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13	S111	BICYCLE RAILING DETAIL
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Reference Documents:

1. Adjustment to Environmental Screening Report TCH TWINNING PHASE IIIB - 2011
2. Geotechnical and Pavement Assessment, Trans Canada Highway Twinning Project km 82 -88, Alberta and British Columbia, Canada, EBA December 2010.
3. Trans Canada Highway (TCH) km 81+300 To 85+500 Animal Underpass Structures Geotechnical Services Report, EBA August 2011.
4. Parks Canada National Best Management Practices
5. Mannix Pit Plan
6. Niblock Pit Plan

01 11 00 SUMMARY OF WORK**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 Manual.

1.2 DEFINITIONS

- .1 British Columbia Ministry of Transportation and Infrastructure is referred to as "MoTI".
 - .1 BC MoTI specifications specified for the work can be found at the following website address:
<http://www2.gov.bc.ca/gov/content/transportation/transportation-infrastructure/engineering-standards-guidelines/standard-specifications-for-highway-construction>
- .2 Changes in Definition, - The following changes in definitions have been made to the "BC MoTI Specifications":
 - .1 Ministry Representative – The word "Ministry Representative" shall mean Parks Canada Departmental Representative or his duly appointed representative.
 - .2 Ministry – The word "Ministry" shall mean Parks Canada Agency.
- .3 Banff National Park of Canada is referred to as "BNP".
- .4 Yoho National Park of Canada is referred to as "YNP".
- .5 Parks Canada Agency is referred to as "PCA".
- .6 Canadian Pacific Railway is referred to as "CP Rail".
- .7 Environmental Surveillance Officer is referred to as "ESO".

1.3 PROJECT LOCATION

- .1 The project is located in Banff National Park, Alberta and Yoho National Park, British Columbia. Construction work is on the Trans Canada between Km 82.5 and Km 88.0. The following are key locations relative to the project:
 - TCH km 0 – BNP East Gate
 - TCH km 46 – Castle Mountain Interchange
 - TCH km 49.9 – Access Road to Mannix Pit
 - TCH km 66.9 – Lake Louise Overflow Campground
 - TCH km 66.9 – Access Road to Km 69 Gravel Pit
 - TCH km 75 – Icefield Parkway Interchange (Km 0 of Icefield Parkway)
 - TCH km 81 – Bedrock Reserve for Quarry Operations
 - TCH km 82 – Alberta/British Columbia and Banff/Yoho National Park borders
 - TCH km 86.7 – Great Divide Lodge Access
 - TCH km 87.1 – Wapta Cut
 - TCH km 88.0 – West Project Limit

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- .1 The project work consists of approximately 5.5 km of highway twinning along the TCH between Km 82.5 and Km 88.0. The existing highway will be widened to a 4 lane divided highway separated by a paved median. The finished roadway surface will include the installation of precast concrete median barrier transitioning to a painted median with provision for future placement of precast concrete median barrier.
- .2 All requirements noted within the Contract Documents shall be completed by the Contractor unless specifically stated otherwise.
- .3 Major scope items include: clearing, grubbing, stripping, grading, embankment construction, drainage, detours, wildlife underpass construction, MSE wall supply and install, traffic management, culvert supply and installation, sub-base course, base course, asphalt surfacing, traffic barriers, signing, and pavement markings.
- .4 Without limiting the scope of work, the work of this Contract generally comprises the following:
 - .1 Clearing and grubbing of areas designated in the Contract documents between km 82.5 and km 88.0, including loading, hauling and placing the waste material in Mannix Pit as directed by the Departmental Representative.
 - .2 Strip organic material between Km 82.5 and Km 88.0, screen and stockpile this material alongside the right-of-way outside the cut / fill slopes between Km 82.5 and Km 88.0, as directed by the Departmental Representative. The Contractor is advised that there is limited storage area for this material. Screen waste shall be hauled and placed at Mannix Pit as directed by the Departmental Representative
 - .3 Installation and maintenance of temporary barriers and supply and installation of temporary traffic control and other temporary construction facilities required for completion of the Work of the Project.
 - .4 Removal, by milling of existing asphalt and stockpile material at Mannix Pit, as directed by the Departmental Representative.
 - .5 Full depth reclamation of exiting sections of roadway designated in the Contract drawings.
 - .6 Excavating all types of material from the right-of-way cuts, hauling and placing this material in embankments or in stockpiles at locations shown on the Drawings and as directed by the Departmental Representative.
 - .7 Conduct drilling and blasting of solid rock; hauling and placement for roadway widening or disposal of surplus material in areas as shown on the Drawings and as directed by the Departmental Representative.
 - .8 Supply and install Corrugated Steel Pipe (CSP) culverts at locations shown on the Drawings and as directed by the Departmental Representative.
 - .9 "Design and Build" Structural Plate Corrugated Steel Pipe Arch culverts (SPCSP) at locations shown on the Drawings and as directed by the Departmental Representative.
 - .10 Construction of a new TCH Wildlife Crossing Bridge Structure at km 83.09 including but not limited to:
 - .1 Excavation and backfill of bridge approaches
 - .2 Design, supply and installation of temporary shoring walls as indicated on the Drawings or as otherwise required by the Contractor's work methods.

- .3 Construction of bridge approach roadway to final grade including bridge end fill, granular subbase / base course and asphalt concrete pavement.
- .4 All shoring and temporary support for excavations.
- .5 All cast in place concrete work for substructure and superstructure elements including reinforcing.
- .6 Design, installation and removal of all formwork, and false work.
- .7 Supply and installation of bridge bearings.
- .8 Supply and installation of precast concrete girders.
- .9 Temporary support and stability of girders.
- .10 Supply and installation of bicycle rails.
- .11 Supply and application of the silane sealer.
- .12 Supply, fabrication and installation of all miscellaneous metals.
- .13 Supply and installation of bridge deck waterproofing membrane.
- .14 Installation of asphalt concrete pavement on bridge deck and approach slabs.
- .11 "Design and Build" Reinforced Soil Retaining Walls at locations shown on the Drawings and as directed by the Departmental Representative.
- .12 Supply and installation of precast privies at locations shown on the drawings and as directed by the Departmental Representative.
- .13 Load, haul and place sub-base course materials. BC MoTI 50mm well-graded base material to be supplied by the contractor or produced from suitable material excavated within the design cut.
- .14 Load, haul and place base course materials. BC MoTI 25mm well-graded base material to be supplied by the contractor or produced from suitable material excavated within the design cut.
- .15 Perform mix design for BC MoTI Medium Mix Class 1 - 19mm Asphalt Concrete Pavement using 150-200A asphalt binder. BC MoTI Class 1 -19mm Medium Asphalt Aggregate is available from stockpiles at Mannix Pit. Mix design is subject to acceptance by the Departmental Representative.
- .1 Recycled Asphalt Pavement (RAP) may not be utilized in the mix design.**
- .16 Purchase asphalt binder 150-200A, mix with aggregate, haul and place BC MoTI Medium Mix Class 1 Asphalt Concrete Pavement (ACP) as directed by the Departmental Representative.
- .17 Supply and installation of new concrete curb and gutter.
- .18 Remove and dispose of existing CSP culverts outside of the Parks as shown on the Drawings and as directed by the Departmental Representative.
- .19 Supply and installation of new CSP culverts as shown on the drawings and as directed by the Departmental Representative.
- .20 Supply and installation of manholes and catch basin structures as shown on the drawings and as directed by the Departmental Representative.
- .21 Installation of Rip Rap for headwalls and various drainage features.
- .22 Placement of screened topsoil on finished slopes.
- .23 Supply and installation of hydroseeding on finished slopes.

- .24 Supply and installation of modified British Columbia Ministry of Highways Precast Concrete Traffic Barriers as shown on the Drawings and as directed by the Departmental Representative.
- .25 Supply and install permanent delineators as shown on the Drawings and as directed by the Departmental Representative.
- .26 Supply and paint temporary roadway paint markings during construction as required.
- .27 Permanent line markings to be installed at the completion of the work as shown on the Drawings and as directed by the Departmental Representative
- .28 Supply and Install regulatory signs
- .29 Traffic signage and traffic control
- .30 Miscellaneous Additional Work as directed by the Departmental Representative.
- .5 The Contractor will be permitted to set up a crushing plant along the newly constructed sub-grade within the Highway Right of Way in YNP at locations as noted in the drawings or as directed by the Departmental Representative.
 - .1 Minimum combined Horse Power for the crushing plant shall be 200 HP. All aggregate which will pass through 375 mm x 450 mm slotted screen openings shall be used for the production of crushed aggregate using a jaw crusher. Rocks which will not pass through these openings shall be stockpiled at locations in the pit as directed by the Departmental Representative. No portion of the products of crushers or screening plants that can be used shall be wasted, but shall be stockpiled or used as directed by the Departmental Representative.
- .6 The Contractor will be permitted to set up a Mobile Asphalt Plant or use a Stationary Asphalt Plant for this Project at Mannix Pit in BNP.
 - .1 The asphalt plant to be used on this project, regardless of location, shall be a minimum of 200 tonnes per hour production, equipped with a dry bag system for pollution control, in addition to, or in replacement of standard cyclone dust collectors, to effectively eliminate emissions of dust and smoke pollutants into the atmosphere.
 - .2 There is no power or phone at Mannix pit.
- .7 Water is available in Mannix Pit either directly or through exposing the submerged water table. The Contractor is responsible for sourcing water required for the Works that may require to obtain it from outside of the National Parks. Accessing local water sources in nearby pits or from other Parks facilities can be coordinated through the Departmental Representative and the ESO but will require the Contractor to obtain a Restricted Access Permit and to adhere to all conditions contained therein.
- .8 In preparation for and during construction of this project, an "Environmental Protection Plan" (EPP) is to be prepared by the Contractor to meet the requirements of Section 01 35 43 – Environmental Procedures to ensure the desired minimal adverse effects are achieved. The Contractor's EPP must be approved by Parks Canada Agency (PCA) prior to the commencement of construction. The Departmental Representative and Parks Canada's environmental surveillance officer (ESO) will refer to the approved EPP in determining compliance with the plan and contract specifications. The EPP will form part of the contract.
- .9 This project is part of the continued upgrade of the TCH through Banff and Yoho National Parks. This twinning project, and its components, has been subject to an environmental assessment – "Adjustment to Environmental Screening Report TCH

TWINNING PHASE IIIB – 2011”. Subsequently, designs of grading and drainage structures incorporate measures to minimize the potential adverse impact on wildlife, water bodies and riparian and terrestrial environments.

- .10 Where material and construction specifications for work covered under the Contract, including any Change Orders are not available, BC MoTI –Standard Specifications for Highway Construction (latest edition) shall apply unless directed otherwise by the Departmental Representative.

1.5 CONTRACT METHOD

- .1 Construct Work under combined price contract.

1.6 WORK BY OTHERS

- .1 The Contractor is advised that the following Work in the vicinity has been or will be contracted by Parks Canada:
 - .1 Rock Recapitalization / Slope Stabilization: km 114 to km 120. Fall 2016
 - .2 Wildlife Overpass (By Others): Km 84+510. Fall 2016 – Spring 2017
 - .3 Line painting at various locations. Spring 2017
 - .4 Other projects and maintenance work may occur along the TCH in 2016 and 2017.
- .2 Where it is necessary that work is to proceed in areas of this project common to both the Contractor and forces of others, the Contractor shall cooperate with the other Contractors and the PCA Departmental Representative in reviewing their construction schedules and sharing his work space, and shall coordinate his operations with the other Contractors, including traffic management and construction staging.
- .3 The Contractors shall coordinate all work on this project with other Contractors including Site Safety and Traffic Control. The Contractor will also need to cooperate and coordinate with other Contractors who will have work camps at the Lake Louise Overflow Campground.
- .4 Niblock and Mannix Gravel Pits are operational pits used by many contractors and Parks Canada. The Contractor shall cooperate with the other users of the pits.

1.7 WORK SEQUENCE

- .1 Schedule work progress to allow Owner / Departmental Representative unrestricted access to inspect all phases of the Work.
- .2 Maintain fire and emergency access on the TCH at all times.
- .3 Co-ordinate Work with other Contractors / Departmental Representatives doing maintenance, survey / testing work.
- .4 **The Contractor shall:**
 - .1 Prepare the whole of the site for safe, efficient winter operations and the travelling public, through the relocation of barriers, re-instatement of damaged pavement, line painting, traffic signage for 2016 winter shutdown prior to **October 28, 2016.**
 - .2 Obtain the Interim Certificate (Substantial Performance) by **August 18, 2017.**
 - .3 Complete all of the Work by **August 25, 2017 (Contract Completion Date).**

1.8 CONTRACTOR USE OF PREMISES

- .1 Contractor has unrestricted use of site subject to Section 01 14 00 and Section 01 29 01, until Contract Completion date.
- .2 Contractor shall limit use of premises for Work, for storage, and for access, to allow:
 - .1 Owner occupancy.
 - .2 Work by other Contractors.
- .3 Coordinate use of premises under direction of the Departmental Representative.
- .4 The Contractor is permitted to extract and process native material from the roadway cuts and structure excavations for the production of granular aggregate. The Contractor is responsible for disposal of waste created from crushing and screening processes. The extraction and processing of native materials from other sources for production of aggregates will not be permitted unless authorized by the Departmental Representative. Any costs related to the processing of native material shall be considered incidental to the Contract. Crushing operations may be located on the new subgrade within the Highway Right of Way at locations approved by the Departmental Representative.
- .5 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .6 The Contractor and any Subcontractors shall obtain a business license from the Lake Louise Visitor Information Centre, prior to commencement of the contract.
- .7 All Contractor's business and private vehicles are required to display a vehicle work pass from Parks Canada. These permits may be obtained free of charge from PCA Environmental Surveillance Officer or as directed by the Departmental Representative.

1.9 OWNER OCCUPANCY

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.10 OWNER FURNISHED ITEMS

- .1 BC MoTI Class 1 -19mm Medium Asphalt Aggregate is available from stockpiles at Mannix Pit for the production of Asphalt Concrete Pavement (ACP).

1.11 CONSTRUCTION SIGNAGE

- .1 No signs or advertisements, other than warning signs, are permitted on site.
- .2 Signs and notices for safety and instruction shall be in both English and French with equal space allotted to each. Signs shall be diamond grade and shall conform to CAN3-Z321.
 - .1 Signage translation must be sent into Parks for verification prior to being posted.
- .3 Maintain approved signs and notices in good condition for duration of project, and dispose of off-site on completion of project or earlier if directed by the Departmental Representative.
- .4 All temporary traffic control signs that are used for longer than one day shall be mounted on wood posts.
- .5 Signage shall be coordinated with other Contractors.

1.12 SETTING OUT OF WORK

- .1 Departmental Representative will establish control points and provide:
 - .1 Detailed cross-section templates showing design centreline and shoulder grades.
 - .2 Complete set of construction Drawings.
 - .3 Alignment notes showing curve data and control point coordinates.
 - .4 Provide a list of control monuments including coordinates and elevations on request.
 - .5 Measurements for Payment (Quantity Surveys) and volumes by the average end method.
- .2 Contractor to:
 - .1 Set additional control points as necessary.
 - .2 Set all work stakes necessary to complete work.
 - .3 Allow sufficient time for Departmental Representative to take measurements for payment.
 - .4 Not damage geodetic benchmarks or control monuments unless authorized by Departmental Representative.
- .3 No separate payment for setting out work, unless Departmental Representative adjusts alignment in field and additional survey costs are incurred. Payment for additional survey required due to changes by Departmental Representative to be paid for as part under **“Lump Sum Price Item 3 – Prime Cost Sum”**

Part 2 Products

- .1 Not used.

Part 3 Execution

- .1 Not used.

END OF SECTION

01 14 00 WORK RESTRICTIONS**Part 1 General****1.1 ACCESS AND EGRESS**

- .1 All existing CP Rail accesses are to be maintained or relocated as required. Location and details of any proposed relocation to be approved by both CP Rail and PCA.
- .2 Provide for pedestrian, cyclist, and vehicular traffic for the duration of the construction.
- .3 The chain off area at Km 86+000 must remain functional over the winter shutdown period.

1.2 USE OF THE SITE AND FACILITIES

- .1 The Work Site (limits shown on Drawings) will be specified by Parks Canada and shall only be used for the purposes of the Work. The Work Site will be made available by Parks Canada to the Contractor for its non-exclusive use for the duration of the Work, unless otherwise provided in the Contract Documents.
- .2 Contractor may establish a construction camp in the west end of the Lake Louise Overflow Campground at TCH Km 66.9. This campground is used by the Public between the end of June to after the long weekend in September. An area 50 m by 50 m will be available for the construction camp. Contractor's Camp shall be limited to accommodation of Contractor's personnel only. The Overflow Campground area will be shared with other Contractors. The area for a camp will be determined by the Departmental Representative. See Section 01 35 43 – Environmental Procedures. Parks Canada regulations prohibit anyone working within the Park from using public campground facilities.
- .3 Office-tool trailer may also be set up at the Overflow Campground or at Niblock Pit. See Section 01 35 43 – Environmental Procedures.
- .4 The Contractor shall not store material or park equipment along the Highway Right of Way clear zone between Km 82.5 and Km 88.0.
- .5 Contractor shall maintain adequate drainage at the Work Site.
- .6 The Contractor shall keep the Work Site clean and free from accumulation of waste materials and rubbish regardless of source. Snow shall be removed by the Contractor as necessary and at his cost for the performance and inspection of the Work.
- .7 The Contractor shall provide sanitary facilities for work force in accordance with governing regulations and the Environmental Procedures for this project. The Contractor shall post notices and take such precautions as required by local health authorities and keep area and premises in sanitary condition.
- .8 Any damage to the Work Site caused by the Contractor shall be repaired by the Contractor at its expense.

1.3 WORKING TIMES

- .1 Work in BNP and YNP is permitted during daylight hours from 07:00 to 19:00, Monday to Saturday. No work will be permitted on Sundays unless prior written approval is granted by the Departmental Representative
- .2 The Contractor will not be permitted to work during the period of any Alberta or British Columbia statutory holiday long weekend, including one day prior to and one day

following. The Contractor will not be permitted to work during the following Civic Holidays or long weekends unless prior written approval is granted by the Departmental Representative:

.1 Statutory and Civic Holidays (2016)

- .1 Canada Day weekend: From 19:00 Wednesday June 29, 2016 to 07:00 Tuesday, July 5, 2016.
- .2 Heritage Day weekend: From 19:00 Thursday July 29, 2016 to 07:00 Tuesday August 2, 2016.
- .3 Labour Day long weekend: From 19:00. Thursday, September 1, 2016 to 07:00 Tuesday, September 6, 2016.
- .4 Thanksgiving Day weekend: From 19:00 Thursday, October 6, 2016 to 07:00 Tuesday, October 11, 2016.
- .5 Remembrance Day weekend: From 19:00 Wednesday, November 9, 2016 to 07:00 Monday, November 14, 2016.

.2 Statutory and Civic Holidays (2017)

- .1 BC Family Day weekend: From 7:00 Friday, February 10, 2017 to 07:00, Tuesday February 14, 2017.
- .2 Good Friday weekend: From 19:00 Thursday, April 13, 2017 to 07:00 Tuesday, April 18, 2017.
- .3 Victoria Day Weekend: From 19:00 Thursday May18, 2017 to 07:00 Tuesday, May 22, 2017.
- .4 Canada Day weekend: From 19:00 Thursday June 29, 2017 to 07:00 Tuesday, July 4, 2017.
- .5 Heritage Day weekend: From 19:00 Friday August 4, 2017 to 07:00 Tuesday August 8, 2017.
- .6 Labour Day long weekend: From 19:00. Thursday, August 31, 2017 to 07:00 Tuesday, September 5, 2017.
- .7 Thanksgiving Day weekend: From 19:00 Thursday, October 5, 2017 to 07:00 Tuesday, October 10, 2017.

1.4 **INSTALLATION OF CULVERTS**

- .1 Contractor shall install culverts in new carriageway prior to placing embankment material.

1.5 **WORK CONDUCTED OVER OR ADJACENT TO WATERWAYS**

- .1 All components of the Work shall be conducted in accordance with Section 01 35 43 – Environmental Procedures and the Environmental Protection Plan prepared for the project.
- .2 All components of the Work shall be conducted without equipment entering into wetlands, water bodies, or streams.
- .3 Refer to Section 01 35 43 – Environmental Procedures for details.
- .4 All waste materials from the Work shall be contained and collected in a manner to prevent any contact with the river valleys and waterways. All collected waste materials

shall be disposed of in accordance with Section 01 35 43 – Environmental Procedures and the Environmental Protection Plan prepared for the project. One “Bear Proof” garbage container will be provided by PCA.

- .5 The Contractor is responsible for the development and supply of construction access to the Work as approved by the Departmental Representative.

1.6 ACCESS TO ADJACENT PROPERTIES

- .1 Construction operations shall be conducted so as to cause minimal inconvenience to the public and to owners of adjoining property. Existing access to property shall be maintained as far as possible and if new access must be provided, every effort shall be taken to provide the new access before the existing access is removed.

1.7 UTILITIES

- .1 **The Contractor shall become familiar with all utilities and services adjacent to the Work and shall be responsible for cost of repair of any damage resulting from his operations.**
- .2 The Contractor shall establish and maintain direct and continuous contact with the owners or operators of any Utilities which may interfere with the Work. The Contractor shall co-operate with them at all times and in all places of Work. The Contractor shall keep the Departmental Representative informed of all communications with the Utility companies and authorities.
- .3 The Contractor shall notify the Departmental Representative and the Utility companies at least seven days in advance of any activities which may interfere with the operation of such Utilities.
- .4 Whenever working in the vicinity of Utilities, the Contractor shall locate such Utilities and expose those that may be affected by the Work, using hand labour as required.
- .5 The Contractor shall assess the possible impact of its operations on all Utilities that may be affected by its operations, and shall, in consultation with Utility owner(s), protect, divert, temporarily support or relocate, or otherwise appropriately treat such Utilities to ensure that they are preserved.
- .6 The Contractor shall immediately report any damage to Utilities to the Departmental Representative and to the Utility company or authority affected, and shall promptly undertake such remedial measures as are necessary at no additional cost to the Owner.

1.8 SURVEY OF EXISTING PROPERTY CONDITIONS

- .1 Submission of tender is deemed to be confirmation that the Contractor has inspected the site and is conversant with all conditions affecting execution and completion of work.
- .2 The Contractor shall regularly monitor the condition of the Work Site and of property on and adjoining the Work Site throughout the construction period, and shall immediately notify the Owner if any deterioration in condition is detected. Such monitoring shall cover all pertinent features and property including, but not limited to, buildings, structures, roads, walls, fences, slopes, sewers, culverts and landscaped areas.
- .3 The Departmental Representative may, but shall not be obligated to, survey and record the condition of the Work Site and of property on or adjoining the Work Site prior to the commencement of construction by the Contractor. If requested, the Departmental Representative will provide a copy of the survey records to the Contractor for reference.

- .4 Whenever supplied with survey records, the Contractor shall satisfy itself as to the accuracy and completeness of the survey records provided by the Departmental Representative for any area before commencing construction in that area.
- .5 Commencement of construction in any area shall be interpreted to signify that the Contractor has accepted such survey records as being a true record of the existing conditions prior to construction.
- .6 The provision of the records of a survey of existing conditions by the Departmental Representative shall in no way limit or restrict the Contractor's responsibility to exercise proper care to prevent damage to all property within or adjacent to the Work Site, whether all such property is covered by the survey or not.

1.9 PROTECTION OF PERSONS AND PROPERTY

- .1 The Contractor shall comply with all applicable safety regulations of WorkSafe BC and the Workers Compensation Act of British Columbia and Alberta including, but not limited to, Occupational Health and Safety Regulations and General Safety Regulations. Within the Site, the Contractor has all the responsibilities of an "employer" under the *Workers Compensation Act* and the *Occupational Health and Safety Regulation* and is designated as the "Prime Contractor".
- .2 Comply with all applicable safety regulations of the Workers' Compensation Board of British Columbia and Alberta (WCB) including, but not limited to, WCB's Industrial Health and Safety Regulations, Industrial First Aid Regulations, and Workplace Hazardous Materials Information System Regulations, when working in that province.
- .3 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.
- .4 The Contractor shall take all necessary precautions and measures to prevent injury or damage to persons and property on or near the Work Site.
- .5 The Contractor shall promptly take such measures as are required to repair, replace or compensate for any loss or damage caused by the Contractor to any property or, if Parks Canada so directs, shall promptly reimburse to Parks Canada the costs resulting from such loss or damage.

1.10 USE OF PUBLIC AREAS

- .1 Off-road construction equipment will not be allowed on the existing TCH except at designated areas where the existing highway is scheduled for re-construction in this Contract, material loading areas, or alternate sites as designated and approved by the Departmental Representative. Steel tracked equipment with cleats will not be allowed on pavement designated for future use. Asphalt, granular, embankment and excavation materials may be hauled on existing highway but this shall be by standard highway trucks not exceeding legal highway load limits unless approved in writing by the Departmental Representative.
- .2 Flag persons shall be provided when vehicles are entering or exiting Work Site access points and when vehicles are entering or exiting gravel pits in the park.
- .3 The Contractor shall ensure that its vehicles and equipment do not cause nuisance in public areas. All vehicles and equipment leaving the Work Site and entering public roadways shall be cleaned of mud and dirt clinging to the body and wheels of the vehicle. All vehicles arriving at or leaving the Work Site and transporting materials shall be loaded in a manner that will prevent dropping of materials or debris on the roadways and, where contents may otherwise be blown off during transit, such loads

shall be covered by tarpaulins or other suitable covers. Spills of materials in public areas shall be removed or cleaned immediately by the Contractor at no cost to the Owner. All activities shall be in accordance with Section 01 35 43 – Environmental Procedures and the Environmental Protection Plan prepared for the project.

- .4 Construction areas and construction crossings shall be flood-lit for night operations.

1.11 USE OF PITS AND QUARRIES

- .1 When the Contractor is operating in a PCA pit or quarry, the Contractor shall utilize the pit or quarry in accordance with the Departmental Representative's authorization. Under no circumstances will waste of useable material be permitted, and excavations shall be continued to depths below water level if suitable material is available.
- .1 Expansion of working pits is not authorized unless written approval has been given from the Departmental Representative. The Contractor shall confine all work in the pit within the limits of the existing cleared area.

1.12 SUPERVISORY PERSONNEL

- .1 Within five days after award notification, the Contractor shall submit to the Departmental Representative confirmation of the names of the supervisory personnel and other key staff designated for assignment on the Contract.
- The following personnel shall be included in the list:
- .2 Project Superintendent.
- .3 Safety Representative.
- .4 Quality Control Manager
- .5 Environmental Representative
- .6 Traffic Control Representative
- .2 The above personnel shall perform the following duties:
- .1 The Project Superintendent shall be employed full time. Either they or their designated deputy shall be present on the Work Site each and every workday that Work is being performed, from the commencement of Work to Total Performance of the Work.
- .2 The Project Superintendent shall nominate a Deputy Project Superintendent who shall have the authority of the Project Superintendent during the latter's absence.
- .3 The Safety Representative shall possess safety qualifications and experience as identified in Section 01 35 29.06. Duties shall encompass all matters of safety activities from commencement of Work until the Total Performance of the Work.
- .4 The Quality Control Manager shall possess quality qualifications and experience as identified in Section 01 45 00. Duties shall encompass all matters of quality activities from commencement of Work until the Total Performance of the Work.
- .5 The Environmental Representative shall be responsible for ensuring compliance with the environmental requirements as detailed in Section 01 35 43 from commencement of Work until the Total Performance of the Work.
- .6 The Traffic Control Representative shall oversee the implementation of the Traffic Management plan as identified in Section 01 35 00.06. Duties shall encompass all matters of traffic activities from commencement of Work until the Total Performance of the Work.

1.13 MEETINGS

- .1 The Work includes attending meetings between the Contractor and the Departmental Representative. The meetings will be called and chaired by the Departmental Representative as required. The Contractor shall be represented at such meetings to the satisfaction of the Departmental Representative.
- .2 The Departmental Representative will schedule an initial meeting to be held on site after award notification. Senior representatives of the Owner, Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors are to be in attendance.
- .3 As described in Section 01 35 43 – Environmental Procedures, an approximately one (1) hour environmental briefing for all staff will take place before beginning work at the site.
- .4 Cost of attending the above meetings shall be considered incidental to the Unit Price items and no additional payment will be made.

1.14 WASTE DISPOSAL

- .1 All surplus, unsuitable and waste materials shall be removed from the job site to approved sites outside Yoho and Banff National Park. Refer to Section 01 35 43 – Environmental Procedures and the Environmental Protection Plan.
- .2 Deposit of any construction debris into any waterway is strictly forbidden.
- .3 Cost for Waste Disposal described above shall be considered incidental to the Unit Price items and no additional payment will be made.
- .4 Waste Disposal shall be completed in accordance with Section 01 35 43 – Environmental Procedures.

1.15 WORK STOPPAGE

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

Part 2 Products

- .1 Not Used.

Part 3 Execution

- .1 Not Used.

END OF SECTION

01 21 00 ALLOWANCES**Part 1 General****1.1 REFERENCES**

- .1 General Conditions.

1.2 PRIME COST SUM

- .1 Included in Contract Price a total Prime Cost Sum of:
 - .1 **\$1,800,000** for bituminous materials as listed below.
 - .2 **\$1,500,000** for items other than bituminous materials as listed below.
- .2 Do not include in the Contract Price, additional contingency allowances for products, installation, overhead or profit.
- .3 Prime Cost Sum provided for in the Lump Sum Arrangement Table is not a sum due to the Contractor. Rather, payment will be made against it for miscellaneous work not included in the unit price table under the General Conditions of the Contract.
- .4 No interpretation of the work as noted below shall indicate that work will be included under the Prime Cost Sum. Items, tasks, and activities included in the Works elsewhere in the Contract shall be paid as indicated in those sections.
- .5 Any and all additional work must be approved in writing by the Departmental Representative prior to commencement.
- .6 All expenditures must be substantiated with verified invoices and/or approved daily extra work reports as noted in Clause 1.3 below.
- .7 Such work may include, but not be limited to:
 - .1 Supply and delivery of bituminous materials including asphalt cement, asphalt prime, asphalt tack, anti-stripping agent, and warm mix A/C admixtures;
 - .2 Additional relocation or removal and disposal of existing signs, guardrail, guide posts and other miscellaneous items
 - .3 Supply and installation of permanent signs (not construction signs)
 - .4 Removal and disposal or plugging of existing culverts;
 - .5 Removal of existing pavement markings
 - .6 Additional supply and installation of lane markings;
 - .7 Supply and installation of specialty items at Day Use Areas including, but not limited to, dry toilets, picnic tables, and garbage bins;
 - .8 Additional survey resulting from changes made by the Departmental Representative;
 - .9 Additional Clearing and Grubbing;
 - .10 Additional stripping and excavation as directed by the Departmental Representative;
 - .11 Remediation or removal and replacement of unsuitable or contaminated soils not described in the contract documents;
 - .12 Supply and installation of wildlife fencing;
 - .13 Additional supply and installation of seeding;
 - .14 Additional supply and installation of Rip Rap;

- .15 Additional road structure repairs;
- .16 Additional remediation or removal and replacement of unsuitable or contaminated soils not described in the contract documents;
- .17 Additional supply and installation of precast concrete barrier;
- .18 Additional drainage improvements; ditching; culvert repairs; and cleaning;
- .19 Sub-drainage not specified in the tender documents;
- .20 Utility Pole Relocation;
- .21 Removal and reinstallation of existing crash attenuator;
- .22 Removal and disposal of existing guardrail;
- .23 EPS unit price adjustments;
- .24 Rehabilitation work in Mannix and Niblock gravel pits;
- .25 Supply and installation of additional landscaping;
- .26 Miscellaneous rock scaling as directed by the Departmental Representative;
- .27 Supply and installation of rock bolts;
- .28 Supply and maintenance of Departmental Representative's office trailer; and
- .29 Miscellaneous work as directed by the Departmental Representative.
- .1 The Contract Price, and not Prime Cost Sum, includes Contractor's overhead and profit in connection with the Work.

1.3 MEASUREMENT PROCEDURES

- .1 Payment for Work under the **“Lump Sum Price Item 3a – Prime Cost Sum – Bituminous Materials”** will be based on supplier's invoices and weight tickets without any mark-up by the contractor or subcontractor
- .2 Payment for Work under the **“Lump Sum Price Item 3b – Prime Cost Sum – Items other than Bituminous Materials”** made using negotiated rates or by material, labour and equipment rates as per the following:
 - .1 Rental rates will be in accordance with current British Columbia Roadbuilders and Heavy Construction Association rate schedule, and will be all inclusive and fully operated.
 - .2 Hourly rental of equipment will be measured in actual working time and necessary travel time within project limits. Transportation time to and from site to be reimbursed only if equipment is used exclusively for additional work.
 - .3 Equipment paid on standby will be paid on 50% of the relevant Less Operator rates to a maximum of 10hrs per day.
 - .4 When based upon actual costs for additional works under Prime Cost Sum, payment will be based upon supplied invoices and other work records.
 - .5 The Prime Contractor may apply a 10% mark-up to subcontractor or supplier invoices only, as approved by the Departmental Representative. No mark-up will be allowed on relevant equipment and labour rates.
 - .6 A claim for additional payment will be considered submitted when all required documentation has been received by the Departmental Representative.

Part 2 Products

- .1 Products shall be in accordance with BC MoTI –Standard Specifications for Highway Construction (latest edition) or as directed by the Departmental Representative.

Part 3 Execution

- .1 Work shall be in accordance with BC MoTI –Standard Specifications for Highway Construction (latest edition) or as directed by the Departmental Representative.

END OF SECTION

01 25 20 MOBILIZATION AND DEMOBILIZATIONS**Part 1 General****1.1 DESCRIPTION**

- .1 Mobilization and Demobilization consists of preparatory work and operations including but not limited to, those necessary for the movement of personnel, equipment, camp, buildings, shops, offices, supplies and incidentals to and from the project sites.
- .2 Any protective measures or movement of Contractor trailers necessitated by animal interactions and required by Parks Canada will be paid by the Departmental Representative, and are not to be anticipated in the Lump Sum Contract Price for Mobilization and Demobilization.

1.2 MEASUREMENT PROCEDURES

- .1 Mobilization and Demobilization:
 - .1 Payment will be made under “**Lump Sum Price Item 1 – Mobilization / Demobilization**”.
 - .2 50% of Lump Sum Contract Price for Mobilization and Demobilization to be paid when mobilization to site is complete.
 - .3 The remainder of the Lump Sum Price for Mobilization and Demobilization to be paid when work is complete and all materials, equipment, camp, buildings, shops, offices, and other facilities have been removed from site and site cleaned and left in condition to the satisfaction of the Departmental Representative and all other Agencies having Jurisdiction.
 - .4 Payment of only **5%** of the total price tendered will be scheduled as outlined above. If the amount bid for mobilization and demobilization is greater than **5%** of the total price tendered, payment of the remainder of the amount will be authorized when the contract has been completed.

Part 2 Products

- .1 Not Used.

Part 3 Execution

- .1 Not Used.

END OF SECTION

01 29 01 SITE OCCUPANCY**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 Manual.

1.2 DEFINITION OF OCCUPANCY

- .1 The Contractor shall be permitted to lease and occupy sites when working in Banff National Park, free of charge from the date of award of the contract up to and including the Contract Completion Date.
- .2 The Contractor's occupancy of the sites identified in Contract will be deemed to have ended, when both of the following conditions are met to the satisfaction of Parks Canada:
 - .1 All the work identified under this Contract, has been completed.
 - .2 All sites' have been cleaned up and any outstanding deficiencies for the work identified under this Contract have been addressed to the satisfaction of the Departmental Representative.
 - .3 Contractor has removed from the park all trailers and equipment and sites have been cleaned-up to the satisfaction of the Departmental Representative.
- .3 Parks Canada will not pay a lease fee to the Contractor on calendar days where the Contractor is not permitted to work by Parks Canada, in accordance with Section 01 14 00 – Work Restrictions Sub-Section 1.5.

Part 2 Products

- .1 Not Used.

Part 3 Execution

- .1 Not Used.

END OF SECTION

01 31 00 PROJECT MANAGEMENT AND COORDINATION**Part 1 General****1.1 MEASUREMENT PROCEDURES**

- .1 This Work shall be incidental to the contract and will not be measured for payment.

1.2 COORDINATION

- .1 Perform coordination of progress schedules, submittals, use of site, temporary utilities, construction facilities, and construction Work, with progress of Work of other Contractors, and Work by Owner, under instructions of the Departmental Representative.

1.3 PROJECT MEETINGS

- .1 Attend weekly project meetings throughout progress of Work and provide information as determined by the Departmental Representative. Meetings shall be chaired by the Departmental representative who will prepare the minutes of the meetings.
- .2 Attend pre-installation meetings, when specified in specifications and when required to coordinate related or affected Work and provide information, as determined by the Departmental Representative.
- .3 Provide physical space and make arrangements for meetings.

1.4 CONSTRUCTION ORGANIZATION AND START-UP

- .1 Within seven (7) days after award of Contract, request a meeting of Contract Representatives to discuss and resolve administrative procedures and responsibilities. Meeting shall be chaired by the Departmental representative who will prepare the minutes of the meeting.
- .2 Senior representatives of the Owner, Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors are to be in attendance.
- .3 Agenda to include following:
 - .1 Appointment of official representative of participants in Work.
 - .2 Schedule of Work, progress scheduling in accordance with Section 01 32 16.07.
 - .3 Schedule of submittals in accordance with Section 01 33 00.
 - .4 Requirements for temporary facilities, offices, storage sheds, utilities, fences in accordance with Section 01 52 00.
 - .5 Site safety and security in accordance with Sections 01 14 00, 01 52 00 and 01 35 43.
 - .6 Quality Control in accordance with Section 01 45 00.
 - .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
 - .8 Owner-furnished materials.
 - .9 Monthly progress claims, administrative procedures, photographs, and holdbacks.

- .10 Close out procedures and submittals in accordance with Sections 01 77 00 and 01 78 00.
- .11 Insurances and transcript of policies.
- .12 Other business.
- .4 Comply with Departmental Representative's allocation of mobilization areas of site, for field offices and sheds, and for access, traffic, and parking facilities.
- .5 During construction, coordinate use of site and facilities through Departmental Representative's procedures for intra-project communications: submittals, reports and records, schedules, coordination of Drawings, recommendations, and resolution of ambiguities and conflicts.
- .6 Comply with instructions of the Departmental Representative for use of temporary utilities and construction facilities.
- .7 Coordinate field engineering and layout work with the Departmental Representative.

1.5 **ON-SITE DOCUMENTS**

- .1 Maintain at job site, one copy each of the following:
 - .1 Contract Drawings
 - .2 Specifications
 - .3 Addenda
 - .4 Reviewed Shop Drawings and mix designs
 - .5 Change Orders
 - .6 Other modifications to Contract
 - .7 Traffic Management Plan
 - .8 Safety Plan
 - .9 Blasting Plan and records
 - .10 WHMIS and associated MSDS
 - .11 Environmental Protection Plan
 - .12 Field test reports
 - .13 Copy of approved Work schedule and most recent updated schedule
 - .14 Labour conditions and wage schedules
 - .15 Applicable current editions of municipal regulations and by-laws, with WCB Notice of Project to be posted.

1.6 **SUBMITTAL SCHEDULE**

- .1 Prepare a schedule of the required submissions and the date the submissions will be made. Include columns for Actual Date of Submission, Review Comments Received, Final Submission and Final Acceptance Received.
- .2 The Owner will not be responsible for any construction delays resulting from delays in submission acceptance if the submittal dates shown in the Submittal Schedule are not achieved.

1.7 **PROJECT SCHEDULES**

- .1 Submit preliminary construction progress schedule in accordance with Section 01 32 16.07 to Departmental Representative coordinated with Owner'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 the Departmental Representative.
- .4 In addition to the project schedule, submit weekly schedules to the Departmental Representative showing Work planned for the following week on a day by day basis.

1.8 CONSTRUCTION PROGRESS MEETINGS

- .1 During course of Work prior to project completion, schedule progress meetings weekly.
- .2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance. Meetings shall be chaired by the Departmental representative who will prepare the minutes of the meetings.
- .3 Agenda to include following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review environmental issues.
 - .3 Review Traffic Control and Emergency Response Protocol issues.
 - .4 Review site safety and security issues.
 - .5 Review issues with Prime Contractor and co-ordination with other contractors.
 - .6 Review of Work progress since previous meeting.
 - .7 Discuss field observations, problems, and conflicts.
 - .8 Review off-site fabrication delivery schedules.
 - .9 Review submittal schedules: expedite as required.
 - .10 Corrective measures and procedures to regain projected schedule.
 - .11 Revisions to construction schedule.
 - .12 Review Weekly Progress schedule, during succeeding work period.
 - .13 Review of quality reports since previous meeting.
 - .14 Review construction budget: Progress payments, variances from contract.
 - .15 Other business.

1.9 SUBMITTALS

- .1 Submit product data to Section 01 33 00 for review for compliance with Contract Documents.
- .2 Submit requests for payment for review, and for transmittal to Departmental Representative. Payment request on last day of the month.
- .3 Submit requests for interpretation of Contract Documents, and obtain instructions through Departmental Representative.
- .4 Process substitutions through Departmental Representative.
- .5 Process change orders through Departmental Representative.
- .6 Deliver closeout submittals for review and preliminary inspections, for transmittal to Departmental Representative.

1.10 CLOSEOUT PROCEDURES

- .1 Notify Departmental Representative when Work is considered ready for Substantial Performance.

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- .2 Accompany Departmental Representative on preliminary inspection to determine items listed for completion or correction.
- .3 Comply with Departmental Representative's instructions for correction of items of Work listed in executed certificate of Substantial Performance.
- .4 Notify Departmental Representative of instructions for completion of items of Work determined in Departmental Representative's final inspection.

Part 2 Products

- .1 Not Used.

Part 3 Execution

- .1 Not Used.

END OF SECTION

01 32 16.07 CONSTRUCTION PROGRESS SCHEDULES – BAR (GANTT) CHARTS**Part 1 General****1.1 MEASUREMENT PROCEDURES**

- .1 This Work shall be incidental to contract and will not be measured for payment.

1.2 PRECEDENCE

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.3 DEFINITIONS

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

1.4 REQUIREMENTS

- .1 Ensure the Project Schedule is practical and remains within specified Contract duration.
- .2 Ensure all the Work required for the Contract is identified in the Project Schedule. Refer to Section 01 11 00 – Summary of Work for a potential list of activities.
- .3 Include an allowance in the schedule for Work performed and paid for as Prime Cost Sum. Refer to Section 01 21 00 – Allowances for a list of activities.

- .4 Plan to complete Work in accordance with prescribed Project Schedule.
- .5 Limit activity durations to maximum of approximately 14 working days, to allow for progress reporting.
- .6 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.
- .7 Include the requirements of Section 01 14 00 – Work Restrictions and Section 01 35 43 – Environmental Procedures.

1.5 SUBMITTALS

- .1 Submit to Departmental Representative within 10 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .2 Submit Project Schedule to Departmental Representative within 10 working days of receipt of acceptance of Master Plan.

1.6 PROJECT MILESTONES

- .1 Project milestones form interim targets for Project Schedule. Completion of each Stage of Construction:
 - .1 Prepare the whole of the site for safe, efficient winter operations and the travelling public, through the relocation of barriers, re-instatement of damaged pavement, line painting, traffic signage for 2016 winter shutdown prior to **October 28, 2016**.
 - .2 Obtain the Interim Certificate (Substantial Performance) by **August 18, 2017**.
 - .3 Complete all of the Work by **August 25, 2017 (Contract Completion Date)**.

1.7 MASTER PLAN

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

1.8 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Permits.
 - .3 Submittals:
 - .1 Project Schedule
 - .2 List of subcontractors, suppliers and Departmental Representative

- .3 Contractor Chain of Command including Sub-Contractors and Departmental Representatives
- .4 Prime Contractor / co-ordination with other Contractors Plan
- .5 Work Plan
- .6 Environmental Protection Plan
- .7 Traffic Management Plan
- .8 Site access / Detour Plan
- .9 Emergency Response Protocol
- .10 Site Specific Health and Safety Plan, incl. MSDS sheets
- .11 On site Contingency and Emergency Response Plan
- .12 Management of Owner supplied material Plan
- .13 Survey Plan
- .14 Quality Control Plan
- .15 Shop Drawings
- .16 Rock Blasting Plan
- .17 Concrete / Asphalt Mix Designs
- .4 Mobilization
- .5 Work Activities by road segments / locations:
 - .1 Grubbing
 - .2 Stripping
 - .3 Detours / Site Access
 - .4 Type D excavation
 - .5 Type A excavation
 - .6 Drainage culvert installation
 - .7 Embankment construction
 - .8 Topsoil placement
 - .9 Seeding
 - .10 Sub-base and base material placement
 - .11 Asphalt Concrete Pavement placement
 - .12 Concrete Barrier removal and reinstallation
 - .13 Concrete barrier supply and installation
 - .14 Installation of SPCSP Wildlife Underpass structures
 - .15 Installation of Bridge Wildlife Underpass structure
 - .16 Lane marking
 - .17 Permanent Signs / Chevron installation
 - .18 Additional Work as and when requested
- .6 Quality Control
- .7 Interim Inspection
- .8 Site Clean-up / De-mobilization

1.9 PROJECT SCHEDULE REPORTING

- .1 Update Project Schedule on monthly basis reflecting activity changes and completions, as well as activities in progress. Provide weekly Progress Reports.

- .2 Include, as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.10 **PROJECT MEETINGS**

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

Part 2 Products

- .1 Not Used.

Part 3 Execution

- .1 Not Used.

END OF SECTION

01 33 00 SUBMITTAL PROCEDURES**Part 1 General****1.1 MEASUREMENT PROCEDURES**

- .1 This work shall be incidental to contract and will not be measured for payment.

1.2 REFERENCES

- .1 Not used.

1.3 ADMINISTRATIVE

- .1 Submit to Departmental Representative 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 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.
- .6 Notify Departmental Representative in writing at time of submission, identifying any deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work is consistent.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.

1.4 "DESIGN AND BUILD", SHOP DRAWINGS, PRODUCT DATA AND MIX DESIGNS

- .1 "Design and Build": The term "Design" refers to all detailed design activities (survey, investigation, drawings, specifications) based on general requirements contained in these specifications and shown on the drawings. "Build" refers to construction of Contractor's detailed design after design has been reviewed by the Departmental Representative. Contractor's responsibility for error and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .2 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data that are to be provided by the Contractor to illustrate details of a portion of Work.

- .3 The term “mix design” means engineered design for proportioning materials in concrete or asphalt concrete pavement including all supporting test results, materials properties and Departmental Representative’s letter of recommendation.
- .4 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.
- .5 Allow fourteen (14) calendar days for Departmental Representative’s review of each submission.
- .6 Adjustments made on shop drawings by the Departmental Representative are not intended to change the Contract Price. If adjustments affect the value of Work, state such in writing to the Departmental Representative prior to proceeding with the Work.
- .7 Make changes in shop drawings as the Departmental Representative may require, consistent with the Contract Documents. When resubmitting, notify the Departmental Representative in writing of any revisions other than those requested.
- .8 Submit letter(s) of certification with all mix designs.
- .9 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 each shop drawing, mix design, product and sample.
 - .5 Other pertinent data.
- .10 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 the Contract Documents.
 - .5 Details of appropriate portions of the Work as applicable:
 - .1 Fabrication,
 - .2 Performance characteristics,
 - .3 Standards.
- .11 After the Departmental Representative’s review, distribute copies.
- .12 Submit one (1) electronic copy of the shop drawings or mix design for each requirement requested in the Specification Sections and as requested by the Departmental Representative.
- .13 Submit one (1) electronic copy of the product data sheets or brochures for requirements requested in the Specification Sections and as requested by the Departmental

Representative where shop drawings will not be prepared due to standardized manufacture of the product.

- .14 Delete information not applicable to project.
- .15 Supplement standard information to provide details applicable to project.
- .16 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .17 The review of shop drawings and mix designs by Departmental Representative is for the sole purpose of ascertaining conformance with general concept. This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for that 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 the generality of the foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.

1.5 **SAMPLES**

- .1 Not used.

1.6 **MOCK-UPS**

- .1 Not used.

1.7 **CERTIFICATES AND TRANSCRIPTS**

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

1.8 **REQUIRED CONTRACTOR SUBMITTALS**

- .1 General
 - .1 This Clause identifies the plans, programs, and documentation required prior to mobilization on site and during the construction phase.
- .2 Pre-Mobilization Submittals

The Contractor shall not begin any site Work until the Departmental Representative has authorized acceptance of submittals in writing. Submit the following plans and programs to the Departmental Representative for review a minimum of twenty (20) days prior to mobilization to the project site:

 - .1 Project schedule, detailing the schedule of the workdays required from Contractor, subcontractors, suppliers and consultants to complete each activity of the project by road segment or location in order to meet stages specified in Section 01 11 00. In addition, for each activity critical elements that could impact on the schedule are to be identified. Submission shall include both a paper copy of the schedule and an electronic copy in Microsoft Projects format

- .2 List of subcontractors, suppliers and consultants, their role and their key personnel, including names and positions, addresses, telephone, cellular telephone and/or pager numbers.
- .3 Plan describing methods the Contractor will have to meet his responsibilities as the Prime Contractor for Traffic Control along the TCH between km 82.5 and km 88.0, and to co-ordinate Work, traffic control, site access, safety, with other Contractors working in their Work zone.
- .4 Contractor Chain of Command, listing key Contractor personnel, including for each name, position, qualification, experience, telephone, cellular telephone and/or pager numbers. The list shall include the names and telephone/cellular telephone/pager numbers for contact persons who are available on a 24-hour basis in the event of emergencies.
- .5 Work Plan, describing in detail for each activity by road segment and location, the Contractor's intended methods of construction, and materials, equipment and manpower he will use to meet stages specified in Section 01 11 00. The Work Plan has to be linked to the Project Schedule.
- .6 Quality Control Plan in accordance with Section 01 45 00 – Quality Control.
- .7 Traffic Management Plan, in accordance with the requirements of Section 01 35 00.06 – Special Procedures for Traffic Control.
- .8 Environmental Protection Plans (EPP) and Environmental Construction Operations Plans (ECO Plans) that shall meet the requirements of Section 01 35 43 – Environmental Procedures.
- .9 Site Access and Detour Plans. It shall include, but not be limited to, engineered Drawings and procedures for accessing all areas of the Work or for proposed detours.
- .10 Survey Plan describing the Contractor's intended methods of surveying during this project.
- .11 Contractor shall develop an "Emergency Procedures Protocol" in consultation with Parks Canada. Parks Canada will supply the Contractor with a template with contact names and numbers to be used for this purpose.
- .12 Health and Safety Plan - The Contractor shall have a Certificate of Recognition (COR) or Registered Safety Plan (RSP) including a site specific Health and Safety Plan acceptable to the Departmental Representative. The Contractor shall implement and maintain the Health and Safety Plan during the Work.
- .13 Blasting Safety Plan, describing special procedures to be followed during rock blasting to ensure protection of the public and workers in accordance with Section 00 73 19 – Health and Safety Requirements.
 - .1 The Contractor shall provide and follow a blast design, approved and signed by the blasting consultant, not less than one week prior to commencing drilling and blasting operations and a minimum of one day before the Contractor proposes to implement any changes to the previously utilized drilling or blasting methods. The design may be prepared by the blaster, but shall be reviewed by the Contractor and forwarded to the blasting consultant for signing. The design shall contain full details of the drilling and blasting patterns and controls that the Contractor proposes to use for controlled blasting. The blast design shall contain the following minimum information:

- .1 Date the design was prepared and proposed date of blast.
- .2 Station limits of proposed blast.
- .3 Plan and section views of proposed drill pattern including free face, burden, blasthole spacing, blasthole diameters, blasthole angles, lift height, hole depth, and subdrill depth.
- .4 The location of production (including buffer) and backline holes.
- .5 Loading diagram showing type and amount of explosives, primers, initiators, and location and depth of stemming.
- .6 Initiation sequence of blastholes including delay times and delay system.
- .7 Manufacturer's data sheets for all explosives, primers, delays, and initiators to be used.
- .8 Blasting consultant's signature, printed name, and company name.
- .9 Blaster's signature, printed name, company name, and blaster's certificate number

.3 Construction Phase Submittals

- .1 Monthly Progress Reports in accordance with Section 01 32 16.07.
- .2 Weekly Progress Reports that outline the detailed Work (Contractor, subcontractors, suppliers, consultants) completed to date as well as the anticipated Work to be performed for the following week on a day-by-day basis. Work to be linked to activities by road segment or location identified in project schedule and to provide information on materials, equipment and manpower. Also, alternate Work to be identified if Work or a portion of, proposed cannot be done due to weather, equipment breakdown, delays in delivery, etc.
- .3 Quality Control Inspection Reports - The Contractor shall maintain a daily inspection report that itemizes the results of all Quality Control inspections conducted by the Contractor. The reports shall be made available for review by the Departmental Representative upon request. A summary of all Quality Control inspections conducted to date shall be submitted by the Contractor with each request for payment.
- .4 "Design and Build" documents, Shop Drawings and Mix Designs - The Contractor shall submit all design drawings, shop drawings and mix designs required to fabricate and / or conduct the work a minimum 30 days prior to fabrication / production.
- .5 Progress Photographs:
 - .1 Formats:
 - .1 Electronic: .jpg files, minimum three (3) mega pixels.
 - .2 Submission requirements: one (1) set of electronic files.
 - .3 Identification: Name and number of project, description of photograph and date.
 - .4 Viewpoints: viewpoints determined by Construction Manager or Departmental Representative.
 - .6 Submission Frequency: prior to commencement of Work and weekly thereafter with progress statement, or as directed by Construction Manager or Departmental Representative.

Parks Canada

- .7 Submit CD with all electronic pictures as part of closeout package.
- .8 Submit an electronic copy of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative and authority having jurisdiction, weekly.
- .9 Submit copies of reports or directions issued by Federal and Provincial health and safety inspectors.
- .10 Submit copies of incident and accident reports.
- .4 Project Completion Submittals
 - .1 Record Drawings -The Contractor shall submit copies of all Contractor's Drawings revised as necessary to record all as-built changes to the Work and the Contractor shall submit a set of Contract Drawings clearly marked to record as-built changes to the Work.
 - .2 Quality Control Records – The Contractor shall submit a bound and itemized set of project quality control documentation.
- .5 The Contractor shall not construe the Departmental Representative's authorization of the submittals to imply approval of any particular method or sequence for conducting the Work, or for addressing health and safety concerns. Authorization of the programs shall not relieve the Contractor from the responsibility to conduct the Work in strict accordance with the requirements of Federal or Provincial regulations and this specification, or to adequately protect the health and safety of all workers involved in the project and any members of the public who may be affected by the project. The Contractor shall remain solely responsible for the adequacy and completeness of the programs and work practices, and adherence to them.

Part 2 Products

- .1 Not Used.

Part 3 Execution

- .1 Not Used.

END OF SECTION

01 35 00.06 SPECIAL PROCEDURES FOR TRAFFIC CONTROL**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 Manual.

1.2 RELATED SECTIONS

- .1 All Division 01, 02 and 3X Sections.

1.3 MEASUREMENT PROCEDURES

- .1 Cost of Traffic Control, including temporary pavement marking, described in this Section 01 35 00.06, shall be considered incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”**, and no additional payment will be made for the duration of the Contract. The Contractor shall receive payment for traffic management on a monthly basis prorated by the number of months working on site divided by the number of months on site identified on Contractor schedule, not to exceed the total lump sum bid price for Traffic Management.
- .2 Cost of keeping existing the TCH roadway between km 82.5 and 88.0, clean, free of pot holes while Contractor is on site shall be considered incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”**, and no additional payment will be made for the duration of the Contract.
- .3 Cost of snow removal for Contractor to do the work identified in the Contract while Contractor is on site shall be considered incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”**, and no additional payment will be made for the duration of the Contract. This excludes snow removal on Public roads.

1.4 REFERENCES

- .1 The Contractor shall provide traffic control in accordance with current edition of:
 - .1 British Columbia - Traffic Control Manual for Work on Roadways.
 - .2 Manual of Uniform Traffic Control Devices for Canada, (MUTCD) distributed by Transportation Association of Canada.

1.5 QUALITY CONTROL

- .1 All Quality Control by the Contractor.

1.6 GENERAL

- .1 **The Contractor will not be permitted to remove the temporary pavement marking until the final pavement markings have been installed to the satisfaction of the Contract and Departmental Representative.**
- .2 At all work sites, the Contractor shall mark **accurately**, at regular intervals, the location and type of existing painted lines prior to their removal or covering, including start and ends of passing lanes and intersections, with a stake at the side of the roadway and make a written record of markings in a book, in order that painted lines can be accurately re-established after work is completed. If no lines are present the Contractor shall mark

accurately (+ or – 20 mm) and at regular intervals in accordance with the Section 2.2.1 of the **“BC MoTI - Traffic Control Manual for Work on Roadways, 2010”**.

- .3 The Contractor shall develop and implement a Traffic Management Plan in accordance with the BC MoTI - Traffic Control Manual for Work on Roadways, except where specified otherwise in these specifications. The Traffic Management Plan will include plans specific to each roadway for this project.
- .4 The Traffic Management Plan must duly consider the traffic volumes associated with the direction volume increases typically experienced on the lead up to weekends and/or special events. Adjustments to the TMP may be required at the request of the Departmental Representative to mitigate delays in excess of the stipulated maximum 20minutes.
- .4 The Contractor shall design, supply, erect, move and maintain all traffic control devices, signs, temporary pavement marking, other safety measures and provide staff to ensure safe passage of all traffic from commencement of site work to date of acceptance by the Departmental Representative.
- .5 All traffic and warning signs shall be either bilingual or of a symbolic or pictorial type. If bilingual signs are used, the English and French message shall be of equal letter size and at the same elevation, with English on left and French on right. Assistance in translation of construction and warning signs to French may be obtained from Parks Canada.
- .6 All speed limits, traffic control and warning signs shall have an “NPC” adhesive sticker added to bottom right-hand corner. These stickers will be supplied by Parks Canada following the acceptance by the Departmental Representative of the Contractor’s traffic management plan.
- .7 **Temporary pavement marking used shall be acceptable to the Departmental Representative and in accordance with Section 2.2.1 of the “BC MoTI Traffic Control Manual for Work on Roadways, 2010”.**
- .8 All temporary pavement markings will be removed at the Contractor’s expense prior to the completion of the Contract.
- .9 Contractor shall have appropriate traffic control measures in place so that one lane of highway traffic is maintained in each direction through the work zone at all times throughout the construction.
- .10 The Contractor shall coordinate traffic management procedures with other Contractors working in the immediate vicinity as well as collaborate with the Departmental Representative in respect to Traffic Management restrictions on the Highway Network. In consideration of the number of grading, paving and bridge construction projects in the corridor the Contractor must make a concerted effort to coordinate their traffic management strategies with other stakeholders. The Contractor must also be prepared to attend traffic management and construction staging coordination meetings as requested by the Departmental Representative.
- .11 The Contractor shall supply, install and maintain two portable Changeable Message Signs (CMS) to inform the traffic of construction delays. Exact installation locations of the CMS to be agreed on site with the Departmental Representative. All cost associated with the supply, installation, maintenance and removal of the two CMS will be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”**. Text for the two CMS will be directed by the Departmental Representative. Removal of the two CMS will only be permitted upon completion of the Works.

1.7 PROTECTION OF PUBLIC TRAFFIC

- .1 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment.
- .2 When working on existing travelled way:
 - .1 Place equipment in a position presenting a 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 travelled way.
 - .3 Do not leave equipment on travelled way overnight.
- .3 Do not close any lanes of road without approval of Departmental Representative. Before re-routing traffic erect suitable signs and devices in accordance with the requirements of the BC MoTI - Traffic Control Manual for Work on Roadways (latest edition), except where specified otherwise.
- .4 **A minimum of one travelling lane 4 m wide in each direction shall be maintained by the Contractor at all times to provide for safe movement of traveling public through work area.** The Contractor shall submit a Traffic Management Plan prior to commencement of work. Short closures may be allowed by the Departmental Representative for some activities such as asphalt removal as long as the delay to motorists does not exceed 20 minutes. During times of heavy traffic volumes, the queue length must also be monitored in conjunction with delay times.
- .5 The Contractor shall provide competent supervision and/or contract personnel as required during non-working hours to ensure that safety flares, flashing beacons, signs, lights, etc., are in proper working order.
- .6 The traffic control measures will be monitored by the Departmental Representative, who may require modifications of these measures from time to time to achieve satisfactory traffic flow, safety of traveling public and coordination with adjacent contracts.
- .7 Traffic control measures will be monitored by the Departmental Representative, who may require modifications of these measures from time to time to achieve satisfactory traffic flow, safety of traveling public and coordination with adjacent contracts.

1.8 INFORMATIONAL AND WARNING DEVICES

- .1 Provide and maintain signs, flashing warning lights and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project Work that requires road user response.
- .2 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified in the Traffic Management Plan submitted by the Contractor and approved by the Departmental Representative. **All temporary signs that are used for longer than one day shall be mounted on wood or steel posts installed in the shoulder areas at locations approved by the Departmental Representative.**
- .3 At each end of the Work site, supply, install and maintain a portable electronic sign with a minimum of three (3) lines with 8 characters for the duration of the project.
- .4 Place signs and other devices to standards and in locations recommended in BC MoTI - Traffic Control Manual for Work on Roadways (latest edition). Provide intermittent signage if work zones exceed 2.0 km in length.

- .5 All construction signs shall be installed to prevent incidental blow down or displacement and must remain in service throughout the construction period
- .6 As situation on site changes, Contractor to update his Traffic Management Plan outlining signs and other devices required for the project and submit for the approval of the Departmental Representative.
- .7 Continually inspect and maintain traffic control devices in use by:
 - .1 Checking signs daily for legibility, damage, suitability and location.
 - .2 Cleaning, repairing or replacing signs as required ensuring clarity and reflectance.
 - .3 Removing or covering signs that do not apply to conditions existing from day to day or time to time.

1.9 CONTROL OF PUBLIC TRAFFIC

- .1 Contractor shall provide competent flag persons, trained in accordance with, and properly dressed and equipped as specified in the BC MoTI - Traffic Control Manual for Work on Roadways.
 - .4 When public traffic is required to pass working vehicles or equipment, that block all or part of travelled roadway.
 - .5 When vehicles are entering or exiting Work Site access points.
 - .6 When vehicles are entering or exiting gravel pits in the park.
 - .7 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.
 - .8 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.
 - .9 Where temporary protection is required while other traffic control devices are being erected or taken down.
 - .10 For emergency protection when other traffic control devices are not readily available.
 - .11 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.
 - .12 At each end of restricted sections where pilot cars are required.
- .2 Delays to public traffic due to Contractor's operations: **maximum 20 minutes**.
- .3 During hours of darkness, Contractor shall determine requirements but as a minimum, flag persons shall be additionally equipped with a red signal hand-light of sufficient brightness to be clearly visible to approaching traffic and flagging stations shall be illuminated by overhead lighting. Signs indicating hazardous conditions and signs requiring increased attention shall be marked with flashers.
- .4 If night shift operations are implemented on 2-lane undivided sections, the public traffic must be escorted through the work zone by pilot cars in both directions.

1.10 OPERATIONAL REQUIREMENTS

- .1 Maintain existing conditions for traffic throughout period of contract except that, when required for construction under contract and when measures have been taken as

specified herein and approved by Departmental Representative to protect and control public traffic, existing conditions for traffic to be restricted as follows:

- .1 Speed limit reduced to 70 km/h in work zones in non-work periods.
- .2 Speed limit reduced to 50 km/h in work zones in work periods.
- .3 Speed limit reduced to 50 km/h on detours at all times.
- .4 A minimum of one unencumbered travelling lane 4m wide in each direction shall be maintained by the Contractor at all times to provide for safe movement of traveling public through work area. The delay due to single lane alternating traffic shall not exceed 20 minutes.
- .5 Full traffic closures for the purposes of blasting will be permitted under the following conditions:
 - .1 Short full closures for a maximum of 20 minutes will be permitted by the Departmental Representative, provided the site specific total delay time to motorists does not exceed 45 minutes.
 - .2 One 60 minute work zone closure per shift between 08:00 hrs and 11:00 hrs.
 - .3 One 60 minute work zone closure per shift between 19:00 hrs and 07:00 hrs.
 - .4 8 hours elapse time between full closures in a day.
 - .5 No full closures between 11:00 hrs and 19:00 hrs.
 - .6 Full closures are only permitted on Monday thru Friday and as otherwise limited under Section 01 14 00 Work Restrictions.
- .6 A schedule for all full work zone closures required longer than 45 minutes must be provided to the Departmental Representative at least one (1) week in advance of the planned closure.
- .7 There may be restrictions to accommodate special events within Yoho National Parks. PCA will provide two (1) weeks' notice of any upcoming restrictions.
- .8 The Departmental Representative reserves the right to stop work in the case of excessive traffic delays.
- .9 Maintain existing conditions for traffic crossing right-of-way.
- .10 Provide the Departmental Representative with construction advisories for posting to the DriveBC website (<http://www.drivebc.ca>) and update advisories regularly to reflect the current and planned construction activities and highway closures.
- .11 Provide the Departmental Representative with construction advisories for posting to the Official Alberta Traffic Advisor website (<http://511.alberta.ca/>) and update advisories regularly to reflect the current and planned construction activities and highway closures.
- .12 Emergency vehicles are to be directed through the Work Site immediately once conditions are safe.
- .13 No stoppage of traffic shall be allowed during inclement weather conditions.
- .2 Maintain existing conditions for traffic crossing right-of-way.
- .3 No stoppage of traffic shall be allowed during inclement weather conditions.

Part 2 Products

- .1 Not used.

□

Project No. 201612

Parks Canada

Trans Canada Highway
km 82.5 to km 88.0
TCH Twinning
Yoho National Park

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SPECIAL PROCEDURES
FOR TRAFFIC CONTROL
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Part 3 Execution

.1 Not used.

END OF SECTION

01 35 29.06 HEALTH AND SAFETY REQUIREMENTS**Part 1 General****1.1 MEASUREMENT PROCEDURES**

- .1 This work shall be incidental to contract and will not be measured for payment.

1.2 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .2 Health Canada/Workplace Hazardous Materials Information System
 - .1 (WHMIS).Material Safety Data Sheets (MSDS).
- .3 Province of Alberta
 - .1 Occupational Health and Safety Act, R.S.A., 2000.

1.3 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan

1.4 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.

1.5 SAFETY ASSESSMENT

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

1.6 MEETINGS

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.
- .2 Parks Canada recognizes that federal Occupational Health and Safety legislation places specific responsibilities upon Parks Canada as owner of the work place. In order to meet those requirements, Parks Canada has implemented a contractor safety regime to ensure roles and responsibilities assigned under Part II of the Canada Labour Code and the Canada Occupational Health and Safety Regulations are implemented and observed when involving contractor(s) to undertake work in Parks Canada work places, including on Parks Canada property.
- .3 After contract award and prior to commencement of any work under the contract, the Project Manager will hold a health and safety meeting with the Contractor. At this meeting, the Contractor is required to complete and sign an Attestation to certify the Contractor will comply with the requirements set out in the Attestation and the terms and conditions of the contract.
- .4 A copy of the "Attestation and Proof of Compliance with Occupational Health and Safety (OHS)" form is attached as Appendix A.

1.7 REGULATORY REQUIREMENTS

- .1 Do Work in accordance with National Parks Act.

1.8 PROJECT / SITE CONDITIONS

- .1 Work at site will involve contact with Alberta Occupational Health and Safety.

1.9 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.10 RESPONSIBILITY

- .1 The Contractor shall act as the Prime Contractor in all matters relating to Occupational Health and Safety. They shall conduct their work and make all such arrangements necessary to allow them to be accepted as such by the relevant Provincial Authorities.
- .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.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.11 COMPLIANCE REQUIREMENTS

- .1 Comply with Occupational Health and Safety Act, General Safety Regulation, British Columbia and Alberta.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.12 UNFORESEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or conditions occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

1.13 HEALTH AND SAFETY REPRESENTATIVE

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Coordinator. Health and Safety Co-ordinator must:
 - .1 Have minimum 2 years site-related working experience specific to activities associated with roadway construction.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

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

1.14 POSTING OF DOCUMENTS

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

1.15 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.16 BLASTING

- .1 Blasting or other use of explosives is not permitted without prior receipt of written approval by the Departmental Representative.
- .2 Production of blasting powder must be done in accordance with Section 01 35 43 – Environmental Procedures.
- .3 Do blasting operations in accordance with Section 31 24 13 – Roadway and Drainage Excavation.

1.17 POWDER ACTUATED DEVICES

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

1.18 WORK STOPPAGE

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

Part 2 Products

- .1 Not used.

Part 3 Execution

- .1 Not used.

END OF SECTION

01 35 32 SPECIAL PROCEDURES FOR TRAFFIC DETOURS**Part 1 General****1.1 SUPPLIED PRODUCTS UNDER THIS SECTION**

- .1 BC MoTI Class 1- 19mm Medium Mix Asphalt Aggregate supplied by the Owner is available from stockpiles at Mannix Pit.

1.2 PRECEDENCE

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.3 RELATED SECTIONS

- .1 All Division 01, 02 and 03 Sections

1.4 MEASUREMENT PROCEDURES

- .1 Detours required for this project at Km 83.1, 84.5 and 86.0.
- .2 The survey, design, layout and staging of detours by the Contractor shall be incidental to the contract and no separate payment will be made to the Contractor.
- .3 The construction, maintenance, and removal of detours shall be paid under the following items:
 - .1 The survey, design, layout and staging of detours by the Contractor shall be incidental to the contract and no separate payment will be made to the Contractor.
 - .2 Mobilization and demobilization required for the construction / maintenance / removal of these detours shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”** and no additional payment will be made.
 - .3 Excavation will be paid under **“Unit Price Item 4 – Roadway Embankments”**, in accordance with Section 31 24 13 – Roadway and Drainage Excavation.
 - .4 Asphalt removal will be paid under **“Unit Price Item 1 – Asphalt Pavement Removal”** in accordance with Section 02 41 13.14 – Asphalt Pavement Removal.
 - .5 Placing Sub-base course will be paid under **“Unit Price Item 6 – Granular Sub Base Course”** in accordance with Section 32 11 19 - Granular Sub-Base Course.
 - .6 Placing Base course will be paid under **“Unit Price Item 8 – Granular Base Course”** in accordance with Section 32 11 24 – Granular Base Course.
 - .7 Placing asphalt will be paid under **“Unit Price Item 9 – Asphalt Concrete Pavement - EPS”** in accordance with Section 32 12 16 – Asphalt Concrete Pavement (EPS). The EPS bonus and penalty provisions will not be applied for detours.
 - .8 Supply and Placing of CSP culverts will be paid under **“Unit Price Item 16 – CSP Culverts”** in accordance with Section 33 42 13 – Pipe Culverts.
 - .9 Installation and relocating Precast Concrete Barriers will be paid under **“Unit Price Item 19 – Precast Concrete Barrier”**.

- .10 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 - Mobilization / Demobilization”**, and no additional payment will be made.
- .11 Traffic Control, including temporary marking, required during the survey, layout, construction and maintenance of these detours shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .12 Maintenance of detours shall be incidental to the contract and no separate payment will be made to the Contractor.
- .13 Waste materials removed from the detour shall be disposed of in accordance with Section 01 14 00 – Work Restrictions.
- .14 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for construction and maintenance of these detours by the Contractor shall be incidental to the contract and no separate payment will be made to the Contractor.

1.5 SCHEDULE

- .1 The Contractor is prohibited from conducting work that will, in the opinion of the Departmental Representative, interfere with smooth traffic flow in accordance with Section 01 14 00 Work Restrictions.

1.6 TRAFFIC CONTROL REQUIREMENTS

- .1 The Contractor shall provide traffic control in accordance with Section 01 35 00.06 – Special Procedures for Traffic Control.

1.7 REFERENCES

- .1 BC Supplement to TAC Geometric Design Guide – latest edition.

1.8 DESIGN CRITERIA

- .1 Detour Road Design Speed to be 70 km/hr. Detour Road Posted Speed to be 60 km/hr. However, these criteria may be reduced by the Departmental Representative at their absolute discretion based on constructability and functionality.
- .2 Detour shall match the laning at the tie-in. Minimum travel lane width shall be 3.5 m lanes plus 0.5 m shoulders. Minimum total width of Detour Roads to be 8 m at all locations.
- .3 Detour Road pavement structure shall include:
 - .1 75mm Asphalt Concrete Pavement placed in single lift,
 - .2 150mm base course using 25mm Well Graded Base aggregates,
 - .3 275mm subbase course using Select Grade Sub-base aggregates.
- .4 Design shall incorporate as much as possible the final roadway layout to avoid removing detour built. Sections of the detour road incorporated into the final roadway must be constructed to match the final road structure design.

1.9 DESIGN REVIEW

- .1 Provide Departmental Representative with four (4) sets of complete working Drawings and one copy of detailed design calculations, for review at least four (4) weeks prior to beginning construction. Drawing to show both detour and final roadway design at each stage. Drawings and design calculations to bear signature and stamp of qualified professional engineer registered or licensed in the Province of the British Columbia.
- .2 Verify existing site conditions and ground elevations before preparing working Drawings.

1.10 QUALITY CONTROL – TESTING

- .1 All Quality Control testing by the Contractor.
- .2 Testing as per approved Contractor's Quality Control Plan.

Part 2 Products**2.1 MATERIALS**

- .1 BC MoTI 50mm well-graded base material to be supplied by the contractor or produce from suitable material excavated within the design cut.
- .2 BC MoTI 25mm well-graded base material to be supplied by the contractor or produce from suitable material excavated within the design cut.
- .3 BC MoTI Class 1 – 19mm Medium Mix Asphalt Aggregate supplied by the Owner is available in stockpiles at Mannix Pit.

Part 3 Execution**3.1 CONSTRUCTION AND PARTIAL REMOVAL OF DETOURS**

- .1 Construction and Partial Removal as per Contractor's Drawings and in accordance with the Contract documents.

3.2 MAINTENANCE OF DETOURS

- .1 Maintenance as per Contractor's Drawings and in accordance with BC MoTI Maintenance Specifications (latest edition).

END OF SECTION

01 35 43 ENVIRONMENTAL PROCEDURES**Part 1 General****1.1 MEASUREMENT PROCEDURES**

- .1 Preparation and implementation of an Environmental Protection Plan (EPP) in accordance with this Section 01 35 43 – Environmental Procedures will not be measured separately for payment and will be considered incidental to the Work.

1.2 SUBMITTALS

- .1 The Contractor is required to prepare an Environmental Protection Plan in accordance with this Section 01 35 43 – Environmental Procedures. The EPP document will be reviewed and accepted for use on the project by the Departmental Representative in collaboration with the Parks Canada designated ESO.
- .2 The EPP will include how the Contractor will manage all environmental risks and implement all recommended mitigations identified in the BIA.

1.3 NATIONAL PARK REGULATIONS

- .1 The Contractor shall ensure that all work is performed in accordance with the ordinances, laws, rules and regulations set out in the Canada National Parks Act and Regulations.
- .2 The Contractor and any sub-Contractors shall obtain a business license from the Parks Canada Administration Office in Lake Louise or Banff, prior to commencement of the contract.
- .3 All Contractor's vehicles are required to display a vehicle work pass from Parks Canada. These permits may be obtained free of charge from the Departmental Representative, PCA Environmental Officer or at the Park Gate.

1.4 CANADIAN ENVIRONMENTAL ASSESSMENT ACT (CEAA)

- .1 Execution of the work is subject to the provisions within the *Canadian Environmental Assessment Act* (CEAA) Guidelines Order of 2003 and subsequent amendments.
- .2 The BIA shall take precedence over requirements detailed in this section and the contractor is obliged to implement all recommendations and mitigations in the BIA and this section, and to include them in their EPP.
- .3 Failure to comply with or observe environmental protection measures as identified in these specifications may result in the work being suspended pending rectification of the problems.

1.5 START-UP AND ENVIRONMENTAL BRIEFING

- .1 **All staff employed at the construction site will be required to attend an approximate one (1) hour environmental briefing presented by PCA prior to their commencement of work on site.** It is recognized that new employees may join the Contractors' work force after the initial round of "environmental briefing". In that case and as required, subsequent "environmental briefings" can be presented as numbers warrant, by arrangement with the ESO through the Departmental Representative. Also, some sub-trades may be present at the site for a short time, to perform once-only duties.

In these cases, the “environmental briefing” will be replaced by the Contractor explaining the environmental sensitivity of the work location to the sub-trade worker(s), and reviewing highlights of personal conduct expected, with reference to a one-page briefing summary to be provided to the Contractor by the ESO. A copy of this summary will be provided to each sub-trade worker joining the work force at the site.

- .2 Parks Canada will have an ESO attending the site to monitor the construction activity for conformance with the EPP. The ESO or alternate designated Parks Canada staff member will present the “environmental briefing”. The ESO’s main duties are to monitor the progress of the construction on an on-going basis to ensure compliance with environmental protection measures, and to provide guidance through the Departmental Representative, in the event of unanticipated environmental problems. Although the ESO has authority to enforce National Parks Act violations, direction to the Contractor will be the duty of the Departmental Representative.
- .3 Prior to commencing any activity not expressly covered or allowed in the project BIA the Contractor may be required to first obtain a Restricted Activity Permit (RAP) in consultation with the ESO and Departmental Representative.

1.6 **CONSTRUCTION SITE ACCESS AND PARKING**

- .1 Points of access from the TCH to the various construction sites will be required. The Contractor shall review both short and long term construction access requirements with the Departmental Representative, both at start-up and on an ongoing basis. In consultation with the Departmental Representative, the Contractor shall formulate an agreement for worker transportation to and from the work sites and where workers shall park their private vehicles.
- .2 The Contractor shall ensure that the environment beyond the work limits is not negatively impacted or damaged by workers’ vehicles or construction machinery and shall instruct workers so that the “footprint” of the project is kept within defined boundaries.

1.7 **PROTECTION OF WORK LIMITS**

- .1 The Contractor’s EPP will detail how the work limits shall be marked and what procedures will be employed to ensure trespass outside these limits does not occur, to the satisfaction of the Departmental Representative and the ESO.

1.8 **EROSION CONTROL**

- .1 Erosion control measures that prevent sediment from entering any waterway, water body or wetland in the vicinity of the construction site are a critical element of the project and shall be included in the Contractor’s EPP and implemented by the Contractor.
- .2 If necessary, on-site sediment control measures shall be constructed and functional prior to initiating activities associated with the asphalt plant and the paving. The Contractor shall prepare an Erosion Control Plan to the satisfaction of the Departmental Representative and the ESO.
- .3 The regular monitoring and maintenance of all erosion control measures shall be the responsibility of the Contractor. If the design of the control measures is not functioning effectively they are to be repaired. The Departmental Representative and ESO also will monitor erosion control performance.

- .4 The site will be secured against erosion during any periods of construction inactivity or shutdown.

1.9 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 habitat. Hazardous or toxic products shall be stored no closer than 100 metres from watercourses.
- .2 A Spill Response Plan will be prepared by the Contractor as part of the EPP and shall detail the containment and storage, security, handling, use and disposal of empty containers, surplus product or waste generated in the application of these products, to the satisfaction of the Departmental Representative and the ESO and in accordance with all applicable federal and provincial legislation. The EPP shall include a list of products and materials to be used or brought to the construction site that are considered or defined as hazardous or toxic to the environment. Such products include, but are not limited to, waterproofing agents, grout, cement, concrete finishing agents, hot poured rubber membrane materials, asphalt cement and sand blasting agents.
- .3 The containment, storage, security, handling, use, unique spill response requirements and disposal of empty containers, surplus product or waste generated in the use of any hazardous or toxic products shall be in accordance with all applicable federal and provincial legislation. Hazardous products shall be stored no closer than 100 metres from watercourses.
- .4 An impervious berm shall be constructed around fuel tanks and any other potential spill area. The berms shall be capable of holding 110% of tank storage volumes and shall be to the satisfaction of the Departmental Representative and the ESO before start-up. Measures such as collection / drip trays and berms lined with occlusive material such as plastic and a layer of sand, and double-lined fuel tanks can prevent spills into the environment.
- .5 The Contractor shall prevent blowing dust and debris by covering and/or providing dust control for temporary roads and on-site work by methods that are approved by the Departmental Representative or ESO.
- .6 The Contractor shall provide spill kits at re-fuelling, lubrication, and repair locations that will be capable of dealing with 110% of the largest potential spill and shall be maintained in good working order on the construction site. The ESO and Departmental Representative prior to project start-up must approve these spill kits. The Contractor and site staff shall be informed of the location of the spill response kit(s) and be trained in its use.
- .7 Timely and effective action shall be taken to stop, contain and clean-up all spills as long as the site is safe to enter. The Departmental Representative and the ESO shall be notified immediately of any spill. If not available, Banff Dispatch will be contacted at (403) 762-1470. Spill response cards will be distributed during the initial Environmental Briefing with basic instructions and phone numbers.
- .8 In the event of a major spill, all other work shall be stopped and all personnel devoted to spill containment and clean-up.
- .9 The costs involved in a spill incident (the control, clean up, disposal of contaminants and site remediation to pre-spill conditions), shall be the responsibility of the Contractor. The site will be inspected to ensure completion to the expected standard and to the satisfaction of the Departmental Representative and ESO.

1.10 EQUIPMENT MAINTENANCE, FUELLING AND OPERATION

- .1 The Contractor shall ensure that all soil, seeds and any debris attached to construction equipment to be used on the project site shall be removed (e.g. power washing) outside the Banff National Park before delivery to the work site.
- .2 Equipment fuelling sites will be identified by the Contractor and approved by the Departmental Representative and the ESO. Except for chain saws, any fuelling closer than 100 metres any streams, wetlands, water bodies or waterways shall require the authorization and oversight of the Departmental Representative.
- .3 Diesel and gasoline delivery vehicles, including bulk tankers shall be parked more than 100 metres from any streams, wetlands, water bodies or watercourses. Gravity fed fuel systems are not allowed. Manual or electric pump delivery systems shall be used. Fuelling personnel shall maintain presence at and immediate attention to the fuelling operation.
- .4 Mobile fuel containers (e.g. slip tanks, small fuel carboys) shall remain in the service vehicle at all times. Protection and containment of approved fuel storage sites is addressed in # 4 of Pollution Control above.
- .5 Equipment used on the project shall be fuelled with E10, and low sulfur diesel fuels and shall conform to local emission requirements. The Contractor is to ensure that unnecessary idling of vehicles is avoided.
- .6 Oil changes, lubricant changes, greasing and machinery repairs shall be performed at locations approved by the ESO or the Departmental Representative. Waste lubrication products (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., anywhere within Banff National Park.
- .7 The Contractor shall ensure that all equipment is inspected daily for fluid/fuel leaks and maintained in good working order.
- .8 Fuel containers and lubricant products shall be stored only in secure locations specified by the Departmental Representative. Fuel tanks or other potentially deleterious substance containers shall be secured to ensure they are tamperproof and cannot be drained by vandals when left overnight in Banff National Park. Alternatively, the Contractor may hire a security person employed to prevent vandalism.

1.11 OPERATION OF EQUIPMENT

- .1 Equipment movements shall be restricted to the 'footprint' of the construction area. The work limits shall be identified by stake and ribbon or other methods approved by the Departmental Representative. Unless authorized by the Departmental Representative, activities beyond the work limits are not permitted. No machinery will enter, work in or cross over streams, rivers, wetlands, water bodies or watercourses, nor damage aquatic and riparian habitat or trees and plant communities. Some of the construction shall require working close to watercourses or water bodies. In these instances, the Contractor is to describe measures to be employed to ensure fugitive materials (e.g. rocks, soil, branches) and especially deleterious substances (e.g. chemicals) do not enter any watercourses, to the satisfaction of the Departmental Representative and ESO.
- .2 The Contractor shall instruct workers to prevent pushing, placement, raveling, storage or stockpiling of any materials (e.g. slash, rock, fill or topsoil) in the trees bordering the right-of-way or into watercourses or water bodies.

- .3 When, in the opinion of Parks Canada, negligence on the part of the Contractor results in damage or destruction of vegetation, or other environmental or aesthetic features beyond the designated work area, the Contractor shall be responsible, at his or her expense, for complete restoration including the replacement of trees, shrubs, topsoil, grass, etc., to the satisfaction of the Departmental Representative and ESO.
- .4 Restrict vehicle movements to work limits.
- .5 Workers private vehicles are to remain within the construction footprint.

1.12 FIRE PREVENTION AND CONTROL

- .1 A fire extinguisher shall be carried and available for use on each machine and at locations within the plant in the event of fire. Basic firefighting equipment recommended (e.g. a water truck; minimum 500 Imperial gallons with 500 feet of fire hose and a pump capable of producing 45 psi water pressure at the nozzle, three shovels, two pulaskis, and two five gallon backpack pumps) shall be maintained at the construction site at a location known and easily accessible to all the Contractors' staff. Contractor's staff shall receive basic training in early response to wildfire events during the "environmental briefing".
- .2 A water truck may be necessary and will depend on the timing of the contract (e.g. not required during winter or snow covered conditions).
- .3 Construction equipment shall be operated in a manner and with all original manufacturers' safety devices to prevent ignition of flammable materials in the area.
- .4 Care shall be taken while smoking on the construction site to ensure that the accidental ignition of any flammable material is prevented. Fires or burning of waste materials is not permitted.
- .5 In case of fire, the Contractor or worker shall take immediate action to extinguish the fire provided it is safe to do so. The ESO and the Departmental Representative shall be notified of any fire immediately. If not available, Banff Dispatch shall be contacted at (403) 762-1470.
- .6 Fires or burning of waste materials is not permitted.

1.13 WILDLIFE

- .1 During the Environmental Briefing all personnel shall be instructed by the ESO on procedures to follow in the event of wildlife appearance near or within the work site and any other wildlife concerns.
- .2 Avoid or terminate activities on site that attract or disturb wildlife and vacate the area and stay away from the immediate location if bears, cougars, wolves, elk or moose display aggressive behaviour or persistent intrusion. Extra care to control materials that might attract wildlife (e.g. lunches and food scraps) must be exercised at all times.
- .3 Notify the ESO and Departmental Representative immediately about dens, litters, nests, carcasses (road kills), bear activity or encounters on or around the site or crew accommodation. Other wildlife-related encounters are to be reported within 24 hours. If the ESO or Departmental Representative is not available, Banff Dispatch will be contacted at (403) 762-1470.

1.14 RELICS AND ANTIQUITIES

- .1 Artifacts, relics, antiquities and items of historical interest such as cornerstones, commemorative plaques, inscribed tablets and similar objects found on the work site

shall be reported to the ESO or the Departmental Representative immediately. The Contractor and workers shall wait for instructions before proceeding with their work.

- .2 All historical or archaeological objects found in Banff National Park are protected under the National Parks Act and Regulations and are the property of Parks Canada. The Contractor and workers shall protect any articles found and request direction from the ESO or the Departmental Representative.

1.15 **WASTE MATERIALS STORAGE AND REMOVAL**

- .1 The Contractor and workers shall dispose of hazardous wastes in conformance with the Environmental Contaminants Act and applicable provincial regulations while observing the Code of Good Practice for Management of Hazardous and Toxic Wastes at Federal Establishments.
- .2 All wastes originating from construction, trade, hazardous and domestic sources, shall not be mixed, but will be kept separate.
- .3 Construction, trade, hazardous waste and domestic waste materials shall not be burned, buried or discarded at the construction site or elsewhere in Banff National Park. These wastes shall be contained and removed in a timely and approved manner by the Contractor and workers, and disposed of at an appropriate waste landfill site located outside the park. Construction waste storage containers, provided by the Contractor, shall be emptied by the Contractor when 90% full. Waste containers will have lids, and waste loads shall be covered while being transported.
- .4 A concerted effort shall be made by the Contractor and workers to reduce, reuse and recycle materials.
- .5 All efforts to prevent wildlife from obtaining food, garbage or other domestic wastes shall be made by the Contractor and contract staff while undertaking their work in Banff National Park. Such wildlife attractants shall not be stored at the work site overnight. Lunches, coolers and food products, including waste food products, shall be securely stored away from access by animals. Daily removal of food scraps, food wrappers, pop cans or other attractive products to bear proof containers, such as the Overflow Campground, is mandatory. It is incumbent on the Contractor to notify Parks Canada and make specific arrangements to have garbage collected by Parks Canada when using existing Parks Canada receptacles.
- .6 The Contractor and workers shall immediately report any circumstances related to food/garbage (e.g. overflowing container or strong smell) and wildlife to the ESO or the Departmental Representative. If neither can be reached, the Contractor/worker shall immediately contact Banff Dispatch at (403) 762-4506 and report the details.
- .7 Sanitary facilities, such as a portable container toilet, shall be provided by the Contractor and maintained in a clean condition.

1.16 **MISCELLANEOUS SITE MANAGEMENT CONTINGENCIES**

- .1 A Contractor's office and work headquarters material laydown, equipment parking and storage area will be permitted at Niblock Pit or Mannix Pit as directed by the Departmental Representative.
- .2 Removal and storage of snow shall be arranged with the ESO and the Departmental Representative.
- .3 The Contractor shall control blowing dust and debris generated from the construction site by means such as covering or wetting down dry materials and rubbish. Dust

generated during the grade construction and or utilization of any temporary access roads must be kept at a reasonable level so as not to impart any hazard to the public traffic. Control measures must be initiated as and when required and may require increased vigilance at the discretion of the Departmental Representative.

- .4 Security services at the construction site may be desirable or necessary during the contract, especially during quiet times. Fuel tanks or other potentially deleterious substance containers must be secured by the Contractor to ensure they are tamperproof and cannot be drained by vandals at his own cost.
- .5 Pets shall not be brought to or maintained at the construction site or worker's camp.

Part 2 Products

- .1 Not Used.

Part 3 Execution

3.1 CLEARING AND GRUBBING

- .1 The Contractor shall ensure that the substrate or riparian area of streams, rivers or watercourses, whether open water or frozen over shall not be disturbed by tracked, wheeled or self-propelled equipment, (e.g. a skidder or truck). The ESO or Departmental Representative will provide direction in the case of work occurring near any wetland area or watercourses.
- .2 The Contractor shall take all measures to ensure that trees do not fall into streams, rivers, wetlands or water bodies or outside the clearing limits as marked by colored flagging. Generally, work within a 30 metre buffer of watercourses, water bodies or wetlands requires the close oversight of the ESO or the Departmental Representative.
- .3 Trees inadvertently felled into streams, rivers, watercourses or outside the clearing limits shall be removed by means (e.g. winch) so as not to damage the substrate or any standing trees left outside the clearing limits. Machinery shall not go outside the clearing limits, or into streams, rivers, watercourses or water bodies to remove felled trees.
- .4 Logs and other salvage materials are to be conveyed to and placed at the storage site without spread of debris or damage to other standing trees or landscape resources outside the marked clearing or storage limits. They shall not be skidded through wetlands, waterways or water bodies.
- .5 During the grubbing component, stumps, roots, imbedded logs and other non-soil debris shall be pulled and shaken free of loose soil and rocks before transport to Mannix Pit
- .6 No slash clearing, pickup or grubbing shall occur outside of the designated area or within 1 metre of the drip line of existing forest.
- .7 Existing areas of vegetation disturbed as a result of this contract shall be rehabilitated using approved topsoil from the park and a native grass seed mix as specified in Section 32 92 22 – Seeding.

3.2 STRIPPING

- .1 A contingency plan for control of dust generated from the construction site shall be prepared, with materials availability arranged in the event of their need. In the event of a work program shutdown during inclement weather (e.g. winter conditions unfavourable for construction) erosion control of bared soils or excavated materials

stockpiles will be required. The Contractor's EPP will describe measures to be implemented in such a circumstance.

- .2 Stripping close to the any watercourse, water body or wetland shall employ methods to ensure materials are not pushed, fall or are eroded into the water or wetlands. Generally, work within a 30 metre buffer of waterways or wetlands requires the close oversight of the ESO and the Departmental Representative.
- .3 No stripping shall occur outside of the designated area or within 1 metre of the drip line of existing forest.
- .4 Stripped soil (including fine forest litter) materials shall be placed and stored at locations and in amounts and form as instructed by the Departmental Representative, for later reclamation use on graded slopes. Stripping piles may require erosion control, sedimentation protection or stabilization, depending on the location and anticipated duration of storage. At the Departmental Representatives direction, the Contractor shall prepare a plan for management of each stripping pile.

3.3 **BLASTING**

- .1 The Departmental Representative will identify a magazine location for explosives should a factory site or "ready-to-use" explosives storage site be required.
- .2 The sweep of the blast area shall include looking for wildlife that may be in the area. If any are found, they shall be hazed out of the area by the ESO or a Park Warden.
- .3 The Contractor shall ensure that all work activities meet or exceed the standards outlined in DFO's "Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters"; Canadian Technical Report of Fisheries and Aquatic Sciences 2107, 1998.
- .4 The Contractor shall, whenever explosives are used, use the Provincial and Workers' Compensation Laws and Regulations, and all respective agencies having jurisdiction over them, such as DFO.
- .5 Steps shall be taken to minimize fly-rock and dust. Vegetation outside of the designated area shall not be damaged or destroyed.
- .6 In order to stabilize slopes of the cut, these shall be scaled of all loose material. Ditches shall be formed and cleaned upon the completion of the blasting, and the natural drainage shall be restored as specified by the contract or as directed by the Departmental Representative.
- .7 The Contractor shall describe the proposed type and quantities of explosives to be used on the project, to the satisfaction of the Departmental Representative and the E.S.O. Some blasting products – such as those very high in nitrogen, may have some limitations imposed for environmental protection purposes.

3.4 **MATERIAL LOADING, HAULING, PLACEMENT AND GRADE BUILDING**

- .1 During grade construction conducted close to any watercourse, water body or wetland methods shall be employed to ensure materials are not pushed, fall or are eroded into the water or wetlands. Generally, work within a 30 metre buffer of waterways or wetlands requires the close oversight of the ESO and the Departmental Representative.
- .2 No grade building shall occur outside of the designated area or within 1 metre of the drip line of existing forest. Any material inadvertently falling outside the work limits is to be removed promptly in a manner that does not damage trees or vegetation at that location. Materials shall be placed at storage sites or on the grade without spillage outside the working limits. Any material inadvertently falling outside the work limits is

to be removed promptly in a manner that does not damage trees or vegetation at that location.

3.5 EXCAVATING AND PLACEMENT

- .1 Excavation will be undertaken according to the approved Grading Plan for the ROW.
- .2 Materials shall be placed at storage sites or on the grade without spillage outside the working limits. Any material inadvertently falling outside the work limits is to be removed promptly in a manner that does not damage trees or vegetation at that location.
- .3 All sediment control measures shall be implemented by the Contractor prior to the commencement of the work in the vicinity of water bodies, watercourses, and wetlands.
- .4 Special precautions may have to be taken during excavation in the vicinity of intermittent or active drainage channels. See Clause 3.12 and 3.12.
- .5 If sediments enter watercourses during any excavation nearby or at its banks, the Contractor shall ensure that sediment levels in the waters of the river or creeks do not exceed specified limits and meet the “desired end result” limits outlined.
- .6 Placement of Rip Rap and backfill at creeks shall be undertaken without contacting the watercourse or wetted margins of the stream, unless approved by the Departmental Representative.
- .7 Fisheries protection windows shall be observed for any watercourse in this contract and will guide the timing of the work so that stream disturbance is prevented.
- .8 If a pump-out sump to dewater excavation sites will be required, the Contractor is to prepare an EPP that details how the dewatering shall be undertaken, to the satisfaction of the Departmental Representative and the ESO. Special attention is to be given to the environmental sensitivity of the discharge area, freezing conditions operation, overflow avoidance, decanting and settlement pond reclamation. Water containing suspended materials shall not be pumped into watercourses, drainage systems or on to land, except with the permission of the Departmental Representative and the ESO.

3.6 CULVERT INSTALLATION

- .1 All culverts shall be installed using best management practices for working in or near water that will result in a minimum amount of sedimentation and damage to the riparian area of the watercourse. The Contractor shall prepare a plan for the installation of each culvert, a minimum one (1) week prior to doing the work for approval by the Departmental Representative and ESO.
- .2 The culverts shall be installed using best management practices for placement, including consideration of aquatic ecology.
- .3 It is preferable to install the culvert during periods of low discharge (e.g. during the fall). The use of sediment control measures may be necessary to ensure that excessive amounts of sediments do not enter watercourses.
- .4 It may be necessary to exclude fish from the immediate construction site while the culvert is being installed. If this practice is necessary, fish shall be salvaged from within the exclusion area, and construction should be carried out expediently to minimize the time spent working in the drainage.

3.7 ASPHALT PLANT OPERATION AND PAVING

- .1 Trucks for hauling asphalt mixture shall have tight, clean, smooth metal beds that have been sprayed with a minimum amount of thin fuel oil to prevent the mixture from

adhering and causing waste asphalt. The vehicle covers shall be securely fastened. Excess truck box lubricants such as light oil, detergent or lime solutions shall not be allowed to contaminate the mix, and shall be disposed of in an environmentally acceptable manner. Truck box lubricant application shall be carried out in a containment berm.

- .2 The asphalt plant must be equipped with pollution control devices in addition to, or in replacement of standard cyclone dust collectors, to effectively eliminate the emission of dust and smoke pollutants into the atmosphere. Use of secondary dust collection systems that require discharge of dust polluted water into natural drainage system will not be allowed. Regardless of requirements stated in above, asphalt plant operation must comply with all environmental pollution control regulations applicable in the plant area. NOTE: Alberta Environment may test dust collector's efficiency.
- .3 The Contractor shall be responsible for the purchase and the safe delivery / storage / handling of asphalt cement and emulsions to the asphalt plant site. Excess hot mix or reject asphalt shall be temporarily stored as directed by the Departmental Representative and removed from Banff National Park for proper recycling or disposal.
- .4 Asphalt material shall be removed and stored at Mannix Pit at a location specified by the Departmental Representative.
- .5 The Contractor shall ensure that there is enough room between the stockpiles and the asphalt plant for a loader in the event of a spill at the asphalt plant. A containment berm with an associated liner made of occlusive material (e.g. plastic of a thickness approved by the Departmental Representative) and covered with absorbent sand or clay shall be installed under the asphalt storage tank to ensure containment of 110% of the tank's capacity.
- .6 The Contractor may wish to protect containment/catchment areas and drip trays at the asphalt plant from rainfall since, if contaminated all of the collected water will have to be disposed of at the expense of the Contractor at an approved disposal facility.
- .7 Sites from which materials have been removed shall be restored to a neat and presentable condition upon the completion of the work.

3.8 CONCRETE MANAGEMENT

- .1 Wet and uncured concrete is an acutely toxic substance for an aquatic environment. Extra care not to introduce these materials into the environment is required.
- .2 The Contractor's EPP shall include the following concrete management elements:
 - .1 Concrete mixer truck washout must be contained in an approved facility with wash products moved back to the concrete batching yard for disposal.
 - .2 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 Departmental Representative and well away from and in areas that drain well away from watercourses. Surplus amounts in excess of one cubic metre are to be returned to the batching yard.
 - .3 Water contaminated in the placing of cement and curing of concrete shall be contained and removed from the site to an approved disposal facility.
 - .4 The concrete batching plant must be operated pursuant to applicable dust, air emission, and water quality control regulations.
 - .5 Waste, solidified concrete from rolling concrete mixers in amounts less than 1 cubic meter and waste solidified concrete from construction pour, shall be buried

in the grade within 48 hours of the pour, subject to approval and direction from the Departmental Representative.

3.9 CRUSHING

- .1 The Contractor shall provide drip and spill containment for the crusher, cone, generators and other components where spills may occur (e.g. plastic lined dirt berms, collection/drip trays, double-walled fuel tanks). Spill response in a timely and effective manner in the event of a spill is mandatory. The measure chosen by the Contractor shall ensure containment of 110% of the capacity of the fuel tank, crankcase, etc.
- .2 Excavation, hauling and placing materials associated with a crushing operation shall be conducted within the approved footprint of the total crushing operation. Crushed materials shall be placed at the designated storage site located within Niblock Pit as identified by the Departmental Representative without spillage or travelling outside the limits of this location. Any material inadvertently falling outside the work limits is to be moved promptly to within the storage limits. Repair of damage outside the work limits will be at the complete expense of the Contractor.
- .3 There is minimal space for parking of workers' private vehicles in the vicinity of the crushing operation. If other Contractors are using the pit at the time of this contract, the Departmental Representative shall address any circulation or parking conflicts, should they arise.

3.10 FINE GRADING, TOPSOIL PLACEMENT AND SEEDING

- .1 This contract involves the final shaping of cut slopes, fills and landscapes disturbed in the construction of the Works. These slopes will be covered by stripped soil and chip compost materials and seeded. Environmental concerns related to these activities largely focus on erosion prevention and sediment control. The Contractor is to present a plan for placement, spreading, and stabilization of reclamation materials that controls erosion and prevents sedimentation, to the satisfaction of the Departmental Representative and ESO.

3.11 PAVEMENT MARKING AND GUARDRAIL PLACEMENT

- .1 Pavement marking shall be undertaken pursuant to standard methods applied in Banff and Yoho National Park for control of paint products, both in transport and handling. The Contractor will present a description of methods to be employed for transporting and controlling paint and hazardous products, application of paint, cleaning of equipment, containment and disposal of waste paint and cleaning products, etc., the satisfaction of the Departmental Representative.

3.12 SPECIAL NOTES FOR ACCESS AND OPERATIONS AT THE WILDLIFE UNDERPASS SITES

- .1 The approaches to and from wildlife crossings are important for the future successful functioning of these structures. Ensure minimal tree removal and vegetation disturbance occur at these locations during construction activity.
- .2 The landscapes and forest cover at both ends of the wildlife crossing structures are important to the proper functioning of structures for wildlife passage. The Contractor is alerted that disturbance or damage to terrain or vegetation outside of the defined construction footprint at this location is unacceptable.

3.13 SPECIFIC CONCERNS RELATIVE TO EROSION CONTROL AND SEDIMENTATION

- .1 The Contractor shall prepare an Erosion and Sedimentation Management Plan for the components of this contract that are undertaken in proximity to watercourses, wetlands or riparian environments. This plan shall be to the satisfaction of the Departmental Representative and ESO. If sediment ponds are required, they shall be designed to settle all sediment particles 0.02 mm or larger. The ponds shall also be designed to handle 1:5 year storm events, with overflow spill capacity for 1:10 year storm events and emergency spillway capacity for 1:100 year storm events.
- .2 An important desired end result is to allow no release into watercourses of sediments in levels that are deleterious to fish or that would harmfully alter, disrupt, or destroy fish habitat. Similarly there is to be no sediment release into areas of vegetation growth or sensitive areas of sediments in levels that would adversely alter growing or hydraulic conditions. The target is 0 mg/L of TSS over background levels. The threshold is a maximum instantaneous increase of 25 mg/L over background levels when background levels are <250 mg/L, or a maximum instantaneous increase of 10% over background levels when background levels are >250 mg/L. This threshold shall not be exceeded.

3.14 SPECIFIC CONCERNS RELATIVE TO SENSITIVE SITES AND ACTIVITIES

- .1 Grade construction and paving activity near streams, rivers, wetlands, water bodies or watercourses must be undertaken with care to prevent damage to aquatic and riparian habitat or associated tree and plant communities. A large and mobile spill kit shall be kept at hand during construction at these sensitive sites in proximity to watercourses.

END OF SECTION

01 45 00 QUALITY CONTROL**Part 1 General****1.1 MEASUREMENT PROCEDURES**

- .1 This work shall be incidental to contract and will not be measured for payment.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
.1 CAN/CSA-A23.2-04, Methods of Test and Standard Practices for Concrete

1.3 TESTING BY THE CONTRACTOR

- .1 Testing required to provide quality control to assure that the Work strictly complies with the Contract requirements shall include, but not be limited to:
- .1 Testing all structural concrete, grout, reinforcing steel, asphalt concrete pavement, structural backfill, corrugated steel culverts, miscellaneous metals, concrete barriers, and all source acceptance testing; and
 - .2 All testing specified in the Contract Documents; and
 - .3 Any other testing required as a condition for deviation from the specified Contract procedures.
- .2 Testing proposed shall be based on testing requirements in the current edition of the BC MoTI Standard Specifications for Highway Construction in collaboration with current ASTM and CSA Standards or as stated below.
- .3 The Contractor shall be fully responsible and bear all costs for all quality control testing and shall conduct such testing in the following manner:
- .1 Provide testing facilities and personnel for the tests and inform the Departmental Representative in advance to enable the Departmental Representative to witness the tests if it so desired;
 - .2 Notify the Departmental Representative when sampling will be conducted;
 - .3 Within one Day after completion of testing, submit test results to the Departmental Representative; and
 - .4 Identify test reports with the name and address of the organization performing all tests, and the date of the tests.
- .4 Approval of tested samples will be for characteristics or use named in such approval and shall not change or modify any Contract requirements.
- .5 Testing agencies, their inspectors, and their representatives are not authorized to revoke, alter, relax, enlarge or release any requirement of the Contract Documents, nor to approve or accept any part of the Work
- .6 The minimum frequency for Quality Control testing during embankment construction will be as follows:

CONSTRUCTION TYPE	TEST TYPE	MINIMUM FREQUENCY OF TESTS
Embankment construction with fine grained or granular soil	Standard Proctor by: ASTM D698	1 per change in material or 1 per week, whichever is more frequent

CONSTRUCTION TYPE	TEST TYPE	MINIMUM FREQUENCY OF TESTS
	Field density by: ASTM D1556 – Sand Cone ASTM D2167 – Balloon ASTM D2922 - Nuclear	1 per 1000 m ² per lift, spaced randomly across full width of embankment
	Proof Roll and or Rutting Test	As required by the Departmental Representative
Embankment construction with blasted rock or oversize granular	Field observation with daily field report; and a summary report signed and stamped by the Contractor's Engineer.	Full time during blasted rock placement
Road structure construction with granular materials	Standard Proctor by: ASTM D698	1 for each material type and 1 for each accepted change in material gradation.
	Field density by: ASTM D1556 – Sand Cone ASTM D2167 – Balloon ASTM D2922 - Nuclear	3 tests per 50 m per lift; on centreline and on lt and rt fog lines
	Proof Roll and or Rutting Test	As required by the Departmental Representative
Culvert Installation	Field Density	Minimum two per 300 mm lift per culvert, spaced through the length and depth of the culvert backfill

1.4 CONTRACTOR'S QUALITY CONTROL PROGRAM

- .1 The Contractor shall prepare a Quality Control Program. The purpose of the program shall be to ensure the performance of the Work in accordance with Contract requirements.
- .2 The Quality Control Program shall be described in a Quality Control Manual. The Contractor shall submit the Manual to the Departmental Representative for review in accordance with Section 01 33 00, Submittal Procedures. The Manual shall develop a logical system for tracking and documenting the Quality Control of the Work. A systematic format and a set of procedures patterned on a recognized Quality Control Standard will be acceptable, subject to review by the Departmental Representative.
- .3 The Quality Control Manual shall include the following information:
 - .1 Distribution list, providing a list of names to whom the Manual shall be distributed;
 - .2 Title page, identifying the Contract, Contractor and copy number;
 - .3 Revision page, identifying the revision number and date of the Manual;
 - .4 Table of contents;
 - .5 Revision control, tabulating the revision number, date of revision, description of revisions and authorized signature;
 - .6 Details of measuring and testing equipment including methods and frequency of calibration;
 - .7 Purchasing details of all materials and equipment including procurement documents and vendor's Quality Control Program standards;
 - .8 Procedures for inspection of incoming items, in-process inspection and final inspection and tagging of all supply items;

- .9 Details of special processes as identified by the Departmental Representative, including qualifications of personnel and certification;
 - .10 Procedures for shipping, packaging and storage of materials;
 - .11 Procedures for maintaining quality records and Statements of Compliance, including filing and storage of documents for a period of one year after Completion of the Works;
 - .12 Details of any non-conformance, including identification and recording of deficiencies, tagging procedures for "HOLD" or "REJECT" items, and final disposition of non-conformance forms by the Quality Control Manager;
 - .13 Inspection and test checklists, including tabulated checklists describing all manufacturing and delivery activities such as Inspection or Test, frequency of tests, description of tests, acceptance criteria of tests, such as verification, witnessing or holding tests and sign-off by the Quality Control Manager and the Departmental Representative, if the Departmental Representative witnesses the tests; and
 - .14 Forms used to ensure the application of the inspection and test checklist requirements. These forms shall be identified in the checklists and describe all testing requirements for Specification compliance.
- .4 The Contractor shall appoint a full time qualified and experienced Quality Control Manager, 100% of his time dedicated to quality matters and who will report regularly to the Contractor's management at a level that shall ensure that Quality Control requirements are not subordinated to manufacturing, construction or delivery. The Quality Control Manager shall be empowered by the Contractor to resolve quality matters.
- .5 The Quality Control Manual shall include samples of all forms to be filled in by the Quality Control Inspectors. All forms shall be signed by the Quality Control Manager and submitted promptly to the Departmental Representative who will add its review signature.
- .6 An independent check of all Work shall be performed by the Contractor. The Contractor shall appoint Quality Control Inspectors to ensure compliance of products and workmanship with Contract requirements. The same personnel may not be used to perform a given task and to check the quality and accuracy of the task.
- .7 At completion of the Work a bound and itemized copy of all Quality Control documents and reports shall be prepared by the Contractor's Quality Manager and submitted to the Departmental Representative.

1.5 INSPECTION

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

- .4 Departmental Representative will order 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.

1.6 **INDEPENDENT INSPECTION AGENCIES**

- .1 Independent Inspection/Testing Agencies will be engaged by the Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.
- .2 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .3 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by the Departmental Representative at no cost to the Departmental Representative.

1.7 **ACCESS TO WORK**

- .1 Allow inspection / testing agencies access to Work, off-site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.8 **PROCEDURES**

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Provide labour and facilities to obtain and handle samples and materials on site.

1.9 **REJECTED WORK**

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, that has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in the opinion of the Departmental Representative, it is not expedient to the greater benefit of the Project to remedy defective Work or Work not performed in accordance with Contract Documents, the Owner may deduct from the Contract Price the difference in value between the Work performed and that called for by Contract Documents, the amount of which shall be determined by Departmental Representative.

1.10 **REPORTS**

- .1 Submit one (1) electronic copy of all inspection and test reports to Departmental Representative in accordance with Section 01 33 00 Submittals Procedures.

1.11 **TESTS AND MIX DESIGNS**

- .1 Furnish test results and designs as may be requested.

1.12 MILL TESTS

- .1 Submit mill test certificates as required of specification sections.

Part 2 Products

- .1 Not Used.

Part 3 Execution

- .1 Not Used.

END OF SECTION

01 52 00 CONSTRUCTION FACILITIES**Part 1 General****1.1 MEASUREMENT PROCEDURES**

- .1 All work of this section except for the provision of the Departmental Representatives office trailer, shall be incidental to contract and will not be measured for payment.

1.2 INSTALLATION AND REMOVAL

- .1 Provide construction facilities in order to execute work expeditiously.
- .2 Remove from site all such work after use.

1.3 SITE STORAGE / LOADING

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.4 CONSTRUCTION PARKING

- .1 Provide and maintain adequate access and parking at the project site in areas approved by the Departmental Representative.
- .2 Build and maintain temporary roads and provide snow removal during period of Work.
- .3 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

1.5 SECURITY

- .1 If required by the Contractor, provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays. For extended shut-downs, the Contractor shall provide the level of security as required to protect the Work. The Contractor is advised that some random acts of vandalism to equipment have occurred within the Park.

1.6 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

1.7 SANITARY FACILITIES

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

1.8 CONSTRUCTION SIGNAGE

- .1 No other signs or advertisements, other than warning and traffic control signs, are permitted on site.
- .2 Signs and notices for safety and instruction shall be in both official languages Graphic symbols shall conform to CAN3-Z321.
- .3 Maintain approved signs and notices in good condition for duration of project, and dispose of off-site on completion of project or earlier if directed by Departmental Representative.

Part 2 Products

- .1 Not Used.

Part 3 Execution

- .1 Not Used.

END OF SECTION

01 56 00 TEMPORARY BARRIERS AND ENCLOSURES**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 Manual.

1.2 MEASUREMENT PROCEDURES

- .1 This work shall be incidental to contract and will not be measured for payment.

1.3 INSTALLATION AND REMOVAL

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

1.4 HOARDING

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

1.5 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around deep excavations.

1.6 WEATHER ENCLOSURES

- .1 Not used.

1.7 DUST TIGHT SCREENS

- .1 Not used.

1.8 ACCESS TO SITE

- .1 Provide and maintain access roads, as may be required for access to Work.

1.9 PUBLIC TRAFFIC FLOW

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

1.10 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

1.11 PROTECTION OF BUILDING FINISHES

- .1 Not used.

Part 2 Products

- .1 Not Used.

□

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Part 3 Execution

.1 .Not Used

END OF SECTION

01 61 00 COMMON PRODUCT REQUIREMENTS**Part 1 General****1.1 REFERENCE STANDARDS**

- .1 Within text of each specifications section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be borne by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.
- .5 Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date or issue is specifically noted.

1.2 QUALITY

- .1 Products, materials, equipment and articles (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, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

1.3 AVAILABILITY

- .1 Immediately after signing contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work
- .2 In the event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

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

Parks Canada

- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber and miscellaneous metals on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 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.
- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 **TRANSPORTATION**

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

1.6 **MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative may establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.7 **QUALITY OF WORK**

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative whose decision is final.

1.8 **CO-ORDINATION**

- .1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.9 CONCEALMENT

- .1 The Departmental Representative will inspect all work prior to any concrete pours. The Contractor shall notify the Departmental Representative 24 hours before any pour for inspection.

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.

1.11 FASTENINGS

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings that cause spalling or cracking of material to which anchorage is made are not acceptable.

1.12 PROTECTION OF WORK IN PROGRESS

- .1 Do not cut, drill or sleeve any load bearing structural member without written approval of Departmental Representative, unless specifically indicated.

Part 2 Products

- .1 Not Used.

Part 3 Execution

- .1 Not Used.

END OF SECTION

01 71 00 EXAMINATION AND PREPARATIONS**Part 1 General****1.1 MEASUREMENT PROCEDURES**

- .1 This work shall be incidental to contract and will not be measured for payment.

1.2 REFERENCES

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

1.3 QUALIFICATIONS OF SURVEYOR

- .1 Qualified surveyor, licensed to practise in Place of Work, acceptable to Departmental Representative.

1.4 SURVEY / LAYOUT REQUIREMENTS

- .1 The Departmental Representative will indicate the beginning and end of the project and sufficient reference points and other information for horizontal and vertical control, to be used by the Contractor for his detailed layout. This information will include, if available, radii and lengths of curves, design superelevations, pavement widths, and centreline deflection points. The Contractor shall protect and shall not remove or destroy, or permit to be removed or destroyed, the stakes or marks set as reference points by the Departmental Representative. Subsequent to the initial reference points staking performed by the Departmental Representative, the Contractor shall perform all layout, survey and construction staking necessary to meet specified requirements for any type of construction.
- .2 The Contractor's detailed survey layout for construction shall include a complete base-line displaying project stationing at 20 m intervals suitable for referencing test locations and for purposes of measurement for payment. For Asphalt Concrete Pavement overlay projects, the base-line shall display project stationing at 20 m intervals.
- .3 Layout for interim lane markings, including those for intersection treatments, shall be performed by the Contractor at their own cost.
- .4 The Contractor shall provide at his own cost, any survey activities as required and including, but not limited to, the following:
 - .1 Layout for interim lane markings, including those for intersection treatments
 - .2 Re-establishing the start and finish of "No Passing Zones", or at new limits as directed by the Departmental Representative
 - .3 String line or other markings for the alignment or grade control of construction equipment

1.5 SURVEY REFERENCE POINTS

- .1 Existing base horizontal and vertical control points will be provided by the Departmental Representative.
- .2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.

- .3 Make no changes or relocations without prior written notice to Departmental Representative.
- .4 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .5 Require surveyor to replace control points in accordance with original survey control.

1.6 SURVEY REQUIREMENTS

- .1 The Departmental Representative shall identify location of all work sites.
- .2 The Contractor shall be responsible for all other survey and layout work identified in the Contract documents and as required to complete the works including but not limited to:
 - .1 Establishing lines and levels, locate and layout, by instrumentation.
 - .2 Staking for grading, cut and fill.
 - .3 Staking for slopes and top of embankment, sub-base course, base course and centreline for paving.
 - .4 Establishing culverts, catch basin structures, invert elevations and locations.
 - .5 Layout for interim and final lane markings, including those for intersection treatments
 - .6 Re-establishing the start and finish of “No Passing Zones”, Passing Lanes or at new limits as directed by the Departmental Representative
 - .7 Re-establishing Reference Survey Control Points that are in danger of being damaged or destroyed.
 - .4 Provide a stake-out report as requested by the Departmental Representative.
 - .5 Provide cut sheet reports for all layers of road template to demonstrate they meet the Contract tolerances.
- .3 Survey Accuracy:
 - .1 All survey work shall be tied into the existing Control Monument Network with grid coordinates in UTM Zone 11 NAD 83. Departmental Representative will provide information on Control Points.
 - .2 All traverses will be closed and balanced. All level loops and traverses will be tied into the Control Monument Network.
 - .3 Secondary Control Points will be tied into and relative to Control Monument Network. Accuracy for Control Point surveys shall be to second order:
 - .1 Horizontal shall be less than $r = 5(d+0.2)$ where “r” is in cm and “d” is in km
 - .2 Vertical shall be less than $0.008 \times k$ where k is distance in kilometres.
 - .4 Staking accuracy shall be:
 - .1 In bush areas, all elevations shall be within 0.1m of correct elevation.
 - .2 In open ground, all elevations shall be within 0.05 m of correct elevation.
 - .3 On highway surface, all elevations shall be within 0.01 m of correct elevation.
- .4 Departmental Representative will complete quality assurance construction survey measurements to verify grades and alignment, interim survey re-measurements for

excavation limits and final neat line measurements to verify payment quantities for completed works.

1.7 RECORDS

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 Record locations of maintained, re-routed and abandoned service lines.

1.8 SUBMITTALS

- .1 Submit name and address of Surveyor to Departmental Representative.
- .2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.
- .3 Submit certificate signed by surveyor certifying those elevations and locations of completed Work that conform to the Contract Documents.

Part 2 Products

- .1 Not Used.

Part 3 Execution

- .1 Not Used.

END OF SECTION

01 74 11 CLEANING**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 Manual.

1.2 MEASUREMENT PROCEDURES

- .1 This work shall be incidental to contract and will not be measured for payment.

1.3 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.
- .2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Clear snow and ice from access to work areas during active construction periods and when access to environmental protection facilities required outside active construction times.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 One bear proof container will be provided by Parks Canada. Contractor to provide any additional on-site bear proof containers he requires for collection of waste materials and debris.
- .6 Remove waste material and debris from site at end of each working day.
- .7 Dispose of waste materials and debris off site.
- .8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .9 Provide adequate ventilation during use of volatile or noxious substances.
- .10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

1.4 FINAL CLEANING

- .1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Prior to final review, remove surplus products, tools, construction machinery and equipment.
- .3 Remove waste products and debris including that caused by Owner or other Contractors.
- .4 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .6 Inspect finishes, and ensure specified workmanship and operation.

- .7 Remove dirt and other disfiguration from exterior surfaces.
- .8 Sweep and wash clean paved areas.
- .9 Remove all construction debris and accumulated dirt from completed drainage systems; manholes; catch basins; and all piping.

Part 2 Products

- .1 Not Used.

Part 3 Execution

- .1 Not Used.

END OF SECTION

01 77 00 CLOSEOUT PROCEDURES**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 Manual.

1.2 MEASUREMENT PROCEDURES

- .1 This work shall be incidental to contract and will not be measured for payment.

1.3 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 Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
 - .2 Request Departmental Representative's Inspection.
- .2 Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
- .3 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Work is complete and ready for Final Inspection.
- .4 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative, and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

Part 2 Products

- .1 Not Used.

Part 3 Execution

- .1 Not Used.

END OF SECTION

01 78 00 CLOSEOUT SUBMITTALS**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 Manual.

1.2 MEASUREMENT PROCEDURES

- .1 This work shall be incidental to contract and will not be measured for payment.

1.3 AS-BUILTS AND SAMPLES

- .1 In addition to requirements in General Conditions, maintain at the site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to the Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.

1.4 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque Drawings and in copy of the Project Manual.
- .2 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .3 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Field changes of dimension and detail.
 - .2 Changes made by change orders.
 - .3 Details not on original Contract Drawings.
 - .4 References to related shop drawings and modifications.

- .4 Specifications: legibly mark each item to record actual construction, including:
 - .1 Changes made by Addenda and change orders.

1.5 **FINAL SURVEY**

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

1.6 **WARRANTIES AND BONDS**

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.
- .4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal.

Part 2 Products

- .1 Not Used.

Part 3 Execution

- .1 Not Used.

END OF SECTION

02 41 13.14 ASPHALT PAVEMENT REMOVAL**Part 1 General****1.1 MEASUREMENT PROCEDURES**

- .1 Payment under **“Unit Price Item 1 – Asphalt Pavement Removal”** shall be the total compensation for all operations involved in milling and pulverizing including but not limited to, cold milling, sweeping, loading, hauling, and stockpiling at Niblock Pit, and cleaning of remaining pavement surface. The Contractor shall refer to Section 32 01 16.8 for Asphalt Pavement Removal – Full Depth Reclamation specifications. Payment shall be made as follows:
 - .1 **“Unit Price Item 1a - Asphalt Pavement Removal – Partial Depth Asphalt Removal (Milling)”** will be measured for payment in square metres regardless of the depth of asphalt pavement of existing roadway actually removed. Milling shall be completed according to these specifications, the contract drawings or as directed by the Departmental Representative, and shall include all labour, equipment and material to satisfactorily complete this item of work.
 - .2 Saw cutting if required shall be considered incidental to **“Unit Price Item 1 - Asphalt Pavement Removal”**.
 - .3 No overhaul will be paid for **“Unit Price Item 1 - Asphalt Pavement Removal”**.
 - .4 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 - Traffic Accommodation”** and no separate payment will be made to the Contractor.
 - .5 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”** and no additional payment will be made for remobilization of equipment if all milling work cannot be completed at once.
 - .6 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment shall be made to the Contractor.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 The Contractor shall separate waste materials for reuse in accordance with Section 01 35 43 - Environmental Procedures.
- .2 The Contractor shall place removed asphalt material in a stockpile at Niblock Pit, or at other locations designated by the Departmental Representative.

Part 2 Products**2.1 EQUIPMENT**

- .1 Use cold milling, planning or grinding self-powered equipment with automatic grade controls capable of operating from string line, and capable of removing part of pavement surface to depths or grades indicated. Maximum particle size of milled materials shall be 50 mm.

Part 3 Execution**3.1 PREPARATION**

- .1 Prior to beginning removal operation, the Contractor shall inspect and verify with the Departmental Representative, all areas, depths and lines of asphalt pavement to be removed.
- .2 The Contractor shall have appropriate Traffic Control measures in place for this work.

3.2 PROTECTION

- .1 The Contractor shall protect existing pavement not designated for removal, concrete deck, concrete curb and barriers, light units and structures from damage. In event of damage, the Contractor shall immediately replace or make repairs to the satisfaction of the Departmental Representative at no additional cost.

3.3 REMOVAL

- .1 Full depth asphalt pavement removal shall be done to the lines shown on the Drawings or as designated by the Departmental Representative.
- .2 Partial Depth Asphalt Pavement Removal by milling to lines and grades shown on the Drawings or as established by Departmental Representative in field:
 - .1 The Contractor shall use equipment and methods of removal and hauling that do not damage or disturb underlying roadway structure.
 - .2 The Contractor shall prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.
 - .3 The Contractor shall provide for suppression of dust generated by removal process.

3.4 STOCKPILING OF MATERIAL

- .1 The Contractor shall place removed asphalt material in a stockpile at Niblock Pit, or at other locations designated by the Departmental Representative. The material shall remain the property of Parks Canada.

3.5 FINISH TOLERANCES

- .1 Finished surfaces in areas where asphalt pavement has been removed shall be within +/-5 mm of the grade specified, and shall not be uniformly high or low.

3.6 SWEEPING

- .1 The Contractor shall sweep remaining asphalt pavement surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.

END OF SECTION

02 81 01 HAZARDOUS MATERIAL**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 Manual.

1.2 MEASUREMENT PROCEDURES

- .1 This work shall be incidental to contract and will not be measured for payment.

1.3 REFERENCES

- .1 Export and Import of Hazardous Waste Regulations (EIHWR Regulations), SOR/92-637.
- .2 National Fire Code of Canada 1995.
- .3 Transportation of Dangerous Goods Act, 1992 (TDG Act) [1992], (c. 34).
- .4 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2001-286).

1.4 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.
- .4 Workplace Hazardous Materials Information System (WHMIS): A Canada-wide system designed to give employers and workers information about hazardous materials used in the workplace. Under WHMIS, information on hazardous materials is to be provided on container labels, material safety data sheets (MSDS), and worker education programs. WHMIS is put into effect by a combination of federal and provincial laws.

1.5 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative current Material Safety Data Sheet (MSDS) for each hazardous material required prior to bringing hazardous material on site.
- .3 Submit hazardous materials management plan to Departmental Representative that identifies all hazardous materials, their use, their location, personal protective equipment requirements, and disposal arrangements.

1.6 STORAGE AND HANDLING

- .1 Coordinate storage of hazardous materials with Departmental Representative and abide by internal requirements for labelling 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 All explosives must be mixed outside of the Park and delivered to the site. No storage of explosives shall be allowed within the National Parks.
- .5 Observe smoking regulations at all times. Smoking is prohibited in any area where hazardous materials are stored, used, or handled.
- .6 Abide by the following storage requirements for quantities of hazardous materials and wastes in excess of 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.
- .7 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.
- .8 Report spills or accidents immediately to Departmental Representative. Submit a written spill report to Departmental Representative within 24 hours of incident.

1.7 **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 on site:
 - .1 Coordinate transportation and disposal with Departmental Representative.
 - .2 Ensure compliance with applicable provincial laws and regulations for generators of hazardous waste.

- .3 Use only a 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 the material.
- .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.
- .6 Ensure that only trained personnel handle, offer for transport, or transport dangerous goods.
- .7 Provide a photocopy of all shipping documents and waste manifests to Departmental Representative.
- .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide a photocopy of completed manifest to Departmental Representative.
- .9 Report any discharge, emission, or escape of hazardous materials immediately to Departmental Representative and appropriate provincial authority. Take reasonable measures to control release.

Part 2 Products

2.1 MATERIALS

- .1 Only bring on site 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, or in municipal solid waste landfills is prohibited. Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
- .6 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.
- .7 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:
 - .1 Hazardous wastes recycled in manner constituting disposal.
 - .2 Hazardous waste burned for energy recovery.

- .3 Lead-acid battery recycling.
- .4 Hazardous wastes with economically recoverable precious metals.

END OF SECTION

03 10 00 CONCRETE FORMING AND ACCESSORIES**Part 1 General****1.1 MEASUREMENT AND PAYMENT PROCEDURES**

- .1 This work will not be measured for payment and shall be considered incidental to the works.
- .2 Include formwork costs in items of concrete work in Section 03 30 00 – Cast-in-Place Concrete.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-O86S1, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
 - .3 CSA O121-[M1978(R2003)], Douglas Fir Plywood.
 - .4 CSA O151, Canadian Softwood Plywood.
 - .5 CSA O153-[M1980(R2003)], Poplar Plywood.
 - .6 CSA O437 Series-[93(R2006)], Standards for OSB and Waferboard.
 - .7 CSA S269.1-[1975(R2003)], Falsework for Construction Purposes.
 - .8 CAN/CSA-S269.3-[M92(R2003)], Concrete Formwork, National Standard of Canada.
- .2 Council of Forest Industries of British Columbia (COFI)
 - .1 COFI Exterior Plywood for Concrete Formwork.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings for formwork and falsework.
- .3 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of British Columbia, Canada.
- .4 Submit WHMIS MSDS - Material Safety Data Sheets.
- .5 Indicate method and schedule of construction, shoring, stripping, and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1 for falsework drawings and CAN/CSA S269.3 for formwork drawings.
- .6 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal

- .2 Separate and recycle waste materials in accordance with Section 01 35 43, Environmental Procedures.
- .3 Place materials defined as hazardous or toxic waste in designated containers.

Part 2 Products

2.1 MATERIALS

- .1 Formwork materials:
 - .1 Forms for unexposed surfaces are at the discretion of the Contractor subject to approval of the Departmental Representative.
 - .2 Forms for exposed surfaces including the cast in place concrete shall be new material, made of "Coated Formply", consisting of Douglas Fir substrate with resin-impregnated paper overlay and factory treated chemically active release agent.
 - .3 All form material for exposed surfaces shall be full-sized sheets, as practical. The re-use of any forms must have the acceptance of the Departmental Representative.
- .2 The minimum acceptable forming for all exposed concrete where the pour height is 1.5 m or less shall have 18 mm approved plywood, supported at 300 mm maximum on centres. Where the pour height is greater than 1.5 m the minimum acceptable forming for all exposed concrete shall have 18 mm approved plywood, supported at 200 mm maximum on centres. Strong-backs or walers placed perpendicularly to the supports shall be employed to ensure straightness of the form.
- .3 Metal bolts or anchorages within the forms shall be so constructed as to permit their removal to a depth of at least 50 mm from the concrete surface.
- .4 Break-back type form ties shall have all spacing washers removed and the tie shall be broken back a distance of at least 20 mm from the concrete surface.
- .5 All fittings for metal ties shall be of such design that, upon their removal, the cavities that are left will be of the smallest possible size. Torch cutting of steel hangers and ties will not be permitted. Formwork hangers for exterior surfaces of decks and curbs shall be an acceptable break-back type with surface cone, or removable threaded type.
- .6 Cavities shall be filled with cement mortar and the surface left sound, smooth, even and uniform in color.
- .7 Form release agent shall be non-toxic, biodegradable, low VOC.
- .8 Falsework materials shall conform to CSA-S269.1.

Part 3 Execution

3.1 FABRICATION AND ERECTION

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with Drawings.
- .2 Fabricate and erect falsework in accordance with CSA S269.1 and COFI Exterior Plywood for Concrete Formwork.
- .3 Do not place shores and mud sills on frozen ground.
- .4 Provide site drainage to prevent washout of soil supporting mud sills and shores.

- .5 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1/A23.2.
- .6 Align form joints and make watertight and keep form joints to minimum.
- .7 Use 20 mm chamfer strips on external corners and/or 20 mm fillets at interior corners, joints, unless specified otherwise.
- .8 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .9 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
- .10 Ensure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .11 Clean formwork in accordance with CSA-A23.1/A23.2 before placing concrete.

3.2 **REMOVAL AND RESHORING**

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 Seven (7) days for slabs, decks, barriers, and other structural members.
 - .2 Three (3) days for abutments and return walls.
- .2 Remove formwork when concrete has reached 50% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .3 Reuse formwork and falsework subject to requirements of CAN/CSA-A23.1.

END OF SECTION

03 20 00 CONCRETE REINFORCING**Part 1 General****1.1 MEASUREMENT AND PAYMENT PROCEDURES**

- .1 Measure reinforcing steel in kilograms of steel supplied and incorporated into the Work, computed from theoretical unit mass specified in CSA-G30.18 for lengths and sizes of bars as indicated or authorized in writing by Departmental Representative, and shall include all labour, equipment and material to satisfactorily complete this item of work.
 - .1 Payment for Plain Reinforcing steel will be made under **“Unit Price Item 18a - Km 83 Wildlife Underpass (Bridge) - Plain Reinforcing - Supply and Place”** and shall include all labour, equipment and material to satisfactorily complete this item of work.
 - .2 Payment for Galvanized Reinforcing steel will be made under **“Unit Price Item 18b - Km 83 Wildlife Underpass (Bridge) - Galvanized Reinforcing - Supply and Place”** and shall include all labour, equipment and material to satisfactorily complete this item of work.
 - .3 No allowance will be made for tie wires, chairs and other material used in fastening the reinforcing steel in place.
 - .4 If bars are substituted at the Contractor’s request, and as a result more steel is used than specified, only the amount specified shall be included for payment.
- .2 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 - Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .3 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”** and no additional payment will be made for remobilization of equipment if all milling work cannot be completed at once.
- .4 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment shall be made to the Contractor.

1.2 REFERENCES

- .1 All standards listed below shall be the latest issue at the time of tender.
- .2 ASTM International
 - .1 ASTM A82/A82M, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - .2 ASTM A185/A185M, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- .3 CSA International
 - .1 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practice for Concrete.
 - .2 CAN3-A23.3, Design of Concrete Structures.
 - .3 CAN/CSA-G30.18, Carbon-Steel Bars for Concrete Reinforcement.
 - .4 CAN/CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

- .5 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles
- .6 CAN/CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC, Reinforcing Steel Manual of Standard Practice.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.
- .3 Shop Drawings:
 - .1 Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacing, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
 - .5 Indicate sizes, spacing and locations of chairs, spacers and hangers.
 - .4 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.
 - .5 Provide type B unless otherwise indicated.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by the Departmental Representative.

- .2 Reinforcing steel: billet steel, grade 400W, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .4 All steelwork shall be galvanized after complete fabrication to the requirements of CAN/CSA-G164-M and ASTM A767M. The galvanizer shall safeguard against embrittlement as required in CAN/CSA-G164-M, Appendix A. Galvanized members shall be subject, at the discretion of the Departmental Representative, to the tests for embrittlement outlined in CAN/CSA-G164-M, Section 5.5.
- .5 For steel not meeting the chemical composition requirements, special galvanizing techniques shall be developed by the galvanizer to ensure that the specified coating thickness and adherence is achieved. A detailed description of the special techniques shall be submitted to the Departmental Representative for review two (2) weeks prior to galvanizing.
- .6 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.
- .7 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
- .8 Mechanical splices: subject to approval of the Departmental Representative.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada, unless indicated otherwise.
- .2 All hooks and bends shall be bent using the pin diameters and dimensions as recommended in the Reinforcing Steel Institute of Canada (RSIC), Manual of Standard Practice.
- .3 Obtain the Departmental Representative's approval for locations of reinforcement splices other than those shown on placing Drawings.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

- .1 Provide the Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, prior to commencing reinforcing work.
- .2 Inform the Departmental Representative 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 the Departmental Representative.
- .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 placing Drawings and in accordance with CAN/CSA-A23.1/A23.2.

- .2 Prior to placing concrete, obtain the Departmental Representative's approval of reinforcing material and placement.
- .3 All lifting and handling shall be done using devices that do not mark, mar, damage or distort the galvanized members and assemblies in any way.
- .4 Galvanized material shall be stacked or bundled and stored to prevent wet storage stain as per American Hot Dip Galvanizers Association (AHDGA) publication "Wet Storage Stain".
- .5 Delivery of a damaged product will be cause for rejection.
- .6 Ensure cover to reinforcement is maintained during concrete pour.
- .7 Protect coated portions of bars with covering during transportation and handling.
- .8 Existing reinforcing steel shall be electrically isolated from the new galvanized reinforcing steel.
- .9 Metal accessories such as anchor bolts, coverplates and electrical boxes that are exposed to the atmosphere shall be electrically isolated from the steel reinforcement.
- .10 Repair of galvanizing shall only be done if bare areas are infrequent, small and suitable for repair as determined by the Departmental Representative.
- .11 Repair of galvanized surfaces shall be in accordance with ASTM 780, Method A3 Metallizing. The thickness of the metallizing shall be a minimum of 180 µm, and the repair tested for adhesion. Alternatively, the galvanizing may be repaired using two coats of a one component zinc-rich coating containing >95% non-toxic electrolytic zinc powder (pure to 99.995%) in a non-toxic solvent.

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.

END OF SECTION

03 30 00 CAST-IN-PLACE CONCRETE**Part 1 General****1.1 PRECEDENCE**

- .1 Sections 01 11 00 – 01 78 00 of these specifications shall take precedence over other sections of these specifications.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

- .1 Cast-in-place concrete shall be measured in cubic metres calculated from neat dimensions as indicated. Payment for cast-in-place concrete shall be made under **“Unit Price Item 18 - Km 83 Wildlife Underpass (Bridge)”**
 - .1 Concrete placed beyond dimensions indicated will not be measured for payment.
 - .2 Supply and installation of joint fillers and joint sealers, concrete sealer, Evazote, asphalt impregnated fibre board, RPVC utility conduits, elastomer strip at approach slab seat, galvanized armour plate for CIP barrier (complete with studs), anchors rods, nuts, washers and anchor rod grouting will not be measured but considered incidental to work.
 - .3 No deductions will be made for volume of concrete displaced by reinforcing steel, structural steel, ducts, voids, fillets scoring and chamfers.
 - .4 No deductions will be made for volume of concrete less than 0.1 m² in cross sectional area displaced by individual drainage openings.
 - .5 Supply and installation of sheet wall drains and perforated pipe drains for the abutment drainage will not be measured for payment and shall be considered incidental to the works.
 - .6 The unit prices bid shall include full compensation for all costs of labour, materials, equipment, tools, formwork, falsework, embedded metallic and non-metallic materials, access, concrete coring, environmental requirements, safety requirements, submittals, and associated Works required for the construction all cast-in-place concrete.
 - .7 An interim payment in the amount of 80% of full value will be made if the concrete has been placed acceptably, and the 7-day test cylinder strength indicates that the concrete will reach the acceptance range of specified strength. Partial payment in advance of 28-day test results will not be deemed to constitute acceptance of the concrete. Final payment will not be made until the specified concrete finish is acceptably completed, and the 28-day strength tests show that the concrete meets the strength requirement of the specification.
- .2 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 - Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .3 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”** and no additional payment will be made for remobilization of equipment if all milling work cannot be completed at once.
- .4 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment shall be made to the Contractor.

1.3 REFERENCES

- .1 Abbreviations and Acronyms:
 - .1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.
 - 1. Type GU, GUb and GUL - General use cement.
 - 2. Type MS and MSb - Moderate sulphate-resistant cement.
 - 3. Type MH, MHb and MHL - Moderate heat of hydration cement.
 - 4. Type HE, HEb and HEL - High early-strength cement.
 - 5. Type LH, LHb and LHL - Low heat of hydration cement.
 - 6. Type HS and HSb - High sulphate-resistant cement.
 - .2 Fly ash:
 - 1. Type F - with CaO content less than 15%.
 - 2. Type CI - with CaO content ranging from 15 to 20%.
 - 3. Type CH - with CaO greater than 20%.
 - .3 GGBFS - Ground, granulated blast-furnace slag.
- .2 Reference Standards
 - .1 ASTM International.
 - 1. ASTM C260 Specification for Air-Entraining Admixtures for Concrete.
 - 2. ASTM C309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - 3. ASTM C494 Specification for Chemical Admixtures for Concrete.
 - 4. ASTM C1017/C1017M, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - 5. ASTM D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - 6. ASTM D624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
 - 7. ASTM D2240, Standard Test Method for Rubber Property – Durometer Hardness
 - 8. ASTM D1751 Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).
 - 9. ASTM D1752, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
 - 10. ASTM F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
 - .2 Canadian General Standards Board (CGSB)
 - 1. CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .3 CSA International
 - 1. CAN/CSA-A3000, Cementitious Materials Compendium. (Consists of A3001, A3002, A3003, A3004 and A3005)

2. CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction.
3. CAN/CSA-A23.5-M86(R1992), Supplementary Cementing Materials.
4. CAN/CSA-G40.20/G20.21, General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with Section 01 32 16.07 – Construction Progress Schedules - Bar (GANTT) Chart, convene pre-installation meeting one (1) week prior to beginning concrete works.
 - .1 Ensure key personnel, site supervisor, Departmental Representative, speciality contractor - finishing, forming, concrete producer and testing laboratories attend.
 1. Verify project requirements.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature, and test samples taken as per the Contract documents.
- .3 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.
- .4 Provide copies of WHMIS MSDS in accordance with Section 01 35 29.06 – Health and Safety Requirements and Section 01 35 43 – Environmental Procedures.

1.6 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Provide Departmental Representative, minimum four (4) weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
 - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .3 Minimum four (4) weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
 - .1 Falsework erection.
 - .2 Hot weather concrete.
 - .3 Cold weather concrete.
 - .4 Curing.
 - .5 Finishes.
 - .6 Formwork removal.
 - .7 Joints.
- .4 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
 - 1. Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
 - 2. Deviations to be submitted for review by Departmental Representative.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.Products

Part 2 Products**2.1 DESIGN CRITERIA**

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

2.2 PERFORMANCE CRITERIA

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

2.3 MATERIALS

- .1 Portland Cement: to CSA A3001, Type GU.
- .2 Blended hydraulic cement: Type GUB to CSA A3001.
- .3 Supplementary cementing materials: with maximum 25% fly ash replacement, by mass of total cementitious materials to CSA A3001.
- .4 Water: to CSA A23.1.
- .5 Aggregates: to CSA A23.1/A23.2.
- .6 Admixtures:
 - .1 Air entraining admixture: to ASTM C260.
 - .2 Chemical admixture: to ASTM C494. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.
 - .1 Compressive strength: 20 MPa at 48 hours, 45 MPa at 28 days.
 - .2 Net shrinkage at 28 days: maximum 0.01 %.
- .8 Curing compound: to CSA A23.1/A23.2.
- .9 Premoulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D1751.
- .10 Epoxy Grout: as indicated.
- .11 Elastomer: as indicated.
- .12 Steel Laminae: as indicated.

- .13 Anchor Rods and Anchor Bolts: as indicated.
- .14 Concrete sealers:
 - .1 Sikagard SN-40 Lo-VOC (or approved equivalent)

2.4 MIXES

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
- .2 Provide concrete mix to meet following plastic state requirements:
 - .1 Uniformity: as required by CSA A23.1/A23.2.
 - .2 Workability: free of surface blemishes, loss of mortar, colour variations, and segregation.
- .3 Provide concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure: C-XL.
 - .2 Compressive strength at 28 days age: 45 MPa minimum.
 - .3 Intended application: Bridge Deck, Barriers and Approach Slabs.
 - .4 Aggregate size 20 mm maximum.
- .4 Provide concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure: C-1.
 - .2 Compressive strength at 28 days age: 35 MPa minimum.
 - .3 Intended application: Substructure.
 - .4 Aggregate size 20 mm maximum.
- .5 Provide quality management plan to ensure verification of concrete quality to specified performance.
- .6 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

Part 3 Execution

3.1 PREPARATION

- .1 Obtain the Departmental Representative's acceptance before placing concrete.
 - .1 Provide 24 hours notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after acceptance of equipment and mix by Departmental Representative.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain the Departmental Representative's acceptance of proposed method for protection of concrete during placing and curing.

- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
 - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
- .11 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 INSTALLATION/APPLICATION

- .1 Cast-in-place concrete work in accordance with CAN/CSA-A23.1/A23.2.
- .2 Sleeves and inserts.
 - .1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.
 - .2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
 - .3 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Departmental Representative.
 - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.
 - .5 Confirm locations and sizes of sleeves and openings shown on drawings.
 - .6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor rods:
 - .1 Set anchor rods to templates in co-ordination with appropriate trade prior to placing concrete.
 - .2 Grout anchor rods in preformed holes or holes drilled after concrete has set only after receipt of written approval from Departmental Representative.
 - 1. Formed holes: 100 mm minimum diameter.
 - 2. Drilled holes: 25 mm minimum diameter larger than bolts used.
 - .3 Protect anchor rod holes from water accumulations, snow and ice build-ups.
 - .4 Set rods and fill holes with shrinkage compensating grout.
- .4 Grout using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.
- .5 Finishing and Curing.
 - .1 Finish concrete to CSA A23.1/A23.2 unless noted otherwise.
 - 1. Schedule:
 - .1 Deck and approach slab – Floated surface finish for exposed face
 - .2 Underside of deck – smooth form finish.
 - .3 Top and inner surface of barriers – sack rubbed finish.
 - .4 Abutments – smooth form finish.

- .5 Bearing seats – broom finish.
- .2 Use procedures as reviewed by Departmental Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
- .6 Joint fillers:
 - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.
 - .2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
 - .3 Locate and form construction and expansion joints as indicated.
 - .4 Install joint filler.

3.3 FIELD QUALITY CONTROL

- .1 Site tests: conduct tests as follows in accordance with section 01 45 00 - quality control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
 - .1 Concrete pours.
 - .2 Slump.
 - .3 Air content.
 - .4 Compressive strength at 7 and 28 days.
 - .5 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by contractor to CSA A23.1/A23.2.
 - 1. Ensure testing laboratory is certified to CSA A283.
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and departmental representative.
- .4 Take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .5 Non-destructive methods for testing concrete: to CSA A23.1/A23.2.
- .6 Inspection or testing by the Departmental Representative will not augment or replace contractor quality control nor relieve contractor of his contractual responsibility.

3.4 PROTECTION

- .1 Protection and curing for concrete placed between October 01 and May 01 shall comply with following requirements in addition to cold weather requirements of CSA A23.1/A23.2.
 - .1 Protect concrete with windproof shelter of canvas or other material to allow free circulation of inside air around fresh concrete.
 - .2 Do not let walls of shelter touch formwork.
 - .3 Provide sufficient space for removal of formwork for finishing.
 - .4 Use heating equipment approved by Departmental Representative.
 - .5 Vent products of combustion outside protective shelter: equipment to be capable of keeping inside air at constant temperature sufficiently high to maintain concrete at following curing temperatures:

1. For initial 3 days: minimum temperature of 15 degrees C, maximum of 27 degrees C at concrete surfaces.
2. For concrete abutments, and footings: cure at 10 degrees C for additional 4 days.
- .6 Keep concrete surfaces continually moist while protected.
- .7 Provide fogging equipment to allow for mist spray curing before start of deck pour.
- .2 Unformed surfaces: cure with burlap and water.
 - .1 Place two layers of damp burlap on surface of concrete.
 - .2 Overlap each strip by minimum 75 mm and secure against displacement by wind.
 - .3 Maintain burlap in place and keep thoroughly wet for seven days after placement.
- .3 Formed surfaces:
 - .1 No additional curing will be required if formwork is left in place for seven days or more.
 - .2 If formwork removed in less than seven days, cure in manner specified for unformed surfaces for remainder of seven day period.
- .4 During curing period, only uncover areas needed for finish treatment. Re-cover and continue curing.

3.5 **CLEANING**

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

END OF SECTION

03 30 51 CONCRETE FOR BRIDGE DECKS**Part 1 General****1.1 MEASUREMENT AND PAYMENT PROCEDURES**

- .1 Concrete for Bridge Decks shall be measured in cubic metres calculated from neat dimensions as indicated and payments shall be made under **“Unit Price Item 18e - Km 83 Wildlife Underpass (Bridge) - Concrete for Deck, Diaphragm and Approach Slabs - Supply and Place”**
 - .1 Concrete placed beyond dimensions indicated will not be measured.
 - .2 Supply and installation of joint fillers and joint sealers, concrete sealer, Evazote, elastomer strip at approach slab seat, anchors rods, nuts, washers and anchor rod grouting will not be measured but considered incidental to work.
 - .3 No deductions will be made for volume of concrete displaced by reinforcing steel, structural steel, or piles.
 - .4 No deductions will be made for volume of concrete less than 0.1 m² in cross sectional area displaced by individual drainage openings.
 - .5 The unit prices bid shall include full compensation for all costs of labour, materials, equipment, tools, formwork, falsework, embedded metallic and non-metallic materials, access, concrete coring, environmental requirements, safety requirements, submittals, and associated Works required for the construction all cast-in-place concrete.
 - .6 An interim payment in the amount of 80% of full value will be made if the concrete has been placed acceptably, and the 7-day test cylinder strength indicates that the concrete will reach the acceptance range of specified strength. Partial payment in advance of 28-day test results will not be deemed to constitute acceptance of the concrete. Final payment will not be made until the specified concrete finish is acceptably completed, and the 28-day strength tests show that the concrete meets the strength requirement of the specification.
- .2 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 - Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .3 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”** and no additional payment will be made for remobilization of equipment if all milling work cannot be completed at once.
- .4 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment shall be made to the Contractor.

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM C1116/C1116M – 10a, Standard Specification for Fiber-Reinforced Concrete.
 - .2 ASTM C1399/C1399M – 10, Standard Test Method for Obtaining Average Residual-Strength of Fiber Reinforced Concrete.
- .2 Canadian Standards Association (CSA International)

- .1 CSA-A23.1-/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Fibres: Provide test data in accordance with ASTM C1018 and ASTM C1399 to show the fibre complies with the specification requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Divert unused plasticizers, water-reducing agents and air-entraining agent materials from landfill to official hazardous material collections site as reviewed by the Departmental Representative.
- .4 Unused plasticizers, water-reducing agents and air-entraining agent materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

Part 2 Products

2.1 MATERIALS

- .1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .2 Reinforcing steel: in accordance with Section 03 20 00 - Concrete Reinforcement.
- .3 Synthetic Fibres: 100% virgin polypropylene to ASTM C1116, Type III.
 - .1 Fibres shall have a minimum length of 50 mm.
 - .2 Fibres shall have a minimum tensile strength of 350 MPa and a minimum modulus of elasticity of 4.2 GPa.

2.2 MIXES

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
 - .2 Provide concrete mix to meet following plastic state requirements:
 - 1. Uniformity: as required by CSA A23.1/A23.2.
 - 2. Workability: free of surface blemishes, loss of mortar, colour variations, and segregation.
 - .3 Provide concrete mix to meet following hard state requirements:
 - 1. Durability and class of exposure: C-XL.
 - 2. Minimum Post-Cracking Residual Strength Index: 0.15
 - 3. Compressive strength at 28 days age: 45 Mpa minimum.
 - 4. Intended application: Bridge deck and end diaphragm.
 - 5. Aggregate size 10 mm maximum.

6. Special Requirements: Synthetic Fibres.

Part 3 Execution**3.1 PREPARATION**

- .1 Deck Overlay Preparation:
 - .1 Support rail elevation for mechanical bridge deck finisher:
 - .1 Departmental Representative will provide input on setting elevations for rails or headers.

3.2 CONSTRUCTION

- .1 Do concrete Work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .2 Fibre reinforced concrete (FRC):
 - .1 Add fibres early in the mixing process following manufacturers recommendations to ensure evenly distributed fibres.
- .3 Place concrete at temperatures limits to CSA-A23.1/A23.2.
- .4 Do not place concrete:
 - .1 When air temperature is above 22 degrees C.
 - .2 During rain or excessive wind or dust.
 - .3 When conditions, as reviewed by Departmental Representative seem detrimental to concrete.
- .5 When air temperature falls below 5 degrees C, comply with cold weather requirements
- .6 Place deck concrete between hours of 6:00 p.m. and 10:00 a.m. as reviewed by Departmental Representative.
 - .1 Provide proper lighting for night pours as reviewed by Departmental Representative.
- .7 Maintain temperature of concrete during discharge between 10 degrees C and 18 degrees C unless permitted otherwise by Departmental Representative.
 - .1 Maintain temperature of mix below maximum temperature of 18 degrees C by adding ice to mix which does not alter design water-cement ratio.
- .8 Immediately prior to placing concrete, thoroughly wet down substrates with clean water.
- .9 Consolidate deck concrete with mechanical vibration even when vibratory drum type finishing machines are used.
- .10 Cast and finish deck with mechanical bridge deck finisher, approved by Departmental Representative.
- .11 Ensure that rate of placing is sufficient to complete proposed placing, finishing and curing operations within scheduled time.
- .12 Ensure that experienced finishing machine operators and concrete finishers are provided to finish deck.
- .13 Do not place concrete until rails for support and operation of finishing machines and headers for hand operated strike-off devices are in place and firmly secured.
 - .1 Rails or headers to be of type, and so installed, that no springing or deflection will occur due to weight of finishing equipment and so located that finishing

- equipment can operate without interruption over entire bridge roadway deck being finished.
- .2 Extend rails for finishing machines beyond both ends of scheduled length of concrete placement sufficient distance to permit float of finishing machine to fully clear concrete to be placed.
 - .3 Set rails or headers to elevations, with allowance for anticipated settlement, camber, and deflection of falsework, as required to produce bridge roadway deck true to required grade and cross section.
- .14 Immediately prior to placing, check falsework and wedges and make necessary adjustments.
- .1 Provide suitable means, such as telltales, to readily permit measurement by Departmental Representative of settlement and deflection.
- .15 Place concrete in uniform heading approximately normal to structure centreline, or in case of screed supported on transverse headers, parallel to centreline.
- .1 Limit rate of placing to that which can be finished before beginning of initial set.
- .16 Immediately after concrete has been placed and consolidated, strike off surface.
- .1 Correct immediately improper adjustment and operation which results in unsatisfactory consolidation and smoothness.
 - .2 Unsatisfactory performance may be cause for rejection of equipment and removal of concrete in place.
- .17 Following completion of strike off by hand methods, float roadway slab surface longitudinally to smooth uniform surface with hand-operated wood float boards 3.5 to 5 m long, minimum 25 mm thick, minimum 200 mm wide, ribbed and trussed as necessary to provide rigid float, and equipped with adjustable handles at each end.
- .1 Provide adjusting screws spaced at maximum 600 mm centres between float board and rib.
 - .2 Maintain float board true to line and free of twist.
- .18 Use floats to remove roughness and minor irregularities left by strike board or finishing machine and to seal concrete surface to approval of Departmental Representative.
- .19 Adjust rails or headers as necessary to correct for settlement or deflection, which occurs during finishing operations.
- .1 Operate finishing floats from transverse bridges that span area being floated: provide sufficient number and type of bridges, as reviewed by Departmental Representative, to permit operation of floats without undue delay.
 - .2 Provide minimum of two bridges when hand operated float boards are used.
 - .3 When finishing machine is used for longitudinal floating, supply one bridge for use by Departmental Representative.
- .20 Finishing bridge deck slab: Floated surface finish for top surface of bridge deck slab and approach slabs.

3.3 PROTECTION

- .1 Protection and curing for concrete placed between October 01 and May 01 shall comply with following requirements in addition to cold weather requirements of CSA A23.1/A23.2.

- .1 Protect concrete with windproof shelter of canvas or other material to allow free circulation of inside air around fresh concrete.
- .2 Do not let walls of shelter touch formwork.
- .3 Provide sufficient space for removal of formwork for finishing.
- .4 Use heating equipment approved by Departmental Representative.
- .5 Vent products of combustion outside protective shelter: equipment to be capable of keeping inside air at constant temperature sufficiently high to maintain concrete at following curing temperatures:
 1. For initial 3 days: minimum temperature of 15 degrees C, maximum of 27 degrees C at concrete surfaces.
 2. For superstructure: maintain concrete at 10 degrees C for additional 14 days.
- .6 Keep concrete surfaces continually moist while protected.
- .7 Provide fogging equipment to allow for mist spray curing before start of bridge deck pour.
- .2 Unformed surfaces: cure with burlap and water.
 - .1 Place two layers of damp burlap on surface of concrete.
 - .2 Overlap each strip by minimum 75 mm and secure against displacement by wind.
 - .3 Maintain burlap in place and keep thoroughly wet for seven days after placement.
- .3 Formed surfaces:
 - .1 No additional curing will be required if formwork is left in place for seven days or more.
 - .2 If formwork removed in less than seven days, cure in manner specified for unformed surfaces for remainder of seven-day period.
- .4 During curing period, only uncover areas needed for finish treatment. Re-cover and continue curing.

END OF SECTION

03 35 00 PRECAST STRUCTURAL CONCRETE**Part 1 General****1.1 MEASUREMENT AND PAYMENT PROCEDURES**

- .1** Payment for Precast Structural Concrete girders will be made under **“Unit Price Item 18f - Km 83 Wildlife Underpass (Bridge) – Precast Structural Concrete Girders - Supply and Place”** and shall include the cost of supply, delivery, storage, and erection of precast units, supply and installation of bearings, removal of erection devices, concrete patching, transverse connections, temporary bearings and temporary bracing for girder stability.
- .2** When materials have been delivered to the worksite or to a bonded storage area approved by the Departmental Representative, payment for Precast Structural Concrete will be made to a maximum of 90% of the cost for supply of the girders based on invoices from the supplier. Payment for the remainder of the price bid will be made as the materials are acceptably installed.
- .3** Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 - Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .4** Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”** and no additional payment will be made for remobilization of equipment if all milling work cannot be completed at once.
- .5** Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment shall be made to the Contractor.

1.2 REFERENCES

- .1** Reference Standards.
 - .1** ASTM International
 1. ASTM A767/A767M, Specification for Zinc Coated (Galvanized) Steel bars for Concrete Reinforcement.
 2. ASTM D 2240, Standard Test Method for Rubber Property – Durometer Hardness.
 - .2** CSA International
 1. CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 2. CSA A23.3, Design of Concrete Structures.
 3. CAN/CSA-A23.4, Precast Concrete - Materials and Construction.
 4. CSA-A251, Qualification Code for Manufacturers of Architectural and Structural Precast Concrete.
 5. CSA-G30.15, Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
 6. CAN/CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement.
 7. CAN/CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

8. CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
9. CSA-G279, Steel for Prestressed Concrete Tendons.
10. CAN/CSA-S6-00, Canadian Highway Bridge Design Code.
11. CSA-W47.1, Certification of Companies for Fusion Welding for Steel Structures.
12. CSA-W48.1, Carbon Steel Covered Electrodes for Shielded Metal Arc Welding.
13. CSA-W59, Welded Steel Construction (Metal Arc Welding).
14. CSA-W186, Welding of Reinforcing Bars in Reinforced Concrete Construction

1.3 DESIGN REQUIREMENTS

- .1 Design precast concrete units, lifting devices, and connections to CSA-A23.3, CAN/CSA-A23.4 and all other applicable standards to safely carry loads due to handling, transportation and erection.
- .2 Design concrete mix based on specified parameters.
- .3 Perform stressing calculations to determine elongations and gauge pressures and establish strand release sequence.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 All submittals shall be made in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit the following items:
 - .1 Written evidence of that the manufacturer's qualifications for precasting meet the requirements of CSA-A251.
 - .2 Written evidence of that the manufacturer's qualifications for welding meet the requirements of the Canadian Welding Bureau (CWB).
 - .3 Stressing calculations showing elongations and gauge pressures, strand release sequence, and jack calibration data based on tests performed within the last six months.
 - .4 Mill certificate and load/elongation curve for each lot of prestressing steel.
 - .5 Concrete mix design indicating compressive strength, proportions of constituent materials, type and brand of cement, type and brand of silica fume, origin of aggregates, and brand names of all admixtures and microscopic air-void analysis results.
 - .6 Written procedures for handling and erecting precast units.
 - .7 Stressing records upon completion of stressing operations.
 - .8 Girder shop drawings which clearly indicate pertinent dimensions, quantities and locations of prestressing strands and non-prestressed reinforcing steel, material grades, fabrication details, connection details, lifting and erection devices, sleeves, openings, inserts, unit identification marks, finishes, weights, concrete strengths, and temporary bracing and erection details.
 - .9 Manufacturer's letters of certification and guarantee.
- .3 All submittals shall bear the stamp and signature of qualified professional engineer registered or licensed to practice in the Province of British Columbia.

1.5 QUALIFICATIONS

- .1** Precast concrete elements shall be fabricated and erected only by a manufacturer certified by the Canadian Standards Association in appropriate categories according to CSA-A251.
- .2** Precast concrete manufacturer shall be certified in accordance with CSA's certification procedures for precast concrete plants prior to submitting tender and to specifically verify as part of tender that plant is currently certified in appropriate categories, including Structural and Prestressed.
- .3** Only precast elements fabricated in such certified plants shall be acceptable to the Departmental Representative Plant certification shall be maintained for the duration of fabrication, erection, and until the warranty expires.
- .4** Welding companies shall be certified to CSA-W47.1.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1** During all aspects of precast structural concrete work, separate and recycle waste materials in accordance with Section 01 35 43, Environmental Procedures.
- .2** 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, non-combustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.

1.7 CERTIFICATIONS AND GUARANTEES

- .1** Upon completion of the work, certify in writing (under the seal and signature of the manufacturer's Professional Engineer registered to practice in the Province of British Columbia) that all precast concrete components and bearings have been fabricated and installed in accordance with the contract documents.
- .2** Upon completion of the work, provide a written guarantee (against material defects and workmanship) that the bearings will perform satisfactorily within the project specifications, design range of movements, and under the design loads for a period of five years after the work has been completed and accepted.

Part 2 Products**2.1 MATERIALS**

- .1** Cement, Aggregates, Water, and Admixtures: to CAN/CSA-A23.1 and A23.4
- .2** Reinforcing Steel: to CAN/CSA-G30.18
- .3** Prestressing Steel: to CAN/CSA-S6 and CSA-G279
- .4** Forms: to CAN3-A23.4
- .5** Miscellaneous Steel: to CAN/CSA G40.21 Type 300W; hot-dipped galvanized
- .6** Welding Electrodes and Related Materials: to CSA-W48.1
- .7** Galvanizing: hot-dipped process with minimum zinc coating of 610 gm/m² to CAN/CSA-G164

2.2 CONCRETE MIX

- .1 The precast manufacturer is responsible for designing the concrete mix for girder fabrication. Ten percent condensed silica fume, by weight of cement, shall be used in all precast concrete. Condensed silica fume shall conform to Table 5 and 6 of CSA Standard A3000-03, Type SF, with a SiO₂ content of at least 85%, of a maximum of 10% ignition loss, and no more than 1% SO₃ content. An acceptable, compatible, superplasticizing admixture shall be used together with the silica fume. Aggregates shall be standard weight and conform to CAN/CSA-A23.1, with a maximum size of 14 mm. Minimum entrained air shall be 5%. Minimum air void spacing of hardened concrete shall be 0.23 mm.

2.3 MANUFACTURED UNITS

- .1 Manufacture units in accordance with CAN/CSA-A23.4 and CSA-A251.
- .2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit which will not be exposed.
- .3 Galvanize steel embedments after fabrication and touch up damaged areas where necessary by zinc metallizing in accordance with ASTM A780 using multiple coats to a dry film thickness of 0.20 mm.
- .4 Notwithstanding the requirements of CAN/CSA-A23.4, the maximum dimensional deviation in mm, of precast units from that detailed on the drawings shall not exceed the following:
 - Length - $\pm 20 \text{ mm} \times \text{length (m)} \div 50$
 - Width - $\pm 3 \text{ mm}$
 - Depth - $\pm 5 \text{ mm}$
 - Camber - $\pm 20 \text{ mm} \times \text{length (m)} \div 50$
 - Sweep - deviation from true, $20 \text{ mm} \times \text{length (m)} \div 50$
 - Projection of Stirrups - $\pm 12 \text{ mm}$
 - Bearing Areas - out of flatness of bearing area, 3 mm
 - Bulkheads - warpage or tilt of ends, 5 mm
 - Void Location - surface to void location, $\pm 15 \text{ mm}$ after casting
- .5 Fabrication tolerances for elastomeric bearings shall conform to AASHTO Standard Specifications for Highway Bridges (1992), Division II, Section 18.2.5.

2.4 SOURCE QUALITY CONTROL

- .1 Provide Departmental Representative with certified copies of quality control tests related to this project as specified in CAN/CSA-A23.4, CSA-A251, and CSA-G279.
- .2 Inspect prestressed concrete tendons in accordance with CSA-G279.
- .3 Provide records from in-house quality control programme based upon plant certification requirements to the Departmental Representative for inspection and review.
- .4 Precast manufacturer shall keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and provide to the Departmental Representative for review upon request.

2.5 SANDBLASTING

- .1 Roughen the end faces and interior end void surfaces by sandblasting to sufficiently remove all laitance and uniformly expose the aggregate particles.

2.6 SEALER

- .1** Apply an approved penetrating silane sealer to the vertical exterior sides of exterior girders.
- .2** Refer to Section 03 30 00 for a list of acceptable commercially available sealing products.
- .3** Apply sealer in accordance with the manufacturer's recommendations and at the minimum application rate specified in the section noted above.

Part 3 Execution**3.1 ERECTION**

- .1** Erect precast concrete units in accordance with CAN/CSA-A23.4, Clause 30.
- .2** Non-cumulative erection tolerances shall be in accordance with CAN/CSA-A23.4, Clause 10.
- .3** Submit to the Departmental Representative, for record purposes and for examination as to concept only, four copies of a detailed erection procedure three weeks in advance of the scheduled start of erection. The erection procedure shall include all drawings and documents necessary to describe the following:
 - .1** Access to work, earth berms and work bridges.
 - .2** Type and capacity of equipment.
 - .3** Sequence of operation, including position of cranes, trucks with girders, and traffic accommodation.
 - .4** Detailed crane position on the ground, particularly adjacent to substructure elements, such as abutment backwalls, with details of load distribution on wheels and outriggers.
 - .5** Details of crane position on the structure, showing wheel loads and axle spacing of equipment moving on structure.
 - .6** Loads and their position from crane wheels and outriggers during all positions of lifting when crane is on structure.
 - .7** Details of temporary works and method of providing temporary supports for stability.
 - .8** Details of lifting of units, showing vertical forces at lifting hooks.
 - .9** Provisions for control and adjustment of errors for width and positioning of exterior units.
 - .10** Complete details of blocking for bearings where necessary to constrain movements due to horizontal forces and/or gravity effects
- .4** The erection procedure shall bear the Seal of a Professional Engineer registered to practice in the Province of British Columbia, who shall assume full responsibility to ensure that his design is being followed. Safety, and compliance with the Occupational Health and Safety Act and Regulations thereunder, shall be integral parts of his design. 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.
- .5** Work shall not commence until the Departmental Representative's acceptance of the erection procedure has been obtained. The Contractor's project manager and field

superintendent may be required to attend a prejob meeting at a location determined by the Departmental Representative prior to commencement of any field work. The Departmental Representative's acceptance 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** Temporary supporting structures and/or berms will not be permitted to remain in any stream channel during spring break-up or run-off periods, unless all necessary approvals have been obtained by the Contractor from pertinent agencies. Incidental damage to other property, such as fills and stream banks, resulting from the existence of berms, shall be the responsibility of the Contractor.
- .7** It is essential that the girders be erected with utmost attention being given to girder positioning, alignment, and elevation. The Contractor shall adjust girder position, bearing location and bearing elevation in order to achieve as closely as possible the lines and grades shown on the drawings. The Contractor shall minimize any differential camber (girder to girder), and the sweep of the girders, by jacking, loading of girders, winching, or whatever means are necessary, and shall provide the necessary temporary attachments to hold the girders in position. The maximum dimensional deviation in mm, of erected precast concrete units from that as detailed on the drawings shall not exceed the following:
- Sweep (Other Units) - deviation from true, $20 \text{ mm} \times \text{length (m)} \div 50$

3.2 **SITE 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. He 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 Departmental Representative. The Contractor shall leave the bridge site, roadway and adjacent property in a neat restored, and presentable condition, satisfactory to the Departmental Representative; when required, he shall provide written evidence that affected property owners or regulatory agencies have been satisfied.

END OF SECTION

03 35 00 BRIDGE DECK WATERPROOFING**Part 1 General****1.1 MEASUREMENT AND PAYMENT PROCEDURES**

- .1** Measurement for Bridge Deck Waterproofing will be measured for payment in square metres and shall include full compensation for all costs of labour, materials, equipment, to supply and install the waterproofing in accordance with the Drawings. Payment will be made under **“Unit Price Item 18g – Km 83 Wildlife Underpass (Bridge) – Deck Waterproofing - Supply and Install”**
- .2** Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 - Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .3** Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”** and no additional payment will be made for remobilization of equipment if all milling work cannot be completed at once.
- .4** Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment shall be made to the Contractor.

Part 2 Materials**2.1 PRODUCTS**

- .1** All materials for this application will be reviewed for acceptance by the Departmental Representative.
 - .1** Tack Coat: The tack coat used in conjunction with the asphalt membrane shall be primer, cut back with an equal volume of gasoline type solvent, or an acceptable alternative cut-back asphalt product and be compatible with the asphalt membrane.
 - .2** Asphalt Membrane: Asphalt membrane shall be hot applied rubberized asphalt and shall be supplied in cakes ready for melting and application.
 - .3** Rubber Membrane: The rubber membrane shall be 1.2 mm thick butyl rubber.
 - .4** Waterproofing Protection Board: The protection board shall be a durable panel of 3 mm thickness specifically designed to provide a protective cushion between the hot mix asphaltic concrete pavement and the asphalt waterproofing membrane. It shall have a water absorption property of 5% or less and shall meet the Ontario Ministry of Transportation and Communications Material Specification for Protection Board.

2.2 EQUIPMENT

- .1** An approved heating and mixing kettle shall be used to heat the hot-applied rubberized asphalt membrane. The kettle shall be of the double boiler oil transfer type with a built-in agitator and equipped with permanently installed dial type thermometers to measure the temperature of the melted compound and the oil.

Part 3 Execution**3.1 PROCEDURE**

- .1** The Contractor shall perform all of the operations involved in waterproofing in sequential order, such that there are no delays between individual operations except those necessary to meet the requirements of these specifications.
- .2** The Contractor shall give the Departmental Representative 48 hours' notice prior to commencing any waterproofing operations.
- .3** The deck concrete, including curbs, sidewalks and medians must be completely dry and cured at least 14 days before application of tack or membrane can proceed.
- .4** The existing surface of the concrete shall be completely shotblasted to expose sound, laitance-free concrete. All dirt and debris shall be removed and disposed of, leaving a prepared surface satisfactory for tack coating. Tack coating and waterproofing shall not commence until the Departmental Representative has accepted all preparation work.
- .5** Immediately prior to the application of the tack coat, the concrete surface shall be air blasted to remove all dust and any other foreign material.
- .6** The tack coat shall be cut back 50% with gasoline solvent.
- .7** The application rate shall be such that the tack material will be absorbed into the concrete, resulting in a surface that is dull and black in appearance.
- .8** The application of an excessive amount of tack as indicated by a shiny black surface shall be avoided.
- .9** Tack coat material shall be applied with approved equipment which will provide uniform application at the required rate.
- .10** The tack coat shall be applied only when the concrete is dry and clean, and when the air and concrete surface temperatures are above 5°C.
- .11** Waterproofing equipment or material shall not be permitted on the tack coat until it has fully cured and is completely tack-free.
- .12** The following reinforcement shall be applied over all construction joints, and over any cracks designated by the Departmental Representative. Prior to the application of the asphalt membrane to the deck, a coat of hot asphalt membrane at least 4 mm thick and wide enough to extend 200 mm on either side of the joint or crack shall be applied in accordance with Section 3.2 below, to the tack-coated concrete surface.
- .13** A strip of butyl rubber membrane material wide enough to extend 150 mm on either side of the joint or crack shall be applied while the asphalt membrane is still hot.
- .14** Along all curbs, barrier walls, and deck drains the hot asphalt membrane shall be applied to the height of the top of the hot mix surface course, and 150 mm onto the deck.
- .15** The rubber membrane shall extend 40 mm up the vertical faces, and 110 mm onto the deck surface.
- .16** Special attention shall be paid to waterproofing around the deck drip tubes. The asphalt membrane shall be carefully applied around the drain tubes so that a positive seal is obtained. (It may be necessary to temporarily plug the tubes prior to waterproofing in order to prevent the entrance of hot membrane.) The tubes shall be trimmed flush with the top of the membrane to allow free drainage of water.

3.2 APPLICATION OF ASPHALT MEMBRANE

- .1 Cakes of asphalt membrane shall be melted in the mechanically agitated heating and mixing unit specified. This unit shall keep the contents continuously agitated until the material can be drawn free flowing and lump-free from the mixing unit at a temperature not exceeding that recommended by the manufacturer.
- .2 Membrane shall not be applied until the tack coat has cured completely.
- .3 The asphalt membrane shall be applied within the temperature range recommended by the manufacturer, to the clean, tack-coated concrete deck, to form a uniform film having a minimum thickness of 4 mm and a maximum thickness of 6 mm.
- .4 The laying operation shall be such that discontinuities in the membrane are avoided and any joints lapped 150 mm.
- .5 The membrane shall be applied over all waterproofed joints and cracks, and shall extend up the face of curbs, barrier walls, and deck drains, to the height of the top of the hot mix surface course.
- .6 Deck drains and drainage tubes shall not be plugged.

3.3 APPLICATION OF PROTECTION BOARD

- .1 The Contractor shall check and ensure that the asphalt membrane thickness conforms to the specified requirement, prior to placing the protection board.
- .2 Protection boards shall be laid on the asphalt membrane, while the membrane is still hot, with the length of the board running transversely, on the deck. It shall be rolled by means of a linoleum or lawn type roller in order to ensure good contact with the membrane.
- .3 The protection boards shall be placed with edges overlapping 25 mm both longitudinally and transversely.
- .4 The protection board edge shall be within 5 mm of all curbs, drain verticals, and deck joint verticals.
- .5 Protection boards shall be placed such that the longitudinal (direction of traffic flow) joints are staggered at least 150 mm.
- .6 Holes shall be cut through the protection board to allow water to drain freely through the drainage tubes.
- .7 In instances where edges of the protection board curl up, the edges shall be cemented down using hot membrane material to the satisfaction of the Departmental Representative.
- .8 Protection boards that are warped, distorted or damaged in any way, by manufacture, storage, handling or exposure to weather, shall be rejected.

3.4 SAMPLING AND TESTING

- .1 The Departmental Representative may require that sufficient quantities of the asphalt membrane, rubber membrane, and protection board be supplied from the materials being used on the project for immediate analysis, flow tests, water absorption, or for other future testing purposes.

3.5 APPROVED MATERIALS

- .1 Hot Applied Rubberized Asphalt Membrane
 - .1 "Bakor" 790-11

Parks Canada

- .2 "Tremproof" 150
- .3 "Permaquick 6100" W.I. 250
- .4 "Hydrotech 6125"
- .5 "Beamalastic 1213 BDM".
- .2 Rubber Membrane**
 - .1 "Elastosheet 6147"
 - .2 "BP47 Elastomeric Reinforcement"
 - .3 "Bakor 990-25"
- .3 Waterproofing Protection Board**
 - .1 Test results and samples of proposed protection board shall be submitted to the Departmental Representative for review. Acceptable products of Protection Board shall consist of spun glass fibres and not cellulose reinforcing fibres. Products which are known to meet the 5% or less water absorption requirement are:
 - .1 "Vibraflex MTO Protection Board"
 - .2 "Bakor Asphalt Protection Board"
 - .3 "IKO Protectboard".

END OF SECTION

05 12 33 MISCELLANEOUS METALS**Part 1 General****1.1 MEASUREMENT AND PAYMENT PROCEDURES**

- .1 Payment for the supply and installation of galvanized steel bicycle rails shall be made under **“Unit Price Item 18h – Steel Bicycle Rail – Supply and Install”** shall be accepted as full compensation for everything furnished and done, including, but not limited to: quality control, shop drawings, fabrication, galvanizing, supply and installation of anchor bolts, railing, neoprene pads, connection brackets, misc. hardware, grout, sealant and shims as required.
- .2 Payment for the supply and installation of galvanized armour plates shall not be measured for payment and shall be considered incidental to **“Unit Price Item 18d – Concrete for Barriers – Supply and Place”** including, but not limited to: quality control, shop drawings, fabrication, galvanizing, and the supply and installation of miscellaneous hardware.
- .3 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 - Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .4 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”** and no additional payment will be made for remobilization of equipment if all milling work cannot be completed at once.
- .5 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment shall be made to the Contractor.

1.2 REFERENCES

- .1 Reference Standards.
 - .1 ASTM International
 1. ASTM A 123M / A 385, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 2. ASTM A 143, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 3. ASTM A780 / A780M-09 (2015), Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
 4. ASTM A 500 / A500M, Standard Specification for Cold-Formed and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - .2 CSA International
 1. CSA W59, Welded Steel Construction (Metal Arc Welding).
 2. CAN/CSA-G.40.20-13 / G.40.21-13, General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel.
 3. CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
 4. CSA W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel.

5. CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
6. CAN/CSA S6-14, Canadian Highway Bridge Design Code.
7. BC MOTI 2012 Standard Specifications for Highway Construction (referred herein as SS).

1.3 DESIGN REQUIREMENTS

- .1 Design Miscellaneous steel units, lifting devices, and connections to CSA-G.40.20-13 / G40.21-13 and all other applicable standards to safely carry loads due to handling, transportation and erection.
- .2 All steel, except where shown otherwise on Drawings, shall conform to CAN/CSA G-40.21, Grade 300W or better.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 All submittals shall be made in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit the following items:
 - .1 Written evidence of that the fabricator's qualifications for steel fabrication meet the requirements of CSA W47.1, Division 3 or better approved by Canadian Welding Bureau (CWB).
 - .2 Written procedures for handling and installation of steel.
 - .3 Steel shop drawings which clearly indicate pertinent dimensions, quantities, weights, material grades, fabrication details, connection details, lifting and erection devices, sleeves, openings, inserts, unit identification marks, finishes and erection details.
 - .4 Fabricator's letters of certification and guarantee.
- .3 All submittals shall bear the stamp and signature of qualified professional engineer registered or licensed to practice in the Province of British Columbia.

1.5 QUALIFICATIONS

- .1 Welding companies shall be certified to CSA-W47.1.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 During all aspects of miscellaneous steel work, separate and recycle waste materials in accordance with Section 01 35 43, Environmental Procedures.
- .2 Prevent paints and other coating chemicals from entering drinking water supplies or streams. Using appropriate safety precautions collect liquid or solidify liquid with an inert, non-combustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.

1.7 CERTIFICATIONS AND GUARANTEES

- .1 Upon completion of the work, certify in writing (under the seal and signature of the fabricator's Professional Engineer registered to practice in the Province of British Columbia) that all miscellaneous steel components have been fabricated and installed in accordance with the contract documents.

- .2 Upon completion of the work, provide a written guarantee (against material defects and workmanship) that the miscellaneous steel work will perform satisfactorily within the project specifications, design range of movements, and under the design loads for a period of five years after the work has been completed and accepted.

Part 2 Products

2.1 MATERIALS

- .1 Miscellaneous Steel: to CAN/CSA G40.21 Type 300W; hot-dipped galvanized
- .2 Welding Electrodes and Related Materials: to CSA-W48.1
- .3 Galvanizing: hot-dipped process with minimum zinc coating of 610 gm/m² to CAN/CSA-G164

2.2 MANUFACTURED UNITS

- .1 Manufacture units in accordance with CSA W47.1.
- .2 Galvanize steel embedments after fabrication and touch up damaged areas where necessary by zinc metallizing in accordance with ASTM A780 using multiple coats to a dry film thickness of 0.20 mm.
- .3 Tolerances of various steel plates and elements shall be as per CAN/CSA S6-14.

2.3 SOURCE QUALITY CONTROL

- .1 Provide Departmental Representative with certified copies of quality control tests related to this project as specified in CAN/CSA G40.21.
- .2 Provide records from in-house quality control programme based upon plant certification requirements to the Departmental Representative for inspection and review.
- .3 Fabricator shall keep complete records of supply source of steel and provide to the Departmental Representative for review upon request.

Part 3 Execution

3.1 FABRICATION AND INSTALLATION

- .1 All miscellaneous steel including railings, armour plate etc. shall be supplied, fabricated and installed as shown on the Drawings and in accordance with SS 422. All steelwork shall be galvanized after fabrication.
- .2 Railing shall be adjusted to produce uniform height and smooth alignment as accepted by the Departmental Representative.
- .3 All the material shall be stored above ground.

3.2 CLEAN-UP

- .1 At completion of contract, all miscellaneous steel shall be cleaned of concrete spatter, mud oil, shop markings if visible to public and other foreign materials.

END OF SECTION

10 14 53 TRAFFIC SIGNAGE**Part 1 General****1.1 REFERENCES**

- .1 Parks Canada Exterior Signage Standards and Guidelines (March 2007)
- .2 ASTM A276-91a, Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
- .3 ASTM B209M-92a, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .4 ASTM B210M-92a, Specification for Aluminum-Alloy Drawn Seamless Tubes.
- .5 ASTM B211M-92a, Specification for Aluminum and Aluminum-Alloy Bar, Rods and Wire.
- .6 CAN/CSA-G40.21-M92, Structural Quality Steels.
- .7 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .8 CAN/CSA-O80 Series-M89, Wood Preservation.
- .9 CSA O121-M1978, Douglas Fir Plywood.
- .10 CSA W47.2-M1987, Certification of Companies for Fusion Welding of Aluminum.
- .11 CGSB1-GP-12c-65, Standard Paint Colours:
- .12 CAN/CGSB-1.28-M89, Alkyd, Exterior House Paint.
- .13 CAN/CGSB-1.59-M89, Alkyd, Exterior Gloss Enamel.
- .14 CAN/CGSB-1.94-M89, Xylene Thinner (Xylol).
- .15 CAN/CGSB-1.99-92, Exterior and Marine Phenolic Resin Varnish.
- .16 CAN/CGSB-1.104-M91, Semigloss Alkyd Air Drying and Baking Enamel.
- .17 CAN/CGSB-1.132-M90, Zinc Chromate Primer, Low Moisture Sensitivity.
- .18 CGSB 1-GP-189M-78, Primer, Alkyd, Wood, Exterior.
- .19 CGSB 31-GP-3M-88, Corrosion Preventive Compound, Cold Application, Soft Film.
- .20 CGSB 62-GP-9M-80, Prefabricated Markings, Positionable, Exterior, for Aircraft Ground Equipment and Facilities.
- .21 CGSB 62-GP-11M-78, Marking Material, Retroreflective, Enclosed Lens, Adhesive Backing.

1.2 MEASUREMENT PROCEDURES

- .1 Measurement for payment for Supplying, Loading, Hauling and Installation of Regulatory Signs, Hazard Markers and bases will be based on each complete unit installed according to these specifications, and shall include all labour, equipment and material to satisfactorily complete this item of work. Payment will be made under **“Lump Sum Price Item 3 – Prime Cost Sum”**.
- .2 Measurement for payment for relocation of existing signage, markers, and bases as indicated will be based on each complete unit relocated and shall include all labour, equipment and material to satisfactorily complete this item of work. Payment will be made under **“Lump Sum Price Item 3 – Prime Cost Sum”**.
- .3 Removal and disposal of existing signs and posts being replaced, and filling the holes, will be incidental to the Work

- .4 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .5 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”**, and no additional payment will be made.
- .6 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 35 43 – Environmental Procedures.
- .2 Divert unused metal and/or plastic materials to recycling facility approved by Departmental Representative.
- .3 Damaged signs and posts from any removals to be transported to recycling facility approved by the Departmental Representative.

Part 2 Products

2.1 MATERIALS

- .1 The Contractor is responsible for supplying all materials associated with the installation of signage.
- .2 Traffic signs shall be as per BC MoTI Standard Specification for Highway Construction Section 635 (latest edition).

Part 3 Execution

3.1 INSTALLATION

- .1 The Contractor shall load, haul and install supplied single post and aluminum signs (see detail sheet for typical sign) and bases in the following manner:
 - .1 The Contractor is responsible for locating power / telephone / gas lines / services / utilities at all proposed sign locations.
 - .2 The Contractor is responsible for layout and measurements to ensure signs are installed as per drawings and as directed by the Departmental Representative.
 - .3 Concrete bases: Excavate one hole for the concrete base at the location and depth provided by the Departmental Representative. Using some of the excavated material, level and compact bottom of hole. Place base with one side parallel to the edge of asphalt and level. The top of the base is to be flush or 1" above finished grade.
 - .4 Adjust the post height by using a pipe cutter or cut off saw. All post cuts will be determined in the field by the contractor. The contractor will measure existing elevations at each site and calculate the cuts needed.
 - .5 Assemble the signs on the forks on the ground. Slide forks onto posts and place the cap.

- .6 Drill 1 hole in base sleeves and posts for ½ " bolts, as shown in the detail sheet and as verified by the Departmental Representative, and shim to plumb if necessary.
- .7 Bases must be perfectly plumbed. Vertical and horizontal tolerances for the base are 0.075m. Tolerance for the plumb of the posts is 0.01 m per 1.0 m or 1/4" on a two foot carpenters level. Tolerances for the signs are 0.075 m for distance from asphalt and 0.075 m for height above white line.
- .8 The Contractor is responsible for hauling all materials to and from each work site.
- .9 Landscape so the top of the base is flush or 25 mm above finished grade.
- .10 Remove all excess material from site, including boulders larger than 100 mm.
- .11 All signs are to be covered until the Departmental Representative advises to uncover.
- .12 The Contractor is to place NPC/PNC stickers (provided by the Departmental Representative) on all signs as indicated by the Departmental Representative.
- .13 Payment for this item shall be based on the number of signs installed and shall include all material, labour and equipment required to satisfactorily complete this item of work.

3.2 **REMOVAL AND SALVAGE**

- .1 Carefully dismantle and salvage post, aluminum and steel materials.
- .2 Deliver salvaged materials to Niblock Pit, Icefields Parkway, km 0.5. Damaged signs and posts to be hauled to recycling facility accepted by the Departmental Representative.
- .3 Fill holes with gravel and compact

3.3 **CLEANING**

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

END OF SECTION

22 42 10 PRECAST PRIVY**Part 1 General****1.1 DESCRIPTION**

- .1 This work shall consist of the supply and installation of Two Stall Precast Privies, also known as washrooms or outhouses, at locations and elevations as shown on the Drawings or as directed by the Departmental Representative.

1.2 MEASUREMENT PROCEDURES

- .1 Payment will be made under **“Unit Price Item 2 – Precast Privy - Supply and Install Two Stall Precast Privy”** and shall include the supply, delivery and installation of the Two Stall Precast Privy including underground tank. No additional payment will be made for the granular backfill, excavation, compaction, finishing slopes or disposal of excess excavation material.
- .2 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”**, and no additional payment will be made.
- .3 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .4 Environmental mitigations required in accordance with Section 01 35 43 - Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Manufacturer's Instructions:
 - .2 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 01 45 00.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 35 43 – Environmental Procedures and Section 02 81 01 – Hazardous Materials.

Part 2 Materials**2.1 GRANULAR BEDDING AND BACKFILL**

- .1 BC MoTI 25mm Well Graded Base material for bedding to be supplied by the contractor from outside the Park or produced from suitable material excavated from within the design cuts and structure excavations.
- .2 BC MoTI 50mm well-graded base material for structure backfill to be supplied by the contractor from outside the Park or produced from suitable material excavated from within the design cuts and structure excavations.

2.2 TWO STALL PRECAST PRIVY

- .1 Dimensions of approximately 10 feet by 14 feet.
- .2 Resistant to fire, rot, insect damage and vandalism.
- .3 Full disabled access.
- .4 Metal roof.
- .5 Large vent for tank.
- .6 Aesthetically similar to existing privies in the corridor.
- .7 Supplier and design must be pre-approved by the Departmental Representative.
Suppliers currently approved are listed below:
 - .1 Timberwolf Precast, PO Box 2171 Golden, BC V0A 1H0.
 - .2 Trikon Precast Concrete Products, 601 Patterson St West, Cranbrook, BC V1C 4J1.

Part 3 Execution**3.1 INSTALLATION**

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue shipping, handling and installation instructions, product carton installation instructions, and data sheets.
- .2 Haul excess excavation and granular backfill to Mannix Pit.

END OF SECTION

31 05 10 CORRECTED DRY DENSITY FOR FILL**Part 1 General****1.1 SUMMARY**

- .1 This Section defines correction to maximum dry density to take into account aggregate particles larger than 19 mm.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C127-[04], Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.
 - .2 ASTM D698-[00ae1], Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - .3 ASTM D1557-[02e1], Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - .4 ASTM D4253-[00], Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

1.3 DEFINITIONS

- .1 Corrected maximum dry density is defined as:
 - .1 $D = D1 \times D2 / (F1 \times D2) + (F2 \times D1)$.
 - .2 $D = (F1 \times D1) + (0.9 \times D2 \times F2)$.
 - .3 Where: D = corrected maximum dry density kg/m³.
 - .4 F1 = fraction (decimal) of total field sample passing 19 mm sieve.
 - .5 F2 = fraction (decimal) of total field sample retained on 19 mm sieve (equal to 1.00 - F1).
 - .6 D1 = maximum dry density, kg/m³ of material passing 19 mm sieve determined in accordance with Method A of ASTM D1557.
 - .7 D2 = bulk density, kg/m³, of material retained on 19 mm sieve, equal to 1000G where G is bulk specific gravity (dry basis) of material when tested to ASTM C127.
 - .8 For free draining aggregates, determine D1 (maximum dry density) to ASTM D4253 wet method when directed by Departmental Representative.

Part 2 Products

- .1 Not Used.

Part 3 Execution

- .1 Not Used.

END OF SECTION

31 11 00 CLEARING AND GRUBBING**Part 1 General****1.1 MEASUREMENT PROCEDURES**

- .1 Quantities for payment for clearing will be paid under **“Unit Price Item 3a – Clearing and Grubbing - Clearing”** and will be measured based on the area in hectares of clearing that has been acceptably completed in accordance with these specifications and will, unless otherwise specified, comprise the full length and breadth of the right-of-way as shown on the drawings or as directed by the Departmental Representative. Payment under this item shall include all labour, equipment and material to satisfactorily complete the work.
- .2 Quantities for payment for clearing will be paid under **“Unit Price Item 3b – Clearing and Grubbing - Grubbing”** and will be measured based on the areas in hectares of grubbing that has been acceptably completed in accordance with these specifications and will, unless otherwise specified, comprise the full length and breadth of the right-of-way as shown on the drawings or as directed by the Departmental Representative. Payment under this item shall include all labour, equipment and material to satisfactorily complete the work.
- .3 Clearing and grubbing waste shall be hauled to Mannix pit for disposal in areas designated by the Departmental Representative.
- .4 No overhaul will be paid for clearing and grubbing.
- .5 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”**, and no additional payment will be made.
- .6 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .7 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor

1.2 DEFINITIONS

- .1 Flush cutting consists of cutting trees, stumps or vegetative growth to within 100 mm of the ground, leaving the root structure undisturbed and disposing of felled trees, previously uprooted trees, stumps and clearing wood debris as specified.
- .2 Clearing consists of cutting trees and brush vegetative growth to within 300 mm of the ground and disposing of felled trees, previously uprooted trees, stumps, and clearing wood debris as specified.
- .3 Grubbing consists of excavation and disposal of stumps, roots and wood debris to a depth of 0.6m below the ground line.
- .4 Chipping consists of chipping wood debris, except merchantable timber, into wood chips. Finished wood chip material shall be able to pass through a 100 mm by 100 mm screen.
- .5 Merchantable timber is all timber with butt diameter in excess of 150 mm and top down to 100 mm.

1.3 QUALITY CONTROL

- .1 All Quality Control testing by the Contractor.

1.4 PROTECTION

- .1 Prevent damage to trees, natural features, bench marks, existing pavement, water courses and root systems of trees that are to remain.
- .2 Repair any damaged items to approval of Departmental Representative.
- .3 Replace any trees designated to remain, if damaged, as directed by Departmental Representative.

Part 2 Products

- .1 Not used.

Part 3 Execution**3.1 PREPARATION**

- .1 Inspect site and verify with Departmental Representative, items designated to remain.

3.2 CLEARING

- .1 Clear as directed by Departmental Representative by cutting trees and vegetative growth.
- .2 Cut off branches and cut down trees overhanging area cleared as directed by Departmental Representative.
- .3 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.
- .4 All clearing shall be felled in such a manner that surrounding vegetation is preserved along the construction limits. Stumps remaining within 3.0 metres of cleared perimeter are to be cut flush with ground and vegetative mat left undisturbed.

3.3 GRUBBING

- .1 Grub out stumps and wood debris including roots and embedded logs up to a depth of 0.6m below the ground surface.
- .2 Grubbing ripper teeth depth shall be kept as shallow as possible to minimize contamination of topsoil with subsoils. This may require individual ripping of stumps in some locations. In addition, while removing stumps, roots or embedded logs, the Contractor shall shake them on site to remove as much soil as possible.

3.4 REMOVAL AND DISPOSAL

- .1 All grubbed wood materials shall be hauled and stockpiled at Mannix Pit.

3.5 FINISHED SURFACE

- .1 In areas of grubbing, leave ground surface in condition suitable for stripping of topsoil to approval of Departmental Representative.
- .2 In areas of flush cutting, leave stumps cut flush with ground elevation and root structure undisturbed.

- .3 Finished surface requirements for TCH in Yoho National Park, km 82.5 to km 88:
- .1 Refer to Best Management Practices “Vegetation Removal Mitigations Module”.
 - .2 In areas of flush cutting, leave stumps cut flush with ground elevation and root structure undisturbed unless otherwise directed by the Departmental Representative.
 - .3 Where possible, vegetative debris should not be left to accumulate on site and must either be burned or chipped.
 - .4 Chips cannot exceed two inches in depth to a maximum coverage of 5% ground cover.
 - .5 Where accessible, all stems suitable for firewood should be removed from site, hauled and stockpiled at a location designated by the Departmental Representative.
 - .6 At inaccessible sites or for trees with little firewood value, no more than 50 stems per linear kilometer may be left on site. A stem is defined as any tree with a DBH greater than 15 centimeters.
 - .7 All retained stems must be limbed and lie flush to the ground.
 - .8 Accumulation of fine wood y fuels is of greatest concern from both a fire management and vegetation re-growth perspective. Fine fuel accumulation cannot exceed 10% ground cover and must be less than 10 centimeters in depth. Fine woody fuels have a diameter less than 3 centimeters.
 - .9 Medium fuels may accumulate to a maximum of 20% ground cover and shall not exceed 20 centimeters in depth. Medium fuels have a diameter ranging from 3 centimeters to 7 centimeters
 - .10 Mechanical distributed areas and burn piles must be seeded with an approved native grass seed mix within 6 months of project completion.
 - .11 Ground disturbance must be kept to a minimum. Off-highway mechanical equipment must have tire pressure of 7 psi or lower.

END OF SECTION

31 24 13 ROADWAY AND DRAINAGE EXCAVATION**Part 1 General****1.1 DESCRIPTION**

- .1 This item consists of the excavation and disposal of all materials in conformity with the lines, grades and dimension indicated on the drawings and as directed by the Departmental Representative and includes:
 - .1 Stripping of organic material.
 - .2 Roadway, culvert and borrow excavation.
 - .3 Construction of roadway ditches, embankments, permanent access and connecting roads, approaches, entrances, day use areas, berms, approved haul roads and other earthworks necessary for the construction of the road.
 - .4 Removal and disposal of unsuitable materials from excavation, embankment and borrow areas.
 - .5 Transportation of excavated materials.
 - .6 Finishing of top surfaces and slopes.
 - .7 Maintenance of the work set forth under this section in a finished condition until any portion thereof has been accepted as completed by the Departmental Representative.

1.2 MEASUREMENT PROCEDURES

- .1 Stripping and placement in stockpiles:
 - .1 The Quantity of Stripping materials for which payment will be made shall be the volume in cubic metres measured in its original position from cross-sections taken before and after stripping. Stripping depth is estimated to be on average 200 mm but will fluctuate from one location to the other. Payment will be made under **“Unit Price Item 4a – Roadway and Drainage Excavation – Stripping and Placement in Stockpile”** and will include cost to strip, load, haul, screen, dispose of waste at Mannix Pit and stockpile screened material alongside the right-of-way outside the cut/fill slopes between km 82.5 and km 88.0 at locations approved by the Departmental Representative.
 - .2 No overhaul will be paid for this Work.
- .4 Roadway and Drainage Excavation:
 - .1 The Quantity of Type ‘D’ Excavation for which payment will be made shall be the volume in cubic metres measured in its original position from cross sections taken by Departmental Representative in areas of excavation. Payment will be made under **“Unit Price Item 4b - Roadway and Drainage Excavation - Type D Excavation”** and shall include cost of excavating, hauling, placing and compacting material between km 82.5 and km 88.0 for construction of the roadway embankment.
 - .2 The Quantity of Type ‘D’ Excavation of material deemed by the Departmental Representative as unsuitable and/or waste/surplus for which payment shall be made will be the volume in cubic metres measured in its original position from cross sections taken by Departmental Representative in areas of excavation. Payment will be made under **“Unit Price Item 4c – Roadway and Drainage**

Excavation - Unsuitable Material Excavation” and shall include cost of excavation, haul, and disposal of material as directed by the Departmental Representative.

- .3 Payment for Type ‘A’ Excavation of material deemed by the Departmental Representative as rock will be made under **“Unit Price Item 4d – Roadway and Drainage Excavation – Type A Rock Excavation”**.
 - .1 Blasting (Bulk Blasting and Trim Blasting) will be measured as the in situ “bank” volume of rock excavated, based on survey measurements taken by the Contractor and confirmed by the Departmental Representative. Payment for this item will be made per cubic meter and shall include the cost of drilling, blasting, excavation, hauling, placement and or disposal of waste/surplus material as directed by the Departmental Representative. Over-excavation and over-break beyond the Limits of Excavation, and secondary breaking of oversize material resulting from blasting will not be measured for payment. The tendered unit prices shall be full compensation for supplying all material, labour, and equipment to execute the work as specified.
 - .2 The contractor shall submit an existing rock face survey for review prior to proceeding with blasting works, and all costs related are considered incidental to Rock Blasting.
 - .3 Structural support, remedial work, half barrels, or blast hole traces shall not be visible on the final rock face and shall be considered incidental to Rock Blasting.
 - .4 Payment for Blasting will not be made until all related submittals have been received and approved by the Departmental Representative
- .4 Departmental Representative will take initial cross sections after clearing, grubbing and stripping are completed and immediately prior to excavation of material to be incorporated into work.
- .5 No overhaul will be paid for this Work.
- .6 Embankment construction will not be measured for payment directly, rather it shall be considered incidental to **“Unit Price Item 4 – Roadway and Drainage Excavation”**
- .5 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”**, and no additional payment will be made.
- .6 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .7 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor
- .8 No measurement payment will be made for:
 - .1 Excavating unnecessarily beyond lines established by Departmental Representative, with exception of unavoidable slide material. Do not measure slide material, when such slides are attributable to negligence.
 - .2 Loading hauling, placing and compaction of boulders less than 1.5 cubic metres into large embankments.
 - .3 Scarifying or benching existing slopes or existing road surfaces.

- .4 Removing unsuitable material from embankment attributable to negligence.
- .5 Watering, drying or compacting soils to achieve specified densities inclusive of all compaction efforts.
- .6 Proof rolling.
- .7 Compaction of material (150 mm) below subgrade horizon in areas of cut.
- .8 Finishing.

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM D698-00a, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,000 ft-lbf/ft³) (600 kN-m/m³).

1.4 DEFINITIONS

- .1 Type A Solid 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 1.5 cubic metres or more in volume.
- .2 Type D Excavation: excavation of materials that are not Rock Excavation or Stripping.
- .3 Borrow: Suitable material obtained from locations outside the limits of the roadway cut and placed as embankment material.
- .4 Stripping: excavation of organic material covering original ground.
- .5 No overhaul will be paid for materials hauled under this Contract.
- .6 Embankment: material derived from usable excavation and placed above original ground or stripped surface.
- .7 Unsuitable Material: material unsuitable for embankment, embankment foundation or material surplus to requirements.
- .8 Topsoil: material passing a 100 mm sieve and capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

1.5 QUALITY CONTROL

- .1 Regulatory Requirements:
 - .1 Adhere to regulations of authority having jurisdiction when blasting is required.
 - .2 Adhere to Provincial and National Environmental requirements when potentially toxic materials are involved.
- .2 All Quality Control testing by the Contractor.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 35 43 - Environmental Procedures.

Part 2 Products**2.1 MATERIALS**

- .1 Embankment materials require acceptance by Departmental Representative.
- .2 Material used for embankment not to contain more than 3% organic matter by mass, frozen lumps, weeds, sod, roots, logs, stumps or other unsuitable material.
- .3 Borrow material:
 - .1 Obtained from sources as indicated or as designated by Departmental Representative.
 - .2 Obtained from borrow pit approved by Departmental Representative.

Part 3 Execution**3.1 COMPACTION EQUIPMENT**

- .1 Compaction equipment must equivalent of one 12 tonne vibratory packer capable of obtaining required densities in materials on project. Equipment that does not achieve specified densities must be replaced or supplemented.

3.2 WATER DISTRIBUTORS

- .1 Apply water with equipment capable of uniform distribution.

3.3 STRIPPING OF TOPSOIL

- .1 Commence topsoil stripping of areas on acceptance by the Departmental Representative after clearing and grubbing debris have been removed from these areas.
- .2 Strip topsoil to depths as verified by the Departmental Representative. Do not mix topsoil with subsoil. Stripping depth is estimated to be on average 200 mm.
- .3 Stockpile stripped materials alongside the right-of-way outside the cut/fill slopes between km 82.5 and km 88.0 at locations directed by the Departmental Representative. The Contractor is advised that there is limited storage area for this material.
- .4 Contractor to screen stripping material to 100 mm max size prior to placement in stockpile. Load, haul and place screen waste material in the designated Cells at Mannix Pit, as directed by the Departmental Representative.

3.4 EXCAVATING

- .1 General:
 - .1 Notify the Departmental Representative when waste materials are encountered and remove to depth and extent as approved by the Departmental Representative. This material shall be placed on the sideslope outside the 2:1 slope.
 - .2 Subcut below subgrade elevation in cut sections only as approved by the Departmental Representative. Compact top 150 mm below subcut to minimum 95% maximum dry density, ASTM D698 (AASHTO T99). Replace with acceptable embankment material and compact.
 - .3 Treat ground slopes, where subgrade is on transition from excavation to embankment, at grade points in accordance with the Drawings.

- .4 The dimensions of the excavations and embankments shall be, in accordance with the typical sections accompanying these specifications, but the dimensions of any or all excavations and embankments may be increased or decreased at any time by the Departmental Representative as conditions and circumstances may determine.
- .2 Drainage:
 - .1 Maintain profiles, crowns and cross slopes to provide good surface drainage at all times.
 - .2 Provide ditches as work progresses to provide drainage.
- .3 Rock excavation:
 - .1 Notify the Departmental Representative material appearing to conform to classification for rock is encountered, to enable measurements to be made to determine volume of rock. Provide 6 hour notification.
 - .2 The Contractor shall submit statement of qualifications and experience of all personnel assigned to drilling and blasting duties. The driller and the blaster shall have a minimum of 5 consecutive years demonstrated experience in drilling and controlled blasting work on projects involving rock cuts over 8 m height on transportation corridors.
 - .3 The Contractor shall retain a blasting consultant, acceptable to the Departmental Representative, to provide a blast design and quality control. The blast consultant shall not be an employee of the Contractor, explosive manufacturer or explosive distributor. Prior to the pre-construction meeting, the Contractor shall provide the name and qualifications of the blasting consultant. The consultant shall have a minimum of 5 consecutive years demonstrated experience in preparation of successful blast designs along transportation corridors.
 - .4 Submit a Rock Blast Design in accordance with Section 01 33 00 – Submittal Procedures and Section 204.04.07 of the **MoTI Standard** Specification for Highway Construction, current edition.
 - .5 Shatter rock to 300 mm below subgrade elevation.
 - .6 Contractor shall be responsible for safety of all blasting. Particular attention should be paid to control of rock falls from excavation slopes so there is no hazard to Park users and wildlife during construction. Contractor shall advise Departmental Representative 24 hours prior to blasting operations. Contractor shall control blasting so there is no flyrock damaging existing trees and vegetation.
 - .7 All rock on cut face that is loose, hanging or that creates a potentially dangerous situation shall be removed or stabilized during or upon completion of excavation of each lift. Drilling of next lift will not be allowed until this work has been completed. Other methods such as machine scaling, hydraulic splitters or light blasting may be used in lieu of, or to supplement hand scaling.
 - .8 Controlled Blasting:
 - .1 The purpose of controlled blasting is to minimize damage to rock back slope and to help ensure long-term stability.
 - .2 Controlled blasting will involve controlled use of explosives and blasting accessories in carefully spaced and aligned drill holes to produce a free surface or shear plane in rock along specific excavation backs slope. Controlled blasting techniques will be used for this project.

- .3 The slopes of the cut shall be scaled of all loose material and ditches shall be formed and cleaned.
- .4 Subgrade shall be constructed to a true and uniform surface as to line and grade preparatory to application of subbase material.
- .4 Borrow Excavation:
 - .1 Completely use in embankments, suitable materials removed from right-of-way excavations before taking material from borrow areas.
 - .2 Obtain embankment materials, in excess of what is available from cut areas, from designated borrow areas.
 - .3 Departmental Representative to designate extent of borrow areas and allowable depth of excavation.
 - .4 Remove waste and stripping material from borrow pits to designated locations.
 - .5 Slope edges of borrow areas to minimum 3:1 and provide drainage as directed.
 - .6 Trim and leave borrow pits in condition to permit accurate measurement of material removed.

3.5 EMBANKMENTS

- .1 This item consists of the construction of the subgrade in embankments and cuts to the lines, grades, cross-sections and dimensions shown on the drawings.
- .2 Scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces. Method used to be subject to prior approval of the Departmental Representative.
- .3 Do not place material that is frozen nor place material on frozen surfaces except in areas authorized.
- .4 Maintain crowned surface during construction to ensure ready run-off of surface water.
- .5 Drain low areas before placing materials.
 - .1 Place and compact to full width in layers not exceeding 200 mm loose thickness. The Departmental Representative may authorize thicker lifts if specified compaction can be achieved and if material contains more than 25% by volume stone and rock fragments larger than 100 mm.
- .6 Rock Embankments:
 - .1 Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case is layer thickness to exceed 0.6 m.
 - .2 Distribute rock material to fill voids with smaller fragments to form compact mass.
 - .3 Fill surface voids at design elevation with rock spalls or selected material to form earth-tight surface.
 - .4 The Contractor may place rock embankments during freezing conditions provided compaction equipment of sufficient size to break large rock particles is used and all snow and ice is removed from fill surface.
 - .5 The Departmental Representative has no preference for which embankments are constructed with rock fill.
- .7 Deductions from excavation will be made for overbuild of embankments.

3.6 SUBGRADE COMPACTION

- .1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.
- .2 Embankment material shall be placed in successive uniform layers over the entire area as follows:
 - .1 Material containing less than 25 percent by volume of stones larger than 100 mm shall be placed in 200 mm compacted layers.
 - .2 Material containing 25 percent or more by volume of stones larger than 100 mm shall be placed in layers not exceeding the maximum size of the stones. Stones larger than 100 mm shall not be placed within 150 mm of the subgrade elevation.
 - .3 In embankments composed principally of material obtained from rock cuts, the larger stones shall be carefully distributed and the interstices filled with smaller stones and other material to form a compact mass. Such embankments shall be constructed in layers not exceeding 1 metre. The placing of individual rocks and boulder exceeding 1.0 metres in least dimension will be permitted provided they are carefully distributed and the interstices filled with finer material to form a dense and compact mass. Each layer, before starting the next, shall be levelled and smoothed with suitable equipment. Hauling and spreading equipment shall be operated over the full width of each layer.
- .3 Each layer shall be brought to its required degree of compaction throughout its entire width before successive layers are placed.
- .4 Compact each layer to minimum 95% maximum dry density, ASTM D698 (AASHTO T99). Top 300 mm of subgrade to be compacted to 100% maximum dry density, ASTM D698 (AASHTO T99).
- .5 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.
- .6 For rock placed as fill, compact with large steel wheeled or tracked equipment of sufficient size to break larger particles. Compact until rock fill is stable under compaction equipment and all voids are filled.

3.7 PROOF ROLLING

- .1 Proof roll using a loaded tandem truck with tires inflated to normal operation pressures.
- .2 Proof roll subgrade.
- .3 Make sufficient passes with proof roller to subject surface to three separate passes of loaded tire. Departmental Representative to determine level of proof rolling.
- .4 Where proof rolling reveals areas of defective subgrade:
 - .1 Remove subgrade material to depth and extent as directed by the Departmental Representative.
 - .2 Backfill excavated subgrade with common material and compact in accordance with Section 31 24 13 – Roadway and Drainage Excavation.
- .5 Where proof rolling reveals areas of defective subgrade, remove and replace in accordance with the appropriate sections. Removal of defective subgrade material shall be the Contractor's responsibility.

3.8 **FINISHING**

- .1 Shape entire roadbed to within 100 mm of design elevations but not to be uniformly high or low.
- .2 Round top of back slope as shown on the Drawings.
- .3 Remove rocks over 150 mm in dimension from slopes and ditch bottoms.
- .4 Trim between constructed slopes and edge of clearing to provide drainage.

3.9 **PROTECTION**

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

END OF SECTION

31 32 19.01 GEOTEXTILES**Part 1 General****1.1 MEASUREMENT PROCEDURES**

- .1 The supply and installation of Geotextiles including but not limited to non-woven geotextile, geo-grid, silt fences, and geosynthetic berms will not be measured directly for payment and shall be considered incidental to the unit price items.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
- .2 ASTM D4491-99a, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
- .3 ASTM D4595-86(2001), Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
- .4 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.
- .5 ASTM D4751-99a, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .6 Canadian General Standards Board (CGSB)
- .7 CAN/CGSB-4.2 No. 11.2-M89(April 1997), Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
- .8 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
- .9 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
- .10 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
- .11 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
- .12 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
- .13 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.
- .14 Canadian Standards Association (CSA International)
- .15 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .16 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .17 Ontario Provincial Standard Specifications (OPSS)
- .18 OPSS 1860-March 1998, Material Specification for Geotextiles.

1.3 SUBMITTALS

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

- .2 Submit to Departmental Representative following samples at least 4 weeks prior to beginning Work for each type of geotextile used on the project.
- .3 Minimum length of 2 m of roll width of geotextile.
- .4 Minimum of 1 m seam with at least 300 mm of geotextile on both sides of seam.
- .5 Submit to Departmental Representative 4 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.

1.4 DELIVERY, STORAGE AND HANDLING

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

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 35 43, Environmental Procedures.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with the EPP.
- .4 Fold up metal banding, flatten and place in designated area for recycling.

Part 1 Products

1.6 MATERIAL

- .1 Nonwoven geotextile shall meet or exceed the specifications of Nilex 4552 Non Woven Geotextile. If the contractor wishes to propose an alternate non-woven geotextile, the approval is subject to the discretion of the Department Representative.

Part 2 Execution

1.7 INSTALLATION

- .1 Filter Fabric for Rip Rap area requirements:
 - .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with Pins.
 - .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
 - .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
 - .4 Overlap each successive strip of geotextile 600 mm over previously laid strip.
 - .5 Join successive strips of geotextile by sewing.
 - .6 Pin successive strips of geotextile with securing pins at 3m intervals.

- .7 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .8 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- .9 Place and compact Riprap in accordance with Section 31 37 00.
- .10 Install as per manufacturers specifications.

1.8 CLEANING

- .1 Remove construction debris from Project site and dispose of debris in an environmentally responsible and legal manner and in accordance with Section 01 35 43 - Environmental Procedures.

1.9 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION

31 37 00 RIP RAP**Part 1 General****1.1 MEASUREMENT PROCEDURES**

- .1 The quantity of placed Rip Rap that will be measured for payment, shall be the number of cubic metres measured in place and accepted in the completed work, and shall include all labour, equipment and material to satisfactorily complete this item as specified.
- .2 Payment for the supply and placement of BC MoTI Class 10 Rip Rap will be made under **“Unit Price Item 5a – Rip Rap - Class 10”**. Material to be placed in accordance with the Drawings and to the satisfaction of the Departmental Representative.
- .3 Payment for the supply and placement of BC MoTI Class 100 Rip Rap will be made under **“Unit Price Item 5b – Rip Rap - Class 100”**. Material to be placed in accordance with the Drawings and to the satisfaction of the Departmental Representative.
- .4 **No overhaul will be paid for this Work.**
- .5 Suitable Rip Rap material to be sourced from blast rock produced during excavation and delivered to the sites where Rip Rap material is required. Hauling surplus Rip Rap material to Km 81 Quarry shall be considered incidental to the work.
- .5 Processing and sorting blast rock to produce suitable Rip Rap will not be measured for payment and shall be considered incidental to the work.
- .6 Excavation, preparation of Rip Rap base, geotextiles, and any other related materials will be considered incidental to the work.
- .7 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”**, and no additional payment will be made.
- .8 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .9 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 35 43, Environmental Procedures.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Divert leftover geotextiles to recycling facility as approved by Departmental Representative.

Part 2 Products**2.1 STONE**

- .1 Hard, dense with relative density not less than 2.65, free from seams, cracks or other structural defects, to meet following size distribution for use intended:

□

- .1 Stone Rip Rap will be obtained from suitable onsite rock excavation locations. The Contractor will be responsible for sorting of Rip Rap and delivering to the sites where Rip Rap is required.
- .2 Rip Rap for Culverts inlet / outlet, spillways and barrier drains:
 - .1 BC MoTI Class 10 Rip Rap
- .3 Rip Rap for wildlife crossing structure inlets / outlets:
 - .1 BC MoTI Class 100 Rip Rap
 - .2 Supply rock spalls or cobbles to fill open joints.

2.2 GEOTEXTILE FILTER

- .1 Geotextile: in accordance with Section 31 32 19.01 - Geotextiles.

Part 3 Execution

3.1 PLACING

- .1 Contractor shall do the layout for placement of Rip Rap.
- .2 Where Rip Rap is to be placed on slopes, excavate trench at toe of slope to dimensions as indicated.
- .3 Fine grade area where Rip Rap is to be placed, to a uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.
- .4 Place Rip Rap (by machine or by hand) to thickness and details as indicated or as agreed to by the Departmental Representative.
- .5 Place stones in manner accepted by Departmental Representative to secure surface and create a stable mass or to match existing Streambed. On slopes, place larger stones at bottom of slopes.
- .6 Hand placing Rip Rap:
 - .1 Use larger stones for lower courses and as headers for subsequent courses.
 - .2 Stagger vertical joints and fill voids with rock spalls or cobbles.
 - .3 Finish surface evenly, free of large openings and neat in appearance.

END OF SECTION

31 72 13 ROCK BOLTS**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 Specification.

1.2 GENERAL

- .1 Rock bolts consist of the installation of deformed steel bars (tendons) in holes drilled into rock or soil. Rock bolts shall be fully grouted and either tensioned or un-tensioned (dowels) as directed by the Departmental Representative.
- .2 Unless otherwise specified, the Post Tensioning Institute (PTI) recommendations for prestressed rock anchors shall apply to rock bolts and other rock anchoring systems.
- .3 Rock bolting operations shall include, but not be limited to, pre-construction and construction work including quality control, site preparation, selection of appropriate installation method, drilling, sealing, bar insertion, grouting and testing of rock bolts.
- .4 Numerous existing rock bolts have been installed at most of the Work sites. Most of these rock bolts are camouflaged and not visible without close on-slope inspection.
- .5 The required number, length, location, and orientation of rock bolts will be determined on site by the Departmental Representative. The Contractor shall be prepared to install any number of rock bolts ranging up to 9 m in length at any or all of the work sites.
- .6 The Contractor shall maintain on site a Reserve Supply of anchor accessories and grout such that there are no delays for procurement of materials.

1.3 MEASUREMENT PROCEDURES

- .1 Payment for this item will be made under **“Lump Sum Price Item 3 – Prime Cost Sum”**.
- .2 The quantity of anchorages delivered to site shall not exceed the amount approved by the Departmental Representative under the Prime Cost Sum. If required, additional anchor procurement will be authorized by the Departmental Representative.
- .3 Installation of rock bolts shall include the supply of tendons, bearing plates, nuts, hardened flat washers, beveled washers, centralizers, couplers, grout, recessing of plates, and mortar, as well as the drilling, installation, and testing of the rock bolts. Installation of rock bolts will be measured as the length in meters of rock bolts successfully installed and embedded into the ground. Excessive bar protruding from the rock face shall not be measured.
- .4 Payment will not be authorized until all related submittals have been received and approved by the Departmental Representative.
- .5 The established Unit Prices for rock bolts shall be considered full compensation for all rock bolts requirements in this Specification. Scaling to facilitate access to the designated anchoring areas is considered incidental to the Work.

- .6 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”** and no additional payment will be made.
- .7 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .8 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment shall be made to the Contractor.

Part 2 Products

2.1 MATERIALS

- .1 The tendons shall be 25 mm diameter, Grade 517/690 MPa deformed steel bars conforming to CAN/CSA G30.18, such as “Dywidag Threadbar” manufactured by Dywidag Canada Limited, or #8 bar supplied by Williams Form or equivalent as approved by the Departmental Representative.
- .2 Steel bearing plates shall conform to CAN/CSA-G40.21, Grade 300 W and have minimum dimensions of 10 mm by 150 mm by 150 mm. Plates shall be of “calotte” or similar style material to accommodate non-perpendicular alignment of the anchor with the plate.
- .3 Nuts shall be hexagonal head, heavy duty type, with hemispherical end matching the bearing plate and shall conform to ASTM A325. Threads and nuts shall be capable of developing the full strength of the anchor.
- .4 Rock bolts and all associated hardware shall be hot-dip galvanized to CSA G164 & CSA G30.18M. Field cut anchor bar shall be touched up with “Galvanox” zinc-rich paint or equivalent as approved by the Departmental Representative.
- .5 Resin grout or cementitious grout may be used. Resin grout shall not be used where the rock is excessively fractured or wet, as determined by the Departmental Representative.
- .6 Resin Grout shall be the product of an established manufacturer who has been producing these products for at least five (5) years. Resin shall be supplied in cartridge form and have a shelf life of not less than six (6) months, as dated on the container, and be used within the first three (3) months of the shelf life. Cartridges shall be stored in accordance with the manufacturer’s recommendations. Resin used for the anchorage length of the bolt shall have a gel set time of one (1) to two (2) minutes. Resin used to encapsulate the remainder of the bolt length shall have a gel time of fifteen (15) to thirty (30) minutes.
- .7 Cement grout shall be a pre-bagged, non-shrink cementitious product such as “Microsil® Anchor Grout” produced by Basalite Concrete Products, or equivalent as approved by the Departmental Representative. Cement grout shall have a minimum three (3) day and twenty-eight (28) day compressive strengths of 30 MPa and 50 MPa, respectively, when tested in accordance with CAN/CSA A23.2-1B. Equipment for mixing and pumping grout shall be capable of satisfactorily mixing and agitating the grout, and pumping it into the holes at the water/cement ratio recommended by the grout manufacturer. Grouting shall be tremied from the base of the hole to rock face. Cementaceous grouts and mortar shall not be warmer than 30°C or colder than 5°C during mixing or pumping.

- .8 Cement mortar levelling pads shall be SIKKA 212, or equivalent as approved by the Departmental Representative, and shall be mixed, placed, and cured in accordance with the manufacturer's recommendations.

Part 3 Execution

3.1 SUBMITTALS

- .1 Anchor Installation Procedure: Prior to ordering anchor materials, the Contractor shall submit an Anchor Installation Procedure for review by the Departmental Representative. The Installation Procedure shall include product information from the anchor hardware and grout manufacturers including their recommended installation procedures, drilling equipment and hole diameter, grouting and tensioning procedures, calibration certificate(s) for anchor testing equipment, and similar information.
- .2 Anchor Installation Records: The Contractor shall submit anchor installation records to the Departmental Representative daily in a format approved by the Departmental Representative. The records shall include, but shall not be limited to, individual anchor reference number, bar length, bar grade/diameter, depth of anchor distal end, proximal extension from face, proximal bar extension behind nut, over-drill depth, grout type, grout temperature, grout volume used, number of spacers used, grout samples taken, lock off load/tension, date/time tested, as-constructed anchor azimuth, dates/time of staged grouting, and date/time completed.
- .3 Driller's Logs: The Contractor shall submit the Driller's Logs to the Departmental Representative within one (1) day after drilling or upon request. The records shall include, but shall not be limited to, details of flush losses/reductions, inferred faults, depth of overburden, hole diameter, rig type, type of flush, water ingress, jamming during drilling, changes in rock type, and other relevant information that may affect the quality of the anchor installation.
- .4 Grout Testing Results: The Contractor shall submit to the Departmental Representative grout testing results, including but not limited to, Compressive Strength Testing within seven (7) days following completion of testing.
- .5 Mill and Galvanizing Certificates: The Contractor shall submit to the Departmental Representative mill and galvanizing certificates for the anchor bar a minimum of one (1) day prior to installation.
- .6 Calibration Certificates: The Contractor shall submit calibration certificates for testing and tensioning equipment within one (1) day of commencing work on site, including but not limited to, hydraulic jacks, gauges, and torque wrenches.

3.2 QUALITY CONTROL

- .1 Drill and install rock bolts under the direct supervision of an individual having at least four (4) years' experience in the installation of resin and cement grouted rock bolts.
- .2 The first ten (10) rock bolts shall be installed in the presence of the Departmental Representative. Thereafter, a minimum of 20% of the rock bolts shall be tested in the presence of the Departmental Representative.
- .3 Hydraulic jacks, gauges, and torque wrenches used for testing and tensioning of rock bolts shall be calibrated by an independent, certified testing laboratory within one (1) year of use.

- .4 Provide the Departmental Representative with any samples of grouting materials that may be requested for quality assurance testing.
- .5 Grout quality control measures shall comprise:
 - .1 Specific Gravity compliance.
 - .2 Apparent viscosity with an ASTM Flow Cone or Marsh Cone.
 - .3 Bleed tests as per CSA A23.2-1B Clause 6.

3.3

PROCEDURES

- .1 Drill holes for each anchor to a uniform diameter recommended by the tendon manufacturers. In the case of cement grouted rock bolts, drill holes to a nominal diameter of 60 mm, or smaller if required to accommodate an expansion shell anchor. Completely clean holes of all drill cuttings, sludge, debris, and water using clean water and air. In the case of resin grout the borehole diameter shall be compatible with the bar and the resin capsules used.
- .2 Rock bolts shall either be installed with an exposed plate and nut, or with the anchor cut off flush to the rock surface without plate and nut, or with the plate counter sunk into a recess in the rock face as directed by the Departmental Representative.
- .3 If required, Rock bolts shall be installed with sufficient thread exposed to accept a plate and nut and to facilitate tensioning and testing. Where a plate and nut is not required, rock bolts shall be cut off flush with the rock surface after tensioning and testing, and be covered with mortar coated with drill cuttings. Wet burlap shall be placed over all mortar to aid curing.
- .4 Cement grouted rock bolts that are to be tensioned shall use an expansion shell for the bond length anchorage. Use commercially manufactured centralizers at intervals not greater than 2 m to keep the bar centred in the hole. Fill the holes with grout by pumping the grout through a delivery line that extends to the lowest end of the hole, while providing a means of venting at the highest end of the hole. Prior to the grout setting, perform testing and tensioning, and attach the bearing plate and nut (if required).
- .5 Installation – Resin Grouted Anchorages. Insert resin cartridges in the hole. The number of cartridges per hole shall be not less than recommended by the manufacturer for the hole length, diameter, and bar size combination. Add additional cartridges as necessary to ensure holes are completely filled with resin. Use at least three (3) fast setting cartridges at the bottom of the hole for anchorage and slow setting cartridges for the remainder of the hole. Mix the resin by inserting the bolt in the hole and rotating it at a uniform penetration rate, rotation rate and duration as recommended by the resin manufacturer. After allowing the fast setting cartridges to set, but at least 10 minutes prior to the gel time of the slower cartridges, perform testing and tensioning, and attach the bearing plate and nut (if required).
- .6 Remove all excess cement grout from rock surfaces.
- .7 Testing: Testing equipment shall consist of a suitably sized hollow core jack, an adjustable bearing truss for aligning the direction of pull with the centreline of the anchor, an extension bar for attaching the jack to the anchor, a hydraulic pump with a gauge, a calibration chart for the ram/gauge combination that provides the applied load directly in kN, and an independently mounted dial gauge for measuring the strain of the anchor under load. Rock bolts for testing will be selected at random by the Departmental Representative. All testing will be undertaken by the Contractor as directed by the

Departmental Representative. The Contractor shall supply all necessary equipment and be capable of performing the following testing:

- .1 Proof Tests: Prior to grouting the free stressing length of the anchor curing, the bond length of the anchor shall be proof tested by loading the anchor in tension to 184 kN and maintaining the load for five (5) minutes. Rock bolts will be considered to have failed and shall be replaced if total axial movement exceeds 12 mm or if movement continues to occur at or below the test load.
- .2 Pull Tests: After grout within the free stressing length of the anchor has cured, the anchor shall be pull tested by loading the anchor in tension to 184 kN and maintaining the load for five (5) minutes. Rock bolts will be considered to have failed and shall be replaced if the total axial movement exceeds 6 mm or if movement continues to occur at or below the test load. Cement grouted rock bolts shall not be pull tested until at least seven (7) days after grouting.
- .8 The first eight (8) rock bolts shall be proof tested; thereafter, a minimum of 3% of the rock bolts shall be proof tested as selected by the Departmental Representative.
- .9 A minimum of 20% of the rock bolts shall be pull tested as selected by the Departmental Representative.
- .10 Additional tests shall be performed as directed by the Departmental Representative where different rock types or anchor installation conditions are encountered as construction progresses.
- .11 Up to five (5) additional rock bolts in the vicinity of a failed anchor shall be tested as required by the Departmental Representative.
- .12 Tensioning: The Departmental Representative will determine the tension load for each anchor. Tensioning equipment shall consist of the hollow core jack. A calibrated impact or torque wrench may be used for light tension loads, subject to approval by the Departmental Representative. Tensioned rock bolts shall be tensioned before the grout within the free stressing length of the anchor cures. Rock bolts shall be tensioned and locked-off at tensions ranging from 50 kN to 158 kN as directed by the Departmental Representative.
- .13 Un-tensioned rock bolts with a bond length anchorage shall be nominally tensioned to 25 kN using an approved impact or torque wrench. Where a bearing plate and nut is not required, these shall be removed and the protruding length of anchor cut off after the grout in the free stressing length has cured. Un-tensioned rock bolts (cement grouted rock bolts with a plate and nut) shall be nominally tensioned to 25 kN after the grout in the free stressing length has cured.

END OF SECTION

32 01 16.8 FULL DEPTH RECLAMATION**Part 1 General****1.1 GENERAL DESCRIPTION**

- .1 Section 32 01 16.8 refers to those portions of the work that are unique to full depth reclamation of existing road structure. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.
- .2 Full depth reclamation is an in-place reclamation procedure in which the full flexible pavement section and a predetermined portion of the underlying granular materials are uniformly pulverized, blended and incorporated into a base or subbase course; further stabilization may be obtained through the use of additives if approved by the Departmental Representative.

1.2 DEMONSTRATION

- .1 Prior to the start of work, the Contractor shall demonstrate effectiveness of proposed reclamation operation by reclaiming test section of minimum 15m long.

1.3 SAMPLES

- .1 The Contractor shall collect samples and testing for the demonstration section, as directed by Departmental Representative.

1.4 MEASUREMENT AND PAYMENT PROCEDURES

- .1 Payment for Full Depth Reclamation shall be made under **“Unit Price Item 1b – Asphalt Pavement Removal - Full Depth Reclamation”** and shall be the total compensation for all operations involved in full depth reclamation including but not limited to, pulverizing, cold milling, sweeping, grading, conditioning, compacting, testing, and preparation of the surface. Payment shall be made as follows:
 - .1 **“Unit Price Item 1b - Asphalt Pavement Removal - Full Depth Reclamation”** will be measured for payment in square metres of pulverizing of existing roadway, or as directed by the Departmental Representative, and shall include all labour, equipment and material to satisfactorily complete this item of work. The depth of existing surfacing varies by location, actual depth of pulverized material shall be adjusted as directed by the Department Representative in order to achieve the desired blend of 50% asphalt and 50% granular base course if possible.
 - .2 Full depth reclamation shall be completed in the areas shown on the Contract Drawings or as specified by the Department Representative.
 - .3 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 - Traffic Accommodation”** and no separate payment will be made to the Contractor.
 - .4 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”** and no additional payment will be made for remobilization of equipment if all full depth reclamation work cannot be completed at once

- .5 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment shall be made to the Contractor.
- .6 Placement and compaction of reclaimed material for shoulder widening as specified in the Drawings will not be measured for payment and will be considered incidental to **“Unit Price Item 1b - Asphalt Pavement Removal - Full Depth Reclamation”**.
- .2 Payment for the placement and compaction of additional base materials for grading works as shown in the design drawings will be paid under **“Unit Price Item 8 – Granular Base Course”**
- .3 Payment of additives, if requested by the Departmental Representative, will be paid under **“Lump Sum Price Item 3 – Prime Cost Sum”**.

1.5 INSPECTION AND TESTING

- .1 The Contractor shall complete proctor testing of samples of reclaimed demonstration section material to establish optimum moisture content and compaction requirements in accordance with ASTM D698 test procedures for modified proctor density.
- .2 The Contractor shall prepare additional demonstration sections and lab testing as directed by the Departmental Representative if it is determined that the pulverized material has substantially changed characteristics due to differing in situ pavement and subgrade or base course conditions from initial demonstration section.
- .3 The Contractor shall complete one (1) ASTM D698 test procedures for modified proctor density per 25,000 m³ of reclaimed material or whenever the composition of the material changes.

Part 2 Products

2.1 MATERIALS

- .1 Material produced from this procedure to be well graded with a maximum particle size of 38mm.

2.2 ADDITIVES

- .1 Liquid additives do not include water.
- .2 The Contractor shall store, transport, handle and apply in a manner so as to ensure no spillage or discharge into adjacent ditches or streams.
- .3 The Contractor shall protect all surfaces treated with additives from inclement weather.

Part 3 Execution

3.1 EQUIPMENT

- .1 The Contractor shall maintain equipment at all times in first class working condition. The Contractor shall use skilled and experienced operators.
- .2 The Contractor shall have the capability to effectively pulverize and blend existing pavement and underlying subbase and/or base materials to achieve. To have capability to handle various types and thicknesses of pavement surface, from 25mm to 250mm of asphalt concrete, to a maximum depth including subbase and/or base material of 400mm.

- .1 To be complete with integral metered liquid additive system to introduce liquid additives uniformly and accurately to blended materials concurrent with pulverizing and placement and only when equipment is moving.
- .2 Metering system to include a totalizer, so amount of liquid addition used during any given period can be read directly, and a litre per minute gauge to indicate instantaneous flow rate during blending operation.

3.2 PREPARATION

- .1 The Contractor shall schedule reclamation operations to minimize traffic disruption.
- .2 The Contractor shall neatly cut existing asphaltic concrete pavement at limits of reclamation operation, or mill as directed by the Departmental Representative.
- .3 The Contractor shall protect adjacent pavement, curb and gutter, appurtenances (manhole castings, valve covers) from damage.

3.3 CONSTRUCTION PROCEDURES

- .1 The Contractor shall pulverize existing pavement and a minimum of 100mm of base materials and blend so entire mass of material is uniformly graded. Disperse liquid additive, if required, uniformly throughout processed material during pulverizing and blending operation.
- .2 Remove all material with any dimension greater than 38mm.
- .3 After material has been processed, the Contractor shall shape, grade and compact to lines, grades and depth as shown on Drawings or as directed by the Departmental Representative.
- .4 Water shall be applied to ensure optimum moisture content at time of blending and compaction. The Contractor shall uniformly compact restored cross section to density not less than 100% Standard Proctor density. The Contractor shall be responsible for any double handling, excavating, loading, hauling, placing, conditioning as required to meet the required density and moisture, and no additional payment shall be made.
- .5 The Contractor shall determine a suitable and consistent compaction and rolling pattern that reliably correlates with the point at which repeated ASTM D 2922 Shallow Depth Nuclear tested density ceases to increase with additional compaction effort. Once this compaction pattern is established and accepted by the Departmental Representative the Contractor may proceed. The Departmental Representative may require the Contractor to re-test and examine the Contractor's compaction and rolling pattern should the materials, conditions, equipment or any other factor reasonably affecting the outcome change from the previous test.
- .6 Where additional granular material is required, the Contractor shall place material on the road surface prior to reclaiming or spread the material on the surface of reclaimed material and blend with reclaimed material.
- .7 The Contractor shall complete the reclamation procedures in continuous segments. The Contractor shall complete each segment, compact, and pave bottom course asphalt by end of each day and open to traffic. The Contractor shall not be permitted to leave reclaimed sections of highway unpaved (bottom lift only required) at end of work day.

3.4 DISPOSAL

- .1 The Contractor shall dispose waste material to an approved off-site disposal area unless specified otherwise in Contract Documents.

3.5 ACCEPTANCE PARAMETERS

- .1 The Contractor shall not proceed with paving or otherwise covering a section of Full Depth Reclamation until the underlying work is accepted by the Departmental Representative. Acceptance will be based on the following:
 - .1 **Rut Resistance** - Any aggregate supplied must, in addition to meeting the gradation requirements specified, not rut when proof rolled with a truck having a 9 tonne single axle dual tire or 17 tonne tandem axle group with dual tires with a tire pressure of 600kPa. Any aggregate which does rut shall be removed and replaced, or blended with suitable aggregates, to meet both the gradation requirement and the rut resistance requirement.
 - .2 **Proof Rolling and Stabilizing Crushed Base Course** - Before acceptance, each compacted course of base course aggregate shall receive one complete coverage by the tires of a truck having a 9 tonne single axle dual tire or 17 tonne tandem axle group with dual tires with a tire pressure of 600 kPa.
 - .3 Any areas where rutting or displacement occurs shall be either excavated or replaced and proof rolled or stabilized by the addition of suitable blending material incorporated uniformly into the base to the satisfaction of the Departmental Representative.
 - .4 The supply, load, haul, placing, proof rolling, and mixing of such stabilizing aggregates as necessary to correct deficiencies in aggregate if requested by the Departmental Representative, will be paid under **“Lump Sum Item 3 - Prime Cost Sum”**. Blending may be performed at the pit or quarry or on the highway in a manner acceptable to the Departmental Representative.

3.6 FINISHING

- .1 Shape entire roadbed to within 15 mm of design elevations but shall not be either uniformly high or low.
- .2 Round top of back slope as shown on the Drawings.

3.7 PROTECTION

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

END OF SECTION

32 11 19 GRANULAR SUB BASE COURSE**Part 1 General****1.1 MEASUREMENT AND PAYMENT PROCEDURES**

- .1 Quantity of Granular Sub-base course for that payment will be made shall be the number of tonnes incorporated into Work and accepted by Departmental Representative, and shall include all labour, equipment and material required to satisfactorily complete this item of work. If no weigh scales are available, the end area method of volumetric calculation will be used with a conversion factor of 2.2 tonnes/m³. Payment will be under **“Unit Price Item 6 – Granular Sub-Base Course”**.
- .2 Supply, loading, hauling, placing, compacting, water for compaction and drying will be incidental to the Work.
- .3 No overhaul will be paid for this Work.
- .4 Supply, installation and maintenance and calibration of weight scales and a scale house by the Contractor shall be considered incidental to the contract and no additional payment will be measured for payment.
- .5 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”**, and no additional payment will be made.
- .6 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .7 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM C136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D422-63(1998), Standard Test Method for Particle-Size Analysis of Soils.
 - .5 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
 - .6 ASTM D1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³) (2,700kN-m/m³).
 - .7 ASTM D1883-99, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
 - .8 ASTM D4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

1.3 **QUALITY CONTROL**

- .1 All Quality Control testing by the Contractor.

1.4 **WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Divert unused granular material to Niblock Pit as approved by Departmental Representative.

Part 2 Products

2.1 **MATERIALS**

- .1 BC MoTI 50mm well-graded base material to be supplied by the contractor from outside the Park or produced from suitable material excavated from within the design cuts and structure excavations.

Part 3 Execution

3.1 **PLACING**

- .1 Load, haul and place granular subbase after subgrade is inspected and accepted by Departmental Representative.
- .2 Construct granular subbase to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice. For each lift, material shall be placed on crown line using a Tonne / metre Spread Sheet. Contractor shall have a checker to indicate spread distance when material is being placed.
- .5 Begin spreading subbase material on crown line or high side of one-way slope.
- .6 Place granular subbase materials using methods that do not lead to segregation or degradation.
- .7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds that will place material in uniform layers of required thickness.
- .8 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Departmental Representative may authorize thicker lifts if specified compaction can be achieved.
- .9 Shape each layer to smooth contour and compact to the specified density before succeeding layer is placed.
- .10 Remove and replace portion of layer in which material has become segregated during spreading.

3.2 **COMPACTION**

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

- .2 Compact to density of not less than 100% maximum dry density in accordance with ASTM D698.
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted subbase.
- .4 Apply water as necessary during compaction to obtain specified density.
- .5 Dry as necessary to obtain specified density.
- .6 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.
- .7 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 **SITE TOLERANCES**

- .1 Finished subbase surface to be within 15 mm of elevation as indicated but not uniformly high or low.

3.4 **PROTECTION**

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

END OF SECTION

32 11 20 SELECT GRANULAR SUB-BASE-COURSE**Part 1 General****1.1 MEASUREMENT AND PAYMENT PROCEDURES**

- .1 Quantity of BC MoTI Select Granular Sub Base (SGSB) for which payment will be made shall be the number of tonnes incorporated into Work and accepted by Departmental Representative, and shall include all labour, equipment and material required to satisfactorily complete this item of work. If no weigh scales are available, the end area method of volumetric calculation will be used with a conversion factor of 2.2 tonnes/m³. Payment will be under **“Unit Price Item 7 – Select Granular Sub Base Course”** and shall include supply, loading, hauling, placing, compacting, water for compaction and drying of material.
- .2 No overhaul will be paid for this Work.
- .3 Supply, installation and maintenance and calibration of weight scales and a scale house by the Contractor shall be considered incidental to the contract and no additional payment will be measured for payment.
- .4 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”**, and no additional payment will be made.
- .5 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .6 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM C136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D422-63(1998), Standard Test Method for Particle-Size Analysis of Soils.
 - .5 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
 - .6 ASTM D1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³) (2,700kN-m/m³).
 - .7 ASTM D1883-99, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
 - .8 ASTM D4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

1.3 **QUALITY CONTROL AND QUALITY ASSURANCE**

- .1 All Quality Control and quality assurance testing by the Contractor.

1.4 **WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 35 43 – Environmental Procedures.
- .2 Divert unused Select Granular Sub Base material to Niblock Pit.

Part 2 Products

2.1 **MATERIALS**

- .1 BC MoTI Select Granular Sub Base (SGSB) material is to be supplied by the contractor from outside the Park or produced from suitable material excavated from within the design cuts and structure excavations.

Part 3 Execution

3.1 **PLACING**

- .1 Select Granular Sub Base (SGSB)
 - .1 Load, haul and place SGSB after subgrade has achieved the requirements of this specification.
 - .2 Construct SGSB to depth and grade in areas indicated on the drawings.
 - .3 Ensure no frozen material is placed.
 - .4 Place material only on clean unfrozen surface, free from snow or ice. For each lift, material shall be placed on crown line using a Tonne / metre Spread Sheet. Contractor shall have a checker to indicate spread distance when material is being placed.
 - .5 Begin spreading SGSB material on crown line or high side of one-way slope.
 - .6 Place granular SGSB materials using methods that do not lead to segregation or degradation.
 - .7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds that will place material in uniform layers of required thickness.
 - .8 Place material to full width in uniform layers not exceeding 300 mm compacted thickness.
 - .9 Shape each layer to smooth contour and compact to the specified density before succeeding layer is placed.
 - .10 Remove and replace portion of layer in which material has become segregated during spreading.

3.2 COMPACTION

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Compact to density of not less than 95% maximum dry density in accordance with ASTM D698.
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted subgrade.
- .4 Apply water as necessary during compaction to obtain specified density.
- .5 Dry as necessary to obtain specified density.
- .6 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers.
- .7 Heavy earth compacting equipment or other heavy construction equipment shall not be used within 3.0m of the abutments or wing walls.
- .8 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .9 Proof rolling
 - .1 For proof rolling use standard roller of 45,400 kg gross mass with four pneumatic tires each carrying 11,350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.
 - .2 Obtain acceptance from Departmental Representative to use non-standard proof rolling equipment.
 - .3 Proof roll granular base. If use of non-standard proof rolling equipment is approved, Departmental Representative to accept level of proof rolling.
 - .4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
 - .5 Where proof rolling reveals areas of defective subgrade:
 - .1 Remove SGSB and subgrade material to depth and extent as directed by Departmental Representative.
 - .2 Backfill excavated subgrade with suitable Type D material and compact in accordance with Section 31 24 13 – Roadway and Drainage Excavation.
 - .3 Replace SGSB material and compact in accordance with Section 32 11 19 – Select Granular Subbase Course.
 - .6 Where proof rolling reveals defective SGSB or subgrade, remove defective materials to depth and extent as directed by Departmental Representative and replace with new materials in accordance with the appropriate sections at no extra cost.

3.3 SITE TOLERANCES

- .1 Finished subgrade surface to be within 50 mm of elevation as indicated but not uniformly high or low.

3.4 PROTECTION

- .1 Maintain finished subgrade in condition conforming to this section until succeeding base is constructed.

END OF SECTION

32 11 24 GRANULAR BASE COURSE**Part 1 General****1.1 MEASUREMENT AND PAYMENT PROCEDURES**

- .1 Quantity of Granular Base course for which payment will be made shall be the number of tonnes incorporated into Work and accepted by Departmental Representative, and shall include all labour, equipment and material required to satisfactorily complete this item of work. If no weigh scales are available, the end area method of volumetric calculation will be used with a conversion factor of 2.2 tonnes/m³. Payment will be under **“Unit Price Item 8 – Granular Base Course”**.
- .2 Supply, loading, hauling, placing, compacting, water for compaction and drying will be incidental to the Work.
- .3 No overhaul will be paid for this Work.
- .4 Supply, installation and maintenance and calibration of weight scales and a scale house by the Contractor shall be considered incidental to the contract and no additional payment will be measured for payment.
- .5 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”**, and no additional payment will be made.
- .6 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .7 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM C136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
 - .5 ASTM D1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³) (2,700kN-m/m³).
 - .6 ASTM D1883-99, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
 - .7 ASTM D4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

- .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

1.3 **QUALITY CONTROL**

- .1 All Quality Control testing by the Contractor.

1.4 **WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Divert unused granular material to Niblock Pit as accepted by Departmental Representative.

Part 2 Products

2.1 **MATERIALS**

- .1 BC MoTI 25mm Well Graded Base material to be supplied by the contractor from outside the Park or produced from suitable material excavated from within the design cuts and structure excavations.

Part 3 Execution

3.1 **SEQUENCE OF OPERATION**

- .1 Load, haul and place granular base after granular sub-base course surface is inspected and accepted by Departmental Representative.
- .2 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, free from snow and ice. For each lift, material shall be placed on crown line using a Tonne / metre Spread Sheet. Contractor shall have a checker to indicate spread distance when material is being placed.
 - .4 Begin spreading base material on crown line or on high side of one-way slope.
 - .5 Place material using methods that do not lead to segregation or degradation of aggregate.
 - .6 For spreading and shaping material, use spreader boxes having adjustable templates or screeds that will place material in uniform layers of required thickness.
 - .7 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Departmental Representative may authorize thicker lifts if specified compaction can be achieved.
 - .8 Shape each layer to smooth contour and compact to the specified density before succeeding layer is placed.
 - .9 Remove and replace that portion of layer in which material becomes segregated during spreading.

3.2 COMPACTION EQUIPMENT

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Compact to density not less than 100% maximum dry density in accordance with ASTM D698.
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
- .4 Apply water as necessary during compacting to obtain specified density.
- .5 Dry as necessary to obtain specified compaction.
- .6 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.
- .7 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .8 Proof rolling
 - .1 For proof rolling use standard roller of 45,400 kg gross mass with four pneumatic tires each carrying 11,350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.
 - .2 Obtain acceptance from Departmental Representative to use non-standard proof rolling equipment.
 - .3 Proof roll granular base. If use of non-standard proof rolling equipment is approved, Departmental Representative to accept level of proof rolling.
 - .4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
 - .5 Where proof rolling reveals areas of defective subgrade:
 - .1 Remove base, SGSB and subgrade material to depth and extent as directed by Departmental Representative.
 - .2 Backfill excavated subgrade with common material and compact in accordance with Section 31 24 13 - Roadway and Drainage Excavation.
 - .3 Replace subbase material and compact in accordance with Section 32 11 19 - Granular Subbase.
 - .4 Replace base material and compact in accordance with this Section.
 - .6 Where proof rolling reveals defective base, SGSB or subgrade, remove defective materials to depth and extent as directed by Departmental Representative and replace with new materials in accordance with the appropriate sections at no extra cost.

3.3 SITE TOLERANCES

- .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.4 PROTECTION

- .1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Departmental Representative.

END OF SECTION

32 12 13.23 ASPHALT PRIME**Part 1 General****1.1 SECTION INCLUDES**

- .1 Asphalt prime is not required unless otherwise directed by Departmental Representative.
- .2 Materials and application of asphalt prime to granular base surface prior to asphalt paving where approved by the Departmental Representative.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

- .1 Supply, Delivery and Application of asphalt prime, as directed by Departmental Representative, will be made under **“Lump Sum Price Item 3 – Prime Cost Sum”** and shall include all labour, equipment and material to satisfactorily complete this item of work

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM D140-01, Standard Practice for Sampling Bituminous Materials.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-16.1-M89, Cutback Asphalts for Road Purposes.
 - .2 CAN/CGSB-16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.

1.4 SUBMITTALS

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit two 1 L samples of asphalt prime proposed for use in new, clean, air tight sealed, wide mouth, bottles made with plastic, to Departmental Representative, at least 2 weeks prior to commencing work.
- .3 Sample asphalt prime coat materials in accordance with ASTM D140.
- .4 Provide access on tank truck for Departmental Representative to sample asphalt material to be incorporated into Work, in accordance with ASTM D140.

1.5 QUALITY ASSURANCE

- .1 Upon request from Departmental Representative, submit manufacturer's test data and certification that asphalt prime material meets requirements of this Section.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials to ASTM D140.
- .2 Provide, maintain and restore asphalt storage area.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 35 43 – Environmental Procedures.
- .2 Divert unused asphalt materials to facility capable of recycling materials.

Part 2 Products**2.1 MATERIAL**

- .1 Asphalt material: to CAN/CGSB-16.1 grade: RM-20, MC-30, MC-250.
CAN/CGSB-16.2 grade: SS-1.
- .2 Sand blotter: clean granular material passing 4.75 mm sieve and free from organic matter or other deleterious materials.
- .3 Water: clean, potable, free from foreign matter.

2.2 EQUIPMENT

- .1 Pressure distributor to be:
 - .1 Designed, equipped, maintained and operated so that asphalt material can be:
 - .2 Maintained at even temperature.
 - .3 Applied uniformly on variable widths of surface up to 5 m.
 - .4 Applied at controlled rates from 0.2 to 5.4 L/m² with uniform pressure, and allowable variation from any specified rate not exceeding 0.1 L/m².
 - .5 Distributed in uniform spray without atomization at temperature required.
- .2 Equipped with meter registering metres of travel 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 that registers temperature of liquid in reservoir.
- .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.
- .8 Cleaned if previously used with incompatible asphalt material.

Part 3 Execution**3.1 APPLICATION**

- .1 Obtain Departmental Representative's acceptance of granular base surface and authorization to apply before applying asphalt prime.
- .2 Cutback asphalt:
 - .1 Heat asphalt prime to a temperature for pumping and spraying as recommended by the supplier.
 - .2 Apply asphalt prime to granular base at rate recommended by the supplier and accepted by the Departmental Representative.
 - .3 Apply on dry surface unless otherwise directed by Departmental Representative.
- .3 Anionic emulsified asphalt:
 - .1 Dilute asphalt emulsion with clean water at 1:1 ratio for application.

- .2 Mix thoroughly by pumping or other method approved by Departmental Representative.
- .3 Apply diluted asphalt emulsion at rate recommended by the supplier and approved by the Departmental Representative.
- .4 Apply diluted asphalt emulsion on damp surface unless otherwise directed by Departmental Representative.
- .4 Apply asphalt prime only on unfrozen surface.
- .5 Do not apply prime when air temperature is less than 10 degrees C or when rain is forecast within 2 hours.
- .6 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt prime material.
- .7 Where traffic is to be maintained, treat no more than one-half width of surface in one application.
- .8 Prevent overlap at junction of applications.
- .9 Do not prime surfaces that will be visible when paving is complete.
- .10 Apply additional material to areas not sufficiently covered as directed by Departmental Representative.
- .11 Keep traffic off primed areas until asphalt prime has set.
- .12 Permit prime to set before placing asphalt paving.

3.2 **USE OF SAND BLOTTER**

- .1 If asphalt prime fails to penetrate within 24 hours, spread sand blotter material in amounts required to absorb excess material.
- .2 Allow sufficient time for excess prime to be absorbed.
- .3 Apply second application of sand blotter as required.

END OF SECTION

32 12 13.16 ASPHALT TACK COAT**Part 1 General****1.1 MEASUREMENT PROCEDURES**

- .1 Supply and delivery of tack coat material shall be paid under **“Lump Sum Price Item 3a – Prime Cost Sum – Bituminous Materials.”**
- .2 Application of tack coat will not be measured separately for payment and will be considered incidental to **“Unit Price Item 9 – Asphalt Concrete Pavement (EPS)”**.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM D140-01, Standard Practice for Sampling Bituminous Materials.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.

1.3 SUBMITTALS

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit two 1 L samples of asphalt tack coat material proposed for use in new, clean, airtight, sealed, wide mouth bottles made with plastic to Departmental Representative, at least 2 weeks prior to beginning Work.
- .3 Sample asphalt tack coat material to: ASTM D140.
- .4 Provide access on tank truck for Departmental Representative to sample asphalt material to be incorporated into Work, in accordance with ASTM D140.

1.4 QUALITY ASSURANCE

- .1 Upon request by Departmental Representative, submit manufacturer's test data and certification that asphalt tack coat material meets requirements of this Section.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with ASTM D140.
- .2 Provide, maintain and restore asphalt storage area.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 35 43 - Environmental Procedures and with the Waste Reduction Work Plan.
- .2 Divert unused asphalt materials to facility capable of recycling materials.

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 Pressure distributor to be:
 - .1 Designed, equipped, maintained and operated so that asphalt material can be:
 - .2 Maintained at even temperature.
 - .3 Applied uniformly on variable widths of surface up to 5 m.
 - .4 Applied at readily determined and controlled rates from 0.2 to 5.4 L/m² with uniform pressure, and with an allowable variation from any specified rate not exceeding 0.1 L/m².
 - .5 Distributed in uniform spray without atomization at temperature required.
 - .6 Equipped with meter, registering metres of travel per minute, visibly located to enable truck driver to maintain constant speed required for application at specified rate.
 - .7 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.
 - .8 Equipped with an easily read, accurate and sensitive device that registers temperature of liquid in reservoir.
 - .9 Equipped with accurate volume measuring device or calibrated tank.
 - .10 Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.
 - .11 Equipped with nozzle spray bar, with operational height adjustment.
 - .12 Cleaned if previously used with incompatible asphalt material.

Part 3 Execution

3.1 APPLICATION

- .1 Obtain Departmental Representative's approval of surface before applying asphalt tack coat.
- .2 Apply asphalt tack coat only on clean and dry surface.
- .3 Dilute asphalt emulsion with water at 1:1 ratio for application.
 - .1 Mix thoroughly by pumping or other method accepted by Departmental Representative.
- .4 Apply asphalt tack coat evenly to pavement surface at rate as directed by Departmental Representative, of 0.5 L/m² plus or minus 0.2 L/m².
- .5 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt tack coat material.
- .6 Do not apply asphalt tack coat when air temperature is less than 10 degrees Celsius or when rain is forecast within 2 hours of application.
- .7 Apply asphalt tack coat only on unfrozen surface.
- .8 Evenly distribute localized excessive deposits of tack coat by brooming as directed by Departmental Representative.
- .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 Departmental Representative.
- .12 Permit asphalt tack coat to set before placing asphalt pavement.

END OF SECTION

32 12 16 ASPHALT CONCRETE PAVEMENT (EPS)**Part 1 General****1.1 WORK DESCRIPTION**

- .1 Work shall consist of supplying, loading, hauling and placing BC MoTI Medium Mix Class 1 Asphalt Concrete Pavement as shown on the Contract Drawings, or as directed by the Departmental Representative
- .2 For the Class 1 mix, asphalt aggregate used shall consist of a 19mm Medium Mix Asphalt Aggregate in accordance with BC MoTI – 2012 Standard Specifications for Highway Construction Section 502 – Asphalt Pavement Construction (EPS).
- .3 Asphalt Cement used shall be 150-200A penetration grade in accordance with BC MoTI – 2012 Standard Specifications for Highway Construction Section 502 – Asphalt Pavement Construction (EPS).
- .4 **The use of Reclaimed Asphalt Pavement (RAP) in the asphalt mix designs is not permitted.**
- .5 Perform mix designs for BC MoTI Class 1 Asphalt Concrete Pavement using Asphalt Cement 150-200A penetration grade and 19mm Asphalt Aggregate. Mix design is subject to acceptance by the Departmental Representative.
- .6 Milled Rumble Strips to be installed on the TCH as detailed herein and as directed by the Departmental Representative.

1.2 MEASUREMENT PROCEDURES AND UNIT PRICE ADJUSTMENTS

- .1 Accepted asphalt concrete pavement will be measured in tonnes and will be paid for at the unit price for “Asphalt Concrete Pavement”. Payment shall be compensation in full for supply of asphalt concrete mix including all materials, supply and application of tack coat, processing, plant mixing, loading, hauling, paver laying, compacting, finishing surface, raking, interim and final lane marking, quality control testing, safety, and maintenance. Payments will be made accordingly under **“Unit Price Item 9a - Asphalt Concrete Pavement (EPS) – BC MoTI Class I Medium Mix Asphalt Concrete”**.
- .2 Applicable payment adjustments (additions or subtractions as applicable) shall be applied to top lift only in accordance with BC MoTI – Standard Specifications for Highway Construction Section 502 – Asphalt Pavement Construction (EPS). Payments shall be under **“Lump Sum Price Item 3 – Prime Cost Sum”**.
- .3 Supply, installation, maintenance, calibration of weight scales and a scale house, or alternately electronic calibrated silo scales, at the plant by the Contractor shall be considered incidental to **“Unit Price Item 9 - Asphalt Concrete Pavement (EPS)”** and no additional payment will be measured for payment. A scale person will be provided if required.
- .4 Preparing asphalt mix designs (including anti-stripping test), **by a qualified test laboratory licensed to practice in British Columbia** shall be considered incidental to **“Unit Price Item 9 – Asphalt Concrete Pavement (EPS)”** and no additional payment will be measured for payment.
- .5 The movement of equipment and crew, shall be considered incidental to **“Unit Price Item 9 – Asphalt Concrete Pavement (EPS)”** for the type of asphalt placed. A move is

defined as the Contractor moving equipment and crew to the next section to pave after having completed, in its totality, the previous section.

- .6 No overhaul will be considered for payment under this contract.**
- .7** Supply and delivery of asphalt cement, and anti-stripping agent(s), if required and accepted by the Departmental Representative, shall be paid under **“Lump Sum Price Item 3a – Prime Cost Sum – Bituminous Materials”**.
- .8** Payment for the installation of the Milled Rumble Strips shall be made under **“Unit Price Item 9b – Asphalt Concrete Pavement (EPS) - Milled Rumble Strips”**
- .9** Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 - Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .10** Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”** and no additional payment will be made.
- .11** Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor.

Part 2 Products

2.1 MATERIALS

- .1** Materials used shall be in accordance with BC MoTI – 2012 Standard Specifications for Highway Construction Section 502 – Asphalt Pavement Construction (EPS).
- .2** BC MoTI Class 1 -19mm Medium Asphalt Aggregate is available from stockpiles at Mannix Pit.
- .3** Penetration grade 150-200A Asphalt Cement shall be used on the TCH.

Part 3 Execution

3.1 METHODOLOGY

- .1** ACP placement:
 - .1** Asphalt concrete mix shall not be placed when the air temperature is below 4°C, or when the weather is rainy.
 - .2** Asphalt concrete mix shall be placed only on clean, dry, and unfrozen surfaces.
 - .3** Unless otherwise shown on the plans, the asphalt concrete mix shall be placed in the following lift thicknesses:
 - .1** in a single lift when the design compacted total thickness is 75 mm or less.
 - .2** in two or more lifts when the design compacted total thickness is greater than 75 mm. The lift thickness selection shall be determined by the Contractor except that:
 - .1** the maximum thickness of any lift shall be 75 mm.
 - .2** the minimum thickness of a final lift shall be 50 mm.

- .3 On widenings, the thickness of asphalt concrete mix up to 75 mm may be placed in one lift. Over 75 mm thickness, the asphalt concrete shall be placed in two lifts.
- .2 Milled Rumble Strips shall be installed in accordance with BC MoTI – Supplement to TAC Geometric Design Guide Section 650 – Rumble Strips. The Milled Rumble Strips shall be continuous SRS and are to be installed at various locations along the TCH or as directed by the Departmental Representative.
- .3 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor.

3.2 **EQUIPMENT, PLANT AND MIXING REQUIREMENTS**

- .1 Execution of the Work shall be in accordance with BC MoTI - 2012 Standard Specifications for Highway Construction Section 502 – Asphalt Pavement Construction (EPS) and Section 504 – Pavement Drainage
- .2 The contractor will be permitted to setup a Mobile Asphalt Plant or use a Stationary Asphalt Plant for this Project. If used, mobile asphalt plant shall be set up at Mannix Pit at the direction of the Departmental Representative.
- .3 Asphalt plant to be used on this project, regardless of location, shall be a minimum of 200 tonne per hour production plant, equipped with a dry bag system for pollution control, in addition to, or in replacement of standard cyclone dust collectors, to effectively eliminate emissions of dust and smoke pollutants into the atmosphere. Use of secondary dust collection systems, requiring discharge of dust polluted water into settling ponds or drainage system will not be permitted. In addition Asphalt plant must comply with all environmental pollution control regulations applicable in the asphalt plant area. The plant operator must make daily inspections of the emission control components, to ensure proper working order and provide the most recent stack monitoring results for viewing by the Departmental Representative or his designate.

END OF SECTION

32 16 15 CONCRETE CURBS AND GUTTERS**Part 1 General****1.2 DESCRIPTION**

- .1 Supply and installation of concrete curb and gutter at locations shown on the Drawings or as directed by the Departmental Representative.

1.3 REFERENCES

- .1 BC MoTI – 2012 Standard Specifications for Highway Construction – Section 582 Concrete Curb and Gutter and Storm Drainage (BC MoTI – SS582).
- .2 CSA A23.1-09
- .3 CSA A23.2-09

1.4 MEASUREMENT FOR PAYMENT

- .1 Supply and installation of concrete curb and gutter in accordance with these specifications. The measurement for payment shall be the number of linear metres, of complete concrete curb and gutter supplied, installed, and accepted by the Departmental Representative, and shall be inclusive of all costs of labour, materials, tools and equipment to satisfactorily complete this work including site preparation, forming, and finalization. Payment will be made under **“Unit Price Item 10 – Concrete Curbs and Gutters - Supply and Install”**.
- .2 Backfill against the curb to the lines, levels, cross-sections, and extents described in the Drawings and as directed by the Departmental Representative shall be considered incidental to **“Unit Price Item 10 – Concrete Curbs and Gutters - Supply and Install”** and no additional payment will be made.
- .3 Traffic Control required during work identified under this Section shall be included under **“Lump Sum Price Item 2 - Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .4 Mobilization and demobilization required for this Work shall be included under **“Lump Sum Price Item 1 - Mobilization / Demobilization”** and no separate payment will be made to the Contractor.
- .5 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment shall be made to the Contractor.

1.5 QUALITY CONTROL

- .1 Contractor to provide quality control documentation as per Section 01 45 00 – Quality Control and as per BC MoTI – SS582, and CSA A23.1-09 applicable.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Store materials in accordance with manufacturer's recommendations
 - .1 Replace defective or damaged materials with new.

Part 1 Products**1.7 GENERAL**

- .1 Concrete curb and gutter to be in accordance with BC MoTI – SS582 but have a typical cross section as indicated in the Drawings.

1.8 WASTE MATERIALS

- .1 Waste materials shall dispose of it outside the National Parks in an approved facility. Contractor to supply disposal ticket(s) to Departmental Representative for approval of disposal site(s) prior to its disposal.

1.9 MATERIAL

- .1 Concrete to be supplied in accordance with CSA A23.1-09 and CSA A23.2-09 under the Performance Alternative method of specification.
- .2 Concrete mix for cast in place curb and gutter shall be designed for C-2 Class exposures as per CSA 23.1.

Part 2 Execution**1.10 PREPARATION**

- .1 Complete pavement removal in accordance with relevant section.

1.11 REMOVAL AND DISPOSAL

- .1 Remove existing concrete curb and gutter in accordance with these specifications.
- .2 Prepare area for installation of new concrete curb and gutter.

1.12 INSTALLATION

- .1 Contractor shall perform all relevant layout and notify the Departmental Representative prior to proceeding.
- .2 Contractor to prepare the base surface, form, and pour the concrete curb and gutter.

1.13 BACKFILL

- .1 Following required curing, the Contractor is to remove forms and backfill the curb as shown on the Contract Drawings or as directed by the Departmental Representative.

1.14 CLEANUP

- .1 Cleanup of work sites as accepted by the Departmental representative in accordance with the Contract Documents.

END OF SECTION

32 17 23 PAVEMENT MARKING**Part 1 General****1.1 REFERENCES**

- .1 CAN/CGSB-1.5-M99 Low Flash Petroleum Spirits Thinner.
- .2 CGSB1-GP-12C-83 Standard Paint Colours.
- .3 CGSB1-GP-71-83 Method, of Testing Paints and Pigments.
- .4 CAN/CGSB 1.74-01 Alkyd Traffic Paint.
- .5 U.S. FED-STD-595B, 1989 – Colours Used in Government Procurement.
- .6 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.2 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative following material sample quantities at least 4 weeks prior to commencing work.
 - .1 Two samples of each type of paint.
 - .2 One sample of glass beads.
 - .3 Sampling to CGSB1-GP-71.
- .3 Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, CGSB specification number and formulation number and batch number.

1.3 MEASUREMENT FOR PAYMENT

- .1 Temporary Pavement Marking including supply of paint and reflective glass beads in accordance with Section 01 35 00.06 - Special Procedures for Traffic Control shall be considered incidental to the contract and will not be measured for payment.
- .2 Payment for final pavement line markings as requested by the Departmental Representative will be made under **“Unit Price Item 11a – Pavement Marking – Lane Painting”** and shall be measured along the centreline of painted lines regardless of line type or line to gap ratio and will include all labour, equipment and material to satisfactorily complete this item of work.
- .3 Payment for final pavement gore and hatching markings as requested by the Departmental Representative will be made under **“Unit Price Item 11b – Pavement Markings - Inlay Thermoplastic Gore and Hatch Marking”** and shall be measured in square metres of inlay thermoplastic paint accepted and will include all labour, equipment and material to satisfactorily complete this item of work.
- .4 Payment for final pavement turning arrow and stop bar markings if requested by the Departmental Representative will be made under **“Unit Price Item 11c – Pavement Marking – Inlay Thermoplastic Arrow and Stop Bar Marking”** and shall include all labour, equipment and material to satisfactorily complete this item of work.
- .5 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 - Traffic Accommodation”** and no separate payment will be made to the Contractor.

- .6 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”** and no additional payment will be made.
- .7 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor.

Part 2 Products

2.1 MATERIALS

- .1 Paint:
 - .1 To CGSB 1.74-2001-CAN/CGSB, alkyd traffic paint.
 - .2 Colour: to FED-STD-595B, yellow 33538 and white 37925.
 - .3 Upon request, Departmental Representative will supply a qualified product list of paints applicable to work. Qualified paints may be used but Departmental Representative reserves right to perform further tests.
- .2 Thinner: to CAN/CGSB-1.4-2000.
- .3 Glass beads:
 - .1 Overlay type: to CGSB1-GP-74M.

2.2 SUPPLY, STORAGE AND HANDLING

- .1 Storage and handling shall meet the requirements of Section 01 35 43 - Environmental Procedures and Section 02 81 01 - Hazardous Materials.
- .2 The Contractor shall make all arrangements for the supply and delivery of paint and glass beads and shall provide the Departmental Representative with records of all materials received and/or returned, on a daily basis.
- .3 The Contractor shall provide, maintain and reclaim all material storage sites.
- .4 No paint formulation shall be diluted or mixed with a different formulation or with any other material, without the specific approval of the Departmental Representative.
- .5 The Contractor shall take all necessary steps to prevent contamination of the materials. Paint shall be protected from freezing.
- .6 The Contractor shall be responsible for the proper clean-up of waste or spilled material, and the proper disposition of containers.

Part 3 Execution

3.1 EQUIPMENT REQUIREMENTS

- .1 Paint applicator to be an approved pressure type mobile distributor capable of applying paint in single, double and dashed lines. Applicator to be capable of applying marking components uniformly, at rates specified, and to dimensions as indicated, and to have positive shut-off.
- .2 Distributor to be capable of applying reflective glass beads as an overlay on freshly applied paint.

3.2 CONDITION OF SURFACES

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

3.3 TRAFFIC CONTROL

- .1 In accordance with Section 01 35 00.06 and Contractor's Traffic Management Plan.

3.4 APPLICATION

- .1 Pavement markings to be laid out by Contractor.
- .2 Apply paint only when air temperature is above 10°C, wind speed is less than 60 km/h and no rain is forecast within next 4 h.
- .3 Apply traffic paint evenly at rate of 3 L/m².
- .4 Do not thin paint.
- .5 Paint lines to be of uniform colour and density with sharp edges.
- .6 Thoroughly clean distributor tank before refilling with paint of different colour.
- .7 Apply glass beads at rate of 200 g/m² of painted area immediately after application of paint.

3.5 TOLERANCE

- .1 Paint markings to be within plus or minus 12 mm of dimensions indicated.
- .2 Remove incorrect markings as directed by the Departmental Representative at Contractor's cost.

3.6 QUALITY CONTROL INSPECTION PLAN

- .1 The Contractor is responsible for quality control inspection throughout every stage of the work to ensure that materials and workmanship comply with the requirements of this specification.
- .2 The Contractor shall develop and submit a Quality Control Inspection Program (QCIP) that addresses all the elements that affect the quality of the line painting including, but not limited to:
 - .1 Paint Application Rates.
 - .2 Glass Bead Application Rates.
 - .3 Pavement Surface and Atmospheric Conditions.
 - .4 Line Widths, Line Lengths and Space Lengths.
- .3 The Contractor shall maintain records of QCIP data, complaints from the public, and other details relevant to the Work and shall provide these records to the Departmental Representative daily.

3.7 HIGHWAY OPERATION

- .1 Highway operation shall be in accordance with the Contractor's Traffic Management Plan and shall meet the following requirements:
 - .1 General
 - .1 Painting shall be carried out during hours of daylight between ½ hour after sunrise and ½ hour before sunset. Generally, the Contractor may

paint lines during any day of the week but is cautioned that traffic volumes are usually higher on all highways on Friday, Saturday and Sunday.

- .2 Operation of the painting truck against the flow of traffic will not be permitted.
- .3 Loading glass beads or paint onto the painting truck is not permitted on a roadway surface.

.2 Operation of Companion Vehicles

- .1 When the roadway to be painted is open to public traffic, the Contractor shall operate a crash attenuator vehicle and a pilot vehicle in conjunction with the painting truck during the painting of all longitudinal lines. Companion vehicle operators shall not attempt to control traffic from inside the vehicle.
- .2 The actual operating parameters of the companion vehicles will be determined by the Contractor to safely accommodate traffic and will be based on site specific conditions such as sight distances, highway geometrics and traffic patterns and volumes. Typical operating parameters are as follows:
 - .1 The crash attenuator vehicle shall be equipped with a crash attenuator that meets National Cooperative Highway Research Program, Report 350 Test Criterion. Test Level 3 for 100 km/hr. The vehicle shall follow behind the painting truck at a distance of 50 to 400 m.
 - .2 The pilot vehicle shall be driven in the same travel lane as the paint machine, following it at a constant distance of approximately two kilometres.
 - .3 The crash attenuator vehicle, pilot truck and the painting truck are to display the same message at all times. The painting truck and the companion vehicles shall be equipped with a two-way radio for communication and overhead revolving beacon with an amber lens of a minimum 180 mm high and 180 mm wide.

3.8 **PROTECTION OF COMPLETED WORK**

- .1 Protect pavement markings until dry.

END OF SECTION

32 17 31 GUIDE POSTS**Part 1 General****1.1 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.28-98, Exterior Alkyd House Paint.

1.2 SUBMITTALS

- .1 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Notify Departmental Representative at least 4 weeks prior to installation of proposed source of guide posts and provide access for inspection.

1.3 MEASUREMENT PROCEDURES

- .1 Measurement for payment for Supply and Installation of Plastic Guide Posts will be based on each post installed according to these specifications, and shall include all labour, equipment and material to satisfactorily complete this item of work. Payment will be made under **“Unit Price Item 12 – Supply and Installation of Guide Posts”**.
- .2 Removal, disposal and/or storage of existing posts being replaced will be incidental to the Work.
- .3 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”**, and no additional payment will be made.
- .4 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .5 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor.

1.4 QUALITY ASSURANCE

- .1 Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Storage and Protection:
 - .1 Stockpile guide posts as recommended by the Supplier.
 - .2 Stockpile guide posts at Niblock Pit.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Divert unused metal and/or plastic materials to recycling facility approved by Departmental Representative.

- .3 Damaged posts from the removal of existing posts to recycling facility accepted by the Departmental Representative.

Part 2 Materials

2.1 ROUND PLASTIC POSTS

- .1 The flexible guide posts shall return to upright positions following repeated impacts and passages of vehicles over them. Such collisions shall not cause serious damage to the post or vehicle. Failure to conform to the requirements specified herein shall be cause for rejection.
- .2 General
 - .1 The posts shall be of uniform quality and workmanship and be free from defects.
 - .2 The Contractor shall provide a complete report of the physical properties of the post to the Departmental Representative. This report shall include properties such as low temperature impact resistance, after-impact recoverability and weather resistance.
- .3 Specifications - Dimensions, Colour and Construction
 - .1 The round posts shall have a minimum outer diameter of 90 mm and on overall length of 1.97 metres.
 - .2 The top 250 mm of the post length shall be black and the remainder shall be white.
 - .3 The post shall be straight. Straight is defined as having no point along the length of the post any more than 6 mm removed from a perfectly straight edge placed parallel to any side of the post.
 - .4 Round posts shall be open at the top and bottom.
 - .5 The surface of the post shall be smooth and free from irregularities or defects. The surface of the post shall not be affected by cleaning using scrapers, detergent and water, or solvent.
 - .6 The black portion of the post shall accept and hold securely high-intensity reflectorized sheeting applied to its surface area with heavy-duty stainless steel staples, glue or other adhesives deemed suitable by the manufacturer.
 - .7 If one piece construction is not used, then the connections between the pieces shall be at least as strong as if constructed of a single piece. The strength shall exist at temperatures ranging from -50°C to 50°C.
 - .8 The reflective portion of round posts shall be visible from all directions and shall be of sufficient size so as to be recognizable in the dark as a guide post reflector. The reflective portion of semi-flat posts shall be visible to traffic.
- .4 Weather Resistance and Durability
 - .1 The post shall not be seriously affected by ozone, exhaust fumes, asphalt or road oils, dirt, vegetation, deicing salts or any other types of air contamination or materials likely to be encountered after installation.
 - .2 The post shall withstand without serious damage all elements likely to be encountered after installation including hot (50°C) or cold (-50°C) temperatures, rain, snow, hail, abrasion and physical abuse.
- .5 Strength and Flexibility

- .1 The posts shall resist, without breaking, tearing, shattering or other serious damage, one highway vehicle impact at a speed of 100 km/h at a test temperature of -33°C.
- .2 The post shall not bend, warp or distort when installed at temperatures up to 50°C or installed in wind velocities up to 120 km/h.
- .6 High-Intensity Reflectorized Sheeting
 - .1 Each post shall have a 50 mm wide reflective sheeting material fastened between 100 mm and 150 mm from the top of the post. The reflective sheeting shall be green when the guidepost is used to mark the edges of approaches located on curves, and white in all other instances. When green is required, white sheeting shall be screen printed green using a process recommended by the sheeting manufacturer.
 - .2 The reflective sheeting material shall be high-intensity encapsulated glass bead reflective sheeting meeting or exceeding the minimum requirements as specified in ASTM-D4956, performance requirement Type III and Class I pressure sensitive adhesive backing requirements.

Part 3 Execution

3.1 INSTALLATION

- .1 Install posts to details as straight and plumbed vertically to a uniform depth of 0.6 m below finished grade.
- .2 Excavate post holes to minimum diameter of 150 mm and compact bottom of hole to provide firm foundation. Set post plumb and backfill with competent material in 150 mm layers. Compact each layer before placing succeeding layer.
- .3 Remove existing posts. Non-damaged posts to be stored at Niblock Pit (TCH km 0.5) Icefields Parkway. Damaged posts to be hauled to recycling facility.

3.2 CLEANING

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

END OF SECTION

32 32 34 REINFORCED SOIL RETAINING WALL**Part 1 General****1.1 DESCRIPTION**

- .1 Work for this item shall include the following:
 - .1 Design of retaining wall using materials suitable for the area in accordance with the Geotechnical Report, and materials found on the accepted product list, including sub-surface drainage;
 - .2 Supply all labour and materials required for the storage of the retaining wall in a secure location to be provided by the Contractor and approved by the Departmental Representative.
 - .3 Construction of the retaining wall prior to the Construction Completion date.
 - .4 Incidental work and cleanup related to the construction of the retaining wall.

1.2 MEASUREMENT PROCEDURES

- .1 "Design and Build" provide an all-inclusive unit price for supply, design and build of the retaining wall system including but not limited to design, shoring, levelling pad, concrete facing panels, coping, wall elements, geotextiles, anchors, concrete sealer, extruded poly styrene subsurface drainage, and various accessories and minor components needed for installation.
- .2 The retaining wall supply will be measured in square metres of face area designed, supplied and stored at a secure location and accepted by the Departmental Representative. Payment will be under **"Unit Price Item 13a – Reinforced Soil Retaining Wall – Design and Supply"**.
- .3 The installation of the retaining wall system shall include the retrieval of the stored materials from the Contractor's storage location, transportation of the materials to site, and the installation of the retaining wall system. Payment shall be made under **"Unit Price Item 13b - Reinforced Soil Retaining Wall – Install"** and shall include all labour, equipment, consumables, and incidentals required to complete the work.
- .4 Excavation of existing embankment material and shall be measured and paid in accordance with Section 31 24 13 Roadway and Drainage Excavation.
- .5 Placement and compaction of select native backfill from on-site stockpiles shall be measured and paid in accordance with Section 31 24 13 Roadway and Drainage Excavation.
- .6 The supply, placement and compaction of granular backfill within the wall reinforced soil zone shall be measured and paid in accordance with Section 32 11 19 Granular Sub Base Course.
- .7 The supply, placement and compaction of imported Drain Rock Material shall not be measured for payment and will be considered incidental to **"Unit Price Item 13 – Reinforced Soil Retaining Wall"**
- .8 The supply, installation and use of shoring systems to complete the excavation shall be considered incidental to the unit price items.

- .9 Supply and installation of geotextiles and geogrid materials shall be incidental to the work.
- .10 Design, supply and installation of sub-surface drainage systems including perforated Pipe Drains, discharge pipes, and cleanouts shall be considered incidental to the contract.
- .11 Supply and application of the concrete sealer shall be considered incidental to the contract.
- .12 Supply and construction of the concrete coping shall be considered incidental to the work.
- .13 Traffic Control required for this Work shall be incidental to **“Lump Sum Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .14 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 Mobilization/ Demobilization”** and no additional payment will be made.
- .15 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor.
- .16 The preparation of detailed retaining wall design; construction staging plans and any supplemental geotechnical investigations deemed required by the wall design engineer; are incidental to retaining wall construction. No additional payment will be made for this item.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM D698-98, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
 - .1 ASTM D1248, Specification for Corrugated Plastic Pipe.
 - .2 ASTM D3031, Specification for Polyvinyl Chloride (PVC) Plastic Pipe.

1.4 DESIGN CRITERIA

- .1 The Contractor shall consider all of the recommendation in the geotechnical report in developing their design and construction techniques.
- .2 The Contractor shall reference the geotechnical report for recommendations on the wall design criteria.
- .3 Design code: CAN/CSA – S6 06 including the limit states approach, Items not covered by CAN/CSA-S6-06, or unless noted otherwise, shall be governed by ASSHTO Standard Specifications for Highway Bridges, Seventeenth Edition, 2002, including applicable interim revisions.
- .4 Service life: 75 years with corrosion calculation based on 100 year minimum service life
- .5 Cast in place or precast concrete copings shall be designed with a positive connection to the wall facing and shall be constructed to provide a smooth alignment at the top of the wall with not abrupt changes in horizontal and vertical alignment.

- .6 Length of reinforcing elements to be as required for internal and external stability, but not less than 80 % of wall height measured above levelling pad, or 3 m, whichever is greater.
- .7 Consider both internal and external stability of wall system in design. External stability to include safety against sliding, overturning, bearing failure, temporary slope stability and global stability.
- .8 All designs, calculations and drawings shall be stamped by a Professional Engineer licensed to practice in British Columbia.

1.5 STAGED CONSTRUCTION

- .1 Provisions for staged construction, if required, shall be shown in the design drawings, including any temporary support required, until retaining wall is complete.

1.6 STORAGE AND HANDLING

- .1 The Contractor shall follow storage and handling instructions of supplier of reinforced soil type retaining wall system.
- .2 The Contractor shall prevent chipping and cracking of precast concrete facing panels and damaged components to embedded connectors for reinforcing elements.
- .3 The Contractor shall prevent damage to galvanized coating of steel reinforcing elements or polymer geogrid reinforcement. Repair or replace as directed by Departmental Representative.
- .4 The Contractor shall prevent staining or other defacement of front surfaces of facing panels during storage and handling. Repair or replace as directed by Departmental Representative.
- .5 The Contractor shall store geotextiles at temperature above minus 10°C and rolled materials may be laid flat or stood on end.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 35 43 – Environmental Procedures.
- .2 All waste materials and construction debris shall be hauled out of the Park to an approved location for disposal.
- .3 Any unused materials shall be either disposed of outside of the Park, or retained by PCA at the discretion of the Departmental Representative.

Part 2 Products

2.1 REINFORCED SOIL WALL SYSTEMS FOR RETAINING WALLS

- .1 Acceptable Proprietary Retaining Wall Systems:
 - .1 Ministry of Transportation and Infrastructure, Recognized Product List, December 1, 2015 Edition, for retaining walls – (up to 9m in height) Concrete Faced walls on page 73.
 - .2 Dry pack (zero slump) concrete products will not be allowed. Wet poured concrete products may be used with a 4 – 6% entrained air.

- .2 Reinforced Soil walls shall incorporate Portland cement concrete facing panels; installed at 90 degrees, placed vertical or plumb, from the supporting foundations.
- .3 The Contractor shall provide the Departmental Representative with a sample of the proposed concrete facing panels for acceptance of colour and exposed wall face pattern prior to initiating wall design. An acceptable wall face panel will be plain with low relief texture, minimal patterning, concrete grey colour and will blend with the surrounded landscape colour and texture.
- .4 The Contractor shall provide the Departmental Representative with (1) electronic copy of complete working drawings, and (1) electronic copy of any geotechnical reports including investigation of global stability for the wall and one (1) electronic copy of detailed design calculations, for review at least 4 weeks prior to beginning construction. Drawings shall indicate details including but not limited to: dimensions of panels, wall elevations, sections and grade profile.
- .5 The Contractor shall verify existing site conditions, soil characteristics/properties required for wall design and ground elevations before preparing working drawings.
- .6 The Contractor shall use only one type of proprietary wall system for the Work. The Contractor shall not substitute for any component normally supplied by supplier of proprietary wall system. The Contractor shall not use more than one type of soil reinforcing element on each structure.

2.2 MATERIALS

- .1 BC MoTI 50mm well-graded base material to be used for the reinforced soil zone and shall be supplied by the contractor from outside the Park or produced from suitable material excavated from within the design cuts and structure excavations.
- .2 Drain Rock material to be supplied by the Contractor or produced from suitable material excavated from within the design cuts and structure excavations. Granular filter material shall meet the following requirements:
 - .1 Screened stone or gravel.
 - .2 Gradations to be within limits specified when tested to ASTM C136.
 - .3 Gradation Table 16 mm Drain Rock

Sieve Designation	% Passing
25 mm	-
16 mm	-100
4.75 mm	70-100
2.00 mm	60- 95
0.425 mm	15- 40
0.180 mm	0- 10
0.075 mm	-
- .3 The Contractor is to ensure that the graduation and physical properties of any native excavated stockpiled materials meets the specific requirements of the wall system that the Contractor is proposing.
 - .1 Native material meeting the wall system manufacturer's specifications may be used as backfill.
- .4 Reinforced Soil walls shall have a concrete facing panel. Provide Departmental Representative with samples of proposed facing for acceptance of colour and wall face pattern prior to initiating wall design. An acceptable wall face will be plain with a low

relief texture, minimal patterning and will blend with the surrounding landscape colour and texture.

- .5 Polymer geogrid soil reinforcing elements: high density polyethylene, uniaxial geogrid in accordance with Ministry of Transportation and Infrastructure, Recognized Product List, **December 1 2015** Edition only.
- .6 Connectors - facing panels to soil reinforcing elements: to specifications of supplier of wall system.
- .7 Levelling pads for facing elements: to specifications of supplier of wall system.
- .8 Perforated pipe sub-drain: in accordance with Section 33 46 19 – Perforated Pipe Drains.

2.3 TECHNICAL ASSISTANCE

- .1 The Contractor shall arrange for technical representative of supplier of the wall system to be on site at 25%, 50%, 75% and 100% completion, at a minimum, of wall construction to ensure correct installation procedures. The Contractor shall arrange for subsequent visits as directed by Departmental Representative.

Part 3 Execution

3.1 EXCAVATION AND FOUNDATION PREPARATION

- .1 The Contractor shall excavate, and prepare soil foundation for the retaining wall system in accordance with Section 31 24 14 – Roadway and Drainage Excavation.

3.2 LEVELLING PAD

- .1 The Contractor may elect to construct a leveling pad as part of the retaining wall system, and will include details of the pad in the design if applicable.

3.3 ERECTION OF FACING PANEL WALL

- .1 Erect facing panels and coping in accordance with instructions of supplier of wall system. Construct to lines, grades and elevations as indicated.
- .2 The Contractor shall provide temporary clamps, hardwood wedges or other means to properly align and level facing panels, and to allow for rotation of panels as backfilling operations proceed.
- .3 The Contractor shall brace at least first row of facing panels externally as directed by the system supplier.
- .4 The Contractor shall install permeable joint fillers, geotextile filters, and other means, as indicated by wall system supplier, to prevent washing of backfill particles through joints.

3.4 SOIL REINFORCING ELEMENTS

- .1 Install reinforcing elements as indicated and to requirements of supplier of wall system.
- .2 Place reinforcing elements perpendicular to facing panels, except where indicated otherwise.

- .3 Lay reinforcing elements horizontally, on compacted backfill. Connect to facing panels as indicated and as instructed by supplier of wall system. For geogrids, pull and anchor taut before placing overlying backfill and ensure that slack in connections to facing panels is removed.

3.5 SUB-DRAINS

- .1 The Contractor shall construct perforated pipe sub-drains in accordance with system supplier's requirements, and to lines, grades, and elevations as indicated.

3.6 BACKFILLING

- .1 The Contractor shall backfill behind facing panels in accordance with system specifications and to following requirements.
 - .1 Place backfill by closely following erection of each lift of facing panels and to requirements of supplier of wall system.
 - .2 At each level of soil reinforcing elements, grade and compact backfill to same elevation as connections with facing panels, before placing reinforcing.
 - .3 Place backfill so as not to displace or buckle reinforcing elements. Avoid sudden braking and sharp turning of tracked and rubber-tired equipment on backfill. Place backfill in direction away from masonry blocks or facing panels. Before operating tracked vehicles over soil reinforcement, place minimum fill thickness of 200 mm above any level of soil reinforcing.
 - .4 Place and compact backfill without causing displacement or rotation of facing panels beyond supplier tolerances. Use only hand-held or hand-guided compacting equipment within 1 m of facing panels.
 - .5 Compact backfill at moisture content not exceeding optimum value in accordance with system supplier's specifications.
 - .6 Ensure that backfill is in contact with soil reinforcing elements for full length of each element. Ensure that backfill occupies open spaces between solid components of wire mesh and geogrids.
 - .7 Backfill excavation in front of wall as soon as required alignment of modular blocks is assured and when approved by Departmental Representative.

3.7 TOLERANCES

- .1 Manufacturing and Installation shall meet manufacturer's specifications and / or drawings.
- .2 Tolerances of precast elements to CAN-A23.4, Section 10.
- .3 Length of precast elements not to vary from design length by more than plus or minus 20 mm.
- .4 Cross sectional dimensions of precast elements not to vary from design dimensions by more than plus or minus 5mm.
- .5 Deviations from straight lines not to exceed 10mm in 3 m
- .6 Precast elements not to vary by more than plus or minus 5 mm from true overall cross sectional shape as measured by difference in diagonal dimensions.

END OF SECTION

32 91 19.13 TOPSOIL PLACEMENT AND GRADING**Part 1 General****1.1 MATERIAL SUPPLIED BY DEPARTMENTAL REPRESENTATIVE**

- .1 Topsoil to be native organic soils stripped and screened from the contract work area stockpiled at locations along the TCH as directed by the Departmental Representative.

1.2 MEASUREMENT PROCEDURES

- .1 Measure placing of topsoil in cubic metres removed from stockpile.
 - .1 Stockpiles will be measured by Departmental Representative and volume of topsoil removed calculated by average end area method.
 - .2 Includes preparation of sub-grade for placing of topsoil.
 - .3 Includes finish grading.
- .2 Measure supply and application of soil amendments, including fertilizer, in standard commercial units of weight/volume as determined by Departmental Representative.
 - .1 Measure applied in cubic metres of soil amendment supplied.

1.3 PAYMENT PROCEDURES

- .1 Payment for stripping will be made in accordance with Section 31 24 13 - Roadway and Drainage Excavation.
- .2 Topsoil placement and finishing will be measured by the cubic metre as measure in original position (from stockpiles) acceptably installed within the areas indicated on the Drawings or as approved by the Departmental Representative. Payment for topsoil placement shall be full compensation for all labour, equipment, materials and incidentals required load, haul from stockpiles, place, fine grade, and prepare the topsoil materials for planting in accordance with the requirements of the Specifications, Drawings and direction of the Departmental Representative. Payment will be made under **“Unit Price Item 14 – Placement of Topsoil on Finished Slopes”**.
- .3 Payment for testing of topsoil to be paid under **“Lump Sum Price Item 3 - Prime Cost Sum”**.
- .4 Payment for supply and application of soil amendments, including fertilizer will be paid under **“Lump Sum Price Item 3 – Prime Cost Sum”**.

1.4 REFERENCES

- .1 Agriculture and Agri-Food Canada
 - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Canadian Council of Ministers of the Environment
 - .1 PN1340-[2005], Guidelines for Compost Quality.
- .3 Canadian Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[December 2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System For New Construction and Major Renovations.
- .4 U.S. Environmental Protection Agency (EPA)/Office of Water

- .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.5 DEFINITIONS

- .1 Compost:
 - .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
 - .2 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).

1.6 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 LEED Submittals:
 - .1 Submit erosion and sedimentation control plan for Credit SSp1 in accordance with LEED Canada-NC.
- .3 Quality control submittals:
 - .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.

1.7 QUALITY ASSURANCE

- .1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 31 00 Project Managing and Coordination.01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 35 43 Environmental Procedures.
- .2 Divert unused soil amendments from landfill to official hazardous material collections site approved by Departmental Representative.
- .3 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 TOPSOIL

- .1 Topsoil for seeded areas and planting beds: mixture of particulates, microorganisms and organic matter that provides suitable medium for supporting intended plant growth.
 - .1 Native topsoil to be stripped from on-site sources.
 - .2 Contain no toxic elements or growth inhibiting materials.
 - .3 Finished surface free from:
 - .1 Debris and stones over 100 mm diameter.
 - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

2.2 SOIL AMENDMENTS

- .1 Fertilizer:
 - .1 Fertility: major soil nutrients present in following amounts:
 - .2 Nitrogen (N): 45 micrograms of available N per gram of topsoil.
 - .3 Phosphorus (P): 25 micrograms of phosphate per gram of topsoil.
 - .4 Potassium (K): 20 micrograms of potassium per gram of topsoil.
 - .5 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
 - .6 Ph value: 6.5 to 8.0
 - .7 Revise fertilizer blend as directed by Departmental Representative to comply with soil test analysis.
- .2 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

2.3 SOURCE QUALITY CONTROL

- .1 Advise Departmental Representative of sources of topsoil and manufactured topsoil to be utilized with sufficient lead time for testing.
- .2 Contractor is responsible for amendments to supply topsoil as specified.
- .3 Soil testing by recognized testing facility for PH, P and K, and organic matter.
- .4 Testing of topsoil will be carried out by testing laboratory designated by Departmental Representative.
 - .1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

Part 3 Execution**3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of sediment and erosion control drawings, sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PREPARATION OF EXISTING GRADE

- .1 Verify that grades are correct.
 - .1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
- .2 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
- .3 Remove debris that protrudes more than 75mm above surface.
- .4 Dispose of removed material off site.
- .4 Cultivate entire area that is to receive topsoil to minimum depth of 100 mm.
- .5 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.3 **PLACING AND SPREADING OF TOPSOIL / PLANTING SOIL**

- .1 Place topsoil after Departmental Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 100 mm.
- .3 Spread topsoil as indicated to following minimum depths after settlement.
 - .1 100 mm for seeded areas.
 - .2 600 mm for shrub beds.
- .4 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.4 **FINISH GRADING**

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
 - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.
 - .1 Leave surfaces smooth, uniform and firm against deep footprinting.

3.5 **ACCEPTANCE**

- .1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.6 **SURPLUS MATERIAL**

- .1 Dispose of materials, except topsoil not required, where directed by Departmental Representative off site.

END OF SECTION

32 92 22 SEEDING**Part 1 General****1.1 DESCRIPTION OF WORK**

- .1 The work covered by this specification shall consist of: hydraulically seeding and fertilizing in the areas within the limits of construction, or as designated by the Departmental Representative.

1.2 MEASUREMENT FOR PAYMENT

- .1 Hydraulic Seeding will be measured by the hectare acceptably installed, complete with fertilizer, and resulting in full grass growth, 75% germination and growth of specified seed mixture, within the dimensions indicated on the Drawings or as approved by the Departmental Representative. Payment for hydraulic seeding shall be full compensation for all labour, equipment, materials and incidentals required to place the materials in accordance with the requirements of the Specifications, Drawings and direction of the Departmental Representative. Payment shall be paid under **“Unit Price Item 15 – Hydraulic Seeding”**
- .2 Areas of blending into existing landscape will not be measured for payment.
- .3 Maintenance is incidental and will not be paid for separately.
- .4 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”**, and no additional payment will be made.
- .5 Traffic Control required for this Work shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .6 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor.

1.3 SUBMITTALS

- .1 Product Data
 - .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Provide product data for:
 - .1 Seed
 - .2 Mulch
 - .3 Tackifier/Soil Stabilizer
 - .4 Fertilizer
 - .3 Submit in writing to Departmental Representative 14 days prior to commencing work:
 - .1 Volume capacity of hydraulic seeder in litres.
 - .2 Amount of material to be used per tank based on volume.
 - .3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.

1.4 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

1.5 MATERIAL DELIVERY, HANDLING AND STORAGE

- .1 Use all means necessary to protect all materials before, during and after installation. Provide adequate protection to materials that may deteriorate if exposed to weather.
- .2 Fertilizer shall be packaged in waterproof bags labelled clearly, indicating net mass, analysis and manufacturer. Store on pallets and protect from weather.
- .3 Seed to be stored in dry weatherproof place and shall be protected from damage by heat, rodents and other causes. Deliver and store grass seed in original packages with label indicating:
 - .1 Analysis of seed mixture;
 - .2 Percentage of pure seed by weight;
 - .3 Year of production;
 - .4 Net mass, and
 - .5 Date tagged and location.

Part 2 Products**2.1 SEED**

- .1 Seed shall be Certified Canada No. 1 Grade quality seed varieties, in accordance with the Canadian Seeds Act and Regulations, and having a minimum purity of 97% and germination of 75%. Seed shall be free of impurities and disease.
- .2 Seed mix for all applications to be the following, by weight:
 - 15% Adanac Slender Wheatgrass
 - 15% Fringed Bromegrass
 - 15% Nortran Tufted Hairgrass
 - 15% Fowl Bluegrass
 - 10% ARC Plateau Rocky Mountain Fescue
 - 5% ARC Mountain Junegrass
 - 10% ARC Glacier Alpine Bluegrass
 - 10% ARC Sentinel Spike Trisetum
 - 5% Citation III Perennial Ryegrass
- .3 Seeding rate to be 35 kg/ha for mechanical seeding and 100 kg/ha for hydraulic seeding.
- .4 Seed tags to be retained and given to the Departmental Representative.
- .5 Seed mix shall be free of Scentless Chamomile, Downy Brome and Canada Thistle.

2.2 FERTILIZER

- .1 Fertilizer 1 shall be a 45-25-20 mixture. This fertilizer shall be applied at the time of seeding at a rate of 300kg/ha.
- .2 Contractor to verify fertilizer blend and application rate following testing of topsoil.

2.3 WATER

- .1 Water shall be free of impurities that would inhibit germination and growth as available from Banff National Park.

2.4 SOIL STABILIZER/TACKIFIER

- .1 Soil stabilizer/tackifier shall be a nontoxic, colourless copolymer emulsion with no less than 52.6% solids.

2.5 MULCH

- .1 Wood fibre mulch shall be manufactured from virgin wood fibres and contain not less than 3% of an organic tackifier by volume. **Cellulose type products are not acceptable.**

Part 3 Execution**3.1 GENERAL**

- .1 Contractor shall advise Departmental Representative prior to the start of seeding operations.
- .2 Contractor shall mechanically remove any weeds prior to seeding. Weed removal method to be approved by Departmental Representative prior to commencement. This will be incidental to the work.
- .3 Contractor shall ensure that equipment is steam cleaned, free of soil and seed from previous project to prevent site contamination.
- .4 Seeding shall be done upon completion of stripped soil material/chip compost placement.
- .5 Contractor shall not perform work under adverse field conditions such as frozen soil, excessively wet or dry soil, or soil covered with snow, ice or standing water.
- .6 Contractor shall hydraulic seed only during dry weather conditions with no rain forecasted for the next 24 hours and ensuring a seasonably dry seedbed to provide for proper curing of soil stabilizers/tackifier. Contractor shall check weather conditions to ensure soil stabilizer has sufficient time to cure prior to heavy rainfall.
- .7 Seeding shall be done to ensure a catch satisfactory to the Departmental Representative's approval. In areas where seed fails to germinate for whatever reason, the Contractor shall re-cultivate and reseed until acceptable germination takes place.
- .8 Contractor shall carry out seeding in locations as shown on Drawings or, as directed by Departmental Representative.

3.2 HYDRAULIC SEEDING

- .1 The following application rates are the minimum required for hydraulic seeding:
 - .1 Seed: 100 kg/hectare
 - .2 Fertilizer: 300 kg/hectare (45-25-20 or Pre-Approved Equivalent)
 - .3 Mulch: 1500 kg/hectare
 - .4 Tackifier: As per Manufacturer's Instructions
 - .5 Water: 30,000 L/hectare

- .2 The Contractor shall measure quantities of materials by weight, or weight calibrated Contractor to calculate and submit applicable area of coverage per tank load of slurry in accordance with Section 01 33 00 – Submittal Procedures
- .3 Contractor shall physically stake and identify limits of tank coverage prior to seeding to the satisfaction of Departmental Representative.
- .4 Each tank load of slurry shall be fully applied within the designated boundaries for each load as staked volume measurement, to the satisfaction of the Departmental Representative.
- .5 The Contractor shall fill the tank half full with required water and add mulch while continuing to fill with water. Seed mix and fertilizer is to be added. All material is to be added into the hydraulic seeder under agitation. The Contractor shall pulverize mulch with tackifier and charge slowly into seeder.
- .6 The Contractor shall charge soil stabilizer/tackifier into seeder after all other material is well mixed in seeder. Contractor shall mix slowly to avoid foaming but thoroughly to complete slurry.
- .7 The Contractor shall use hydraulic seeding equipment with a minimum slurry tank capacity of 4500 litres.
- .8 The Contractor's equipment shall have an agitation system for slurry capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and mechanical method:
 - .1 Pumps shall be capable of maintaining a continuous non-fluctuating flow of solution.
 - .2 Equipment shall be capable of seeding up to 150m distance from hydraulic seeder using hand operated hoses and appropriate nozzles.
- .9 The Contractor shall apply slurry when wind velocities will not affect the application and cause the mixture to be blown.
- .10 The Contractor shall apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed. Ensure good contact of slurry with soil with minimal air pockets.
- .11 The Contractor shall use the correct nozzle(s) for application and use hoses to access difficult to reach surfaces and to control application.
- .12 The Contractor shall ensure that the application is uniform and the surface is evenly covered. Contractor shall blend into retained landscape for approximately 1 metre.
- .13 The Contractor shall clean all structures, appurtenances and natural features not designated to be seeded of any overspray, to the satisfaction of the Departmental Representative.
- .14 The Contractor shall ensure that at all times during the seeding, that no vehicles are parked within the path of public travel and the Contractor shall provide warning devices as directed by the Departmental Representative to ensure safe operations.

3.3 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Establishment period is a minimum of four months of continuous growing season. Growing season shall not to be divided by winter.
- .2 The Contractor shall repair and reseed dead or bare spots, as directed in these specifications to Departmental Representative's satisfaction, to allow establishment of

seed prior to acceptance. In the case of erosion, the Contractor shall be compensated at the specified unit rates for reseeding.

- .3 For areas of poor seed germination and growth, as determined by the Departmental Representative, the soil shall be scarified or re-cultivated as directed by the Departmental Representative, and seeding and fertilizing undertaken as specified. This work is incidental to the contract.

3.4 CONSTRUCTION COMPLETION ACCEPTANCE

- .1 Seeded areas will be accepted by the Departmental Representative provided that all areas are uniformly established and turf is not eroded or rutted and relatively free of weeds. Seeded areas to be growing for a minimum of four continuous months prior to construction completion acceptance inspection.
- .2 Areas seeded in fall will be accepted in following spring, a minimum of four months after start of growing season, provided acceptance conditions are fulfilled.
- .3 Minimum 75% growth by area of coverage of specified seed mixture must be present in order to be acceptable.

3.5 MAINTENANCE DURING WARRANTY PERIOD

- .1 Maintenance shall occur for one full year from Construction Completion Acceptance. The estimated period of maintenance within one calendar year shall be from approximately April 1 to October 31. The Contractor will be required to employ all of the necessary measures to establish and maintain all seeding in an acceptable, vigorous and healthy growing condition.
- .2 The Contractor shall repair and reseed dead or bare spots, as directed in these specifications to Departmental Representative's satisfaction, to allow establishment of seed prior to acceptance. In the case of erosion, the Contractor shall be compensated at the specified unit rates for reseeding.
- .3 For areas of poor seed germination, or as determined by the Departmental Representative, the soil shall be scarified or re-cultivated as directed by the Departmental Representative, and seeding and fertilizing undertaken as specified. This work is incidental to the contract.
- .4 For small areas of poor seed germination or as determined by the Departmental Representative, the soil shall be scarified to a depth of 25 mm and seeding and fertilizing shall be undertaken as specified. This work is incidental to the contract.
- .5 Weed control shall be undertaken as determined by the Departmental Representative. Hand pulling of weeds may be required. This work is incidental to the contract.

3.6 CLEANING

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

END OF SECTION

33 05 15 MANHOLES AND CATCH BASIN STRUCTURES**Part 1 General****1.1 MEASUREMENT PROCEDURES**

- .1 Supply of Catch Basin structures:
 - .1 The quantity of Catch Basin structures that will be measured for payment shall be the number of Catch Basin structures assembled and delivered at the sites of installation or stockpiled at Niblock Pit if surplus to requirements, in accordance with the Contract documents. **Payment will be made under “Unit Price Item 16a – Manholes and Catch Basin Structures - Supply Catch Basins”.**
 - .2 The supply of gratings and ancillary materials and hardware will not be measured directly for payment but shall be considered incidental **“Unit Price Item 16a – Manholes and Catch Basin Structures - Supply Catch Basins”.**
 - .3 Hauling Catch Basin structures from stockpiles in Niblock Pit to the sites will not be measured directly for payment but shall be considered incidental **“Unit Price Item 16a – Manholes and Catch Basin Structures - Supply Catch Basins”.**
- .2 Installation of Catch Basin structures
 - .1 The quantity of Catch Basin structures that will be measured for payment shall be the number of Catch Basin structures assembled and accepted by the Departmental Representative, and shall be inclusive of all costs of labour, materials, equipment to satisfactorily complete this item as specified and in accordance with the plans and specifications, this Section, and Section 33 42 13 - Pipe Culverts. Payment will be made under **“Unit Price Item 16b – Manholes and Catch Basin Structures - Install Catch Basins”.**
 - .2 The survey and layout of drainage structures as per requirements identified in this Section and Section 33 42 13 - Pipe Culverts, will not be measured directly for payment but shall be considered incidental to **“Unit Price Item 16 – Manholes and Catch Basin Structures”.**
- .3 Work required as part of the installation of Catch Basin and Barrier Drains, to be paid under the following items:
 - .1 Placing Sub-base course will be paid under **“Unit Price Item 6 – Granular Sub Base Course”** in accordance with Section 32 11 19 - Granular Sub-base Course.
 - .2 Placing Base course will be paid under **“Unit Price Item 8 – Granular Base Course”** in accordance with Section 32 11 24 – 20mm Granular Base Course.
 - .3 Placing Rip Rap for will be paid under **“Unit Price Item 5a – Rip Rap – Class 10”**, in accordance with Section 31 37 00 – Rip Rap.
 - .4 Supply and installation of CSP Pipe for catch basin leads will be paid under **“Unit Price Item 17 – CSP Culverts”** for the applicable size and type installed in accordance with Section 33 42 13 – Pipe Culverts. The supply and installation of pipe anchors and anchor plates will not be measured directly for payment but shall be considered incidental to **“Unit Price Item 17 – CSP Culverts”.**
- .4 Earthworks associated with the construction of Ditch Dams shall be considered incidental to **“Unit Price Item 5 – Rip Rap”**

- .5 Payment for the supply and placement of asphalt concrete pavement shall be made under **“Unit Price Item 9 – Asphalt Concrete Pavement (EPS)”**.
- .6 Payment for excavation shall be made under **“Unit Price Item 4 – Roadway and Drainage Excavation”**.
- .7 Payment for asphalt removal shall be made under **“Unit Price Item 1 – Asphalt Pavement Removal”**.
- .8 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 - Mobilization / Demobilization”**, and no additional payment will be made.
- .9 Traffic Control during the survey, layout, Construction of the Catch Basin structures shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .10 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM A48/A48M-00, Standard Specification for Gray Iron Castings.
 - .2 ASTM C139-99, Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
 - .3 ASTM C478M-97, Specification for Precast Reinforced Concrete Manhole Sections Metric.
 - .4 ASTM C618-00, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
 - .5 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A3000-98 (April 2001), Cementitious Materials Compendium. Includes:
 - .1 CAN/CSA-A5-98, Portland Cement.
 - .2 CAN/CSA-A8-98, Masonry Cement.
 - .3 CAN/CSA-A23.5-98, Supplementary Cementing Materials.
 - .2 CSA-A23.1/A23.2-00(June 2001), Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .3 CSA-A165 Series-94(R2000), CSA Standards on Concrete Masonry Units.
 - .4 CAN/CSA-G30.18-M92(R1998), Billet Steel Bars for Concrete Reinforcement.
 - .5 CAN/CSA-G164-M92R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 013300 - Submittal Procedures.
- .2 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work. Include manufacturer's Drawings, information and shop drawings where pertinent.

1.4 STAGED CONSTRUCTION

- .1 Provisions for staged construction shall be shown in the shop drawings, including any temporary support required, until catch basin structure is complete.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 35 43 - Environmental Protection.
- .2 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .3 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.
- .4 Place unused concrete materials in the roadway embankment as approved by Departmental Representative.
- .5 Place unused aggregate materials in stockpile in Mannix Pit as approved by Departmental Representative.

Part 2 Products**2.1 MATERIALS**

- .1 BC MoTI 25mm well-graded base material for bedding to be supplied by the contractor from outside the Park or produced from suitable material excavated from within the design cuts and structure excavations.
- .2 BC MoTI 50mm well-graded base material for backfill to be supplied by the contractor from outside the Park or produced from suitable material excavated from within the design cuts and structure excavations.
- .3 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

Part 3 Execution**3.1 EXCAVATION AND BACKFILL**

- .1 Excavate and backfill in accordance with Section 31 24 13 - Roadway and Drainage Excavation.
- .2 Obtain approval of Departmental Representative before installing manholes or catch basins.

3.2 CONCRETE WORK

- .1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

- .2 Position metal inserts in accordance with dimensions and details as indicated.

3.3 **INSTALLATION**

- .1 Construct units in accordance with details indicated on the drawings, plumb and true to alignment and grade.
- .2 Complete units as pipe laying progresses. Maximum of 1 unit behind point of pipe laying will be allowed.
- .3 Dewater excavation to approval of Departmental Representative and remove soft and foreign material before placing concrete base.
- .4 Precast units:
 - .1 Set precast concrete unit on 150 mm minimum of granular bedding compacted to 95% maximum density to ASTM D698 with the top of units at correct elevation.
 - .2 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
 - .3 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.
- .5 Grout around pipes that lead to and from the precast units and trim the pipes flush with the inside surface of the precast unit.
- .6 Place concrete for bottom and bending, as shown on the Drawings.
- .7 Compact granular backfill to 95% maximum density to ASTM D698 no sooner than seven (7) days after concrete placement.
- .8 Place manhole frame and cover on top section to conform to finished grade. If adjustment required use concrete ring. Installation tolerance 25 mm± from finished grade.
- .9 Shape asphalt at 20H:1V to conform to grade of Catch Basin grate. Catch Basin grate to be between 40 - 65 mm below finished grade.
- .10 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.

END OF SECTION

33 42 13 PIPE CULVERTS**Part 1 General****1.1 MEASUREMENT**

- .1 Supply and installation and/or extension of CSP culverts:
 - .1 Clearing of Culverts as indicated on Contract Drawings and as directed by the Departmental Representative will be paid under **“Lump Sum Price Item 3 – Prime Cost Sum”**.
 - .2 The quantity of CSP culverts that will be measured for payment shall be the number of linear metres of the types and sizes furnished at the sites of installation or in stockpiles at Niblock Pit if surplus to requirements, in accordance with this section and the Drawings and will inclusive of all costs of layout and survey, labour, materials, and equipment to satisfactorily compete the Works. Payment will be made under **“Unit Price Item 17 – CSP Culverts - Supply and Install”**.
 - .3 The supply of bolt-type corrugated 600 mm wide couplers and ancillary materials will not be measured directly for payment but shall be considered incidental to **“Unit Price Item 17 – CSP Culverts - Supply and Install”**.
 - .4 Hauling CSP Culverts from stockpiles in Niblock Pit to the culvert sites will not be measured directly for payment but shall be considered incidental to **“Unit Price Item 17 – CSP Culverts - Supply and Install”**.
 - .5 At locations of extensions to existing culverts, thoroughly cleaning and flushing the existing culvert, excavating 1 metre back from present exposed end, cutting off damaged sections of exposed end and painting remaining end with a high zinc dust oxide paint and supplying and placing a joint sealant shall be considered incidental to **“Unit Price Item 17 – CSP Culverts - Supply and Install”**.
- .2 Work required as part of the installation of CSP Culverts, to be paid under the following items:
 - .1 Excavation for the types of materials encountered will be paid under **“Unit Price Item 4 – Roadway and Drainage Excavation”**, in accordance with Section 31 24 13 – Roadway and Drainage Excavation. Excavation, removal and disposal of existing culverts at the same location of the new installation shall be considered common material and will be paid under **“Unit Price Item 4 – Roadway and Drainage Excavation”**.
 - .2 Asphalt removal will be paid under **“Unit Price Item 1 - Asphalt Pavement Removal”** in accordance with Section 02 41 13.14 – Asphalt Pavement Removal.
 - .3 Placing granular backfill around the culvert will be paid under **“Unit Price Item 8 – Granular Base Course”** in accordance with Section 32 11 24 - 25 mm Granular Base Course and Section 33 42 13 - Pipe Culverts
 - .4 Trench backfill and compaction of native material shall be considered incidental to **“Unit Price Item 17 – CSP Culverts - Supply and Install”**.
 - .5 Placing Sub-base course will be paid under **“Unit Price Item 6 – Granular Subbase Course”** in accordance with Section 32 11 19 - Granular Sub-Base Course.

- .6 Placing Base course will be paid under **“Unit Price Item 8 – Granular Base Course”** in accordance with Section 32 11 24 –Granular Base Course.
- .7 Placing asphalt will be paid under **“Unit Price Item 9 – Asphalt Concrete Pavement - EPS”** in accordance with Section 32 12 16 – Asphalt Concrete Pavement (End Product Specifications).
- .8 Placing Rip Rap if required will be paid under **“Unit Price Item 5 – Rip Rap”**, in accordance with Section 31 37 00 – Rip Rap.
- .3 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”**, and no additional payment will be made.
- .4 Traffic Control during the survey, layout and Construction of the culverts shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .5 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor. For measurement associated with the supply and install of Manholes and Catch Basin Structures refer to Section 35-05-14 “Manholes and Catch Basin Structures”.
- .6 No separate measurement will be made for couplings, fittings or end sections for CSP, SPSCP or HDPE.
- .7 Measure removal of or plugging of existing culverts under Prime Cost Sum in metres of invert length for each size, type and class of pipe removed and disposed where the location is not coincidental to new culvert.
- .8 Culvert installation must be coordinated with embankment construction. No payment will be made for re-excavation of embankment material required to install culverts.

1.2 REFERENCES

- .1 CSA-G401-01 Corrugated Steel Pipe Products.
- .2 CSA-B182.8-02 Profile Polyethylene Storm Sewer and Drainage Pipe and Fittings.

1.3 SUBMITTALS

- .1 Submit manufacturer's test data and certification at least one week prior to beginning Work.
- .2 Provisions for staged construction shall be shown in the shop drawings, including any temporary support required.
- .3 Certification to be marked on pipe.

1.4 STORAGE AND HANDLING

- .1 Handle and store pipe products in a manner to avoid damage, alteration, deterioration and soiling.
- .2 Store pipes on a clean and flat surface in Niblock Pit.
- .3 Where the material supplied is damaged, the Contractor shall immediately separate nested sections of the plate or pipe to facilitate more detailed inspection. Culvert material designated by the Departmental Representative as unacceptable, due to damage or failure to meet specified requirements, shall be immediately repaired or replaced by the Contractor.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Section 01 35 43 - Environmental Procedures.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products**2.1 CORRUGATED STEEL PIPE**

- .1 Corrugated steel pipe: to CSA-G401.
- .2 Culverts to be annular or spiral with annular ends. Coupling bands to be two piece annular bolted with minimum width of nine corrugations.
- .3 Minimum wall thickness to be 2.0 mm.
 - .1 Or greater in accordance with manufactures recommendations in the specific installed conditions.
- .4 Corrugations to be 68 mm x 13 mm.
- .5 For all exposed culvert ends, 4:1 mitred end sections will be required.
- .6 Design Code CHBDC S6-06.
- .7 Design Live Load CL-800.

2.2 GRANULAR BEDDING AND BACKFILL

- .1 BC MoTI 25mm Well Graded Base material for pipe bedding to be supplied by the contractor from outside the Park or produced from suitable material excavated from within the design cuts and structure excavations.
- .2 BC MoTI 50mm well-graded base material for backfill to be supplied by the contractor from outside the Park or produced from suitable material excavated from within the design cuts and structure excavations.

2.3 RIP RAP

- .1 Rip Rap shall be installed in accordance with Section 31 37 00 – Rip Rap.

Part 3 Execution**3.1 CUT ENDS**

- .1 All exposed ends of CSP culverts to have sloped end sections conforming to roadside slope, by cutting culvert with mechanical saw.
- .2 All cut edges shall be made smooth by grinding so that all the burrs are removed. Any damaged galvanizing shall be restored by zinc metallizing in accordance with CSA G401.

- .3 Where an existing culvert is extended, up to 3 m of the existing culvert end shall be removed as directed by the Departmental Representative.

3.2 **BEDDING**

- .1 Dewater excavation, as necessary, to allow placement of culvert bedding in dry condition.
- .2 Place minimum thickness of 300 mm of approved granular material on bottom of excavation and compact to minimum 95% maximum density to ASTM D698.
- .3 Shape bedding to fit lower segment of pipe exterior so that width of at least 50% of pipe diameter is in close contact with bedding and to camber as indicated or as directed by Departmental Representative, free from sags or high points.
- .4 Place bedding in unfrozen condition.

3.3 **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 Do not allow water to flow through pipes during construction except as permitted by Departmental Representative.

3.4 **JOINTS: CORRUGATED STEEL CULVERTS**

- .1 Match corrugations of coupler with pipe sections before tightening.
- .2 Insert and tighten bolts.
- .3 Tap couplers firmly with a rubber mallet or similar non-marring tool as they are being tightened, to take up slack and ensure snug fit.
- .4 Repair spots where damage has occurred to coating in the field by applying two coats of zinc rich paint approved by the CSP supplier. Allow each coat to dry before placing second coat, bedding or backfill.

3.5 **BACKFILLING**

- .1 Backfill around and over culverts as indicated or as directed by Departmental Representative.
- .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 98% maximum density to ASTM D698 taking special care to obtain required density under haunches. Hand tamp where necessary to obtain compaction.
- .4 Protect installed culvert with minimum 900 mm cover of compacted fill before heavy equipment is permitted to cross. During construction, width of fill, at its top, to be at least twice diameter or span of pipe and with slopes not steeper than 2H:1V.
- .5 Place backfill in unfrozen condition.
- .6 Place rip rap.

3.6 TRENCHING EXISTING PAVEMENT STRUCTURES

- .1 Where trenches are cut into existing pavement structures, backfill will match the existing materials and thickness, payment for backfill and paving will be made at the unit price for the type of material used.

3.7 CULVERT EXTENSIONS

- .1 Extensions to existing culverts shall be as noted on drawings. Payment for installation shall include all hardware and necessary features to attach new sections. Backfill and bedding shall be as per drawings and paid as per the appropriate unit price item.

3.8 CULVERT / STRUCTURE REMOVAL

- .1 Culvert removal shall be as indicated on drawings and shall include disposal of sections to a site outside of the National Parks.
- .2 Bedding and backfill for culvert removal shall be paid as per the appropriate unit price item.

END OF SECTION

33 42 35 SPECIAL PROCEDURES SPCSP WILDLIFE UNDERPASS**Part 1 General****1.1 SECTION INCLUDES**

- .1 Special Procedures for the “Design and Build” of Structural Plate Corrugated Steel Pipe Arch structures at locations as shown on the design drawings.

1.2 MEASUREMENT PROCEDURES

- .1 Design, supply, delivery, and installation of SPCSP culverts:
 - .1 The quantity of SPCSP culverts that are designed, supplied to site and accepted by the Departmental Representative shall be measured in linear meters. Payment will be made under **“Unit Price Item 19a – SPCSP Wildlife Underpass – Design and Supply”**.
 - .2 Detailed design and submittal of shop drawings shall be considered incidental to **“Unit Price Item 19a – SPCSP Wildlife Underpass – Design and Supply”**.
 - .3 The quantity of SPCSP culvert installation that will be measured shall be the number of linear metres assembled and accepted by the Departmental Representative, and shall be inclusive of all costs of labour, materials, equipment to satisfactorily complete this item as specified and in accordance with the Contract documents. Payment will be made under **“Unit Price Item 19b – SPCSP Wildlife Underpass - Install”**.
 - .4 Survey, layout and construction of the SPCSP as per requirements identified in this Section and Section 33 42 13 - Pipe Culverts will not be measured directly for payment but shall be considered incidental to **“Unit Price Item 19b – SPCSP Wildlife Underpass - Install”** and no separate payment will be made to the Contractor.
 - .5 The survey, design, layout, supply, installation and removal of temporary roadway support (lock blocks, retaining wall), and access for the culvert installation will not be measured directly for payment but shall be considered incidental to **“Unit Price Item 19b – SPCSP Wildlife Underpass - INstall”**.
- .2 Work required as part of the installation of SPCSP culverts, to be paid under the following items:
 - .1 Asphalt removal will be paid under **“Unit Price Item 1 - Asphalt Pavement Removal”** in accordance with Section 02 41 13.14 – Asphalt Pavement Removal.
 - .2 Excavation for the types of materials encountered will be paid under **“Unit Price Item 4 – Roadway and Drainage Excavation”**, in accordance with Section 31 24 13 - Roadway and Drainage Excavation.
 - .3 Placing bedding material for the culvert in accordance with envelope shown on drawings will be paid under **“Unit Price Item 8 – Granular Base Course”** in accordance with Section 32 11 24 – Granular Base Course and Section 33 42 13 - Pipe Culverts.

- .4 Placing granular backfill around the culvert in accordance with envelope shown on drawings will be paid under **“Unit Price Item 6 - Granular Sub-Base Course”** in accordance with Section 32 11 19 – Granular Sub-Base Course and Section 33 42 13 - Pipe Culverts.
- .5 Placing Sub-base course will be paid under **“Unit Price Item 6 – Granular Sub-Base Course”** in accordance with Section 32 11 19 – Granular Sub-Base Course.
- .6 Supply and installation of geotextiles in accordance with Section 31 32 19.01 shall be considered incidental to the unit price items.
- .7 Placing Base course will be paid under **“Unit Price Item 8 – Granular Base Course”** in accordance with Section 32 11 24 – 25mm Well Graded Base.
- .8 Placing asphalt will be paid under **“Unit Price Item 9 – Asphalt Concrete Pavement (EPS)”** in accordance with Section 32 12 16 – Asphalt Concrete Pavement (EPS).
- .9 Placing representative native material in structure to allow animal passage shall be considered incidental to **“Unit Price Item 4 – Roadway and Drainage Excavation”** in accordance with Section 31 24 13 – Roadway and Drainage Excavation.
- .10 Placing Rip Rap will be paid under **“Unit Price Item 5 – Rip Rap** in accordance with Section 31 37 00 – Rip Rap.
- .11 Supply and Placing of Precast Concrete Barriers will be paid under **“Unit Price Item 20 –Precast Concrete Barrier”** in accordance with Section 34 71 13.01 – Precast Concrete Barrier.
- .3 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”**, and no additional payment will be made.
- .4 Traffic Control during the survey, layout and construction of the culverts shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.
- .5 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment shall be made to the Contractor.

1.3 LOCATION

- .1 SPCSP structures are located at the following locations:
 - .1 TCH Km 84.9 - 4x7m Elliptical Pipe Arch
 - .2 TCH Km 86.0 – 4.7x3.2m Elliptical Pipe Arch

1.4 SCHEDULE

- .1 Work to be completed in accordance with Section 01 14 00 – Work Restrictions.

1.5 TRAFFIC CONTROL REQUIREMENTS

- .1 The Contractor shall provide traffic control in accordance with Section 01 35 00.06 - Special Procedures for Traffic Control.

1.6 STAGED CONSTRUCTION

- .1 Provisions for staged construction shall be shown in the shop drawings, including any temporary support required, until culvert is complete.

1.7 DESIGN REVIEW

- .1 Provide Departmental Representative with one (1) electronic copy of complete working Drawings, and one (1) electronic copy of detailed design calculations, for review at least 4 weeks prior to beginning construction. Drawings and design calculations to bear signature and stamp of qualified professional engineer registered or licensed in Province of British Columbia in Canada.
- .2 Verify existing site conditions and ground elevations before preparing working Drawings.
- .3 Contractor to note that the size and configuration of the structure shown on the drawings is for the purpose of intent and to indicate the major features of importance. Use of an equivalent structure will be considered. The following conditions will apply however:
- .4 The depth of cover to the culvert overt shall not be greater than the maximum cover specified by the pipe manufacture but not less than 1.4 metres below the finished pavement.
- .5 The height of opening and end area shall be of equivalent size to the structure as shown on the drawing.
- .6 Product must be on BC MoTI approved product list.
- .7 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Ensure each drawing submitted bears stamp and signature of qualified professional engineer registered or licensed in Province of British Columbia.

1.8 DESIGN CRITERIA

- .1 Design code: CAN/CSA S6 06
- .2 Design to ensure minimum effective service life of 75 years.

1.9 PERFORMANCE REQUIREMENTS

- .1 Tolerances in fabrication and installation as per Manufacturer's recommendations and in accordance to Section 33 42 13 - Pipe Culverts.
- .2 Pipe joints shall be sealed against leakage using an external membrane or geotextile.

1.10 STORAGE AND HANDLING

- .1 Follow storage and handling instructions of SPCSP culvert supplier.

1.11 QUALITY CONTROL – TESTING

- .1 All Quality Control testing by the Contractor
- .2 Testing as per approved Contractor's Quality Control Plan

- .3 As per Section 33 42 13 – Pipe Culverts

1.12 **WARRANTY**

- .1 All material shall be under warranty for five (5) years after the date of Final Certificate of Completion. All workmanship shall be under warranty for two (2) years after the date of the Final Certificate of Completion

Part 2 Products

2.1 **MATERIALS**

- .1 Materials supplied in accordance with this Section and Section 33 42 13 – Pipe Culverts.
- .2 BC MoTI 25mm Well Graded Base material for pipe bedding to be supplied by the contractor from outside the Park or produced from suitable material excavated from within the design cuts and structure excavations.
- .3 BC MoTI 50mm well-graded base material for sub base course and structure backfill to be supplied by the contractor from outside the Park or produced from suitable material excavated from within the design cuts and structure excavations.
- .4 Non-woven geotextile to be placed over the SPCSP joints prior to back filling.

Part 3 Execution

3.1 **EXCAVATION AND FOUNDATION PREPARATION**

- .1 Excavate, and prepare soil foundation for SPCSP, as per Contractor's approved shop Drawings and in accordance with Section 31 24 14 - Roadway and Drainage Excavation.
- .2 Soil foundation will be inspected by Departmental Representative prior to SPCSP assembly.
- .3 Waterproof membrane shall be installed in accordance with manufactures specifications.

3.2 **TECHNICAL ASSISTANCE**

- .1 Arrange for qualified and experienced technical representative of SPCSP culvert supplier of to be on site for initial stage of installation to ensure correct installation procedures. Arrange for a minimum of 2 additional visits during installation or as directed by Departmental Representative. Field report for each visit to be submitted to Departmental Representative.

3.3 **SPCSP CULVERT ASSEMBLY**

- .1 Assemble SPCSP in accordance with the approved design drawings and manufacturer's instructions. Construct to lines, grades and elevations as indicated.

3.4 **BACKFILLING**

- .1 Backfill SPCSP in accordance with the approved design drawings and manufacturer's instructions.

Project No. 201612

Trans Canada Highway

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TCH Twinning

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END OF SECTION

33 71 13.01 PRECAST CONCRETE BARRIER**Part 1 General****1.1 DESCRIPTION**

- .1 Supply and installation of precast concrete barriers in accordance to this section. Precast Concrete barrier supplied shall be as per British Columbia 2012 Standard Specifications for Highway Construction, Section 941 – Precast Reinforced Concrete Barriers. In addition, all end faces to have 25 mm chamfered edges.

1.2 MEASUREMENT PROCEDURES

- .1 Supply and Stockpile Precast Concrete Barrier:
 - .1 Supply and stockpile 810mm Precast Concrete Barrier shall be per each unit of specific type 810mm precast concrete barrier including end treatments supplied, loaded, hauled and stockpiled at locations as directed by the Departmental Representative in accordance with these specifications. Payment will be made per the applicable component Unit Price bid under **“Unit Price Item 20a – Precast Concrete Barrier – Supply Concrete Barrier”**.
- .2 Install Precast Concrete Barrier:
 - .1 Installation of precast concrete barrier shall be measured by the number of linear metres of precast concrete barrier including end treatments loaded, hauled from stockpiles and installed in their final location in accordance with the Contract documents. Payment will be made under **“Unit Price Item 20b – Precast Concrete Barrier – Install Concrete Barrier”**.
- .3 Barrier drain pipes shall be supplied and installed in accordance with the Contract documents. Payment will be made under **“Lump Sum Price Item 3 – Prime Cost Sum”**
- .4 Barrier costs shall be inclusive of all costs of labour, materials, and equipment to satisfactorily complete this item as specified and in accordance with this Section.
- .5 The supply and installation of barrier mounted reflectors shall not be measured directly and shall be considered incidental to the unit price items.
- .6 The placement and removal of Precast Concrete Barriers for use as temporary barricades during construction will not be measured for payment and shall be considered incidental to the contract.
- .7 The survey and layout of the Precast Concrete Barriers as per requirements identified in this Section and the plans, will not be measured directly for payment but shall be considered incidental to **“Unit Price Item 20 –Precast Concrete Barrier.**
- .8 Mobilization and demobilization required for this Work shall be incidental to **“Lump Sum Price Item 1 – Mobilization / Demobilization”**, and no additional payment will be made.
- .9 Traffic Control for survey, installation or relocation of Precast Concrete Barriers shall be incidental to **“Lump Sum Price Item 2 – Traffic Accommodation”** and no separate payment will be made to the Contractor.

- .10 Environmental mitigations required in accordance with Section 01 35 43 – Environmental Procedures, for the Work in this Section shall be incidental to the contract and no separate payment will be made to the Contractor

Part 2 Products

- .1 810mm Special Drainage Barrier to be per manufactured as per the contract drawings and as directed by Departmental Representative.
- .2 Barrier reflectors to be hard plastic type raised pavement markers mounted with fast cure construction adhesive.
 - .1 Reflectors to be placed at 25m intervals mounted as per the Drawings or as directed by the Departmental Representative.
 - .2 Acceptable products include:
 - .1 3M Raised Pavement Marker (RPM)
 - .2 Stimsonite Raised Pavement Marker (RPM)
 - .3 Or equivalent as approved by the Departmental Representative

Part 3 Execution

3.1 DELIVERY

- .1 Care shall be taken to protect Precast Concrete Barrier from elements and temperature extremes during curing period. Under no circumstances are barrier components to be exposed to freezing conditions until fully cured.
- .2 Storage of Precast Concrete Barriers on site to be in single layer, for first seven days.
- .3 Stacking of three layers high, with wood blocking between lifts, permitted with Departmental Representative approval, after seven days.
- .4 Barriers to be stacked three layers high, with wood blocking between lifts, at delivery location. Cost of supply and installation of wood blocking shall be incidental to the contract and no separate payment will be made.

3.2 INSTALLATION

- .1 Precast Concrete Barriers shall be installed permanently on asphalt concrete pavement in accordance with these Specifications or as directed by the Departmental Representative.
- .2 Contractor shall do the layout of the barriers for both removal and installation operations.
- .3 The Departmental Representative will determine location of barriers with drainage opening for drainage and for small animal crossings. Some of the roadside drainage barriers will require the installation of drain pipe to control runoff. The drain shall be supplied installed at locations and as directed by the Departmental Representative.

3.3 FIELD QUALITY CONTROL

- .1 Contractor shall carry out all the necessary quality control to ensure the barrier work complies with these specifications.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.

- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION