from within right-of-way and from designated borrow locations that meets specified gradation and material requirements and will be incorporated into embankment.

**PART 2 – PRODUCTS**

- 2.1 Materials
- .1 Select Granular Sub-grade Fill: to Section 31 05 16 – Aggregates.
-

**PART 3 –  
EXECUTION**

- 3.1 Inspection of Sub-grade Surface .1 Place Select Granular Sub-grade Fill after underlying surface is inspected, accepted by DR. Cover sub grade with approved geotextile.
- 3.2 Placing .1 Place Select Granular Sub-grade Fill to depths and grades indicated. To minimize impacts to the existing vegetation the Work shall be performed in a manner to minimize the number of passages of heavy equipment over the sub-grade in any given area. The Work shall proceed sequentially along the trail: clearing (mostly complete) grubbing, then topsoil stripping and side casting or removal, mineral soil excavation to subgrade over a short section immediately followed by placing sub-grade fill as required, the geotextile and root barrier (as required.). Trucks bringing granular fill into the trail shall be used to back haul excess soil from the site. The subgrade not being tracked by machines and not left exposed overnight.
- .2 When placing the first lift of granular material on the sub-grade the material shall be lightly rolled and without vibration. The density of this first layer shall not be required to obtain specified densities if agreed to by the DR.
- .3 Begin spreading Select Granular Sub-grade Fill material on crown line or on high side of one-way slope.
- .4 Place material in uniform layers not exceeding 450 mm compacted thickness. DR may authorize thicker layers if specified compaction can be achieved or if, in areas of soft soils, additional thickness is required to support equipment.
- .5 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .6 Remove and replace segregated material.
- 3.3 Compacting .1 Compact to 98% maximum dry density, to ASTM D698 and ASTM D4718 or as noted in clause 3.2.2, above.
- .2 Shape and roll alternately to obtain smooth, even and uniformly compacted structure. Compaction may be modified as described in clause 3.2.2, above.
- .3 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.
- .4 When placing granular sub-base around retained roots, roots shall be protected with fabric and the material shall be lightly rolled without vibration. The first layer shall not be required to obtain specified densities if agreed to by the DR.
-

- 3.4 Finish Tolerance
- .1 Finished compacted surface to be plus / minus 50 mm of established grade and cross section.
  - .2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- 3.5 Maintenance
- .1 Maintain finished Select Granular Sub-grade Fill in condition conforming to this Section until acceptance by DR and succeeding material is applied.
  - .2 Apply dust control measures as required.
  - .3 Ensure that Select Granular Sub-grade Fill surface is in properly compacted state prior to application of succeeding material.

**END OF SECTION**

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PART 1 - GENERAL

- 1.1 Measurement for Payment
- .1 The unit prices bid for these items shall be full compensation for all work necessary and incidental for the supply, hauling, placing, and compaction of granular sub-base to the cross sections, dimensions and grades indicated on Drawings and as directed by the DR.
  - .2 Payment for various separate types and uses of Granular Sub-Base (trail, highway widening) shall be made at the unit prices bid for each of these items.
  - .3 The unit prices bid for these items shall include, but not be limited to: ensuring the material supplied and equipment delivering the materials to site are free of invasive species plant materials, supply and application of water as required to meet the specified density, and all other work and materials necessary to complete this portion of the Work to the satisfaction of the DR.
  - .4 Measure for payment for these items shall be per square metre of completed granular sub-base, length X finished surface design width as shown on the Drawings. Measurements shall be taken on the finished surface of the granular sub-base. Where the actual measured width on the finished surface differs from the design width, the actual width may be used for payment at the discretion of the DR. Where the actual measured thickness of the finished granular sub-base course differs by more than 20 mm from the design thickness the payment may be pro-rated at the discretion of the DR. Additional thickness agreed by DR will be paid separately.
- 1.2 References
- .1 ASTM C117, Standard Test Method for Materials 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 D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - .4 ASTM D4718, Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.
  - .5 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>(2,700 kN-m/m<sup>3</sup>)).
  - .6 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
  - .7 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
  - .8 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
-

**PART 2 – PRODUCTS**

- 2.1 Materials .1 Granular Sub-base: material to Section 31 05 16 – Aggregates.

**PART 3 –  
EXECUTION**

- 3.1 Inspection of Subgrade Surface .1 Place Granular Sub-base after underlying surface is inspected and accepted by DR. Cover sub-grade with approved geotextile.
- 3.2 Sequence of Operation .1 Stockpile Granular Sub-base off site as specified under Section 31 05 16 – Aggregates.
- .2 Place Granular Sub-base after subgrade is inspected and accepted by DR. To minimize impacts to the existing subgrade the Work shall be performed in a manner to minimize the number of passages of heavy equipment over the sub-grade in any given area. The Work shall proceed sequentially along the trail: clearing (mostly complete) grubbing, then topsoil stripping and side casting or removal, mineral soil excavation to subgrade over a short section immediately followed by placing sub-grade fill, geotextile, and root barrier, all as required, and placing the sub-base. Trucks bringing granular fill into the trail shall be used to back haul excess soil from the site. The subgrade not being tracked by machines and not left exposed overnight.
- .3 Placing:
- .1 Construct Granular Sub-base to depth and grade in areas indicated.
- .2 Ensure no frozen material is placed.
- .3 Place material only on clean unfrozen surface, properly shaped and compacted, free from snow and ice, and covered by approved geotextile and geogrid.
- .4 Begin spreading sub-base material on crown line or on high side of one-way slope.
- .5 Place material using methods which do not lead to segregation or degradation of aggregate.
- .6 Place material to full width in uniform layers not exceeding 300 mm compacted thickness or as directed by DR where subgrade is strong. Where subgrade is weak, the first layer of sub-base fill may be 450 to 600 mm thick or as directed by DR. Subsequent lifts should be no greater than 200 mm thick.
- .7 Where groundwater movement across the trail is to be maintained, or where water is expected to enter the excavation preventing compaction
-

of the sub-base, the DR will direct the use of open-graded sub-base material. It is anticipated that open-graded sub-base material will be used in all wetland zones as identified on the contract drawings and additional locations to be agreed with the DR.

.8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.9 Remove and replace that portion of layer in which material becomes segregated during spreading.

.4 Compaction Equipment:

.1 Compaction equipment to be capable of obtaining required material densities.

.5 Compacting:

.1 Compact to density not less than 98% maximum dry density in accordance with ASTM D698 and D4718 or as noted in clause 3.7 above. At the discretion of the DR proof rolling of the compacted sub-base using fully loaded haul trucks may be substituted for a portion of the required density tests.

.2 When placing the first lift of granular sub-base on a sensitive sub-grade the material shall be lightly rolled and without vibration. The density of this first layer shall not be required to obtain specified densities if agreed to by the DR.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.4 Apply water as necessary during compacting to obtain specified density.

.5 Dry gravel if granular sub-base is excessively moist.

.6 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers.

.7 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

.8 When placing granular sub-base around retained roots, roots shall be protected with fabric and the material shall be lightly rolled without vibration. The density of this first layer shall not be required to obtain specified densities if agreed to by the DR.

3.3 Site Tolerances .1 Finished sub-base surface to be within plus or minus 15 mm of established grade and cross section.

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- 3.4 Maintenance
- .1 Maintain finished Granular Sub-base in condition conforming to this Section until acceptance by DR and until succeeding material is applied.
  - .2 Apply dust control measures as required.
  - .3 Ensure that Granular Sub-base surface is in properly compacted state prior to application of succeeding material.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement for .1 The unit prices bid for this item shall be full compensation for all work necessary  
Payment .2 and incidental for the supply, hauling, placing, and compaction of various  
thicknesses of granular base to the cross sections, dimensions and grades  
indicated on Drawings and as directed by the DR.
- .3 The unit prices bid for these items shall include, but not be limited to: ensuring  
the material supplied and equipment delivering the materials to site are free of  
invasive species plant materials, supply and application of water as required to  
meet the specified density, restoring the base surface to specified condition just  
prior to paving if required, and all other work and materials necessary to  
complete this portion of the Work to the satisfaction of the DR.
- .4 Measure for payment for these items shall be per square metre of completed  
granular base course, length X finished surface design width as shown on the  
Drawings. Measurements shall be taken on the finished surface of the granular  
base. Where the actual measured width on the finished surface differs from the  
design width, the actual width may be used for payment at the discretion of the  
DR. Where the actual measured thickness of the finished base course differs by  
more than 10 mm from the design thickness the payment may be pro-rated at the  
discretion of the DR.
- .5 Measure for payment for granular base shoulder dressing shall be per linear  
metre of completed shoulder roadway measured along the shoulder dressing  
using granular base course, length X finished surface design width as shown on  
the Drawings and accepted by the DR.
- 1.2 References .1 ASTM C117, Standard Test Method for Materials 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 C136, Standard Test Method for Sieve Analysis of Fine and Coarse  
Aggregates.
- .4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics  
of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
- .5 ASTM D4718, Standard Practice for Correction of Unit Weight and Water  
Content for Soils Containing Oversize Particles.
- .6 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil  
Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>(2,700 kN-m/m<sup>3</sup>)).
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- .7 ASTM D1883, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
- .8 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .9 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .10 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

## PART 2 - PRODUCTS

- 2.1 Materials .1 Granular base: material to Section 31 05 16 – Aggregates.

## PART 3 – EXECUTION

- 3.1 Sequence of Operation .1 Stockpile Granular Base off site as specified under Section 31 05 16 – Aggregates.
  - .2 Place Granular Base after underlying surface is to within tolerances.
  - .3 Placing:
    - .1 Construct Granular Base to depth and grade in areas indicated.
    - .2 Ensure no frozen material is placed.
    - .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 or on high side of slope.
    - .5 Place material using methods which do not lead to segregation or degradation of aggregate.
    - .6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
    - .7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
    - .8 Remove and replace that portion of layer in which material becomes segregated during spreading.
    - .9 For granular base shoulder dressing place granular base to the width shown on the drawings flush to the asphalt surface and sloped to match the base surface at the prescribed distance. Compact shoulder material and sweep asphalt to leave a clean surface.
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- .4 Compaction Equipment:
  - .1 Compaction equipment to be capable of obtaining required densities.
- .5 Compacting:
  - .1 Compact to density not less than 98% maximum dry density in accordance with ASTM D698 (Standard Proctor). At the discretion of the DR proof rolling of the compacted sub-base using fully loaded haul trucks may be substituted for a portion of the required density tests.
  - .2 Shape and roll alternately to obtain smooth, even, and uniformly compacted base.
  - .3 Apply water as necessary during compacting to obtain specified density.
  - .4 Dry gravel if Granular Base is excessively moist.
  - .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers.
  - .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- 3.2 Site Tolerances
  - .1 Finished Trail base surface to be within plus or minus 0.5% of established cross section slope with positive drainage.
  - .2 Finished Trail surface not to have irregularities exceeding 10 mm when checked with 3 m straight edge placed in any direction.
  - .3 Finished Highway base surface to be within plus or minus 10 mm of established grade and cross section slope with positive drainage.
  - .4 All finished Granular Base surfaces are subject to acceptance by DR.
- 3.3 Maintenance
  - .1 Maintain finished Granular Base in condition conforming to this section until succeeding material is applied or return Granular Base to condition acceptable to DR prior to paving or project completion.
  - .2 Apply dust control measures as required.
  - .3 Ensure that Granular Base surface is in properly compacted state prior to application of succeeding material.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement for .1 The unit prices bid for these items shall be full compensation for all work  
Payment Payment .2 necessary and incidental to supply all materials, install, remove, and return the  
area to natural condition as indicated on Drawings and directed by the DR.  
Removal of temporary accesses and pull-overs shall occur after the separate  
paving contract is completed. Where identified, temporary access points shall  
remain in place as permanent. Normal costs incurred by the OEM for these  
access points and pull-offs will not be charged to the Contractor.
- .2 The lump sum price bid for all Temporary Access Points, regardless of number  
installed and removed, shall include, but not be limited to: ensuring the material  
supplied and equipment delivering the materials to site are free of invasive  
species plant materials, additional clearing required, geotextiles, and granular  
materials, providing all labour and equipment necessary to complete the Work,  
preparing the area, installing all materials, maintaining the access road, removing  
the access upon completion of the Work, and returning the area to a natural  
condition to the satisfaction of the DR. Environmental costs, including silt  
fencing, associated with these pull-overs shall be paid separately.
- .3 The lump sum price bid for all Temporary Pull-Overs, regardless of number,  
shall include, but not be limited to: ensuring the material supplied and equipment  
delivering the materials to site are free of invasive species plant materials,  
additional clearing required, geotextiles, and granular materials, providing all  
labour and equipment necessary to complete the Work, preparing the area,  
installing all materials, maintaining the pull-overs, removing the pull-overs upon  
completion of the Work, and returning the area to a natural condition to the  
satisfaction of the DR. Environmental costs associated with these pull-overs shall  
be included in the costs of the temporary pull-overs.
- .4 The lump sum price bid for all Temporary Pull-Overs, regardless of number,  
shall include, but not be limited to: ensuring the material supplied and equipment  
delivering the materials to site are free of invasive species plant materials,  
additional clearing required.
- .5 For measurement and payment for culvert installation and removal associated  
with Temporary Access Points, refer to Section 33 42 13 - Pipe and Box  
Culverts, Clause 1.1.10 and 1.1.11.
- .6 Payment for Temporary Access Points and for Temporary Pull-offs shall at the  
Lump Sum price bid regardless of the number or lengths of the access roads or  
pull-offs installed, maintained, and removed. Payment shall be distributed as  
follows: 50% in the first Progress Payment and 50% when all the temporary  
access points or temporary pull-offs are removed and returned to a natural  
condition to the satisfaction of the DR.
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- .7 For the Contractor's first Progress Payment, it is a condition precedent to the Owner's obligation (paragraph 3 of GC5.4) that the Contractor has provided all necessary documentation required by the Contract for the first Progress Payment.
  - .8 Where the Access Points are shown as permanent, payment for the Work shall be made at the rates tendered for trail construction for similar items.
- 1.2 Related Sections
- .1 Division 1, General Requirements, all sections.
  - .2 Section 01 35 43 - Environmental Procedures.
  - .3 Section 01 35 44 – Cultural Resources Procedures.
  - .4 Section 31 05 16 - Aggregates.
  - .5 Section 31 11 00 - Clearing and Grubbing.
  - .6 Section 31 32 19 – Geotextiles.
  - .7 Section 32 11 16 - Granular Sub-Base.
  - .8 Section 32 11 23 – Granular Base.
  - .9 Section 32 15 60 - Dust Control.
  - .10 Section 33 42 13 - Pipe and Box Culverts.

## PART 2 - PRODUCTS

- 2.1 Materials
- .1 Granular base: material to Section 31 05 16 – Aggregates.
  - .2 Geotextiles: material to Section 31 32 19 – Geotextiles.
  - .3 Granular sub-base: material to Section 32 11 16 - Granular Sub-Base.
  - .4 Granular Base: material to Section 32 11 23 – Granular Base.
  - .5 Pipe Culverts: refer to Section 33 42 13 - Pipe and Box Culverts (new or re-used).

## PART 3 – EXECUTION

- 3.1 Selection of Locations for Temporary Accesses
- .1 The Contractor will be able to access the trail alignment where the trail comes up to the Highway and where the trail crosses existing roads and parking lot entrances.
  - .2 In addition to the above access locations the Contractor may construct additional temporary access points only at locations previously cleared for trail access by the clearing contractor and identified on the Drawings. Each location requested
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shall be approved by the OEM and the DR prior to reinstalling the access point. The OEM and DR can help to suggest methods of construction that will minimize environmental impacts. Additional temporary access points may be requested by the Contractor at least 30 days prior to commencement of construction and will be approved at the sole discretion of the DR. Separate payment will not be made for additional clearing or additional access point construction.

- .3 The Contractor shall consider sight lines along the Highway and roads to provide safe locations for construction traffic to enter and exit the access road.
- .4 The Drawings provide approximate locations of access points have been cleared by others prior to construction. The Drawing also shows existing access points which require reconstruction.
- .5 The Contractor shall note that ditch crossings or other works at all existing temporary access points will be removed by the clearing contractor prior to completion of the trail clearing.

### 3.2 Selection of Locations for Temporary Pull-outs

- .1 The Contractor will be permitted to construct temporary pull-outs along the trail alignment to permit construction vehicles to pass each other to aid in the construction of the trail where the distance between the access point and the work face is greater than 250 metres. Approximately 12 – 15 are assumed.
- .2 The number of temporary pull-outs should be minimized and should be chosen to minimize additional clearing. All proposed temporary pull-out locations shall be approved at the discretion of the DR and OEM. The Contractor shall allow 30 days for the approval process.
- .3 Widening on both sides of the trail to minimize impacts shall be considered by the Contractor to minimize impacts.
- .4 Locations in wetlands, riparian zones, archeological sites, and similar areas will not be considered. The Contractor should consider areas with few trees, level ground, and simple construction and restoration for temporary pull-overs.

### 3.3 Construction of the Temporary Access Points and Pull-outs

- .1 After receiving approval for the location the OEM will review the site to determine if amphibian salvage or other measures are required prior construction of the access road or pull-out.
  - .2 Do additional clearing, if required, of trees and vegetation in accordance with Section 31 11 00 - Clearing and Grubbing. Clearing is prohibited during the bird nesting window, March 12 to August 17.
  - .3 Cover the access road alignment or pull-out area with a high survivability geotextile to protect the organic materials.
  - .4 Install a culvert for the roadside ditch subject to acceptance by DR and OEM that has sufficient capacity to permit the passage of all storm water flow anticipated at the location selected. Culvert installation shall be in accordance with Section
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- 33 42 13 – Pipe and Box Culverts, Section 01 35 43 – Environmental Procedures, and where applicable, Section 33 42 15 – Fisheries Work
- .5 Place and compact granular sub-base and base of sufficient thickness to permit construction traffic to access the trail alignment and have functional pull-offs.
- .6 Install siltation control and erosion control measures to protect the surrounding environment from silt and other contamination.
- 3.4 Maintenance
- .1 Maintain finished Granular Base in condition that permits construction traffic to exit the site without tracking debris or dirt onto the road.
- .2 Apply dust control measures as required.
- .3 Ensure the access road provides safe conditions for vehicle use.
- .4 Install suitable method of closure on the access road, which may include but is not limited to signage, fences and gates, to prevent the public from using the access point when it is not required for construction, including at night, and on weekends. Install suitable bi-lingual signage noting for use by construction traffic only.
- .5 Provide suitable signage and fences at access or other points along the highway to prevent access to the trail from any other locations other than access points approved by the DR and to prevent unapproved trails forming through the park.
- 3.5 Removal and Cleaning
- .1 After construction is complete, including paving (separate contract by others), all temporary access points and pull-overs shall be removed by the Contractor except where designated as permanent access points. Where temporary access points are to be retained as permanent access points, the Contractor shall finish and clean to the same standard as the main trail.
- .2 Remove granular base and sub base materials where the temporary access point is to be removed.
- .3 Remove geotextile material gathering it up to capture the imported granular materials and leaving the original organic surface intact where the temporary access point is to be removed.
- .4 Remove culvert and restore the drainage ditch to original cross section and grade where the temporary access point is to be removed.
- .5 The area shall be covered with erosion control blankets (separate payment) if erosion is a concern.
- .6 Remove those sediment control devices and materials that are no longer needed and install any devices that are needed, as directed by the DR.
- .7 Return the gravel shoulder of the road or highway to original condition and repair any damage to the asphalt.
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- .8 Refer to Section 01 74 11 - Cleaning, for any additional requirements to return the area to acceptable condition to the satisfaction of the DR.
- .9 Parks retains the right to have any of the temporary facilities left in place upon completion of the project without additional cost. Trail connections to the permanent access points shall be finished and restored to the same standard as the main trail in accordance with Section 31 24 13 – Highway and Trail Excavation, Embankment, and Compaction.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement Procedures
- .1 The unit prices bid for this item shall be full compensation for all work necessary and incidental for the supply and placing of asphalt tack coat to the areas designated for asphaltic pavement as shown on the Drawings and as directed by the DR.
  - .2 The prices bid shall include, but not be limited to: tacking of prepared surfaces; and all other work and materials incidental and necessary to complete this portion of the Work to the satisfaction of the DR.
  - .3 Measurement for payment for this item shall be per neat square metre of asphalt tack coat placed, (length X width) and accepted by the DR.
- 1.2 References
- .1 American Association of State Highway and Transportation Officials (AASHTO)
    - .1 AASHTO M081-92-UL-04, Standard Specification for Cutback Asphalt (Rapid-Curing Type).
  - .2 ASTM International
    - .1 ASTM D140/D140M-09, Standard Practice for Sampling Bituminous Materials.
    - .2 ASTM D633-11, Standard Volume Correction Table for Road Tar.
    - .3 ASTM D1250-08, Standard Guide for Use of the Petroleum Measurement Tables.
  - .3 Canadian General Standards Board (CGSB)
    - .1 CAN/CGSB-16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.
- 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 - 4 L samples of asphalt tack coat material proposed for use in new, clean, airtight, sealed, wide mouth containers to DR, at least 2 weeks prior to beginning Work.
    - .2 Sample asphalt tack coat material to: ASTM D140.
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- .3 Provide access on tank truck for DR to sample asphalt material to be incorporated into Work to ASTM D140.
- 1.4 Quality Assurance .1 Upon request from DR, submit manufacturer's test data and certification that asphalt prime material meets requirements of this Section.
- 1.5 Delivery, Storage and Handling .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements with manufacturer's written instructions.
  - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .3 Storage and Handling Requirements:
    - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
    - .2 Replace defective or damaged materials with new.
  - .4 Deliver, store and handle materials in accordance with ASTM D140.
  - .5 Provide, maintain and restore asphalt storage area.
- 1.6 Waste Management and Disposal .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

## PART 2 - PRODUCTS

- 2.1 Materials .1 Anionic emulsified asphalt: to CAN/CGSB-16.2, grade: SS-1.
    - .2 Water: clean, potable, free from foreign matter.
  - 2.2 Equipment .1 Equipment required for Work of this Section to be in satisfactory working condition and maintained for duration of Work.
    - .2 Pressure distributor:
      - .1 Designed, equipped, maintained and operated so that asphalt material can be:
        - .1 Maintained at even temperature.
        - .2 Applied uniformly on variable widths of surface up to 5 m.
        - .3 Applied at readily determined and controlled rates from 0.2 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>.
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- .4 Distribute in uniform spray without atomization at temperature required.
- .2 Equipped with meter, registering travel in metres per minute, visibly located to enable truck driver to maintain constant speed required for application at specified rate.
- .3 Equipped with pump having flow meter graduated in units of 5 L or less per minute passing through nozzles and readily visible to operator. Pump power unit to be independent of truck power unit.
- .4 Equipped with easily read, accurate and sensitive device which registers temperature of liquid in reservoir.
  - .1 Measure temperature to closest whole number.
- .5 Equipped with accurate volume measuring device or calibrated tank.
- .6 Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.
- .7 Equipped with nozzle spray bar, with operational height adjustment in increments of 0.6 metres and capable of being raised or lowered.
- .8 Cleaned if previously used with incompatible asphalt material.

**PART 3 -**  
**EXECUTION**

- 3.1 Examination
    - .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for asphalt tack coat installation in accordance with manufacturer's written instructions.
      - .1 Visually inspect substrate in presence of DR.
      - .2 Inform DR of unacceptable conditions immediately upon discovery.
      - .3 Proceed with installation only after unacceptable conditions have been remedied.
  - 3.2 Application
    - .1 Apply asphalt tack coat only on clean and dry surface.
    - .2 Dilute asphalt emulsion with water at 1:1 ratio for application.
      - .1 Mix thoroughly by pumping or other method approved by DR.
    - .3 Apply asphalt tack coat evenly to pavement surface at rate at a rate of 0.5 L/m<sup>2</sup> when diluted with water at 1:1 ration.
    - .4 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt tack coat material.
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- .5 Apply asphalt tack coat only when air temperature greater than 5 degrees C and when rain is not forecast within 2 hours minimum of application.
  - .6 Apply asphalt tack coat only on unfrozen surface.
  - .7 Apply tack coat only to surfaces that are expected to be overlaid on same day.
  - .8 Evenly distribute localized excessive deposits of tack coat by brooming as directed by DR.
  - .9 Where traffic is to be maintained, treat no more than one half of width of surface in one application.
  - .10 Keep traffic off tacked areas until asphalt tack coat has set.
  - .11 Re-tack contaminated or disturbed areas as directed by DR.
  - .12 Permit asphalt tack coat to cure before placing asphalt pavement.
  - .13 Carry out measurements in presence of DR upon request.
  - .14 Inspect tack coat application to ensure uniformity.
    - .1 Re-spray areas of insufficient or non-uniform tack coat coverage as directed by DR.
    - .2 Ensure tack coating performed using hand held devices is consistent in appearance with adjacent areas of machine applied material.
- 3.3 Cleaning
- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
    - .1 Leave Work area clean at end of each day.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement and Payment .1 The unit prices bid for this item shall be full compensation for all work necessary and incidental for the supply, hauling, placing, rolling and compaction of hot mix asphaltic concrete pavement to the lines, grades and cross-sections indicated for designated areas as indicated in the Drawings and as directed by the DR.
- .2 The prices bid shall include, but not be limited to: provision of mix designs; joint preparation; adjusting and cleaning of castings; supply, placing, rolling and compaction of the specified compacted thickness hot mix asphaltic concrete; testing; temporary pavement markings; and all other work and materials incidental and necessary to complete this Work to the satisfaction of the DR.
- .3 Measurement for payment for this item shall be per neat square metre of compacted asphaltic concrete of type indicated, placed (length X width) to the specified thickness and accepted by the DR
- 1.2 Areas included in paving .1 The areas to be paved under this contract are:
- .1 The multi-use trail paralleling Highway 4 where specified.
- .2 Incinerator Rock Parking lot and cul-de-sac.
- .3 Highway 4 widening at the Esowista curve.
- .4 Local Highway widenings to accommodate roadside concrete barrier placement where specified.
- .2 Mix Design: Submit asphalt concrete mix design and trial mix test results to DR for review at least 4 weeks prior to beginning Work.
- 1.3 References .1 Asphalt Institute (AI)
- .1 AI MS-2, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.
- .2 ASTM International
- .1 ASTM C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
- .2 ASTM C117, Standard Test Method for Material Finer Than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.
- .3 ASTM C123, Standard Test Method for Lightweight Particles in Aggregate.
- .4 ASTM C127, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
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- .5 ASTM C128, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
  - .6 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .7 ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .8 ASTM C207, Standard Specification for Hydrated Lime for Masonry Purposes.
  - .9 ASTM D995, Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
  - .10 ASTM D2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
  - .11 ASTM D3203, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
  - .12 ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- 1.4 Action and Informational Submittals
- and.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Product Data: Upon request of DR, submit manufacturer's instructions, printed product literature and data sheets for asphalt mixes and aggregate and include product characteristics, performance criteria, physical size, finish and limitations.
  - .3 Mix Design: Submit asphalt concrete mix design and trial mix test results to DR for review at least 4 weeks prior to beginning Work.
- 1.5 Delivery, Storage and Handling
- 1.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements.
- PART 2 - PRODUCTS
- 2.1 Material
- .1 Performance graded asphalt cement: to CGSB-16.3-M90, Grade 80-100.
  - .2 RAP:
    - .1 Crushed and screened to ensure 100% of RAP material passes 37.5 mm screen before mixing.
-

- .3 Aggregates: in accordance with Section 31 05 16 - Aggregate and requirements as follows:
  - .1 Crushed stone or gravel.
  - .2 Gradations: within limits specified when tested to ASTM C136 and ASTM C117.
  - .3 Gradations to conform to the below table:

Sieve Designation	% Passing	
	Lower Course	Surface Course
19 mm	100	-
12.5 mm	84-99	100
9.5 mm	73-88	-
4.75 mm	55-68	55-75
2.36 mm	35-55	38-58
1.18 mm	27-46	28-47
0.600 mm	18-36	20-36
0.300 mm	10-26	10-26
0.150 mm	4-17	4-17
0.075 mm	3-8	3-8

- .4 Coarse aggregate: aggregate retained on 4.75 mm sieve and fine aggregate is aggregate passing 4.75 mm sieve when tested to ASTM C136.
  - .5 When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75 mm sieve and stockpile separately from coarse aggregate.
  - .6 Do not use aggregates having known polishing characteristics in mixes for surface courses.
  - .7 Sand equivalent: ASTM D2419. Min: 40.
  - .8 Magnesium Sulphate soundness: to ASTM C88. Max% loss by mass:
    - .1 Coarse aggregate: 15%.
    - .2 Fine aggregate: 18%.
  - .9 Los Angeles degradation: Grading B, to ASTM C131. Max% loss by mass:
    - .1 Coarse aggregate, surface course: 25%.
-

- .10 Absorption: to ASTM C127. Max% by mass:
  - .1 Coarse aggregate, surface course: 1.75%.
- .11 Loss by washing: to ASTM C117. Max% passing 0.075 mm sieve:
  - .1 Coarse aggregate, surface course: 1.5%.
- .12 Lightweight particles: to ASTM C123. Max% by mass less than 1.95 relative density:
  - .1 Surface course: 1.5%.
- .13 Flat and elongated particles: to ASTM D4791, (with length to thickness ratio greater than 5): Max% by mass:
  - .1 Coarse aggregate, surface course: 10%.
- .14 Crushed fragments: at least 60% of particles by mass within each of following sieve designation ranges, to have at least 2 freshly fractured faces. Material to be divided into ranges, using methods of ASTM C136.

<b>Passing</b>		<b>Retained on</b>	
25 mm	to	12.5 mm	
12.5 mm	to	4.75mm	

- .15 Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.
  - .4 Mineral filler:
    - .1 Ensure finely ground particles of limestone, hydrated lime, Portland cement or non-plastic mineral matter approved by DR are thoroughly dry and free from lumps.
    - .2 Add mineral filler when necessary to meet job mix aggregate gradation or as directed by DR to improve mix properties.
    - .3 Ensure mineral filler is dry and free flowing when added to aggregate.
  - 2.2 Equipment
    - .1 Pavers: mechanical [grade controlled] self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.
    - .2 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.
    - .3 Vibratory rollers:
      - .1 Drum diameter: 1200 mm minimum.
-



- .2 Amplitude of vibration (machine setting): 0.5 mm maximum for lifts less than 40 mm thick.
  - .4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
    - .1 Boxes with tight metal bottoms.
    - .2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
    - .3 In cool weather or for long hauls, insulate entire contact area of each truck box.
    - .4 Use only trucks which can be weighed in single operation on scales supplied.
  - .5 Hand tools:
    - .1 Lutes or rakes with covered teeth for spreading and finishing operations.
    - .2 Tamping irons having mass 12 kg minimum and bearing area not exceeding 310 cm<sup>2</sup> for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by DR, may be used instead of tamping irons.
    - .3 Straight edges, 4.5 m in length, to test finished surface.
- 2.3 Mix Design
- .1 Mix design to be approved in writing by DR.
  - .2 Mix may contain maximum 20% by mass of RAP. D R may approve higher proportion of RAP if Contractor demonstrates ability to produce mix meeting requirements of specification.
  - .3 Design of mix: by Marshall method to requirements below:
    - .1 Compaction blows on each face of test specimens: 75.
    - .2 Mix physical requirements:

<b>Property</b>	<b>Pavement Course</b>
Marshall Stability at 60 degrees C kN min	5.5 surface course/ 6.4 lower course
Flow Value mm	2-4
Air Voids in Mixture, %	3-5 surface course/ 3-6 lower course
Voids in Mineral Aggregate, % min	15 surface course/ 14 lower course
Index of Retained Stability % minimum	75

- .3 Measure physical requirements as follows:
  - .1 Marshall load and flow value: to ASTM D1559.
  - .2 Air voids: to ASTM D3203.
  - .3 Index of Retained Stability: measure in accordance with Marshall Immersion Test ASTM D1559.
- .4 Do not change job-mix without prior approval DR. When change in material source proposed, new job-mix formula will be provided and approved by DR.

PART 3 -  
EXECUTION

3.1 Plant and  
Mixing  
Requirements

- .1 Batch and continuous mixing plants:
  - .1 To ASTM D995.
  - .2 Feed aggregates from individual stockpiles through separate bins to cold elevator feeders.
    - .1 Do not load frozen materials into bins.
  - .3 Feed cold aggregates to plant in proportions to ensure continuous operations.
  - .4 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.
  - .5 Before mixing, dry aggregates to moisture content not greater than 0.5% by mass or to lesser moisture content if required to meet mix design requirements.
  - .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 manner to minimize segregation and temperature loss.
  - .8 Maintain temperature of materials within 5° C of specified mix temperature during mixing.
  - .9 Mixing time:
    - .1 In batch plants, dry mix for hot less than 10s. Continue wet mixing as long as necessary to obtain thoroughly blended mix but not less than 30s or more than 75s.
    - .2 In continuous mixing plants, mixing time as required but not less than 45s.
  - .10 Where RAP is to be incorporated into mix:
    - .1 Feed from separate cold feed bin specially designed to minimize consolidation of material.
      - .1 Provide 37.5 mm scalping screen on cold feed to remove oversized pieces of RAP.

- .2 Ensure positive and accurate control of RAP cold feed by use of hydraulic motor or electric clutch and equip with anti-rollback device to prevent material from sliding backward on feed belt.
  - .3 Combine RAP and new aggregates in proportions as specified. Dry mix thoroughly, until uniform temperature within plus or minus 5° C of mix temperature is achieved prior to adding new asphalt cement. Do not add new asphalt cement where temperature of dried mix material is above 160° C.
- .2 Dryer drum mixing plant:
- .1 To ASTM D995.
  - .2 Load aggregates from individual stockpiles to separate cold feed bins. Do not load frozen materials into bins.
  - .3 Feed aggregates to burner end of dryer drum by means of multi-bin cold feed unit and blend to meet job-mix requirements by adjustments of variable speed feed belts and gates on each bin.
  - .4 Where RAP is to be incorporated into mix, dryer drum mixer is to be designed to prevent direct contact of RAP with burner flame or with exhaust gases hotter than 180° C.
  - .5 Feed RAP from separate cold feed bin designed to minimize reconsolidation of material.
  - .6 Meter total flow of aggregate and RAP using electronic weigh belt system with indicator that can be monitored by plant operator and which is interlocked with asphalt pump to ensure proportions of aggregate, RAP and asphalt entering mixer remain constant.
  - .7 Allow for easy calibration of weighing systems for aggregates and RAP without having material enter mixer.
  - .8 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.
    - .1 Calibrate weigh bridge on charging conveyor by weighing amount of aggregate passing over weigh bridge in set amount of time.
    - .2 Difference between this value and amount shown by plant computer system to differ by not more than plus or minus 2%.
  - .9 Make provision for conveniently sampling full flow of materials from cold feed.
  - .10 Provide screens or other suitable devices to reject oversize particles or lumps of aggregate and RAP from cold feed prior to entering drum.
  - .11 Provide system interlock stop on feed components if either asphalt or aggregate from bin stops flowing.
-

- .12 Accomplish heating and mixing of asphalt mix in approved parallel flow dryer-mixer in which aggregate enters drum at burner end and travels parallel to flame and exhaust gas stream.
  - .1 Control heating to prevent fracture of aggregate or excessive oxidation of asphalt.
  - .2 Equip system with automatic burner controls and provide for continuous temperature sensing of asphalt mixture at discharge, with printing recorder that can be monitored by plant operator.
- .13 Ensure mixing period and temperature to produce uniform mixture in which particles are thoroughly coated, and moisture content of material as it leaves mixer is 0.5% maximum.
- .3 Temporary storage of hot mix:
  - .1 Provide mix storage of sufficient capacity to permit continuous operation and designed to prevent segregation.
  - .2 Do not store asphalt mix in storage bins in excess of 12 hour.
- .4 Mixing tolerances:
  - .1 Permissible variation in aggregate gradation from job mix (percent of total mass).

4.75 mm sieve and larger	5.5
2.36 mm sieve	4.5
0.600 mm sieve	3.5
0.150 mm sieve	2.5
0.075 mm sieve	1.5

- .2 Permissible variation of asphalt cement from job mix: 0.25%.
- .3 Permissible variation of mix temperature at discharge from plant: 5° C.

- 3.2 Preparation
- .1 Reshape granular roadbed.
  - .2 When paving over existing asphalt surface, clean pavement surface. When levelling course is not required, patch and correct depressions and other irregularities to approval of DR before beginning paving operations.
  - .3 Apply prime coat and/or tack coat in accordance with Section prior to paving.
  - .4 Prior to laying mix, clean surfaces of loose and foreign material.
-



- .4 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.
  - .5 Correct irregularities in alignment left by paver by trimming directly behind machine.
  - .6 Correct irregularities in surface of pavement course directly behind paver.
  - .7 Do not throw surplus material on freshly screeded surfaces.
  - .7 When hand spreading is used:
    - .1 Use approved wood or steel forms, rigidly supported to assure correct grade and cross section. Use measuring blocks and intermediate strips to aid in obtaining required cross-section.
    - .2 Distribute material uniformly without broad casting material.
    - .3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes. Reject material 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.
      - .1 Control temperature to avoid burning material.
      - .2 Do not use tools at higher temperature than temperature of mix being placed.
- 3.5 Compacting
- .1 Roll asphalt continuously using established rolling pattern for test strip and to density of not less than 97% of 75 blow Marshall density in accordance with ASTM D1559 with no individual test less than 95%.
  - .2 General:
    - .1 Provide at least 2 rollers and as many additional rollers as necessary to achieve specified pavement density. When more than 2 rollers are required, 1 roller must be pneumatic tired type.
    - .2 Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.
    - .3 Operate roller slowly initially to avoid displacement of material. Do not exceed 5 km/h for breakdown and intermediate rolling for static steel-wheeled and pneumatic tired rollers. Do not exceed 9 km/h for finish rolling.
    - .4 Use static compaction for levelling coarse less than 25 mm thick.
    - .5 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 25 impacts per metre of travel. For lifts less than 50 mm thick, impact spacing not to exceed compacted lift thickness.
-

- .6 Overlap successive passes of roller by at least one-half width of roller mm and vary pass lengths.
  - .7 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.
  - .8 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.
  - .9 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.
  - .10 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side.
    - .1 Ensure that all points across width of pavement receive essentially equal numbers of passes of compactors.
  - .11 When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.
  - .12 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.
  - .3 Breakdown rolling:
    - .1 Begin breakdown rolling immediately following rolling of transverse and longitudinal joint and edges.
    - .2 Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.
    - .3 Operate breakdown roller with drive roll or wheel nearest finishing machine. When working on steep slopes or super-elevated sections use operation approved by DR.
    - .4 Use only experienced roller operators.
  - .4 Intermediate rolling:
    - .1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.
    - .2 Rolling to be continuous after initial rolling until mix placed has been thoroughly compacted.
  - .5 Finish rolling:
    - .1 Accomplish finish rolling with two-axle or three-axle tandem steel wheeled rollers while material is still warm enough for removal of roller marks.
      - .1 If necessary to obtain desired surface finish, use pneumatic-tired rollers as directed by DR.
    - .2 Conduct rolling operations in close sequence.
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- 3.6 Joints .1 General:
- .1 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.
  - .2 Construct joints between asphalt concrete pavement and Portland cement concrete pavement as indicated.
  - .3 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.
- .2 Transverse joints:
- .1 Offset transverse joint in succeeding lifts by at least 600mm.
  - .2 Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.
  - .3 Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.
- .3 Longitudinal joints:
- .1 Offset longitudinal joints in succeeding lifts by at least 150mm.
  - .2 Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100° C prior to paving of adjacent lane.
    - .1 For airfield runway paving, avoid cold joint construction in mid 30 m of runway.
    - .2 If cold joint cannot be avoided, cut back by saw cutting previously laid lane, by at least 150 mm, to full depth vertical face, and tack face with thin coat of hot asphalt of adjacent lane.
  - .3 Overlap previously laid strip with spreader by 100 mm.
  - .4 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.
  - .5 Roll longitudinal joints directly behind paving operation.
  - .6 When rolling with static or vibratory rollers, have most of drum width ride on newly placed lane with remaining 150mm extending onto previously placed and compacted lane.
- .4 Construct feather joints so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out coarse aggregate in mix.
- .1 Place and compact joint to smooth finish without visible breaks in grade.
  - .2 Locate feather joints as indicated.
- .5 Construct butt joints as indicated.
-



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|-------------------------|----|---|
| 3.7 Finish Intolerances | .1 | Finished asphalt surface to be within 5 mm of design elevation but not uniformly high or low.   |
|                         | .2 | Finished asphalt surface not to have irregularities exceeding 5 mm when checked with 4.5 m straight edge placed in any direction.   |
| 3.8 Defective Work      | .1 | Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required.   |
|                         | .2 | If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form true and even surface and compact immediately to specified density. |
| 3.9 Cleaning            | .1 | Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.  |

**END OF SECTION**

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PART 1 - GENERAL

- 1.1 Measurement for Payment .1 No separate payment will be made for ongoing dust control. Include ongoing water dust control in all Work as part of the relevant unit prices of the contract.
- .2 Supply and apply water as part of dust control only if directed to do so by the DR.
- 1.5 Related Sections .1 Section 01 35 43 - Environmental Procedures.

PART 2 - PRODUCTS

- 2.1 Materials .1 Water shall be supplied by the Parks without charge.
- .2 The Contractor shall apply for hydrant use permission to the Park administration and shall supply, install, and remove a suitable valve and connection system to the hydrant being used.

PART 3 -  
EXECUTION

- 3.1 Application .1 Control dust at all times for the duration of the Contract or as directed by DR.
- .2 Apply water with distributors equipped with means of shutoff and with spray systems to ensure uniform application.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Payment Procedure .1 The unit prices bid for this item shall be full compensation for all work necessary and incidental for the supplying and placing pavement markings as indicated in the Drawings and as directed by the DR.
- .2 Measurement for payment for pavement markings at the Highway 4 realignment at the Esowista Curve shall be at the lump sum price tendered in the Unit Price Table. Temporary marking tape is incidental in the payment item.
- .3 Measurement for payment for pavement markings at the Incinerator Rock and Long Beach Parking Lots shall be at the lump sum price tendered in the Unit Price Table. Temporary marking tape are incidental in the payment item.
- .4 Measurement for payment for multi-use trail centerline pavement markings shall be at the per linear metre price tendered in the Unit Price Table. Measurement will be made in the field along the completed painted centerline.
- .5 Measurement for payment for pavement markings at each of the painted cross walks shall be at the lump sum price tendered in the Unit Price Table and shall include all new markings shown on the Contract Drawings for each location.
- 1.2 References .1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.5, Low Flash Petroleum Spirits Thinner.
- .2 CAN/CGSB 1.74, Alkyd Traffic Paint.
- .2 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 printed product literature and data sheets for pavement markings and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 33 - Health and Safety Requirements.
- .3 Samples:
- .1 Submit to Departmental Representative following material sample quantities at least 4 weeks prior to commencing work.
- .1 Two 1 L samples of each type of paint.
-

- .2 One 1 kg sample of glass beads.
  - .3 Sampling to CGSB 1-GP
  - .2 Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, CGSB specification number, formulation number and batch number.
- 1.4 Delivery, Storage and Handling
- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 61 00 - Product Requirements.
  - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

## PART 2 - PRODUCTS

- 2.1 Materials
- .1 Paint:
    - .1 To CSGB 1-GP-74M, alkyd traffic marking.
    - .2 To CSGB 1-GP-149M, alkyd reflectorized traffic marking.
    - .3 Colour: to CSGB 1-GP-12C, yellow 505-308, black 512-301 and white 513-301.
  - .2 Thinner: to CSGB 1-GP-5M.
  - .3 Glass reflective beads: Overlay type to CSGB 1-GP-74M, suitable for application to wet paint surface for light reflectance.
  - .4 Temporary pavement marking tape:
    - .1 Material composition shall be at the discretion of the manufacturer subject to the approval of the DR. Each formulation shall be identified by a code number.
    - .2 The colour of the marking to be brilliant white or yellow at the discretion of the DR. The brightness value shall exceed 70% for the white and 45% for yellow obtained with a Gardner Multi-purpose Reflectometer when measuring 0 - 45 degrees C daylight luminous directional reflectance with the green filter.

## PART 3 - EXECUTION

- 3.1 Examination
- .1 Pavement surface to be dry, free from water, frost, ice, dust, oil, grease and other deleterious materials.
-

- |                                  |    |   |
|----------------------------------|----|---|
| 3.2 Equipment Requirements       | .1 | Paint applicator: approved pressure type mobile with positive shut-off distributor capable of applying paint in single, double and dashed lines and capable of applying marking components uniformly, at rates specified, and to dimensions as indicated. |
|                                  | .2 | Distributor: capable of applying reflective glass beads as overlay on freshly applied paint.  |
| 3.3 Application                  | .1 | Lay out pavement markings.  |
|                                  | .2 | Unless otherwise approved by DR, apply paint only when air temperature is above 10 degrees C, wind speed is less than 60 km/h and no rain is forecast.  |
|                                  | .3 | Apply traffic paint evenly at rate of 3 m <sup>2</sup> /L.  |
|                                  | .4 | Do not thin paint unless approved by DR.  |
|                                  | .5 | Symbols and letters to dimensions indicated.  |
|                                  | .6 | Paint lines: of uniform colour and density with sharp edges.  |
|                                  | .7 | Thoroughly clean distributor tank before refilling with paint of different colour.  |
|                                  | .8 | Apply glass beads at rate of 0.5 kg/l of painted area immediately after application of paint.   |
|                                  | .9 | Remove temporary markings immediately after installing permanent pavement markings.   |
| 3.4 Tolerance                    | .1 | Paint markings: within plus or minus 12 mm of dimensions indicated.   |
| 3.5 Protection of Completed Work | .1 | Protect pavement markings until dry.  |

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement for Payment
- .1 The unit prices bid for this item shall be full compensation for all work necessary and incidental for the supply and installation of all traffic signage; relocation of signage, including posts, bases (where required) and hardware as indicated in the Drawings and as directed by the DR.
- .2 Measurement for payment for this item shall be at by count for each type of sign specified in the Unit Price Table.
- 1.2 References
- .1 ASTM International
- .1 ASTM B221M, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
- .2 ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .3 ASTM D4956, Standard Specification for Retro-reflective Sheeting for Traffic Control.
- .2 CSA Canadian Standards Association
- .1 CSA 0121M-1978, Douglas Fir Plywood.
- .3 Sign Pattern Manual, British Columbia.
- .4 Specifications for Standard Highway Sign Materials, Fabrication and Supply – BC Ministry of Transportation and Infrastructure, latest edition.
- .5 2012 Standard Specifications for Highway Construction – BC Ministry of Transportation and Infrastructure, latest edition.
- 1.3 Delivery, Storage and Handling
- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 61 00 - Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

**PART 2 - PRODUCTS**

- 2.1 Materials
- .1 Signs
- .1 Aluminum sheet sign blank conforming to the requirements of ASTM B 209, Aluminum Alloys 6061-T-6 or 5052-H38.
- .2 Sign face to be silk screened with face to be retro-reflective diamond grade (or equal) to show the same color, shape and message at night as they appear in daytime.
-

- .3 Message to be in accordance with Uniform Traffic Control Manual of Canada, latest edition. Worded messages to be bilingual with English on the left side and French, of equal size, on the right side.
- .4 Selected signage will have translations to the First Nations language of the area. Translations will be provided by Parks Canada.
- .5 Conform to the Specifications for Standard Highway Sign Materials, Fabrication and Supply – BC Ministry of Transportation and Infrastructure, latest edition
- .2 Posts
  - .1 Sign posts shall be perforated square galvanized steel posts to BC Ministry of Transportation and Infrastructure Specification Section 635.28 or perforated U channel galvanized steel posts.
  - .2 Where signs are mounted on concrete barriers sign posts shall be round galvanized steel pipe 2 3/8" (60.325mm) Schedule 40, conforming to ASTM A-53, grade B and mounted as shown on BC Ministry of Transportation and Infrastructure Specification Drawing SP635-3.8.3.
  - .3 Posts shall be hot dipped galvanized conforming to ASTM A653 G-90 or CSA G164.
  - .4 Field cut pipe ends shall be coated with cold galvanizing compound.
- .3 All hardware, nuts, bolts, washers, to be stainless steel.

### PART 3 - EXECUTION

-

- 3.1 Installation
  - .1 Steel pipe posts to be supplied in continuous lengths, with no splices, and shall be field cut to suit each particular installation. All field cuts to be painted with cold galvanizing compound.
  - .2 Posts to be installed plumb.
  - .3 For signs on concrete barriers, install sign and post to conform to Drawing SP635-3.8.2 and SP635-3.8.3, 2016 Standard Specifications for Highway Construction.
  - .4 For signs on shoulders and soil install sign post as per manufacturer's recommendations and minimum dept of bury of 450 mm. Buried end must have 200 mm long cross bar attached to prevent pullout.
- 3.2 Location
  - .1 Lay out sign locations as per the Contract Drawings.
  - .2 Sign location to be reviewed and approved by DR prior to installation.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement for Payment .1 The unit prices bid for these fencing and wood safety railings shall be full compensation for all work necessary and incidental including but not limited to the setting of posts, hardware, cutting, drilling, and installation of wood fencing and railings to the dimensions, lines, and grades indicated in the Drawings and as directed by the DR.
- .2 The unit prices bid for the 600 mm high log rail and the 900 mm high log rail shall include, but not be limited to, the supply and delivery of the wood posts and rails, setting poles in post holes and backfilling, cutting and fitting, drilling holes, fastening, and all other associated work to complete the installation.
- .3 The unit prices bid for the 1400 mm high safety railings, and 1800 mm high wood plank fence shall include, but not be limited to, setting poles in post holes and backfilling, cutting and fitting, drilling holes, fastening, and all other associated work to complete the installation. PCA shall supply to the Contractor without charge the wood for these items. The Contractor is responsible for the local delivery to site of this material.
- .4 The costs associated for the supply and installation of the wood in the bridge 3 structure, the railings on all the bridges and the wood for the elevated boardwalk (except boardwalk hand rails) shall be included in the costs of those structures and not paid separately.
- .5 The costs associated for the supply and installation of the wood hand railings on the elevated boardwalk shall be paid at the unit rate tendered in the Unit Price Table. Measurement shall be linear metre along the top rail of each hand railing and accepted by DR.
- .6 Measurement for payment for the wood fencing, safety railings, and log rails shall be linear metre along the top rail of the fences and barriers installed and accepted by the DR.
- 1.2 References .1 Canadian Standards Association (CSA International)
- .1 CSA 080 Series 15, Wood Preservation.
- .2 CSA G164, Galvanizing irregular shapes.
- 1.3 Related Sections .1 Section 01 74 21 – Waste Management and Disposal.
- .2 Section 03 48-00 – Pre-cast Concrete Specialties.
- 1.4 Delivery, Storage and Handling .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements and with manufacturers' written instructions.
-



- .2 Storage and Handling Requirements:
  - .1 Store materials off ground and in dry location and in accordance with manufacturer's recommendation in clean, dry, well-ventilated area.
  - .2 Store and protect wood from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
  - .4 Exercise care during fabrication, transportation, and erection of wood products.

## PART 2 - PRODUCTS

### 2.1 Materials Supplied .1 by Owner

- .1 Wood Safety Rails
    - .1 PCA will supply to the Contractor the following lumber for the safety rails located above retaining walls and steep slopes:
      - .1 2,750 pieces 38mm X 140mm X 2450 mm wood railings.
      - .2 250 pieces 38mm X 140mm X 2600 mm wood railings.
      - .3 600 pieces 140mm X 140mm X 1500 mm wood posts.
  - .2 Wood for Green Point Campground Fence
    - .1 PCA will supply to the Contractor the following lumber for the fence at Green Point Campground:
      - .1 65 pieces 100mm X 100mm X 2400 mm wood posts.
      - .2 200 pieces 50mm X 100mm X 2400 mm wood for frame.
      - .3 130 pieces 50mm X 100mm X 1400 mm wood for frame.
      - .4 1,000 pieces 25mm X 150mm X 1400 mm wood planks.
      - .5 260 pieces 25mm X 25mm X 2300 mm wood for frame.
      - .6 65 pieces 150mm X 150mm X 50 mm wood caps.
  - .3 Wood Log Rails
    - .1 PCA will supply the following lumber (round debarked logs) for the railings at the road crossings and parking lots:
      - .1 210 pieces 150mm to 200mm diameter X 2500 mm log rails.
  - .4 Wood for Bridges, Elevated Trail and W-Beam Guardrails
    - .1 PCA will supply the following lumber for each of the noted work items.
      - .1 2241 pieces 150mm X 50mm X 3600mm wood planks for elevated trail decking.
-

- .2 315 pieces 150mm X 50mm x 1900mm wood planks for back of W-beam guardrails.
  - .3 640 pieces 40mm X 175mm X 1215mm rounded wood rails for Bridge handrails.
- 2.1 Materials Supplied by Contractor
- .1 150mm to 200mm diameter debarked log rails – 2000mm long
  - .2 150mm to 200mm diameter treated debarked log posts – 1200mm and 1500mm long
  - .3 Galvanized steel nuts, bolts, washers, spiral spikes to CSA G164.
  - .4 The lengths of posts that will come into direct contact with the soil shall be treated with a non-toxic wood preservative and permitted to cure before returning the material to the Park. Preservation shall be applied by brush or dipping.

PART 3 -  
EXECUTION

- 3.1 Examination
- .1 Verification of Conditions: verify conditions of ground surface to determine acceptability for product installation in accordance with manufacturers' written instructions.
  - .2 Inform DR of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation after unacceptable conditions have been remedied and after receipt of written approval to proceed from DR.
- 3.2 Timber Mark
- .1 If a Timber Mark is required to remove timber from the Park, the Owner shall make arrangements for the timber mark and pay the costs for the same.
  - .2 Inform DR of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation after unacceptable conditions have been remedied and after receipt of written approval to proceed from DR.
- 3.3 Grading
- .1 Remove debris and correct ground undulations along construction line to obtain a smooth uniform gradient.
- 3.4 Installation
- .1 Install members true to line, levels and elevations, square and plumb.
  - .2 Construct continuous members from pieces of longest practical length.
  - .3 Excavate post holes to dimensions shown on drawings.
  - .4 Space line posts a maximum of 2.4 m apart, measured parallel to the ground surface or as indicated on the drawings.
-

- .5 Place posts in post holes, plumb and level for safety railings and fences and tamp approved native excavated material in 100 mm lifts all round to maintain pole in a plum position. Dispose of surplus excavated material. Supply additional material if backfill is not mounded 25 mm above the existing ground.
  - .6 Nail and/or bolt horizontal rails into place. Railing shall follow the profile of the trail for a continuous visually smooth line along the rails.
- 3.5 Cleaning
- .1 Wipe soil from surfaces.
  - .2 Leave Work Area clean at the end of each day.
  - .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
  - .4 Develop Construction Waste Management Plan related to Work of this section and in accordance with Section 01 11 00 – General Instructions and Section 01 35 33 – Health and Safety Requirements.
  - .5 Packaging Waste Management: remove for and return of pallets, crates, padding, packaging materials in accordance with Section 01 11 00 – General Instructions and Section 01 35 33 – Health and Safety Requirements, and 01 35 43 – Environmental Procedures.
  - .6 Waste Management: separate waste materials for recycling in accordance with Section 01 11 00 – General Instructions.
  - .7 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- 3.6 Protection
- .1 Protect installed products and components from damage during construction.
  - .2 Repair damage to adjacent works.

**END OF SECTION**

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PART 1 - GENERAL

- 1.1 Measurement for Payment .1 The unit prices bid for the amphibian fencing shall be full compensation for all work necessary and incidental including but not limited to supply, minor clearing, levelling the ground, setting of posts, digging the base of the fence into the ground, hardware, cutting, and securing the fence at culvert locations to install the fencing at the locations indicated in the Drawings and as directed by the DR.
- .2 Measurement for payment for the amphibian fence shall be linear metre along the top rail of the fence installed and accepted by the DR.
- .3 Surplus amphibian fence will be purchased from the Contractor by the Owner at the invoice price, plus shipping and handling costs plus 10% profit.
- 1.2 Delivery Storage and Handling .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements and with manufacturers' written instructions.
- .2 Storage and Handling Requirements:
- .1 Store materials off ground and in dry location and in accordance with manufacturer's recommendation in clean, dry, well-ventilated area.
- .2 Store and protect wood from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Exercise care during fabrication, transportation, and erection of wood products.
- 1.3 Related Sections .1 Section 01 35 43 - Environmental Procedures.
- .2 Section 01 35 44 - Cultural Resource Procedures.

PART 2 - PRODUCTS

- 2.1 Materials 1. Amphibian Fence and supports:
- .1 Fence vertical support structure shall be constructed with a recycled plastic wood product. Upper rail shall be 50mm X 100mm cedar.
- .2 Fabric shall be Animex AMX760 or approved equal fencing and Hinsperger's poly material or approved equal.
- .3 Mesh material shall be used in areas where flowing water is anticipated.
-

**PART 3 -**  
**EXECUTION**

- 3.1 Examination .1 Verification of Conditions: verify conditions of ground surface to determine acceptability for product installation in accordance with manufacturers' written instructions. Position fence to minimize impacts on trees and amphibian habitat. Follow directions provided by the OEM on the routing of the fencing.
- .2 Inform DR of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation after unacceptable conditions have been remedied and after receipt of written approval to proceed from DR.
- 3.2 Grading .1 Remove debris and smooth gradient with hand tools between posts only as directed by OEM. This grading shall be minimized to avoid habitat destruction.
- 3.3 Installation .1 Install members true to line, levels and elevations, square and plumb.
- .2 Excavate a footing trench only as directed by OEM to minimize impacts to roots and habitat. Bury bottom edge of fabric approximately 100 mm. and to the alignment agreed by the DR.
- .3 Install 38mm X 86mm support posts at 1 m spacing with minimum 450 mm bury. Lengths of support posts will vary depending upon ground conditions. Install two 45-degree diagonal braces (36mm X 86 mm X 640 mm long in line with fence) at every third post. Install single 45-degree diagonal braces (36mm X 86 mm X 640 mm long 90 degrees to fence and on road side) at every third post (unbraced). Anchor all braces with 36mm X 86 mm X 450 mm long stakes. Install mesh across diagonal braces.
- .4 Install 50mm X 100mm cedar top rail to support posts with overhang on forest side of post.
- .5 Attach Animex or approved equal to fence on forest side of framing, 25 mm buried, 150 mm folded toward forest, 450mm on vertical face, 52 mm on underside of top rail, and 83 mm hanging down. Attach Animex fabric or approved equal to frame with the hardware and to the dimensions recommended by the manufacturer.
- .6 Fasteners for the fence frame to be #9 100 mm stainless steel flat head deck screws or equal. Minimum of three screws shall be used at each attachment point of the frame.
- .7 For all frame joints the material shall be such that the materials are in full contact for the length of the joint. Ensure joints overlap in a vertical fashion so they do not form a climbable seam.
- .8 Secure fence to crossing and water culverts to ensure an amphibian proof attachment.
-

- 3.4 Cleaning
- .1 Wipe soil from surfaces of upright fence and folded upper lip.
  - .2 Leave Work Area clean at the end of each day.
  - .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
  - .4 Develop Construction Waste Management Plan related to Work of this section and in accordance with Section 01 11 00 – General Instructions and Section 01 35 33 – Health and Safety Requirements.
  - .5 Packaging Waste Management: remove for and return of pallets, crates, padding, packaging materials in accordance with Section 01 11 00 – General Instructions, Section 01 35 33 – Health and Safety Requirements, and Section 01 35 43 – Environmental Procedures.
  - .6 Waste Management: separate waste materials for recycling in accordance with Section 01 11 00 – General Instructions.
    - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- 3.5 Protection
- .1 Protect installed products and components from damage during construction.
  - .2 Repair damage to adjacent works.

**END OF SECTION**

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[PART 1 - GENERAL

- 1.1 Measurement for .1 The unit prices bid for these items shall be full compensation for all work  
Payment .1 Payment necessary and incidental for the supply, delivery, and installation of various types  
of retaining walls and their components to the lines, grades and cross-sections  
indicated in the Drawings and as directed by the DR.
- .2 Included in the price of the walls are the shaping of the subgrade, temporary  
grading and slope stabilization during excavation and construction, placing and  
compaction of the granular foundation, sub-drainage system, including drain  
rock surround, supply and installation of the wall facing material, premium costs  
for working around the wall system and any tie-back system, engineering and  
supply of sealed shop drawings of structural walls, and dressing the toe of wall  
with backfill material. Where a wall system has a specific finish treatment for  
the top of the wall (bench block, cap block, etc.), the supply and installation of  
this will be included in the price and included in the measurement. All materials  
and equipment shall be free of invasive species.
- .3 Additional payment under the appropriate tender items shall be made for  
excavation and disposal of unsuitable material, excavation, placement, and  
compaction of suitable common excavation within the wall prism, supply and  
compaction of granular base material within the wall prism, supply and  
placement of uniaxial geogrids, and safety railings where required. All materials  
and equipment shall be free of invasive species.
- .4 Measurement for payment for various wall types shall be per square metre of  
wall face installed and measured from the bottom of the wall segments to the top.
- .5 Measurement for payment for tie-back geogrids shall be per square metre  
measured in place for each layer of grid installed, less overlaps.
- .6 Measurement for payment for expanded polystyrene shall be per cubic metre  
incorporated into the walls as measured in place including a 4 mil poly wrap.
- .7 Measurement for payment for the aluminum amphibian exclusion strip on the  
Amphibian wall (stationing H0+015 to H0+205) shall be per linear metre  
measured in place and include anchoring into place and silicon and rubber seal at  
the lock block joints.
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1.2 Scope of Work .1 This Section outlines the requirements for design, supply, and construction of mechanically stabilized earth (MSE) retaining walls and gravity walls. The wall locations are shown on the Contract Drawings.

The Work is defined as follows:

- .1 Design, fabrication and delivery of the walls and all necessary components including but not limited to: Envirogrid wall components or equal, precast concrete blocks, soil reinforcing materials and accessories. The Contractor engage a professional engineer registered and licensed in the Province of British Columbia, fully qualified and experienced in the design of such retaining walls, to be responsible for the design of and supervision of installing the walls. Design shall include local stability of the wall, including during construction and temporary stability of the excavations during construction. Global stability of the constructed wall shall be the responsibility of the Owner's appointed Geotechnical Engineer.
- .2 Construction may include but not be limited to the following: excavation for the wall, placement of a gravel levelling pad, installation of the sub-drain system, placement of precast concrete blocks and top blocks, placement of Envirogrid (or similar) materials, placement of rough stone for stacked stone gravity walls, installation of soil reinforcing materials and accessories, placing and compacting backfill material, and other work as required to complete a fully functional MSE retaining system or gravity wall system.
- .3 Quality control during design, fabrication, delivery, and construction of the MSE Wall. It is recommended that supplier have a representative during critical stages of installation.
- .4 The Contractor shall cover the cost of construction, quality control, and project closure documentation including Record Drawings.

1.3 Related Work .1 Division 01 – General Requirements.  
.2 Section 03 20 00 - Concrete Reinforcement.  
.3 Section 03 41 00 - Precast Concrete.  
.4 Section 31 05 16 – Aggregates.  
.5 Section 31 24 13 – Highway and Trail Excavation, Embankment and Compaction.  
.6 Section 32 11 16 – Granular sub-base.

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1.4 Reference Standards .1 Design and construction work is to be in accordance with the following standards and guidelines, except where specified otherwise. All standards are to be the most current issue at time of tender.

Primary References

- .1 CAN/CSA S6-06, “Canadian Highway Bridge Design Code” (CHBDC) including recent updates.
- .2 The Canadian Foundation Engineering Manual 4th Edition.
- .3 AASHTO M288 Geotextile Specification for Highway Applications.
- .4 CAN/CSA A23.3 “Design of Concrete Structures”.
- .5 CAN/CSA A23.4 “Precast Concrete Materials and Construction”.

Secondary References

- .1 AASHTO Standard Specifications for Highway Bridges, and accompanying Commentary, latest edition LFRD.
- .2 American Society for Testing and Materials (ASTM) where noted.

1.5 Definitions .1 MSE: Mechanically Stabilized Earth is soil constructed with artificial reinforcing.

.2 Reinforced Backfill: Soil that is used as fill behind the MSE concrete block face, and within the reinforced soil mass.

.3 Drain Rock: Free draining aggregate material used directly behind the concrete retaining wall blocks. Refer to Section 31 05 16 - Aggregates.

.4 Foundation Soil: Soil supporting the leveling pad and reinforced soil zone of the retaining wall system.

.5 Referenced geotechnical report Final Geotechnical Site Assessment Report – Pacific Traverse Trail, Pacific Rim National Park Reserve, Vancouver Island, BC. Wood (refer to appendices.)

.6 Geosynthetic: A planar product manufactured from polymeric material used with soil, an aggregate, or other geotechnical engineering materials.

.7 Geotextile: A permeable geosynthetic comprised solely of textiles used to separate dissimilar granular materials.

.8 Geogrid: A geosynthetic formed by a regular network of tensile elements and apertures, typically used for reinforcement applications.

.9 Woven Geotextile: A geosynthetic made of monofilament, multifilament, or fibrillated yarns, or of slit films and tapes.

.10 Non-woven Geotextiles: A Geosynthetic made of extruded synthetic polymer fibers or filaments that are needle punched or heat bonded in place into a non-woven mass.

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- .11 Modular Concrete Block Facing Units: A segmental precast concrete block unit that incorporates an alignment and key or connection device and forms part of the MSE case area.
  - .12 Wall Batter: The angle of the exposed face of the modular concrete block facing, as shown on the drawings.
  - .13 Leveling Pad: An un-reinforced concrete or compacted granular fill footing or pad which serves as a flat surface for placing the initial course of concrete block facing units.
  - .14 Green Wall: A modular retaining wall system capable of supporting vegetation growth on the outer face of the wall.
- 1.6 Submittals
- .1 Shop drawing of the retaining wall designed and stamped by a professional engineer registered and licensed in the Province of British Columbia.
  - .2 Material description and installation instruction for each manufactured product specified including MSE Wall Units and geosynthetic reinforcement
  - .3 Independent laboratory reports indicating compressive strength, moisture absorption and freeze-thaw durability of the concrete retaining wall units from the proposed production facility. Only tests performed within the past 12 months will be considered current and valid.
  - .4 Independent test reports verifying the long-term design strength properties (creep, installation damage, and durability) and soil interaction properties of the geosynthetic reinforcement.
- 1.7 Related Sections
- .1 Section 01 35 43 - Environmental Procedures.
  - .2 Section 01 35 44 – Cultural Resource Procedures.

## PART 2 – PRODUCT

- 2.1 MSE Wall General
- .1 Construction of the MSE wall must follow requirements noted in the referenced geotechnical report and according to manufacturer installation guideline.
  - .2 Block shall be any accepted product in the latest edition of BC MoTI “Recognized Product List”.
- 2.2 Materials
- .1 MSE Concrete Segmental Block Retaining Wall Requirements:
    - .1 LockBlock or approved equal: Precast concrete face blocks consisting of a size 1.5 X 0.75 X 0.75 m (unless approved otherwise), mechanically connected to soil reinforcing members embedded in an engineered backfill, plus accessories as shown or noted.
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- .2 Segmental Block: Precast concrete face blocks consisting of an approximate size 0.2 X 0.3 X 0.4 m mechanically or aggregate interlocking to soil reinforcing members. The exposed face of the concrete blocks shall be a split face finish.
  - .3 Walls shall have a stepped top block (for LockBlock walls) or cap blocks.
  - .4 The manufacturer of the concrete blocks should demonstrate that each block is comprised of the following:
    - .1 4% +/- 1% air-entrained concrete (ASTM C 223/C233M-14).
    - .2 Minimum 28 day compressive strength of 20 MPa (ASTM C39/C39M; ASTM C150).
    - .3 A maximum aggregate size of 20 mm (ASTM C33/C33M-13).
    - .4 A maximum slump of 80 mm (ASTM C143/C143M-12).
    - .5 12 mm chamfered edges.
    - .6 Have a minimum mass of 1960 kg.
    - .7 Positive interlocking mechanisms (keys) between blocks that are intended to be stacked.
    - .8 Lifting hooks that are made with new steel with corresponding Mil Test Certificates. Lifting hooks must demonstrate an 8:1 safety factor.
  - .5 All individual block units shall be free of cracks and other defects that would interfere with the placement and locking of units. All keys shall be free of damage.
  - .6 All block components of the MSE wall system shall be supplied from one supplier.
  - .2 Earth and Rock Fill MSE Retaining Wall System Requirements:
    - .1 Wall system consisting of contained rock and/or earth fill capable of supporting a completed wall face at a slope of 4 vertical to 1 horizontal or steeper. Envirogrid is a system that would meet this requirement. All Envirogrid cells shall be filled with compacted granular fill except the front face which shall have a mx of granular and nearby salvaged organic materials or as specified by the DR.
  - .3 Stacked Stone Retaining Wall Requirements:
    - .1 Stones shall be natural or blast rock with weights between 10 kg and 100 kg of similar makeup and appearance that shall be hand fitted together to form a stable gravity wall without the use of cement, mortar, or other binding agents. A non-woven geofabric shall be installed on the back side of the wall to prevent loss of fines into the wall cavities. Stacked stone walls shall not be used where the height of the wall exceeds 1.2 metres.
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- .4 Drain Rock
  - .1 To Section 31 05 16 – Aggregates.
- .5 Granular Fill for EnviroGrid walls (or equal)
  - .1 To Section 31 05 16 – Aggregates – Crushed Granular Sub-base.
- .6 Leveling Pad
  - .1 To Section 31 05 16 – Aggregates - Granular Base.
- .7 Reinforced Backfill
  - .1 To Section 31 05 16 – Aggregates - Crushed Granular Sub-base.
- .8 Geogrid used in Reinforced Backfill
  - .1 Uni-axial geogrids for use as reinforcement tiebacks in the MSE backfill shall consist of high density polyethylene, polypropylene, or high density polyester geogrid mats which connect by gravity contact through the wall facing units and shall meet the following specifications at a minimum:

<b>Property</b>	<b>Test Method</b>	<b>Unit</b>	<b>Minimum Average Roll Value (Machine Direction)</b>
Tensile Strength at Ultimate	ASTM D6637	kN/m	68.6
Tensile Strength at 5% strain	ASTM D6637	kN/m	25.4
Creep Reduced Strength	ASTM D5262	kN/m	43.4
Long Term Allowable Design Load	GRI GG-4(b)	kN/m	37.6
Mass/Unit Area	ASTM D5261	g/m <sup>2</sup>	315

Based on the general physical properties outlined above, equivalent geogrids would include, but not limited to, the following:

- .1 Miragrid 5Xt Uni-Axial Geogrid.
- .2 Tensar UX1500HS.
- .3 StrataGrid SG350.
- .4 Or approved equals.

.9 Non-Woven (drainage) Geotextile

- .1 Non-woven geotextiles for used to separate dissimilar granular materials shall consist of a product that meets the following specifications at a minimum.

<b>Property</b>	<b>Requirement</b>
Minimum Thickness	1.5 mm
Mass per Unit Area	150 g / m <sup>2</sup>
Grab Tensile Strength	500 N
Grab Tensile Elongation	50%
Puncture	180 N
Mullen Burst	950 kPa
Trapezoidal Tear	180 N
UV Degradation	50% / 500 hrs
Apparent Opening Size	0.25 m

Based on the general physical properties outlined above, equivalent geotextiles would include, but not limited to the following:

- .1 Nilex 4550.
  - .2 Geotex 401.
  - .3 Armtec 200.
  - .4 Or approved equals.
- .10 Light Weight Fill
- .1 Expanded Polystyrene (EPS) shall have the following properties:

<b>Property</b>	<b>Requirement</b>
Density	28.8 kg/m <sup>3</sup>
Compressive Resistance	75kPa
Elastic Modulus	7500 kPa

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<b>Property</b>	<b>Requirement</b>
Water Absorption	2.0% max. by volume
Oxygen Index	24.0% min.by volume
Compressive Resistance @ 5% Deformation. Minimum	170kPa
Compressive Resistance @ 10% Deformation, Minimum	200kPa

ESP 29 meets the above properties.

PART 3 -  
EXECUTION

- 3.1 Delivery, Storage and Handling .1 Deliver, store, and handle materials in accordance with manufacturer's recommendations, in such a manner as to prevent damage. Check the materials upon delivery to assure that the appropriate material has been received. Store above ground on wood pallets or blocking. Remove damaged or otherwise unsuitable material, when so determined, from the site.
- .2 Exposed faces of concrete wall units shall be free of chips, cracks, stains, and other imperfections.
- .3 Geosynthetics (including geosynthetic reinforcement, geotextile filter, pre-fabricated drainage composite, Envirogrid material or approved equal) shall be delivered, stored, and handled in accordance with ASTM D4873.
- 3.2 Installation .1 Installation shall be completed according to wall supplier's instruction. The Contractor must have a supplier's representative on site during the critical stages of construction.
- .2 Cap blocks on concrete walls to be affixed to the top to manufacturers recommendations.
- .3 LockBlock (or equal) walls shall have a stepped top block.
- .4 EPS blocks shall be locked together by using a locking plate or gang nail system to secure the blocks and geogrid tieback system in place and wrapped in 4 mil poly sheeting.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement for .1 The unit prices bid for culverts shall be full compensation for all work necessary and incidental for the supply, delivery, and installation for various diameters, dimensions, and materials of culverts as shown on the Contract Drawings and directed by the DR. Payment will be made at the unit price tendered in the Table of unit Prices for each type of culvert work. Locations provided on the Contract Drawings are approximate and will be confirmed on site by the DR. No additional payment will be provided for changes to culvert locations prior to installation.
- Payment .2 The prices bid shall include, but not be limited to: excavation; disposal of surplus materials; temporary shoring as required; supply and installation of pipe culverts, including couplings, working within the applicable fisheries windows, dewatering; conveying stream flows through or around the work site to prevent contamination, supply, placement and compaction of bedding and backfill materials free of invasive species; supply and placement of spawning gravel in pipes and box culverts where specified, supply and placement of native organics, and topsoil in pipes and box culverts for amphibian passage where specified, compaction testing of placed bedding and granular material; reinstatement; cleaning; and all other work and materials incidental and necessary to complete the Work to provide a complete and functional system in accordance with the Drawings and to the satisfaction of the DR.
- .3 Payment for concrete box culverts (extra strength for shallow cover) that are for water passage will include the supply and placement of a 400 mm thick layer of fisheries gravel on the invert of the culvert, supply and placement of materials to provide side slopes for channel grading and supply and installation of a concrete curb on each end of the box.
- .4 Payment for concrete box culverts (extra strength for shallow cover) that are intended for the use of amphibian underpasses will include the supply from the immediate area and placement of soil and organic ground material to a depth of 400 mm in the bottom of the culvert, woody debris, Envirogrid (or similar) wing walls on the 4 corners, the concrete curb on both ends of the culvert, and, where specified, openings for manhole grates. Hand railings will be paid separately.
- .5 Measure for payment for circular culverts shall be per linear metre for each type and size of culvert installed. Measurement for the culvert will be made horizontally from end to end of the culvert. Where the culvert is an extension, measurement will be made from the far edge of the coupling to the end of the culvert.
- .6 Measure for payment for amphibian crossing box culverts of a set length shall be by count for each type and size of culvert installed.
- .7 Measure for payment for water passage box culverts shall be by count for each type and size of culvert installed.
- .8 Measure for payment for culvert extensions will be by count for each size of culvert extended. Payment shall include cleaning and excavating around the
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existing pipe, cutting back of damaged ends of existing culverts to be extended, removing and reinstalling any headwalls, and grates, and disposal of waste material. Payment for the new length of culvert installed will be paid separately under the appropriate unit items.

- .9 Measure for payment for new pipe culverts of a set length will be by count for each size of culvert installed to 8 metres length. Where a culvert extends beyond 8 metres in length at the direction of the DR, an additional per linear metre payment or portion thereof at the unit rate bid and described in clause 1.1.5 of this section will be made for the length above 8 metres.
- .10 Measure for payment for the supply, installation, removal, and disposal of temporary culverts for temporary construction access points shall be by count for each temporary culvert. Payment will be made under the appropriate size of temporary culvert paid at time of installation.
- .11 Measurement for payment for the supply and installation of frames and grated covers for amphibian crossings shall be by count.

#### 1.2 References

- .1 ASTM International
  - .1 ASTM C76M, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
  - .2 ASTM C443M, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
  - .3 ASTM C850M, Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drain and Sewers with less than 0.6 m of Cover Subject to Highway Loadings.
- .2 CSA International
  - .1 CSA A3000-[08], Cementitious Materials Compendium.
  - .2 CSA A257 Series-09, Standards for Concrete Pipe and Manhole Sections.
  - .3 CAN/CSA G401, Corrugated Steel Pipe Products.
- .3 BC Ministry of Environment
  - .1 MOE Standards and Best Practices for Instream Works (2004).

#### 1.3 Delivery, Storage and Handling

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
  - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .3 Storage and Handling Requirements:
    - .1 Store materials in accordance with manufacturer's recommendations.
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- .2 Store and protect pipe and pipe material from damage.
- .3 Replace defective or damaged materials with new.

- 1.4 Related Sections
  - .1 Section 01 35 43 - Environmental Procedures.
  - .2 Section 01 35 44 – Cultural Resource Procedures.

PART 2 –  
PRODUCTS

- 2.1 Corrugated Steel Pipe
  - .1 Corrugated steel pipe: to CAN/CSA-G401.
  - .2 Water-tight cut-off collars: as indicated.
  - .3 Steel Spiral Rib Pipe: To CAN3-G401. specification except that the external helical corrugation pattern shall be 19mm x 19mm x 190mm, as described in AASHTO.M.36 or ASTM A760.
  - .4 Steel Spiral Rib Pipe Material: Galvanized or Aluminized Steel Type II to CAN3-G401.
  - .5 Corrugated fluming: to CAN/CSA-G401.
- 2.2 Concrete Pipe
  - .1 Non-reinforced circular concrete pipe and fittings: to ASTM C14M maximum diameter 300 mm, strength class as shown on Contract Drawings, designed for flexible rubber gasket joints to ASTM\_C443M.
  - .2 Reinforced circular concrete pipe and fittings: to ASTM.C76M for all pipe greater than 300 mm diameter, strength class as shown on Contract Drawings, designed for flexible rubber gasket joints to ASTM.C443M.
  - .3 Reinforced concrete arch pipe: to ASTM C506M.
  - .4 Reinforced concrete elliptical pipe: to ASTM C507M.
    - Lifting holes:
      - .1 Pipe 900 mm or less: no lift inserts required.
      - .2 Pipe greater than 900 mm diameter: engineered lift insert systems designed for the weight of the pipe cast into the pipe walls during manufacture. Not to exceed two in each piece of pipe.
      - .3 Manufacturer to provide properly rated lifting clutches to be used with lift insert cast into pipe.
      - .4 Lift insert opening not required to be grouted provided it does not extend beyond the depth of the engineered design.

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| 2.3 Concrete Box                                   | .1 | Reinforced rectangular concrete box culvert sections and fittings: to ASTM.C850M, box sections with less than 0.6m cover for highway loading.  |
|  | .2 | Joint Sealant: Cover joint with filter fabric only to permit some seepage.   |
|  | .3 | Reinforced concrete box culverts to ASTM.C1433.  |
|  | .4 | Lifting holes: Engineered lift insert systems designed for the weight of the box cast into the box ceiling during manufacture.   |
|  | .5 | Manufacturer to provide properly rated lifting clutches to be used with lift insert cast into box.   |
|  | .6 | Lift insert opening not required to be grouted provided it does not extend beyond the depth of the engineered design.  |
|  |    |  |
| 2.4 PVC Pipe Profile                               | .1 | PVC Profile Pipe: PVC profile pipes and fittings conforming to ASTM. F794 and certified to CSA.8182.4, 200 mm to 1200 mm diameters. Fittings to be certified to CSA. B182.2 and conform to ASTM D3034 and ASTM F679. |
|  | .2 | Pipe to have a minimum pipe stiffness of 320 kPa at 5.0% deflection, when tested in accordance with ASTM D2412. Pipe to be marked to clearly indicate class rating as required under ASTM F794.                      |
|  | .3 | Pipe to have factory assembled spigot gaskets and integral bell joint features.  |
|  | .4 | Gaskets to meet requirements of ASTM F477.   |
|  | .5 | Normal pipe laying length joint to joint to be 4.0 m.  |
|  | .6 | Maximum short term installed deflection not to exceed 5.0% of diameter.  |
|  |    |  |
| 2.5 HDPE Plastic Pipe, Open Profile                | .1 | HDPE Open Profile Pipe (Corrugated Exterior, Smooth Inner Wall) and Fittings certified to CSA B182.8, 100mm to 900mm diameter.   |
|  | .2 | Pipe to have minimum pipe stiffness of 320 kPa at 5.0% deflection, when tested in accordance with ASTM.D2412. Exterior pipe corrugation to be embossed with stiffness rating as required by CSA.8182.8.              |
|  | .3 | Pipe to have factory assembled spigot gaskets and integral bell joint features certified to CSA 8182.8.  |
|  | .4 | Gaskets to meet requirements of ASTM F477.   |
|  | .5 | Maximum short term installed deflection not to exceed 5.0% of diameter.  |
|  |    |  |
| 2.6 Temporary Culverts for Temporary Access Points | .1 | The pipe supplied for temporary culverts shall be suitable for drainage work and have a minimum service life of 5 years.   |
|  | .2 | The pipe shall be clean and not introduce any invasive plant species or contaminants into the Park.  |
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- .3 New or used pipe is acceptable for temporary culverts.
- 2.7 Spawning Gravel .1 Refer to Section 31 05 16 - Aggregates.
- 2.8 Granular Bedding and Backfill .1 Refer to Section 31 05 16 – Aggregates, Section 32 11 10 – Select Granular Subgrade Fill, Section 32 11 16 – Granular Sub-Base, and Section 32 11 23 – Granular Base.
- PART 3 - EXECUTION
- 3.1 Examination .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for pipe culvert installation in accordance with manufacturer's written instructions. Refer to Section 01 35 43 – Environmental Procedures for detailed requirements related to watercourses and instream works. Note that some or all of the culverts identified on the Drawings could carry watercourses, could be fish bearing or feed into a fish bearing stream and the applicable working restrictions related to such watercourses may apply.
- .1 Visually inspect substrate in presence of DR.
- .2 Inform DR 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 DR.
- .4 No instream works are permitted unless defined in Contract Drawings, OEM has confirmed if the watercourse is fish bearing or feeds into a fish bearing stream, and until OEM confirms that all fish isolation and salvage activities have been completed for a specific location.
- .5 Instream work is restricted to the fish timing window applicable to that stream unless authorized in writing by the OEM. Fisheries windows vary with the species of fish in each stream. Refer to Table 3 in section 01 35 43 – Environmental Procedures for watercourses having the fisheries window of August 15 to September 15. Other streams are generally June 15 to September 15.
- .2 Verification of Watercourse: Visually inspect location with OEM to confirm categorization of watercourse, permitting requirements and any environmental requirements for each culvert prior to commencement of the works at each location. Work in any watercourses deemed fish bearing or feeding fish bearing watercourse as determined by the OEM, shall only be carried out during the applicable fisheries window. Work shall only be permitted outside the applicable fisheries window if the watercourse, including roadside ditches is deemed non-fish bearing, is dry, or there is no flow during the anticipated construction period. Approval to proceed with in-stream works is at the sole discretion of the OEM.
- .3 Submit work plan well in advance to allow for Fisheries and Oceans review. Notify OEM 10 days in advance of actual start of construction.
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- .4 Do not start work until OEM confirms in writing that Fisheries and Oceans Canada has completed review and accepted the proposed work. Modify work where required by this review.
  - .5 OEM to do amphibian survey and salvage where required in advance of the work.
- 3.2 Preparation
- .1 Temporary Erosion and Sedimentation Control:
    - .1 Provide details of temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent surroundings to the OEM prior to commencing work. The OEM shall be given sufficient notice to enable the OEM to be present during implementation of these measures.
    - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation is established.
    - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- 3.3 Trenching
- .1 Do trenching Work in accordance with Section 31 23 33 - Excavating, Trenching, and Backfilling.
  - .2 Obtain DR's approval of trench line and depth prior to placing bedding material or pipe.
- 3.4 Bedding
- .1 Dewater excavation, as necessary, to allow placement of culvert bedding in dry condition.
  - .2 Place 100 mm minimum thickness of approved, compacted granular pipe bedding material on bottom of excavation.
  - .3 Shape bedding to fit lower segment of pipe exterior so that width of at least 50% of pipe diameter is in close contact with bedding and to camber as indicated or as directed by DR, free from sags or high points.
  - .4 Place bedding in unfrozen condition.
- 3.5 Laying Corrugated Steel Pipe Culverts
- .1 Begin pipe placing at downstream end.
  - .2 Ensure bottom of pipe is in contact with shaped bed or compacted fill throughout its length.
  - .3 Lay pipe with outside circumferential laps facing upstream and longitudinal laps or seams at side or quarter points.
  - .4 Lay paved invert or partially lined pipe with longitudinal centre line of paved segment coinciding with flow line.
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- .5 Do not allow water to flow through pipes during construction except as permitted by DR.
- 3.6 Joints: Corrugated Steel Culverts .1 Corrugated steel pipe:
- .1 Match corrugations or indentations of coupler with pipe sections before tightening.
  - .2 Tap couplers firmly as they are being tightened, to take up slack and ensure snug fit.
  - .3 Insert and tighten bolts.
  - .4 Repair spots where damage has occurred to spelter coating by applying two coats of asphalt paint or two coats of zinc rich paint to match pipe coating as approved in writing by DR.
- .2 Structural plate:
- .1 Erect in final position by connecting plates with bolts at longitudinal and circumferential seams.
  - .2 Drift pins may be used to facilitate matching of holes.
  - .3 Place plates in sequence recommended by manufacturer with joints staggered so that not more than three plates come together at any one point.
  - .4 Draw bolts up tight, without overstress, before beginning backfilling.
  - .5 Repair spots where damage has occurred to spelter coating by applying two coats of asphalt paint or two coats of zinc rich paint to match pipe coating as approved in writing by DR.
- 3.7 Laying Concrete Pipe Culverts .1 Begin at downstream end of culvert with bell ends of pipe facing upstream.
- .2 Ensure barrel of pipes are in contact with shaped bed throughout its length.
  - .3 Water to flow through pipes during construction only as permitted by DR.
- 3.8 Joints: Concrete Pipe Culverts .1 Install rubber gasket joints to manufacturer's written recommendations.
- .2 Ensure that spigot ends are fully entered into bell ends.
- 3.9 Laying Concrete Box Culverts .1 Begin at downstream end of culvert with bell end of first pipe section facing upstream and spigot end downstream.
- .2 Ensure box sections are in full contact with leveled bed throughout its length.
  - .3 Allow water to flow through boxes during construction only as permitted by Departmental Representative.
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- 3.10 Joints: Concrete Box Culverts
- .1 Using chains, come-a-longs, and/or winches, ensure that spigot ends are fully entered into bell ends.
  - .2 Lay filter cloth on the outside of the top slab and exterior sides of the box joints.
- 3.11 Extending Existing Culverts
- .1 When extending existing culverts use similar or identical diameters and materials.
  - .2 When extending existing culverts expose the exterior end of the existing culvert including the invert. If the existing end is damaged trim back the culvert to a point the culvert is free of damage. Ensure that spigot ends are fully entered into bell ends.
  - .3 Use a coupling specifically designed and approved for the type of culvert being extended. Position the coupling such that it is centered on the joint between the existing and new culverts. Install gaskets where specified by the coupling manufacturer.
  - .4 Continue laying culvert as to specifications in this section.
- 3.12 Backfilling
- .1 Backfill around and over culverts as indicated or as directed by DR.
  - .2 Place granular backfill material in 150 mm layers to full width, alternately on each side of culvert, so as not to displace it laterally or vertically.
  - .3 Compact each layer to 95% maximum density to ASTM D698 taking special care to obtain required density under haunches.
  - .4 Protect installed culvert with at least minimum cover of compacted fill recommended by manufacturer before heavy equipment is permitted to cross. For HDPE, this is 300 mm.
  - .5 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.
- 3.13 Fluming
- .1 Assemble and install fluming as indicated.
  - .2 Set top edges of fluming flush with side slope.
- 3.14 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.
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- .4 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
- .5 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement for Payment
- .1 The lump sum prices bid for fisheries enhancements and amphibian enhancements shall be full compensation for all labor, materials, and equipment, necessary and incidental for the supply and installation of all enhancements indicated in the Drawings and as directed by the DR.
  - .2 Included in the lump sum prices are dewatering and water diversions, excavations, disposal of excavated materials, supply and placement of spawning gravels, root wads, large woody debris, anchoring rocks and cables, processing of native organics, and all other materials and work to complete the fisheries enhancements and amphibian enhancements as indicated in the Drawings and as directed by the DR. All materials shall be free of invasive species. The OEM will arrange for fish and amphibian salvage. Environmental work not specifically detailed on the drawings such as silt fencing and erosion control blankets will be paid under the appropriate items.
  - .3 Measurement for payment for these lump sum items shall be at by count for each area completed as specified in the Unit Price Table.
- 1.2 References
- .1 All work shall be done in accordance to Section 01 35 43 - Environmental Procedures.
  - .2 “Large Woody Debris Fish Habitat Structure Performance and Ballasting Requirements, Watershed Management Report No. 8, D’Aoust & Millar (1999).
- 1.3 Special Considerations
- .1 All work below high water mark shall be done during the fisheries window unless approval from the DR and OEM is provided in advance of the work.
  - .2 Provide a minimum of 10 days’ notice to OEM and DR prior to doing the work at each location to provide time for fish and amphibian salvage.
  - .3 Do not start work until OEM confirms in writing that Fisheries and Oceans Canada has completed review and accepted the proposed work. Modify work where required by this review.
- 1.4 Related Sections
- .1 Section 01 35 43 - Environmental Procedures.
  - .2 Section 01 35 44 – Cultural Resource Procedures.
  - .3 BC Ministry of Environment Standards and Best Practices for Instream Works (2004).
-



**PART 2 – PRODUCTS****2.1 Materials**

- .1 Large Woody Debris for Instream Works
    - .1 Large woody debris (LWD) should be 600 mm diameter (min) and lengths sized for restoration sites.
    - .2 Log sill structures must be embedded 50% log dia (min) into channel bed and keyed into banks 1 m (min).
    - .3 Root wads attached to 2 m length of trunk are preferable and logs are acceptable.
    - .4 LWD should be western red cedar, Sitka spruce, or Douglas fir (preferred.) Western Hemlock will be considered if preferred species are not available.
    - .5 OEM will assist in selecting from material available on site for LWD meeting the requirements set in the above clauses. Contractor shall stockpile LWD from clearing and grubbing locally on site.
    - .6 All LWD structures must be ballasted to avoid remobilization during high water
  - .2 Rock Ballast for Large Woody Debris
    - .1 Rock ballast is not required for LWD structures in off-line amphibian ponds (not connected to the stream). Smaller diameter in-situ stems and branches may be used.
    - .2 Total rock ballast for each LWD structure shall be calculated as per D'Aoust & Millar (1999).
    - .3 12.5 mm (1/2 inch) galvanized wire core wire rope.
    - .4 Length of wire rope to be determined in the field.
    - .5 Wire rope to be threaded through 19mm holes augured through upper 25% portion of log.
    - .6 Ensure no slack in completed assembly.
    - .7 Using 15 mm (9/16 inch) diameter rock bit drill 200 mm (8 inches) deep.
    - .8 Clean bore holes as per the manufacturers' specifications to prepare for adhesive.
    - .9 Attach cables to boulders with Hilti RE500 adhesive or equivalent. Follow manufacturers' procedures.
  - .3 Spawning Gravel – To section 31 05 16, aggregates, clause 2.9.
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**PART 3 - EXECUTION**

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| 3.1 Installation | .1 | Do work in isolation of water. Follow procedures laid out in BC Ministry of Environment Standards and Best Practices for Instream Works (2004) subject to approval of the OEM. |
|                  | .2 | Adhere to requirements of Section 01 35 43 - Environmental Procedures.   |
| 3.2 Location     | .1 | Lay out fisheries enhancements and amphibian enhancements at locations as per the Contract Drawings.   |

**END OF SECTION**

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**PART 1 - GENERAL**

- 1.1 Measurement for .1 The unit price bid for adjusting existing manholes shall be full compensation for all  
Payment .2 work necessary and incidental to complete the adjustment of manholes shown on the  
Contract Drawings and directed by the DR.  
.3 The prices bid shall include, but not be limited to: excavation; disposal of surplus  
materials; supply and installation of manhole risers and rings, grout, removal and  
resetting of the steel frame and cover, and all other work and materials incidental and  
necessary to complete the Work and to the satisfaction of the DR.  
.3 Measure for payment for this item shall be by count for each manhole adjusted to the  
satisfaction of the DR.
- 1.2 References .1 CSA International  
.1 CSA A3000-[08], Cementitious Materials Compendium.  
.2 CSA A257 Series-09, Standards for Concrete Pipe and Manhole Sections.  
.2 ASTM  
.1 Cast iron frames, grates, & covers ASTM A48, Standard for Grey Iron Castings.
- 1.3 Delivery, Storage .1 Deliver, store and handle materials in accordance with manufacturer's written  
and Handling .2 instructions.  
.2 Storage and Handling Requirements:  
.1 Store materials in accordance with manufacturer's recommendations.  
.2 Store and protect manhole and riser materials from damage.  
.3 Replace defective or damaged materials with new.

**PART 2 –  
PRODUCTS**

- 2.1 Concrete .1 Precast concrete manhole sections: to ASTM C478M, precast reinforced concrete.  
Manholes .2 All products designed to H20 loading.  
.3 Mortar: Aggregate to CSA A82.56. Cement to CAN/CSA-A8.
- 2.2 Iron Castings .1 Cast iron: to ASTM A48, all products designed to H20 loading.  
.2 Manhole frames: Dobney Foundry C-23 frame or equal.

- .3 Manhole grates: Dobney C-23 G Grate or equal.

PART 3 -  
EXECUTION

- 3.1 Examination .1 Verification of Conditions: verify elevation that manhole shall be adjusted to sit flush with new pavement or ground line.  
.2 Proceed with installation only revised grade is approved by DR.
- 3.2 Install Frame and Cover Units .1 Set new frames and grates on Amphibian crossings to 5 mm above existing pavement to ensure water drains away from the opening.  
.2 Use precast concrete riser rings to bring frame to within 50 mm of final elevation.  
.3 Set frame to final required elevation with shims and join frame and risers to box culvert with cement mortar, parge and trowel smooth.
- 3.3 Adjusting Tops Of Existing Units .1 Remove existing covers and frames and store for re-use at locations specified.  
.2 Precast units:  
.1 Raise or lower precast units by adding or removing precast sections as required.  
.2 When amount of raise is less than 300 mm use standard manhole bricks, precast riser rings or Cast-in place form system.  
.3 Re-use existing cover and frames.  
.3 Re-set gratings and frames to required elevation on not more than 3 courses of brick. Make brick joints and join brick to frame with cement mortar, parge and trowel smooth.  
.4 Ensure adjustments conform to requirements regarding distance to first step.

**END OF SECTION**

**PART 1 - GENERAL**

- 1.1 Concrete No Post Barriers .1 Concrete no post barriers are included in Section 03 48 00 - Precast Concrete Specialties.
- 1.2 Measurement for Payment .1 The unit prices bid for W-beam guardrails, termination devices, and 1400 mm safety railing shall be full compensation for all work necessary and incidental for the supply, delivery, and installation of strong post roadside guardrails as shown on the Contract Drawings and directed by the DR. Payment will be made at the unit price tendered in the Table of unit Prices for W-beam guardrails. Locations provided on the Contract Drawings are approximate and will be confirmed on site by the DR. No additional payment will be provided for adjustment of guardrail locations.
- .2 The prices bid shall include, but not be limited to: excavation, disposal of surplus materials, supply and installation of w-beam guardrails, all hardware, and wood posts and all other work and materials incidental and necessary to complete the Work to provide a complete and functional system in accordance with the Drawings and to the satisfaction of the DR.
- .3 Measurement for payment for W-beam guardrails shall be per linear metre field measured along the front face of the completed guardrail as accepted by the DR.
- .4 Measurement for payment for 1400 mm safety railing shall be per linear metre field measured along the top of the completed safety rail as accepted by the DR, including the end treatment.
- .5 Measurement for payment for end treatments on the guardrails shall be by count for the completed end treatment guardrail as accepted by the DR.
- 1.3 References .1 2016 Standard Specifications for Highway Construction, BC Ministry of Transportation and infrastructure.
- .1 Section 312 - Steel Traffic Barriers and Wood Posts.
- 1.4 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:
- .4 Store materials in accordance with manufacturer's recommendations.
- .5 Store and protect railings and post material from damage.
- .6 Replace defective or damaged materials with new.
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**PART 2 – PRODUCTS**

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|--------------------------------|----|--|
| 2.1 W-beam Steel Guardrail     | .1 | AASHTO Standard Designation M-180, Corrugated Sheet Steel Beams for Highway Guardrails.  |
|                                | .2 | Shape – W-beam for ARTBA Design G4 and MB4 installations.  |
| 2.2 Wood Posts                 | .1 | 2016 Standard Specifications for Highway Construction, BC Ministry of Transportation and infrastructure, Section 312 - clause 312.06 Wood Posts.   |
|                                | .2 | Douglas Fir/Hemlock “Number 1, structural Posts and Timber”  |
|                                | .3 | Preservation Treatment, all posts and wood blocks shall be pressure treated in accordance with CSA Standard 080-M “Wood Preservation.”   |
| 2.3 End Treatments             | .1 | FLEAT 350 end treatment or similar approved equal. Refer to BC Ministry of Transportation “approval list”.   |
| 2.4 Material Supplied by Owner | .1 | PCA will supply at no cost to the Contractor approximately 315 pieces of 50mm X 150mm X 1900mm planks to be installed on the trail side of the guardrails. The Contractor shall be responsible to pick up this material in the local area. |

**PART 3 - EXECUTION**

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|------------------|----|---|
| 3.1 Examination  | .1 | Verification of Conditions: verify that conditions are acceptable for W-beam guardrail installation in accordance with manufacturer's written instructions. |
| 3.2 Installation | .1 | 2016 Standard Specifications for Highway Construction, BC Ministry of Transportation and infrastructure   |
|                  | .1 | Section 312, Steel Traffic Barriers and Wood Posts.   |
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- 3.3 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 for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

**END OF SECTION**

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