



Public Services and
Procurement Canada

Services publics et
Approvisionnement Canada

SPECIFICATIONS FOR

**Hogs Back Fixed Bridge &
Dam Rehabilitation
Bundle 2
Bridge Replacement
Rideau Canal, Ottawa**

Project No. R.079166.029

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Prepared by:

AECOM

AECOM
85, Sainte-Catherine Street West
Montreal (Quebec)
Canada H2X 3P4



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CONCRETE CORE TESTING - HOGS BACK DAM, OTTAWA, ONTARIO (2018)

HOGS BACK DAM AND FIXED BRIDGE - AS BUILT (1977)

ENVIRONMENTAL STANDARDS AND GUIDELINES DOCUMENT, ONTARIO WATERWAYS,
JULY 2017

DESIGNATED SUBSTANCE REPORT – HOGS BACK FIXED BRIDGE AND DAM, 2018

PLAN SHOWING TOPOGRAPHY OF HOGS BACK DAM (2018)

BASIC IMPACT ANALYSIS – HOGS BACK FIXED BRIDGE AND DAM REHABILITATION
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Part 1 General

1.1 DESCRIPTION

- .1 This section provided a summary of the work requirements, including, but not limited to, construction periods, contract method, existing services, archeological constraints, existing site conditions, benchmark data, examination, permits and fees, use of site and facilities, access and egress, protection of work, scheduling and project meetings.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement of Summary of Works.
- .2 Payment included in Lump Sum Price as set out in section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L1 - Mobilization.
 - .2 Item No. L2 - Demobilization.
 - .3 Item No. L7 - General Work.
 - .4 Item No. L18 - Fees, Permits and Certificates
 - .5 Item No. L29 - Signage Salvaging and Installation
- .3 Lump Sum price for General Work is for any work item that is not specifically identified for payment under other Items and for general expenses related to site setup, layout, operation and maintenance not covered elsewhere.

1.3 DESCRIPTION OF WORK

- .1 These detailed specifications cover requirements for furnishing labour, materials, tools, equipment, required power and systems, transportation, supervision and quality control necessary to completely perform work, as described by the drawings and specification for Hogs Back Fixed Bridge & Dam Rehabilitation Project.
- .2 The contractor shall retain qualified personnel to perform the work.
- .3 General Description of Project: Project works as per Drawings, including but not limited to:
 - .1 Replacement of superstructure components
 - .2 Complete the rehabilitation of substructure top components as left by Bundle 1 contract. These are;
 - .1 Completion of top 600 mm of east and west abutment extensions including the wingwalls
 - .2 Completion of rehabilitation of top 600 mm of Pier 2 and 5
 - .3 Replacement of bridge lighting
 - .4 Implementation of electrical connection within existing network
 - .5 Installation of conduits for public electrical and communication services
 - .6 Adjustment of the road for the new bridge
 - .7 Reconstruction of the asphalt pavement

.4 Description of Work:

- .1 Construction Project consists of work as described below, indicated on drawings and in these, specifications, but is not limited to the following:
 - .1 Mobilization/Demobilization: Activation, mobilizing then demobilizing of Contractor's personnel, general equipment and operating supplies to site. Establishment of offices, storage and general facilities for operations at the site and administrative items related to project. Does not include items of work specifically addressed and paid under other work items.
 - .2 General Work: General work items related to setting up, operating and maintaining work or storage areas and work not specifically covered by other work items.
 - .3 Document Existing Site Conditions: Inspections and surveying to record existing conditions verify dimensions and maintain record drawings.
 - .4 Utilities: Connect to existing public utilities and make arrangements for setup of utilities required for duration of work including; power, communications, lighting, water, heating and ventilation.
 - .5 Quality Control: Inspection, testing and Engineering as part of Contractor's Quality Control Plan.
 - .6 Site Access: Providing site access for conveyance of materials and equipment. Developing a staging area and facilities in order to undertake work. Contractor staging area is restricted to the public vehicle parking lot located at the south-east of the Hogs Back Bridge and at the sections of the Hogs Back Road closed to public for construction, as shown on the drawings. Contractor shall maintain the site access during the contract period including snow ploughing and dust control. The contractor will remove the site access roads and laydown areas and restore the site to its original condition. No additional access road, or laydown area, or staging area, or work area other than what is shown on design drawings will be allowed at site unless otherwise authorized by Departmental Representative.
 - .7 Scaffolding and work platforms: Designing, supplying, installing, maintaining and dismantling all scaffolding and work platforms required to complete work. Provide scaffolding and work platforms as required to complete all work as indicated on drawings and described in specifications. Design of scaffolding, work platforms and stairs are done by Contractor's Engineer.
 - .8 Enclosures: Design, supply, install, maintain and dismantle enclosures to contain work or for housing and heating where needed.
 - .9 Construction Fence: Supplying, installing, maintaining and dismantling construction fence around the construction site and staging area. Fencing shall have access gates which should be closed and locked during non-working time. Refer to Section 01 56 00- TEMPORARY BARRIERS AND ENCLOSURES and to Section 01 20 01 – SITE ACCESS.
 - .10 Road Traffic Control: The Contractor must provide a traffic management plan detailing traffic control measures for maintaining pedestrians and cyclists trail, and vehicular traffic for the entire duration of the project. The Contractor is responsible for implementing and maintaining such

traffic control measures including traffic detours and diversion. The Contractor shall deploy a competent person responsible for ensuring compliance of traffic control measures at all times. Refer to Section 01 55 26 - TRAFFIC CONTROL.

- .11 Installing and maintaining bilingual safety and cautionary signage in and around the construction site including installing and maintaining project sign boards.
- .12 Signage Salvaging and Installation: Remove and dispose of the two existing “Walk your bicycle” signs. Remove, store and re-install other signs that could be damaged within construction area. Install permanent Public Safety Sign around Dam provided by others.
- .13 Environmental Procedures: All works shall be carried out at site in compliance with the approved Site Specific Environment Management Plan. The Contractor will produce this document based on PCA’s Basic Impact Assessment for this site, Environmental Standard Guidelines (ESG), PCA’s Best Management Practices (BMP) and Departmental Representative’s Environment Management Plan. The contractor’s site specific EMP shall be written by a qualified consultant.
- .14 The Contractor shall submit its Site Specific Health and Safety Plan in compliance with the Departmental Representative’s Health and Safety Policy. All work shall be carried out in accordance with site specific health and safety plan and any negligence or non-compliance will lead to stoppage of works at Contractor’s risk and cost. Refer to Section 01 35 29.06 - HEALTH AND SAFETY REQUIREMENTS.
- .15 Should the Contractor encounter historical artifacts, Departmental Representative should be notified immediately and no work shall progress further in that area until the Departmental Representative confirms to proceed.
- .16 All concrete and steel works shall be carried out as per technical specifications and drawings. Work includes but not limited to:
 - .1 Demolition of bridge slab and concrete pre-stressed box girders
 - .2 Fabrication and installation of new steel bridge girders
 - .3 Construction of cast-in-place deck
 - .4 Construction of top section of the abutment extensions and wingwalls
- .17 Concrete Repairs: Carry out concrete repairs as left from Bundle 1 contract as indicated including reinforcing steel, anchors, and steel embedded parts. Includes crack repairs and injection. Work includes but not limited to:
 - .1 Tunnel T2 repairs
 - .2 Piers and abutment wall repairs
- .18 Road work: Carry out road work as per technical specifications and drawings. Road work includes but not limited to:
 - .1 Asphalt removal, road base construction, paving, and pavement markings

- .19 Traffic Barriers: Remove existing traffic barriers, fabricate and install new traffic barriers as per related design drawings and specification sections. Work includes but not limited to:
 - .1 Removal and disposal of existing traffic barriers
 - .2 Fabrication of new traffic barriers
 - .3 Construction of new traffic barrier foundation outside of bridge superstructure
 - .4 Installation of new traffic barriers
- .20 Electrical work: Carry out electrical work as per technical specification and drawings. Electrical work includes but not limited to:
 - .1 Maintain the lighting during work
 - .2 Removal and recovery of existing streetlights, fixtures, junction and pull box and wiring;
 - .3 Excavation, trench fill, concrete, reinforcement and concrete base formwork
 - .4 Installation of temporary electrical supply to the street lights at the west side of the bridge
 - .5 Installation of temporary lights on the pedestrian detour over the dam
 - .6 Installation of conduits for public electrical and communication services
 - .7 Supply and installation of lighting system and concrete bases
 - .8 Supply and installation of cabling including conduits and accessories
 - .9 Implementation of electric connection within existing network.
- .21 Installation of temporary footbridge for pedestrian and cyclists detour on the pathway located along the dam deck. Temporary footbridge to the pathway located on the dam deck is to be installed to allow uninterrupted access to pedestrian and cyclist traffic from dam deck to west side of the bridge as per technical specification and drawings. Installation of temporary footbridge will require removal of existing handrails at the west end of pedestrian pathway located on the dam deck and the portion of the traffic barriers on hogs back road. Contractor to reinstate the handrails and barriers to original immediately after temporary footbridge is removed at the end of the job.
- .22 Implement and maintain temporary pedestrian and cyclist pathway detour along the north side of Hogs Back Road, on west side of the bridge, over the existing pedestrian deck on the dam through Hogs Back Park located at the east side of the bridge. The temporary detour is required to provide uninterrupted access across the river for pedestrians and cyclists. Temporary pedestrian and cyclist pathway detour along the PCA parking lot access road is required to link pedestrian and cyclists in the City of Ottawa pathway network leading to Mooney's Bay. The work will involve construction of 3m wide multi-use pathway as shown on design drawings.

- .23 Repair the upstream handrails of pedestrian pathway on dam deck as per project drawings as part of the pedestrian pathway detour implementation.
- .24 Excavating, trenching, and backfilling needed to complete work as per technical specifications and drawings. Designing, supplying, installing, maintaining and dismantling all temporary earth retaining systems required to complete work.
- .25 Winter Work: Construction activities may take place in winter and contractor to take into consideration of winter construction and need for heating/hoarding requirements.
- .26 Snow Removal: Removal of snow from work areas, access roads, staging areas, storage areas, multi-use pathway and parking areas.
- .27 Cleaning: Complete general clean-up to satisfaction of departmental representative. Include progressive cleaning of site.
- .28 Dust Control: Install effective mitigation techniques for dust control. .
- .29 Existing grass: Cut existing grass in Contractor work area during construction.
- .30 Prepare and submit “As-built Drawings” within 30 (thirty) days from the date of substantial performance of work.
- .31 Landscaping: Supply and install trees, shrubs and sods as per landscape drawings and specifications.
- .32 Warranties for all plantings and installations.

1.4 CONSTRUCTION PERIODS

- .1 The construction schedule starts from May 9, 2020 and finishes on December 31, 2020 All work related to bridge superstructure replacement, road work, electrical work and pavement must finish, and Hogs Back Road must open to vehicle and pedestrian traffic by December 31, 2020. Site restoration and landscaping must be completed by Victoria Day Weekend of May 2021.
- .2 Commence work in accordance with notification of acceptance of offer and complete the work within the dates outlined in contract.
- .3 Comply with dewatering and drawdown schedule of Parks Canada, and be aware of work restrictions in spring and fall as water level increases and decreases. Water levels at drawdown period may increase to navigation levels due to weather events.
- .4 Comply with work schedule restrictions.

1.5 CONTRACT METHOD

- .1 Construct Work under Lump Sum and Unit Rate Price as per Section 01 22 01.

1.6 CONTRACTOR USE OF PREMISES

- .1 At completion of work, all areas of site utilized by contractor or affected by construction shall be reinstated to equal to or better condition which existed before the work started.

1.7 OWNER OCCUPANCY

- .1 PCA Operations must have unrestricted access to the dam and its operation during construction works.

1.8 EXISTING SERVICES

- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to normal use of premises.
- .3 Provide alternative routes for personnel, pedestrian and vehicular traffic.
- .4 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .5 Submit schedule and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .6 Provide temporary services to maintain critical building, infrastructure and tenant systems.
- .7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal pedestrian traffic.
- .8 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .10 Record locations of maintained, re-routed and abandoned service lines.
- .11 Construct barriers in accordance with Section 01 56 00- Temporary Barriers and Enclosures.

1.9 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy of each document as follows:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed Shop Drawings.
 - .5 List of Outstanding Shop Drawings.
 - .6 Change Orders.
 - .7 Other Modifications to Contract.
 - .8 Field Test Reports.
 - .9 Copy of Approved Work Schedule.

- .10 Health and Safety Plan and Other Safety Related Documents.
- .11 Environmental Protection Plan
- .12 Other documents as specified.

1.10 **ACCESS TO SITE**

- .1 Refer to section 01 20 01 – SITE ACCESS

1.11 **CANAL REGULATIONS**

- .1 The "Historic Canals Regulations" apply to and govern work of this Contract. Ensure that Work avoids encroachment into areas required for future work.
- .2 The regulations may be obtained from Justice Canada's website at:
<http://laws-lois.justice.gc.ca/eng/regulations/sor-93-220/>.
- .3 Contractor shall not mobilize or begin any work prior to Parks Canada issuing the permit under Historic Canals Regulation (SOR93-220 Sections, 11, 14 and 15) and unless the Departmental Representative advises the Contractor to mobilize at site.
 - .1 Permits will not be issued before following are submitted and accepted:
 - .1 Site Specific Environmental Management Plan (EMP).
 - .2 Site Specific Health and Safety Plan.
 - .3 Site Layout Plan.
 - .4 Changes to project scope of work not assessed under site specific EMP or BIA will require review and acceptance by the Departmental Representative and may require issuing revised permit.

1.12 **WORK RESTRICTIONS**

- .1 Refer to section 01 14 00 – WORK RESTRICTIONS

1.13 **ARCHAEOLOGICAL REQUIREMENTS AND RESTRAINTS**

- .1 Site may contain possible archeological remnants.
- .2 Archaeologists may monitor and record some or all aspects of excavations, site access routes and disturbances to soil overburden due to equipment and general work operations.
- .3 If suspected artifacts are uncovered while Archaeologists are not present, stop work immediately in that area, protect artifacts and notify Departmental Representative.
- .4 Proceed with other work and await further direction for work in affected area from Departmental Representative on how to proceed.
- .5 The Contractor shall seek and obtain acceptance of Departmental Representative and PCA's Archeological Authority on submittals or changes in scope of work or methodologies that may affect archaeological resources, cultural resources or environment prior to providing direction to the Contractor.
- .6 Comply with mitigation measures outlined in site-specific Basic Impact Assessment (BIA) and other federal, provincial, territorial or municipal act or regulation applying to the National Parks and Historic Sites of Canada.
- .7 Employ minimal intervention approach for all work.

- .8 Damage to heritage elements will not be tolerated.

1.14 EXISTING SITE CONDITIONS

.1 Hogs Back Fixed Bridge:

- .1 The Hogs Back Fixed Bridge was rebuilt in 1977 as a three span pre-stressed box girder superstructure with two concrete abutments and two large concrete piers that are common with the Hogs Back Dam. The design live load for the bridge and tunnel T2 is HS20-44.
- .2 The overall length of the bridge is approximately 68.1 meters with a roadway width of approximately 8.5 meters.
- .3 The overall width of the bridge including sidewalks is approximately 12.2 meters.
- .4 There are nine pre-stressed concrete box girders placed side by side within each span that are simply supported with expansion joints separating each span. The roadway surface is composed of a reinforced concrete deck, waterproofing membrane and asphalt wearing surface over the existing girders. There is a cantilevered sidewalk that services pedestrian and bicycle traffic on the south side of the entire bridge.
- .5 A narrow pedestrian tunnel is located immediately adjacent to the west abutment of the bridge structure. Some components of this tunnel are not clearly separate from the adjacent bridge.

.2 The Hogs Back Dam:

- .1 The Hogs Back Dam was reconstructed in 1977 at the same time as the fixed bridge. The current structure utilizes the original concrete apron from the removed structure, with foundations placed directly on bedrock. The structure consists of two abutments (common with the bridge), two large piers (common with the bridge) and four smaller piers that are specific to the dam only.
- .2 A sheet pile wall with a concrete cap follows the upstream shore to the west, followed by some natural shoreline. Both of the abutments of the dam are extended by relatively large reinforced concrete walls downstream of the structure, constructed in 1977. The wall protects the embankment and retains fill upon which viewing platforms and the pedestrian path are located.
- .3 The original 1920's concrete gravity Upstream East Wall was assessed to be in poor condition.
- .4 Rehabilitation work was conducted on Hogs Back Bridge from 2018-2020. This work includes, but is not limited to the:
 - .1 Replacement of upstream east retaining wall.
 - .2 Repair and extension of east abutment.
 - .3 Repair of piers.
 - .4 Extension of piers 2 and 5.
 - .5 Widening of pier 5.
 - .6 Repair of apron and local extension around piers 2 and 5.
 - .7 Replacement and repair of west retaining wall.
 - .8 Extension of west abutment and Tunnel T2.

- .9 Reparation of underside of the dam slab for mechanical gates
- .5 In total the dam has 8 bays, with the two most westerly being operated by mechanized gates, and the remaining six are operated manually with timber stop logs. The structural detailing for the two most westerly sluices varies slightly from the other sluices mainly with a larger pier required for the mechanized gates, a slightly larger span and somewhat lower sill elevation. These two most westerly sluices serve as low flow channels when the upstream reservoir is partially dewatered during the winter. All remaining sluices are similar, with exception of the third sluice from east that has a lower sill elevation to create a low flow channel. The total hydraulic opening is 64.6 m measured perpendicular between abutment faces. The two western sluices have 8.5 m wide openings controlled by mechanically operated gates and are separated by a 2.4 m wide pier. The remaining six sluices are controlled by timber stop logs that have 6.1 m wide openings separated by 1.2 m wide piers. All sluices have gains to receive timber stop logs for flow control and the two western sluices have an extra set of gains to receive the mechanical gates. The gains consist of stiffened steel plate liners embedded into the piers and abutments.
- .6 The dam superstructure consists of precast concrete deck slabs spanning between the piers and abutments with the exception of a localized cast-in-place slab surrounding the mechanically operated gates. The dam deck is 7.2 m wide which includes a 2.4 m wide pedestrian walkway and a 4.8 m wide operational deck. The pedestrian walkway consists of two 1219 mm wide variable depth precast slabs per sluice, with minimum thickness of 254 mm and a maximum depth of 298 mm plus and integral 152 mm high curb. From Pier 2 to the east abutment, the operating deck is composed of four 254 mm thick precast panels either 1219 mm or 610 mm wide per sluice for a total width of 4.814 m including a 0.508 m wide opening for installation of the stop logs. The ends of each precast deck panel are supported on two neoprene bearing pads at the piers/abutments. Between the bearing pads, the precast slabs are coped to accept shear blocks extending up from the pier and abutment bearing seats. From the west abutment to Pier 2, the operating deck is a continuous 457 mm thick cast-in-place slab, 3035 mm wide which supports the mechanical equipment for raising and lowering the gates.
- .7 An open metal railing secures the deck edges and separates the operational deck from the pedestrian walkway. The reinforced concrete apron varies in elevation between sluices from approximately 69.641 m to 71.165 m and the operational deck elevation is approximately 76.956 m.

1.15 MINIMUM STANDARDS

- .1 Use new materials and work to at least all applicable minimum standards of; Canadian General Standards Board, Canadian Standards Association, National Building Code of Canada 2015 (NBCC), ASTM, applicable Provincial, Municipal, and all other national and international codes.
- .2 In case of conflict or discrepancy, most stringent requirement will apply.

1.16 ABBREVIATIONS

- .1 Abbreviations used are:

- .1 ASTM - American Society for Testing and Materials.
- .2 ACI - American Concrete Institute.
- .3 ANSI - American National Standards Institute.
- .4 CSA - Canadian Standards Association.
- .5 CWB - Canadian Welding Bureau.
- .6 NBCC - National Building Code of Canada.
- .7 CPM - Critical Path Method.
- .8 CGSB - Canadian General Standards Board.
- .9 GC - General Conditions.
- .10 MNR - Ministry of Natural Resources
- .11 MOE - Ministry of the Environment
- .12 NCC - National Capital Commission
- .13 OPSS - Ontario Provincial Standard Specifications
- .14 PSPC - Public Services and Procurement Canada, formerly Public Works and Government Services Canada (PWGSC).
- .15 PCA – Parks Canada Agency

1.17 DEFINITIONS

- .1 Unless context clearly indicates otherwise, these definitions apply:
 - .1 Canal - Rideau Canal National Historic Site.
 - .2 Dam – Hogs Back Dam
 - .3 Bridge - Hogs Back Fixed Bridge
 - .4 Plans - Drawings listed in "List of Drawings".
 - .5 Specifications - the subject matter listed in the "List of Contents", addenda to the specifications, and all relative written communications sent by Departmental Representative to the Contractor in connection with the Work.
 - .6 Departmental Representative: Public Services and Procurement Canada (PSPC)/ Consultant.

1.18 BENCHMARK

- .1 Benchmark data available from Natural Resources Canada, Geodetic Survey Division or the Province of Ontario.
- .2 Refer to plans for available benchmark information and location.

1.19 WATER LEVELS

- .1 Contractor required to work near water.
- .2 Information on control of water levels may be obtained from Departmental Representative.
- .3 Topographical and bathymetrical information upstream of the dam is as shown on the project plans and as provided in the reference documents.
- .4 Normal navigation period runs from approximately Victoria Day weekend to Thanksgiving weekend.

- .1 May 15, 2020 to October 12, 2020.
- .2 Navigation season may be subject to change.
- .5 Water levels below are presented using Canadian Geodetic Vertical Datum for 1928 (CGVD28).
- .6 The Dam Inflow Design Flood (IDF) for the spring flood, with a return period larger than 1000 years, is estimated to 927 m³/s. Water level under that flood can reach 75.61m.
- .7 Normal Navigation Season water levels for summer are:
 - .1 Upstream: 74.95 m
- .8 Water level under flood conditions during navigation season are:
 - .1 With mechanical gates 1 and 2 open and stoplogs sluices closed: 74.95 m for floods up to the 1:500-yr flood.
- .9 Operations to lower water level start at end of Navigation season and progress in a specific sequence along the waterway.
 - .1 At this site it is not expected that drawdown levels will be reached until first week of December 2020.
 - .2 Water levels after drawdown can be as low as 70.50 m.
- .10 .2 Water levels fluctuate continuously due to rain, snow, snowmelt, evaporation, leakage and operational requirements.

1.20 REQUIREMENTS OF REGULATORY AGENCIES

- .1 Adhere to local municipality noise by-laws.
- .2 Dispose of unwanted materials off Canal lands at location approved by Ontario Ministry of the Environment.

1.21 PROTECTION OF WORK

- .1 Protect finished work against damage until take-over.
- .2 Protect the work from damage caused by ice, flooding, and other adverse climatic conditions.
- .3 Protect adjacent work against the spread of dust and dirt beyond the work areas.
- .4 Protect operatives and other users of site from all hazards.

1.22 DEPARTMENTAL REPRESENTATIVE SITE OFFICE

- .1 Provide and maintain secure construction office for exclusive use of Departmental Representative as follows:
 - .1 Office of sound, lockable, insulated, weather-proof construction.
 - .2 Greater than 12 square metres in floor area.
 - .3 Equipped with electric light, minimum 4 electrical outlets and heat.
 - .4 Supply wireless data service for use by Contractor and Departmental Representatives.

- .5 Supply office desk, 900 mm x 1200 mm reference table, 4 chairs, 1 drafting stool, and 1 lockable 4-drawer filing cabinet;
- .6 Maintain minimum temperature of 21 degrees C during hours of work and 17 degrees during off-hours.
- .7 Maintain office and utilities in good working order.
- .2 Pay all costs, including heating, lighting and data.
- .3 Office to remain property of Contractor.

1.23 CONTRACTOR'S OFFICE

- .1 Provide an office for contractor at site location, open during regular working hours.
 - .1 Provide dedicated meeting room large enough to accommodate site meetings for up to 10 people.
 - .2 Dedicated meeting room not to be used for contractor staff or for storage.

1.24 EXPLOSIVES

- .1 Uses of explosives are not allowed on this project.

1.25 EXAMINATIONS

- .1 Examine site and conditions likely to affect work and be familiar and conversant with existing conditions.
- .2 Provide photos of surrounding properties, objects and structures liable to be damaged or be the subject of subsequent claims.

1.26 CLEAN-UP

- .1 Clean and tidy premises on daily basis, do not permit accumulation of debris, trash and/or garbage.
- .2 Remove Rubbish, debris and garbage from construction activities off site at least on weekly basis or when not manageable within designated staging areas within any given week
- .3 At completion of the work, remove surplus materials, tools, plant, rubbish and debris and dispose of them in an approved manner.
- .4 Accumulation of construction debris at site, including the material from demolition works and garbage, is not acceptable.

1.27 TAXES

- .1 Pay all taxes properly levied by law (including Federal, Provincial and Municipal).

1.28 FEES, PERMITS AND CERTIFICATES

- .1 Pay all fees and obtain all permits. Provide authorities with plans and information for acceptance certificates. Provide inspection certificates as evidence that work conforms to requirements of Authority having jurisdiction.
 - .1 Payment to be included in Lump Sum price for fees, permits and certificates.

1.29 FIELD QUALITY CONTROL

- .1 Carry out work using qualified licenced workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification.
- .2 Permit employees registered in Ontario apprenticeship program to perform specific tasks only if under direct supervision of qualified licenced workers.
- .3 Determine permitted activities and tasks by apprentices, based on level of training attended and demonstration of ability to perform specific duties

1.30 HAZARDOUS MATERIALS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and the provision of Material Safety Data Sheets (MSDS) acceptable to Human Resources Development Canada, Labour Program.

1.31 TEMPORARY UTILITIES

- .1 Make required arrangements with utility providers to provide temporary light, telephone, power and water to fulfill requirements of construction a per 01 51 00 – TEMPORARY UTILITIES.

1.32 REMOVED MATERIALS

- .1 Unless otherwise specified, materials for removal become Contractor's property and to be taken from site.

1.33 CUT, PATCH AND MAKE GOOD

- .1 Repair, replace and refinish, to Departmental Representative's approval, existing surfaces and items damaged in connection with the work, at Contractor's expense.
- .2 The repaired, replaced and refinished items to be at least equal or better to those that existed immediately before damage occurred.
- .3 Disturbed lawn areas to be reinstated in accordance with Section 32 94 00 - GENERAL LANDSCAPING.

1.34 SIGNS AND SAFETY DEVICES

- .1 Provide common-use signs and safety devices related to traffic control, information, instruction, use of equipment and public safety devices in both official languages or by use of commonly-understood graphic symbols to Departmental Representative's approval.
- .2 No advertising permitted on this project.

1.35 SITE SIGNAGE

- .1 Remove and dispose of the two existing “Walk your bicycle” signs.
- .2 Remove, store and re-install signs that could be damaged within the construction area.

- .1 Before removing any signage, produce a field survey to note each sign location, angle of installation, installation height, dimensions and existing defective or damaged materials.
- .2 Replace defective or damaged materials with new equivalent materials, approved by Departmental Representative.
- .3 Install permanent Public Safety Sign around Dam provided by others.
 - .1 Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.
 - .2 Comply with sign manufacturer's installation instructions and approved drawings.

1.36 **USE OF SITE AND FACILITIES**

- .1 Execute work with least possible interference or disturbance to the normal use of premises and traffic flow around Hogs Back Dam & Fixed Bridge. This includes vehicular, pedestrian and cyclist traffic. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Multi-use pathway located over the Hogs Back Dam Deck is to remain open to public use at all times including the temporary footbridge to be constructed which will connect the pedestrian and cyclist pathway on dam deck to Colonel By Drive.
- .3 The dam deck located at the north of the bridge is not to be used by contractor for any purpose other than for implementation and maintenance of pedestrian and cyclist detour.
- .4 Public pedestrians, cyclists and vehicular traffic to parking lot and Pirate Adventure Park located at the south-east of Hogs Back Bridge is to remain uninterrupted for the duration of the project.
- .5 Limits of the designated staging area at the parking lot located at the south-east of the Hogs Back Bridge must be kept to the limits shown on design drawings as the parking lot will be shared with public.
- .6 The river and the canal must remain free of obstruction during the navigation season.
- .7 Contractor will be responsible for all snow removal required in the area of the work, including access roads, parking area and multi-use pathways.
- .8 Where security is reduced by work provide temporary means to maintain security.

1.37 **TEMPORARY FACILITIES**

- .1 Provide and maintain suitable storage facilities, of type and location approved by Departmental Representative.
- .2 Observe and enforce all construction safety measures required by authorities having jurisdiction.
- .3 Provide and maintain all necessary enclosures, guards, guardrails, hoardings, barricades, warning signs and similar items.
- .4 Provide sufficient chemical toilet conveniences in a sanitary condition for use of all persons at the site in a location approved by Departmental Representative.

- .5 Enclose the work and storage area with secure fencing as directed by Departmental Representative.
- .6 The Contractor will remove the access roads and laydown areas and restore the site based on the restoration plan. No additional access road, laydown area or work area will be allowed at site unless otherwise authorized by the Departmental Representative.

1.38 ACCESS AND EGRESS

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.39 SCAFFOLDS AND WORK PLATFORMS

- .1 Design, install, and inspect scaffolds and work platforms required for work in accordance with relevant municipal, provincial and other regulations.
- .2 Provide design drawings, signed and sealed by qualified Professional Engineer licensed in the province of Ontario, where prescribed.
- .3 Additions or modifications to scaffolding must be approved by Professional Engineer in writing.
- .4 If any work platform or a barge placed under the bridge which may impair the flow through a sluiceway, or requires sluiceway to be fully closed, the Contractor shall respect the following:
 1. Ensure that at least 2/3 of the dam is available to pass the flow.
 2. If either gate 1 and 2 need to be closed, the contractor will be responsible to operate, under direction of PCA, the adjacent stoplog sluiceways for the duration of the gate closure
 3. Gate 1 and/or 2 cannot be fully closed during the fall drawdown period.
 4. No work platform or barge can be attached to or apply load against the stoplogs or mechanical gates.

1.40 GUARANTIES AND WARRANTIES

- .1 Before completion of work collect all manufacturer's guarantees and warranties and deposit with Departmental Representative.

1.41 PROJECT MEETINGS

- .1 Provide physical space and make arrangements for meetings.
- .2 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.
- .3 Preconstruction meetings:
 - .1 Within 15 days of award of contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
 - .2 Establish time and location of meeting and notify parties concerned minimum of 5 days before the meeting

- .3 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .4 Progress meetings:
 - .1 During course of work and 2 weeks prior to project completion, schedule progress meetings bi-weekly.
 - .2 Notify parties minimum 5 days prior to meetings.
 - .3 Prepare minutes of meetings and distribute to attending parties and affected parties not in attendance within 3 days after meeting.

1.42 SITE SUPERVISION AND KEY PERSONNEL

- .1 The project team members submitted for evaluation during the tendering process shall not be substituted without the written consent of the Departmental Representative. In the event substitution is proposed after contract award, the Contractor must propose Key Personnel with equivalent experience as described in Team Identification and Qualification during tendering process and obtain approval of Departmental Representative for the proposed substitution.
- .2 Project Manager
 - .1 Must attend all site meetings.
- .3 Site Superintendent:
 - .1 Must be present at site during the full duration of construction, have the authority on major decisions regarding budget and schedule and cannot be one of the foreman or workers.
 - .2 Must attend all site meetings.
- .4 Scheduler:
 - .1 Must attend site meetings when requested by Departmental Representative.
- .5 Quality Manager:
 - .1 Must attend site meetings when requested by Departmental Representative.

1.43 CONTRACT DOCUMENTS

- .1 Drawings and specifications are complementary, items shown or mentioned in one and not in the other are deemed to be included in the contract work.
- .2 Contractor responsible for printing/duplicating required drawings or specifications for:
 - .1 Suppliers;
 - .2 Sub-contractors;
 - .3 On-Site drawings & specifications;
 - .4 Project Record drawings.

1.44 TESTING LABORATORY SERVICES

- .1 Departmental Representative will appoint and pay for costs of inspection and testing services for quality assurance purposes, unless indicated otherwise.

- .2 Contractor to appoint and pay for costs of inspection and testing services for quality control.
- .3 Provide safe working areas and assist with testing procedures, including provisions for materials or services and co-ordination, as required by testing agency and as authorized by Departmental Representative.
- .4 Where tests indicate non-compliance with specifications, Contractor to pay for initial test and all subsequent testing of work to verify acceptability of corrected work.

1.45 **SCHEDULING**

- .1 Submit the construction progress schedule, (in CPM form) within 15 days of award of contract. Progress schedule must include the quantity of work to be accomplished within each 2-week timeframe. No progress payments will be made until the construction progress schedule is approved. Submit together with the progress schedule a cost breakdown for each lump sum payment item.
- .2 When requested by Departmental Representative, resubmit the schedule with all revisions made to show the progress of the work and to show any changes which are required to meet the approved completion dates, within 10 working days.
- .3 Take all necessary measures to complete the work within the scheduled times approved by Departmental Representative.
- .4 Do not make changes to the approved schedule, without Departmental Representative's approval.
- .5 The requirements of Section 01 33 00 SUBMITTAL PROCEDURES apply to the construction progress schedule.
- .6 Carry out work during "regular hour" Monday to Friday from 07:00 to 18:00 hours.
- .7 Give Departmental Representative 48 hours' notice for work to be carried out during "off hours".
- .8 Evening, night and weekend work is permitted; however, a written permission from the local city council will be required prior to any evening, night and weekend work.
- .9 Work as shown on the project drawings must start at first week of May 2020 and must be completed by end of December 2020.
- .10 Contractor to finish all work, have site restored and demobilize entirely from site before Victoria Day weekend 2021.
- .11 Hogs Back Road to be open to vehicular and pedestrian traffic by January 1, 2021.

1.46 **LAYOUT OF THE WORK**

- .1 Contractor is responsible for layout and control survey work, and checking plan dimensions against field measurements. Contractor to locate benchmark at described location.
- .2 Contractor to relocate and identify new benchmarks at their original locations after reconstruction of the bridge.
- .3 Lay out the work according to elevations and dimensions shown on plans and verified in field, or determined in field.

- .4 Notify Departmental Representative immediately of any discrepancies between field measurements and dimensions shown on the plans.
- .5 Be responsible for rectification of errors resulting from failure to verify dimensions, elevations and other pertinent data shown on the plans.

1.47 COST BREAKDOWN

- .1 Before submitting first progress payment request, submit breakdown of Contract Amount in detail as directed by Departmental Representative and aggregating Contract Amount. After approval by Departmental Representative cost breakdown will be used as basis for progress payments.

1.48 ENVIRONMENTAL MANAGEMENT PLAN

- .1 The Contractor shall submit Site Specific Environmental Management Plan (SSEMP) within seven (30) days from the date of Notice to Proceed and prior to commencement of work. The SSEMP must be written by a qualified consultant.
- .2 Update EMP specifications in accordance with PCA Environmental Standards and Guidelines (ESG) and the Basic Impact Analysis (BIA).
- .3 Permit under Historic Canal Regulation (HCR) will not be issued until the site specific EMP is accepted and approved by Departmental Representative. The Contractor is not permitted to commence work on site prior to issuance of HCR Permit.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 11 00 GENERAL INSTRUCTIONS.

1.2 ACCESS AND EGRESS

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders, scaffolding and work platforms, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.3 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Maintain existing services to buildings and infrastructures and provide for personnel and vehicle access.
- .3 Multi-use pathway located over the Hogs Back Dam Deck, detour located at the Hogs Back Park and the access to the PCA parking lot are to remain open to public use at all times including when the temporary multi-use pathway and footbridge will be constructed at the west end of the pathway in accordance with Section 01 51 00 Temporary Utilities.
- .4 The contractor construction and staging areas must be secured by fencing and kept to the limits shown on the design drawings. Provide access for personnel, pedestrians, cyclists and vehicular traffic to the park areas adjacent to Hogs Back Bridge.
- .5 Limits of the designated staging area at the parking lot located at the south-east of the Hogs Back Bridge must be kept to the limits shown on design drawings as the parking lot will be shared with public.
- .6 Parking lot access roads must remain in good condition at all times.
- .7 Some events may require the use of the Zone B parking a few days ahead of time for set up. If a restriction is requested for the use of Zone B during week days, it will be communicated in a timely manner. Events are, but may not be limited to:
 - .1 Enbridge Christie Lake Canoe - June 6, 2020
 - .2 Ottawa Dragon Boat Festival - June 22-23, 2020
 - .3 Hope Volleyball - July 11-12, 2020
 - .4 Canadian Sprint Canoe Kayak Championships - August 25-30, 2020 (full week event)
 - .5 For these events, the Contractor will have to park vehicles in the contractor area or will have to obtain related authorization and manage transportation to another parking area.
- .8 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

- .9 Each gate into the construction areas shall be operated by a permanent traffic control person to control construction traffic. Where security is reduced by work provide temporary means to maintain security.
- .10 Accept liability for damage, safety of equipment and overloading of existing equipment.
- .11 Closures: protect work temporarily until permanent enclosures are completed.
- .12 Design live load for existing tunnels T2 is HS20-44. There is no design live load information for Tunnel T3 located at the east side, which is assumed to be HS20-44. Therefore, stockpiling, storing material or heavy equipment on the tunnels, which will exceed their design live load capacity is not allowed. It is the responsibility of the Contractor to ensure the tunnels are not overloaded. If the Contractor chooses to utilize the area on top of the existing Tunnels for any construction activity such as placement of crane or stock piling material which will exceed the design live load capacity of the tunnels, it is contractor's responsibility to design and install temporary shoring systems under the tunnels. Temporary shoring system for the tunnels is to be designed and certified by Contractor's engineer who is registered to practice in the Province of Ontario.

1.4 EXISTING SERVICES

- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions to a minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

1.5 SPECIAL REQUIREMENTS

- .1 Regular work hours permitted for construction are Monday to Friday 7:00 to 18:00 hours.
- .2 Night and weekend works are allowed with minimum 48 hours advance notice to Departmental Representative.
- .3 Evening, night and weekend work will be permitted; however, a written permission from the local city council will be required prior to any evening, night and weekend work.
- .4 The Contractor must request to submit a noise exemption application to the City of Ottawa (noiseexemption@ottawa.ca), subject to the GENERAL CONSTRUCTION (Section 13) and CONSTRUCTION EQUIPMENT (Section 22) provisions of Noise By-law 2017-255.
- .5 Where approved for noise exemption permit, the Contractor shall demonstrate and implement adequate noise control systems per the following constraints.
 - .1 Maximum of 85dBA when measured at the point of reception between 22:00 to 07:00 Monday to Saturday and 22:00 to 09:00 on Sundays, statutory and public holidays.
- .6 Submit schedule in accordance with Section 01 32 16.19- Construction Progress Schedule - Bar (GANTT) Chart.
- .7 Ensure Contractor's personnel employed on site become familiar with and obey regulations including environmental, archeological, safety, fire, traffic and security regulations.

- .8 Keep ingress and egress within limits and avenues of work.
- .9 Deliver materials outside of peak traffic hours between 9:00 to 12:30, 13:15 to 15:30, and 17:30 to 18:00, unless otherwise approved by Departmental Representative.
- .10 No trees or vegetation shall be removed from April 12st to August 28th to protect nesting birds.
- .11 Paving of the bridge and pavement markings shall be completed by November 30, 2020 and comply with OPSS 310 requirements, unless agreed otherwise with the Departmental Representative, to ensure temperature is within allowable limits and paving companies are still in operation.
- .12 If the paving and pavement markings of the Hogs Back Road cannot be completed before the temperatures drop below allowable limits for paving and pavement markings, Contractor is to place temporary paving and temporary pavement markings to allow vehicular traffic until temperatures are favorable in spring. Temporary pavement is to be removed in spring and permanent pavement and marking are to be installed by the Contractor. There will be no separate payment for the installation of temporary pavement, removal of the temporary pavement, installation of permanent paving and permanent pavement markings in spring.

1.6 WATER LEVEL AND WATERWAY NAVIGATION RESTRICTIONS

- .1 Navigation season typically starts on the Friday before Victoria Day weekend and ends on Monday of Thanksgiving Day.
- .2 Work must not disrupt the maintenance period before and after each navigation season on the Rideau Canal.
- .3 The maintenance period typically lasts a few weeks before and a few weeks after the navigation season on the Rideau Canal.
- .4 The water levels at Hogs Back Dam are adjusted to accommodate the filling of the canal for the skate way. By mid-November to end of November, stop logs are removed and mechanized gates are opened and the upper reach is lowered and remains at its winter setting until spring.
- .5 Construction activities must be conducted so that at least one mechanized gate of Hogs Back dam can be closed at all times. Any operation requests must be submitted to Departmental Representative two (2) weeks in advance.

1.7 TRAFFIC RESTRICTIONS

- .1 Multi-use pathways must remain open and unobstructed at all times, including the pathway adjacent to the Contractor staging area. Occasional temporary closure of multi-use pathway is possible with prior approval of Departmental Representative but shall not exceed 15 minutes and shall be outside of peak hours.
- .2 For safety of public, if any work activity requires temporary closure to multi-use pathway located on the Hogs Back Dam at north side of the bridge, a traffic control person is required at both east and west end of the pathway to control the pedestrian and cyclist traffic.
- .3 Temporary closure of multi-use pathway must be included in the Traffic Control and Management Plan of the Contractor.

- .4 Departmental Representative must be notified at least 48 hours prior to any closure of multi-use pathways.
- .5 The use of the multi-use pathway detours and diversions to be restricted to the public traffic. It shall not be used as a means of equipment transportation.
- .6 Contractor to provide adequate barriers, fences, signage, traffic control persons and enclosures to protect safety of public for the entire duration of the project.
- .7 Public pedestrians, cyclists and vehicular traffic access to parking lot and Pirate Adventure Park located at the south-east of Hogs Back Bridge is to remain uninterrupted for the duration of the project.
- .8 Any temporary road closure or interruption to traffic on Hogs Back Road will be restricted to one long duration complete road closure. Some exceptions are possible, such as works stated in Section 32 94 00 General Landscaping but must be approved by Departmental Representative prior to opening Hogs Back Road to the public.
- .9 Minimize traffic along access roads and maintain safe speeds in accordance to local regulations.
- .10 Contractor to provide Departmental Representative with a Traffic Control and Management Plan in accordance with Section 01 55 26 Traffic Control.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 GENERAL

1.1 DESCRIPTION

- .1 This Section includes but is not limited to:
 - .1 Installation of temporary access paths as indicated for conveyance of materials, equipment and labour to work areas.
 - .2 Protecting existing surfaces along temporary access paths.
 - .3 Providing construction fence and perimeter security measures around work/storage areas.
 - .4 Maintaining access paths and work/storage areas for duration of work.
 - .5 Restoring access paths and work/storage areas to condition found before start of work.
 - .6 Installing temporary scaffolding, work platforms and staircases to all levels where work will take place.
 - .7 Installing temporary scaffolding and work platforms in sections matching stages of work and to remain in place until work completed in each section.
 - .8 Parking.
- .2 This section does not include:
 - .1 Repairs to sodded areas affected by Contractor's activities described in Section 32 94 00 - GENERAL LANDSCAPING.

1.2 MEASUREMENT AND PAYMENT

- .1 No measurement of Site Access to be made.
- .2 Payment to be included in the Lump Sum Price, in accordance with Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L8 - Site Access.
 - .2 Item No. L13 - Construction Fencing.

1.3 RELATED WORK

- .1 Section 01 11 00 – GENERAL INSTRUCTIONS
- .2 Section 01 35 29.06 - HEALTH AND SAFETY REQUIREMENTS.
- .3 Section 01 35 46 - ARCHEOLOGICAL, CULTURAL ENVIRONMENTAL PROCEDURE.

1.4 REFERENCES

- .1 Canadian Standards Association (CSA).
 - .1 CSA Z797-09 (R2014), Code of Practice for access scaffold.

1.5 EXAMINATION AND PREPARATION

- .1 Examine site in accordance with Section 01 71 00 - EXAMINATION AND PREPARATION.
- .2 Make arrangements to examine site with Departmental Representative 5 days in advance of mobilizing.

1.6 INFORMATION AND SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES.
- .2 Submit Site Layout Plan at least 15 days prior to proposed mobilization date.
 - .1 Prepare Site Layout Plan indicating proposed layout of construction zone, staging area, Contractor parking areas and public areas.
 - .2 Indicate location and dimensions in plan view drawing for proposed work areas, parking areas, fencing, gates, storage areas, access paths, access systems, office trailer locations, equipment layout, utility locations and other site layout features to describe Contractor's use of site.
 - .3 AutoCAD drawings used for development of Contract Drawings available upon request.
- .3 Submit Site Access Plan at least 15 days prior to work.
 - .1 Prepare site plan indicating proposed layout and design of site access methods and systems.
 - .2 Indicate proposed design, staging and layout of access systems to be used to access areas of work.
 - .3 Show access routes, construction access roads.
 - .4 Demonstrate methods to be used to improve construction access roads or construct work areas.
 - .5 Indicate staging of work.
 - .6 Site Access Plan to be signed and sealed by Contractor's Engineer.

1.7 ACCESS TO THE SITE

- .1 Hogs Back Fixed Bridge & Dam is located on Hogs Back Road between Colonel By Drive at west side and Riverside Drive at east side in City of Ottawa.
- .2 Site must be accessed from the East Side: Riverside Drive to Hogs Back Road.
- .3 If required, site can be accessed from the West side, upon approval by Departmental Representative. Occasional access is possible only from Prince of Wales Dr through Hogs Back Swing Bridge, that is owned and maintained by the National Capital Commission (NCC). Swing bridge deck is designed to CL-625 loading.
- .4 Since commercial vehicles are prohibited on Colonel By Dr, access to Hogs Back Road from Colonel By Dr is forbidden.
- .5 Access to the Lock site and its facilities must remain unobstructed for emergency and Canal vehicle access.
- .6 Access to NCC parking lot, PCA parking lot, recreation areas and Hogs Back Park must remain unobstructed for visitor use.
- .7 Access for emergency vehicle along Hogs Back Road must adhere to City of Ottawa requirements.
- .8 Access to the work, construction zone, limits of work and staging areas to be as indicated or as directed by Departmental Representative.
- .9 Remove temporary access structures and restore access and work areas to original condition upon completion of work, at Contractor's expense, except where noted otherwise.

- .10 For access requiring use of public roads, make all arrangements, obtain required permits and confine activities to such routes and load limits as the authorities having jurisdiction may require.
- .11 Obtain land access permit from NCC for use of NCC Hogs Back Park pathways for pedestrian and cyclist detour on NCC lands.

1.8 SECURITY

- .1 Secure all work and storage areas. This includes installing a fence to prevent public access to areas where construction activities occur and where construction materials are stored.
- .2 Secure access to work areas in approved manner.
- .3 Take appropriate security precautions to safeguard equipment, tools, and materials on site from vandalism and theft.

1.9 PARKING

- .1 Parking to be restricted to designated parking areas and staging areas. Move or park vehicles only on approved access roads.
- .2 Designated parking area is to be kept free of material, equipment and construction debris.
- .3 Workers commuting to site to use indicated parking area.
- .4 Equipment to be parked in staging area or work areas.
- .5 Provide environmental protection for parked equipment that may leak fuel or oil within 10 m of water body.

1.10 PROTECTION OF TRAFFIC

- .1 Protect traffic on public roadway as stated in Section 01 55 26 - TRAFFIC CONTROL.
- .2 Maintain public roadway and public parking by routinely cleaning to remove Construction debris in accordance with Section 01 74 00 - CLEANING.
- .3 Provide traffic control person to watch for vehicles, cyclists or pedestrians whenever vehicles or equipment cross the roadway, pedestrians and cyclists pathways or travel between Staging Area and Construction Zone.

1.11 SNOW REMOVAL

- .1 Snow removal from construction zone, staging area, contractor parking areas, public parking areas, work -areas, construction access roads, and multi-use pathway detour as per Section 01 74 00 - CLEANING.
- .2 After navigation season ends in October, the contractor will be responsible from snow clearance of access road to the parking lot and within the parking lot.

Part 2 PRODUCTS

2.1 CONVEYANCE SYSTEMS

- .1 Materials: new or used, in good condition.

2.2 GRANULAR BASE

- .1 Granular Base: MTO Granular A.

Part 3 EXECUTION

3.1 REQUIREMENTS OF REGULATORY AGENCIES

- .1 Obtain approvals from and pay fees to Federal or Provincial agencies for works as may be required by this Contract.

3.2 SHOP DRAWINGS

- .1 Contractor's Engineer responsible for conceptual and detail design of access systems.
- .2 Submit shop drawings showing layout, details, staging plan and schedule for access systems to Departmental Representative for review.

3.3 CONSTRUCTION FENCING

- .1 Supply, install, and maintain for duration of work minimum 1.8 m high welded-wire construction fence to prevent public access to construction zone and staging area where construction activities to occur or where construction materials stored.
- .2 Provide gates where required for access.
- .3 Provide secure coverings using fencing or other accepted method to prevent Public access to work areas during construction.
- .4 Obtain Departmental Representative's approval on measures for "securing" fencing or stabilizing fencing before proceeding with work.
- .5 Secure fence using methods accepted by Departmental Representative that do not damage site structures or site features.
- .6 Do not drill into site structures or site features unless accepted by Departmental Representative in writing.
- .7 Adjust fencing layout to suit changing conditions and address deficiencies.
- .8 Remove fences in their entirety from site after work is completed. Make good any damage.

3.4 SCAFFOLDING AND WORK PLATFORMS

- .1 Design, construct and maintain scaffolding and work platforms in accordance with CSA Z797.
 - .1 Scaffolding and work platforms to be subject to wind, rain, ice, snow and flooding.
 - .2 Scaffolding and work platforms to be designed, inspected and certified by Contractor's Engineer.
- .2 Ensure transition area from stairs and ladders are safe and clear from obstructions and cross bracing.
- .3 Ensure scaffolding and work platforms setup to provide adequate height and width for passage of workers and equipment through areas.
 - .1 Minimum height: 2 m.
 - .2 Minimum width: 1 m.
- .4 Scaffolding and work platforms to remain in place in each staged area for duration of work including but not limited to preparation, inspection, heating, installation, and curing.
- .5 Securely brace scaffolding and work platforms to resist wind loads.
- .6 Make periodic inspections of scaffolding and work platforms as work progresses and immediately make good any damage or deficiencies.

- .7 Immediately make changes to scaffolding and work platforms required by Ministry of Labour officials.
- .8 Do not load or permit to be loaded any part of work or temporary access structure with weight or force that endangers work or labourers.
- .9 If any work platform or a barge placed under the bridge which may impair the flow through a sluiceway, or requires sluiceway to be fully closed, the Contractor shall respect the following:
 1. Ensure that at least 2/3 of the dam is available to pass the flow.
 2. If either gate 1 and 2 need to be closed, the contractor will be responsible to operate, under direction of PCA, the adjacent stoplog sluiceways for the duration of the gate closure
 3. Gate 1 and/or 2 cannot be fully closed during the fall drawdown period.
 4. No work platform or barge can be attached to or apply load against the stoplogs or mechanical gates.

3.5 CONSTRUCTION ACCESS ROADS

- .1 Construct and maintain access roads to work and storage areas and work pads for construction activities.
- .2 Improve construction access roads and work pads to prevent damage to site structures and minimize damage to landscaping and trees during wet conditions.
- .3 Place minimum 150 mm thick gravel base (granular A) over geotextile fabric.
 - .1 Alternately ground protection mats may be used;
 - .1 High Density Polyethylene or similar high density durable plastic.
 - .2 Thickness: 13 mm minimum.
 - .3 Width: 3m minimum.
- .4 Construction access road and construction activities to be limited to south side of the dam
- .5 Asphalt pathways, the sodded areas and access roads impacted by construction activities must be restored at the cost of the Contractor.

3.6 ENCLOSURES AND BARRIERS

- .1 Provide enclosures and barriers to Section 01 56 00 - TEMPORARY BARRIERS AND ENCLOSURES.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section covers measurement of work for payment purposes, and scope of work included in pay items in Unit Price Table and Lump Sum Price Table.

1.2 MEASUREMENT AND PAYMENT

- .1 Lump Sum Price Item - Work items not designated in Unit Price Table and not measured for payment to be paid as Lump Sum Price. These items include costs associated to perform work including but not limited to materials, equipment, personnel, overhead, etc.
- .2 The items of work listed below are not intended to be complete but are provided to give an indication to the Contractor how the Contract Lump Sum and Unit Price will be broken down for payment purposes.
- .3 Work not specifically addressed and covered in Unit Price Item but indicated to be completed or required to be completed in order to complete work, to be included in Lump Sum Item No. L7 - General Work.
- .4 Unit Price Items - Items for which measurement to be made for payment using Unit Prices. These items include costs associated to perform work including but not limited to materials, equipment, personnel, overhead, etc.

1.3 LUMP SUM PRICE TABLE

- .1 Items included in the lump sum price are the following:
 - .1 Item No. L1 – Mobilization
 - .2 Item No. L2 – Demobilization
 - .3 Item No. L3 – Document Existing Site Conditions
 - .4 Item No. L4 – Connect and Setup Temporary Utilities and Facilities
 - .5 Item No. L5 – Usage of Utilities
 - .6 Item No. L6 – Heating and Hoarding
 - .7 Item No. L7 – General Work.
 - .8 Item No. L8 – Site Access
 - .9 Item No. L9 – Barricades and Enclosures
 - .10 Item No. L10 – Site Cleaning
 - .11 Item No. L11 – Snow Removal
 - .12 Item No. L12 – Traffic Control
 - .13 Item No. L13 – Construction Fencing
 - .14 Item No. L14 – Archeological, Cultural, Environmental Procedures
 - .15 Item No. L15 – Clearing and Grubbing
 - .16 Item No. L16 – Landscaping
 - .17 Item No. L17 – Quality Control
 - .18 Item No. L18 – Fees, Permits and Certificates

- .19 Item No. L19 – Project Record Documents
- .20 Item No. L20 – Metals Fabrication and Installation
- .21 Item No. L21 – Fabrication of Structural Steel for Bridge and Bearings
- .22 Item No. L22 – Installation of Structural Steel for Bridge and Bearings
- .23 Item No. L23 – Demolition of Existing Superstructure
- .24 Item No. L24 – Selective Demolition for Electrical
- .25 Item No. L25 – Bridge Deck and Multi-use Pathway
- .26 Item No. L26 – Bridge Traffic Barriers
- .27 Item No. L27 – Electrical Work
- .28 Item No. L28 – Road Work
- .29 Item No. L29 – Signage Salvaging and Installation

1.4 UNIT PRICE TABLE

.1 Unit price items are the following:

- .1 Item No. U1 – Common Excavation
- .2 Item No. U2 – Common Backfilling
- .3 Item No. U3 – Backfilling with Granular A
- .4 Item No. U4 – Backfilling with Granular B Type I and Type II
- .5 Item No. U5 – Geotextile
- .6 Item No. U6 – Concrete Removal
- .7 Item No. U7 – Reinforcing Steel
- .8 Item No. U8 – Cast-in-place Concrete
- .9 Item No. U9 – Concrete Repair
- .10 Item No. U10 – Dowels
- .11 Unit No. U11 – Curbs
- .12 Item No. U12 – Asphalt Paving - Surface Course
- .13 Item No. U13 – Asphalt Paving - Lower Course
- .14 Item No. U14 – Asphalt Paving - Multi-use and Pedestrian Pathways

1.5 CONTRACT LUMP SUM PRICE WORK ITEMS PAYMENT PROCEDURES

.1 Item No. L1 – Mobilization:

- .1 Includes but not limited to activation, mobilizing of Contractor's personnel, general equipment and operating supplies to site. Establishment of offices, storage and general facilities for operations at the site and administrative items related to project. Does not include items of work specifically addressed and paid under other work items.

.2 Item No. L2 – Demobilization:

- .1 Includes but not limited to demobilizing of Contractor's personnel, general equipment and operating supplies from site and restoring the site for Owner's occupancy upon completion of work.

- .3 Item No. L3 - Document Existing Site Conditions:
 - .1 Includes but not limited to inspections, surveying to record existing conditions, verifying dimensions, photographic documentation of existing site conditions, performing utility locates, and maintaining record drawings, design, construction and fabrication of temporary shoring systems for existing site features,
- .4 Item No. L4 – Connect and Setup Temporary Utilities and Facilities:
 - .1 Includes but not limited to set up of utilities required for the duration of the work such as power, communication, lighting, water, heating, ventilation; implement and maintain temporary multi-use pathways and detours as outlined on drawings; design, fabricate and install temporary footbridge for pedestrian and cyclist detour on the pathway located along the dam deck; implement temporary power bypass for connecting the existing pullbox NW of the dam to new handhole NE of the dam, implement temporary lighting at each extremities of the dam connected to temporary bypass, disconnect, remove all utilities and restore the area upon completion of work.
- .5 Item No. L5 - Usage of Utilities:
 - .1 Includes but not limited to the monthly cost of using temporary utilities.
- .6 Item No. L6 - Heating and Hoarding
 - .1 Includes but not limited to the space heating of enclosures for cold weather works.
- .7 Item No. L7 - General Work.
 - .1 Includes but not limited to general work items related to setting up, operating and maintaining work or storage areas and work not specifically covered by other work items.
- .8 Item No. L8 - Site Access:
 - .1 Includes but not limited to providing site access for conveyance of materials and equipment; developing staging areas and facilities in order to undertake work; maintaining the site access during the contract period including dust control; designing, supplying, installing, maintaining and dismantling scaffolding and work platforms; removal of the site access roads and laydown areas and restore the site to its original condition upon completion of work.
- .9 Item No. L9 - Barricades and Enclosures:
 - .1 Includes but not limited to design, supply, maintain and dismantle enclosures to contain work or for housing to maintain heating where needed.
- .10 Item No. L10 - Site Cleaning:
 - .1 Includes but not limited to progressive site cleaning and complete general cleaning of site to satisfactory of project requirements.
- .11 Item No. L11 - Snow Removal:
 - .1 Includes but not limited to removal of snow from work areas, access roads, staging areas, storage areas, multi-use pathways and parking areas.

- .12 Item No. L12 - Traffic Control:
 - .1 Includes but not limited to traffic control measures for maintaining multi-use pathways and vehicular traffic for the entire duration of the project; implementing and maintaining traffic detours and diversion; supplying, installing and maintaining traffic control signs.
- .13 Item No. L13 - Construction Fencing:
 - .1 Includes but not limited to supplying, installing, maintaining and dismantling construction fence around the construction site, staging areas and along the designated multi-use pathways.
- .14 Item No. L14 – Archeological, Cultural, Environmental Procedures:
 - .1 Item includes work to protect archaeological and cultural resources, and provide environmental protection including but not limited to; implementing mitigation measures from site-specific EMP and Basic Impact Assessment (BIA), installation, maintenance, and removal of environment mitigation measures, environmental testing, and other environmental procedures.
- .15 Item No. L15 – Clearing and Grubbing:
 - .1 Includes but not limited to cutting of trees, brush, vegetative growth; removing previously cut and uprooted trees, stumps and surface debris; excavating and disposing stumps and roots.
- .16 Item No. L16 –Landscaping:
 - .1 Includes but not limited to supply and install trees, shrubs and sods as per landscape drawings and specifications; surface preparation; supply and install top soil.
- .17 Item No. L17 - Quality Control:
 - .1 Item includes but not limited to inspection, testing and Engineering by the Contractor or Contractor’s independent Inspection and Testing Agencies.
- .18 Item No. L18 - Fees, Permits and Certificates:
 - .1 Includes but not limited to Permits and Certificates needed from authorities to perform the work and their fees.
- .19 Item No. L19 - Project Record Documents:
 - .1 Includes but not limited to creating and progressively maintaining project record drawings, shop drawings and manufacturer’s documentation and instructions.
- .20 Item No. L20 – Metals Fabrication and Installation:
 - .1 Includes but not limited to removing, salvaging, refurbishing, refabricating, repainting, and reinstalling barriers and handrails that are needed to be removed to complete the work; fabricating, painting and installing the barriers and handrails which are removed but damaged and are not salvageable; fabricating installing and painting sleeves for existing dam deck handrail repairs; fabricating, painting, coating and installation of all miscellaneous steel components such as drains, sleeves, etc.; hot dip galvanizing the items identified as galvanized.

- .21 Item No. L21 – Fabrication of Structural Steel for Bridge and Bearings:
- .1 Includes but not limited to fabrication, surface preparation and coating of structural steel for bridge, diaphragms, bracing, cable support beams, bearings, bearing pads; nuts, bolts, washers and all other materials needed for the structural steel; radiographic and any other testing of the fabricated components. Measurement for payment will be considered after all tests required had been completed, finished products had been inspected and results had been reviewed and accepted by Departmental Representative.
- .22 Item No. L22 – Installation of Structural Steel for Bridge and Bearings:
- .1 Includes but not limited to installation of structural steel, bearings and all other items related to installation of the structural steel components. Measurement for payment will be considered for installed in place, tested, inspected and accepted product by Departmental Representative.
- .23 Item No. L23 - Demolition of Existing Superstructure:
- .1 Item includes but not limited to demolition and removal of bridge structures, pedestrian handrails, bridge traffic barriers and their foundations, sidewalks, curbs, pavement, waterproofing system, expansion joints, precast concrete slabs, prestressed concrete box girders, bearings, drainage systems, manholes, piping, approach slabs, backfilling of trenches and excavated areas resulting from site demolition activities, demolition and removal of concrete foundations, removing below grade subcomponents, disconnecting, capping or sealing and removing site utilities.
- .24 Item No. L24 – Selective Demolition for Electrical:
- .1 Includes but not limited to the removal, disposal, relocation, loading and unloading of electrical equipment, conduit, wiring, junction boxes, pullboxes, hardware and accessories, as well as any incidental expenses for a complete execution of the works. The price also includes excavation and backfilling, as well as surface refurbishment resulting from electrical demolition.
- .25 Item No. L25 – Bridge Deck and Multi-use Pathway:
- .1 Includes but not limited to installation of cast-in-place concrete for the bridge superstructure including, bridge deck, multi-use pathway and curb; supply and installation of embedded steel items such as anchors, expansion joints and joint cover assemblies, pipe sleeves and drainage, joint sealant, deck waterproofing; reinforcement, formwork, shoring and all miscellaneous items to complete the work; test slabs for high strength concrete.
- .26 Item No. L26 – Bridge Traffic Barriers:
- .1 Includes but not limited to fabricating, coating and installation of bridge traffic barriers. Measurement for payment will be considered for installed in place, tested, inspected and accepted product by Departmental Representative.
- .27 Item No. L27 – Electrical Work:
- .1 Item includes but not limited to excavation and backfilling of trenches, installation of a new handhole NE of the dam before road closure and connection to existing NCC panel supply, installation, connection of lampposts for bridge

and multi-use pathway lighting; supply installation and connection of network of underground conduits and cables for street lights; supply and installation of conduits for future use; supply, installation, connection of temporary and permanent conduits and wiring; supply, installation, connection of handboxes, pullboxes, and junction boxes; supply, installation, connection of conduits and cables under the bridge structure and within the cast-in-place concrete; supply and installation of cable supports under the deck. Item includes all tools, equipment, manpower, testing of the system and commissioning.

.28 Item No. L28 – Road Work:

- .1 Includes but not limited to pavement cleaning, pavement marking removal; demolishing, recycling and disposing pavement; installation of temporary and permanent pavement markings including supply of paint and markings, thinner, glass reflective beads, equipment to perform the work and all temporary and permanent traffic control applications.

.29 Item No. L29 – Signage Salvaging and Installation:

- .1 Includes but not limited to removal, and disposal of designated signs; removal, storage, and re-installation of the signs that could be damaged within construction area; installing permanent traffic and public safety signs as required for the Work.

1.6 UNIT PRICE ITEM DESCRIPTION

.1 Item No. U1 - Common Excavation:

- .1 Common excavation to be measured and paid at unit price by cubic meter of common material excavated, excluding rock excavation and concrete excavation. Shoring and trenching is to be included in the unit price. This item includes work described in Section 31 23 33.01 - EXCAVATING, TRENCHING AND BACKFILLING related to common excavation.

.2 Item No. U2 – Common Backfilling:

- .1 Common backfilling to be measured and paid at unit price by cubic meter of Type 4 material placed and compacted. This item includes the work described in Section 31 23 33.01 – EXCAVATING, TRENCHING AND BACKFILLING related to common backfilling.

.3 Item No. U3 – Backfilling with Granular A:

- .1 Backfilling with Granular A to be measured and paid at unit price by cubic meter of Granular A material placed and compacted. Unit price to include the cost of material supply and delivery to site. This item includes the work described in Section 31 23 33.01 – EXCAVATING, TRENCHING AND BACKFILLING related to backfilling with granular A material.

.4 Item No. U4 – Backfilling with Granular B Type I and Type II:

- .1 Backfilling with Granular B Type I and Type II to be measured and paid at unit price by cubic meter of Granular B material placed and compacted. Unit price to include the cost of material supply and delivery to site. This item includes the work described in Section 31 23 33.01 – EXCAVATING, TRENCHING AND BACKFILLING.

- .5 Item No. U5 – Geotextile:
- .1 Geotextile is to be measured and paid at unit price by square meter of Geotextile placed and approved. Areas of overlap to be excluded from the measurement quantity. Unit rate price to include supply and installation of Geotextile.
- .6 Item No. U6 – Concrete Removal:
- .1 Concrete removal to be measured and paid at unit price by in-place cubic meter of concrete excavated/removed from top of abutment walls, abutment backwalls; top of South West, North West, North East and South East wingwalls; top of Pier 2 and Pier 5 and top of Tunnel T2. Unit price to include removal, disposal, surface preparation and environmental mitigation measures.
- .7 Item No. U7 – Reinforcing Steel:
- .1 Reinforcing Steel to be measured and paid at unit price by unit of kg of reinforcing steel installed. Reinforcement for bridge deck is excluded from this unit rate item.
- .8 Item No. U8 - Cast-in-place Concrete:
- .1 Cast-in-place Concrete to be measured and paid by unit price of cubic metres of concrete placed and accepted in-place. Unit price for cast-in-place concrete to include all formwork, scaffolding, platforms and curing required to complete the work. Unit price includes the drilling installation of rebars to existing concrete using epoxy adhesive. Cast-in-place concrete for bridge deck, multi-use pathway and curb located on the bridge deck (between the bridge expansion joints) to be excluded from this item.
- .9 Item No. U9 - Concrete Repair:
- .1 Concrete surface repair to be measured and paid in square meter of surface repaired and accepted. Price includes concrete removal and disposal, surface preparation, dowels, formwork, reinforcement and cast-in-place concrete (including drilling, sealing and curing).
- .10 Item No. U10 – Dowels:
- .1 Dowels for cast-in-place concrete to be measured and paid at unit price for each dowel supplied, installed and accepted in place including labour, materials, drilling and epoxy adhesive. Dowels required for bridge deck and multi-use pathway and curb located on the bridge deck (between the bridge expansion joints) is excluded from this item.
- .11 Unit No. U11 – Curbs:
- .1 Curbs will be measured and paid at unit price in linear meter of curb installed and accepted in place. Unit price to include supply and installation of dowels and supply and installation of expansion joint material. Curb located on the bridge deck is excluded from this item.
- .12 Item No. U12 – Asphalt Paving - Surface Course:
- .1 Asphalt paving surface course to be measured and paid by unit square meter of placed and accepted asphalt. Unit rate to include sawcutting, sawcut joint sealant, tack coat, asphalt concrete placement, compacting.

- .13 Item No. U13 – Asphalt Paving - Lower Course:
 - .1 Asphalt paving lower course to be measured and paid by unit square meter of placed and accepted asphalt. Unit rate to include, sawcutting, sawcut joint sealant, prime coat, tack coat, sand blotter, cold planning, asphalt concrete placement, compacting.
- .14 Item No. U14 – Asphalt Paving - Multi-use and Pedestrian Pathways:
 - .1 Asphalt paving multi-use and pedestrian pathways to be measured and paid by unit square meter of placed and accepted asphalt. Unit rate to include, sawcutting, sawcut joint sealant, prime coat, tack coat, sand blotter, cold planing, water proofing where needed, asphalt concrete placement, compacting.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 SPEC NOTE DESCRIPTION: This Section represents a simplified approach to construction progress General

1.1 DESCRIPTION

- .1 This section indicates the approach and requirements for creation and submittal of progress schedule.

1.2 MEASUREMENT AND PAYMENT

- .1 There shall be no separate measurement for payment for the work under this Section.
- .2 Include cost in the Contract Lump Sum Price, as specified in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L7 - General Works

1.3 RELATED REQUIREMENTS

- .1 Section 01 22 01 – MEASUREMENT AND PAYMENT

1.4 DEFINITIONS

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

- .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.5 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Certificate of Substantial Performance and Certificate of Completion as defined times of completion are of essence of this contract.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Submit Master Plan Contract Bar (GANTT) Chart to Departmental Representative within 15 working days of Award of Contract as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

1.7 PROJECT MILESTONES

- .1 Identify critical dates in Construction Schedule.
- .2 Refer to Section 01 11 00 – GENERAL INSTRUCTIONS for critical dates.

1.8 MASTER PLAN

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

1.9 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule respects submittal requirements and key project dates identified earlier, identify project milestones.

1.10 PROJECT SCHEDULE REPORTING

- .1 Update Project Schedule on weekly basis and with request for progress payment, reflecting activity changes and completions, as well as activities in progress.

- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.
- .3 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.
- .4 Include Actual Start and Actual Completed dates with schedule updates.

1.11 PROJECT MEETINGS

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

1.12 PROGRESS PAYMENT REQUEST

- .1 Progress schedule is to accompany Request for Progress Payment. If project is behind schedule, Contractor is to provide measures to regain slippage.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies general requirements and procedures for Contractor's submissions of shop drawings, product data and samples to Departmental Representative for review.
- .2 Additional specific requirements for submissions are specified in individual sections of these specifications.

1.2 MEASUREMENT AND PAYMENT

- .1 Work covered under this section is not considered separately for payment when submittals are incidentals to specific work items.
- .2 If not covered elsewhere, payment for Engineering, inspection, and testing is to be included in Lump Sum price, in accordance with Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L7 – General Work

1.3 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete and submittal acceptance is confirmed.
- .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 Contractor to review submittals and stamp, sign and date submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review and acceptance.
- .10 Keep one reviewed and accepted copy of each submission on site.

- .11 Submit copies specified for each type of submittal in electronic format as Adobe Acrobat PDF files. Forward PDF files through email or alternate means as directed by Departmental Representative.

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work.
- .4 Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .5 Allow 5 working days for Departmental Representative's review of each submission.
- .6 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative for review prior to proceeding with Work.
- .7 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .8 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .9 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.

- .2 Layout, showing dimensions, including identified field dimensions, and clearances.
- .3 Setting or erection details.
- .4 Capacities.
- .5 Performance characteristics.
- .6 Standards.
- .7 Operating weight.
- .8 Wiring diagrams.
- .9 Single line and schematic diagrams.
- .10 Relationship to adjacent work.
- .10 After Departmental Representative's review, distribute copies.
- .11 Submit one electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .12 Submit one electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product. Clearly identify the product to be used.
- .13 Submit one electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 6 months of start date of related work.
- .14 Submit one electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .15 Submit one electronic copy of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .16 Submit electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .17 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .18 Submit one electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

- .19 Delete information not applicable to project.
- .20 Supplement standard information to provide details applicable to project.
- .21 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.
- .22 The review of shop drawings by Public Services and Procurement Canada (PSPC) is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that PSPC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.
- .23 Submittals include, but are not limited to:
 - .1 Notice of Project
 - .2 Master Plan (Bar “GANTT” Chart)
 - .3 Project Schedule
 - .4 Contract Amount Breakdown
 - .5 Project Payment Schedule
 - .6 Site Layout Plan
 - .7 Site Access Plan
 - .8 Minutes of Meetings
 - .9 Copies of Orders, Directions, and Reports Issued by Agencies Having Authority
 - .10 Quality Control and Inspection Testing Plan
 - .11 Quality Control and Inspection Testing Reports
 - .12 Material Safety Data Sheets (MSDS)
 - .13 Materials and Equipment Technical Data Sheets
 - .14 Manufacturer’s Instructions, Guarantees, Warranties, and Product Data and Literature
 - .15 Survey Report of Existing Site Conditions
 - .16 Photos of Existing Site Conditions
 - .17 Traffic Control and Management Plan
 - .18 Site Specific Health and Safety Plan
 - .19 Incident and Accident Reports
 - .20 Worksite Health and Safety Reports
 - .21 Workplace Safety and Insurance Board Experience Rating Report
 - .22 Hazardous Material Handling Plan

- .23 Construction Safety Checklists
- .24 Environmental Management Plan
- .25 Erosion, Sediment, and Dust Control Plan
- .26 Work Area Plan
- .27 Spill Control Plan
- .28 Non-hazardous Waste Disposal Plan
- .29 Air Pollution Control Plan
- .30 Contaminant Prevention Plan
- .31 Waste Water Management Plan
- .32 Historical, Archaeological, Cultural Resources, Biological Resources and Wetlands Plan
- .33 Pesticide Treatment Plan
- .34 Water Quality Testing Reports
- .35 Waste Numbers and Permits
- .36 Hazardous Material Disposal Permits and Certificates
- .37 Waste Reduction Workplan
- .38 Snow Removal Plan
- .39 Excavation Plan
- .40 Shoring Shop Drawings
- .41 Backfill Material Testing Report
- .42 Concrete mix design
- .43 Shop Drawings for Reinforcement
- .44 Shop Drawings for Formwork and Falsework
- .45 Daily Temperature Logs
- .46 Shop Drawings for Metal Fabrications

1.5 SAMPLES

- .1 "Samples" means examples of materials, equipment, quality, finishes, workmanship.
- .2 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .3 If delivering samples to Departmental Representative's business address, courier must be prepaid.
- .4 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .5 Where colour, pattern or texture is criterion, submit full range of samples.
- .6 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .7 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

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

1.6 CERTIFICATES AND TRANSCRIPTS

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

1.7 ELECTRONIC FILES

- .1 When submissions are created electronically, the contractor is to make copies of all electronic records which are produced for the submissions listed in this section. This includes, but is not limited to, drawings, documents, and spreadsheet files.
 - .1 All files are to be properly labeled and placed in a well-organized folder structure.
 - .2 The data is to be stored on a memory stick.
 - .3 The following are the preferred electronic file formats:
 - .1 General: Adobe Acrobat PDF, open, editable, unlocked.
 - .2 Drawings: Editable AutoCAD 2015 DWG upon request.
 - .3 Documents: Editable MS Word DOC upon request.
 - .4 Spreadsheet: Editable Excel upon request.
 - .5 Product Sheets: Manufacturer's Adobe Acrobat PDF file preferred or Scanned Adobe Acrobat PDF.
- .4 Three identical CDs containing all electronic records each, are to be submitted before the Certificate of Final Completion.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section includes Health and Safety requirements for this project.

1.2 MEASUREMENT AND PAYMENT

- .1 There shall be no separate measurement Payment for the work under this Section.
- .2 Include cost in the Contract Lump Sum Price. Payment shall be made as set out in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L7 – General Work

1.3 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA): Canada
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .2 National Building Code 2015 (NBC):
 - .1 NBC 2015, Division B, Part 8 Safety Measures at Construction and Demolition Sites.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS)
- .4 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .5 Province of Ontario
 - .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O., 1990, c.0.1, as amended and O. Reg. 213/91 as amended – Updated 2005.
 - .2 Workplace Safety and Insurance Act, 1997.
 - .3 Municipal statutes and authorities.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 30 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site-specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
 - .3 Measures and controls to be implemented to address identified safety hazards and risks.
 - .4 Contractor's and Sub-contractor's Safety Communication Plan.
 - .5 Contingency and Emergency Response Plan addressing standard operating procedures specific to the project site to be implemented during emergency

- situations. Coordinate plan with existing Emergency Response requirements and procedures provided by the Contractor.
- .3 Submit a separate site-specific Health and Safety Plan for Diving Operations, at least seven (7) days prior to commencement of diving work. Health and Safety Plan must include:
 - .1 Site-specific safety hazard assessment and measures to be taken to address the anticipated hazards associated with diving work.
 - .2 Diving Contractor's and Contractor's Safety Communication Plan must include information for all key contacts.
 - .3 Contingency and Emergency Response Plan addressing standard operating procedures specific to the Diving Operations to be implemented during emergency situations.
 - .4 Diving Contractor's Health and Safety Policy.
 - .5 Name of Health and Safety Coordinator.
 - .4 Submit copies of orders, or directions, or reports issued by health and safety inspectors having jurisdiction.
 - .5 Submit copies of incident and accident reports.
 - .6 Submit WHMIS MSDS - Material Safety Data Sheets to Departmental Representative
 - .7 Submit Workplace Safety and Insurance Board (WSIB)- Experience Rating Report
 - .8 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan.
 - .9 Submit copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative monthly.
 - .10 Submit Construction Safety Checklists after completion
 - .11 Submit Hazardous Materials Handling plan describing hazardous waste materials isolation, removal, handling, storage, transportation, disposal and staff training procedures to be followed.
 - .12 Submit required permits and proof that hazardous materials (such as lead-based paint) were disposed off-site in accordance with authority having jurisdiction.
 - .13 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety. Revise plan as appropriate and resubmit within five (5) days after receipt of comments from Departmental Representative.

1.5 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.
- .2 File a separate Notice of Project with Provincial authorities prior to commencement of work for diving operations.
- .3 File other required notices in accordance with Acts and Regulations of Province of Ontario.
- .4 Submit copies of Notice of Project to Departmental Representative.

- .5 Keep copy of Notices of Project and other notices on site at all times.

1.6 SAFETY ASSESSMENT

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

1.7 MEETINGS

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

1.8 REGULATORY REQUIREMENTS

- .1 Comply with the Acts and regulations of the Province of Ontario.
- .2 Comply with specified standards and regulations to ensure safe operations at site.

1.9 PROJECT/SITE CONDITIONS

- .1 Work at site will involve contact with:
 - .1 Silica in concrete; specifically, during concrete removals.
 - .2 Lead-based paint.
 - .3 Corroded metals.
 - .4 Benzene in fuel oil, paints and adhesives.
 - .5 Fresh concrete, concrete admixtures and bonding agents.
 - .6 Asphalt tar.
 - .7 Live electrical conduits and cables during removal and installation.
- .2 Specific Designated Substances Survey (DSS) has been done for the site. The report is provided as a reference document.
- .3 Hazards on-site include but are not limited to:
 - .1 Working around moving equipment.
 - .2 Working near excavations and heavy machinery.
 - .3 Heavy lifting via crane and rigging.
 - .4 Overhead work.
 - .5 Work near and above water.
 - .6 Icy surfaces.
 - .7 Working at heights.
 - .8 Working during cold and adverse weather conditions including extreme temperatures.
 - .9 Places where no system/anchor point for the workers to tie themselves off while working.

1.10 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 Site-specific Health and Safety Plan covers sub trades utilized on the project.
- .3 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns, either accepting or requesting improvements.

1.11 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Contractor will be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 Ensure a clear delineation in time and/or space between Parks Canada staff and Contractor's own forces such that Contractor shall maintain designation as "Constructor" as defined by the Occupational Health and Safety Act for the Province of Ontario.
- .4 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.

1.12 COMPLIANCE REQUIREMENTS

- .1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990, c. 0.1 and Ontario Regulations for Construction Projects, O. Reg. 213/91.
- .2 Comply with Ontario Occupational Health and Safety Act, Regulation 629/94, for diving operations.
- .3 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.13 UNFORESEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, stop work and follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Ontario having jurisdiction.
- .2 Immediately stop work and advise Departmental Representative verbally and in writing should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of work.

1.14 HEALTH AND SAFETY SUPERVISOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Supervisor. Health and Safety Supervisor must:
 - .1 Have site-related working experience specific to activities associated with similar Canal reconstruction projects.
 - .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, report directly to and be under direction of site supervisor.

1.15 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 of Ontario having jurisdiction, and in consultation with Departmental Representative.
- .2 Provide documents as follows and post on site:
 - .1 Contractor's Health and Safety Policy.
 - .2 Contractor's Name.
 - .3 Notice of Project.
 - .4 Name, trade, and employer of Health and Safety Coordinator.
 - .5 Ministry of Labour Orders and reports.
 - .6 Occupational Health and Safety Act and Regulations for Construction Projects for Province of Ontario.
 - .7 Address and phone number of nearest Ministry of Labour office.
 - .8 Material Safety Data Sheets.
 - .9 Written Emergency Response Plan.
 - .10 Site Specific Health and Safety Plan.
 - .11 Valid certificates of first-aid personnel on duty.
 - .12 WSIB "In Case of Injury At Work" poster.
 - .13 A valid WSIB clearance certificate.
 - .14 Location of toilet and cleanup facilities.
 - .15 Special site-specific handling or operational procedures.
- .3 Comply with Provincial general posting requirements

1.16 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 immediately corrected.

1.17 BLASTING

- .1 Blasting or other use of explosives is not permitted on this project.

1.18 POWDER ACTUATED DEVICES

- .1 Use powder actuated devices only after submittal of full justification for the requirement of their use and receipt of written permission from Departmental Representative.

1.19 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.
- .2 Assign responsibility and obligation to Competent Supervisor to stop or start Work when, at Competent Supervisor's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative or his/her designate may also stop Work for health and safety considerations.

1.20 EQUIPMENT LOCK-OUT/TAG-OUT

- .1 Coordinate and comply with Parks Canada/PSPC multi lock lock-out/tag-out procedures for electrical and mechanical equipment on-site.

1.21 FIRE SAFETY REQUIREMENTS

- .1 Comply with National Building Code of Canada 2015 (NBC) for fire safety in construction and National Fire Code of Canada 2015 (NFC) for fire prevention, firefighting and life safety in building in use.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This Section describes requirements for protection of archaeological and cultural resources and the environment that apply to the Work. These requirements apply to all Sections of this Specification, without limiting the conditions and approvals imposed by statute.
- .2 Control Work to provide effective archaeological, cultural, environmental, water body, and fish habitat protection. Departmental Representative and Parks Canada Agency (PCA) Environmental Authority will monitor protection and mitigation measures and will identify whenever such protection is found to be ineffective.
- .3 Change protective measures or work procedures as directed by Departmental Representative to ensure environmental, water body and fish habitat protection.
- .4 Comply with environmental requirements of the Contract Documents, applicable federal, provincial, and local statuses, acts, regulations, and ordinances of Agencies having jurisdiction.
- .5 The Rideau Canal is designated as National Heritage Site, including the Hogs Back Fixed Bridge & Dam site.

1.2 MEASUREMENT AND PAYMENT

- .1 There shall be no separate measurement for payment for the work under this Section. Include cost in the Contract Lump Sum Price.
- .2 Payment shall be made as set out in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L14 – Archeological, Cultural, Environmental Procedures. Item includes work to protect archaeological and cultural resources, and provide environmental protection including but not limited to; implementing mitigation measures from site-specific EMP and Basic Impact Assessment (BIA), installation, maintenance, and removal of environment mitigation measures, environmental testing, and other environmental procedures.

1.3 RELATED REQUIREMENTS

- .1 Section 01 74 00 - Cleaning
- .2 Section 32 01 90.33 – Tree and Shrub Preservation
- .3 Section 35 01 40.92 – Preservation of Water Courses and Wetlands

1.4 REFERENCE STANDARDS

- .1 Environmental Standards and Guidelines Document, Ontario Waterways, Parks Canada Agency, July 2017.
- .2 Historic Canals Regulations, SOR/93-220, Department of Transport Act, May 1993.
- .3 Environmental Protection Act, Province of Ontario, R.S.O.,1990.

- .4 Ontario Water Resources Act, Province of Ontario, R.S.O, 1990.
- .5 Ontario Provincial Standard Specification .1 OPSS 805, November 2010, Construction Specification for temporary Erosion and Sediment Control Measures.

1.5 REFERENCE DOCUMENTS

- .1 Throughout these specifications the document makes reference to the Basic Impact Assessment (BIA). The BIA does not form part of the reference document to the tender package but will be made available to the successful bidder.
- .2 For the purpose of assisting the bidder in preparing their bids, the mitigation measures extracted from the BIA have been incorporated in this section of the specifications.

1.6 REGULATION AND PERMITS

- .1 “Historic Canal Regulations” apply to and govern work under this contract.
- .2 Regulations may be obtained from Justice Canada's website at:
<http://laws-lois.justice.gc.ca/eng/regulations/sor-93-220/>
- .3 The Contractor shall not mobilize or begin any work until Parks Canada issues permit under Historic Canals Regulation (SOR93-220 Sections, 11, 14 and 15).
 - .1 Permit will not be issued before following submittals are submitted and accepted:
 - .1 Site Specific Environmental Management Plan (EMP).
 - .2 Site Specific Health and Safety Plan.
 - .3 Site Layout Plan.
- .4 Changes to project scope of work not assessed under site specific Environmental Management Plan (EMP) and Basic Impact Analysis (BIA) will require review and acceptance by Departmental Representative and may require issuing revised permit.
- .5 Parks Canada and Departmental Representative will evaluate any change in the scope of work to validate if any revision to Environmental Management Plan (EMP) is required. If revision or amendment to the Environmental Management Plan (EMP) required, Departmental Representative will communicate with the Contractor in writing.

1.7 DEFINITIONS

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.
- .3 Deleterious Material: any substance that, if added to a water body, could degrade water quality or impact fish, fish habitat and aquatic wildlife. This includes, but is not limited to:
 - .1 Concrete dust.

- .2 Soils (clay, silt, sand).
- .3 Oil, diesel, or gasoline.
- .4 Chipped or fresh concrete and admixtures.
- .5 Alkali water resulting from fresh concrete or cementitious grout.
- .6 Salt.
- .7 Lead.
- .8 Solvents.

- .4 Dripline: the location on the ground surface directly beneath a theoretical line described by the tips of the outermost branches of the trees.
- .5 Barrier: fence consisting of approved material, supported by steel posts and being a minimum of 1.8 m high, without breaks or unsupported sections.

1.8 HERITAGE PROTECTION

- .1 Preserve heritage elements of site by executing Work without damage to site features or character defining elements.
- .2 Notify the Departmental Representative and PCA Environmental and Archeological Authority immediately if heritage items are damaged.
- .3 Employ minimal intervention approach for all Work.
- .4 Access roads, staging areas, and work pads require review and approval.
- .5 Damage to heritage elements will not be tolerated.
- .6 Ensure appropriate supervision work, adequate training for workers, and other necessary precautions to protect existing structures.
- .7 Notify the Departmental Representative immediately where reasonable concern exists that damage may result from work.
- .8 Contractor may propose alternative work methodologies subject to acceptance of the Departmental Representative and PCA Environmental Authority.
- .9 Protect possible archaeological and cultural resources by excavating only to limits indicated.
 - .1 Excavation beyond indicated limits requires acceptance by PCA Environmental and Archeological Authority

1.9 RELICS AND ANTIQUITIES

- .1 Corner stones and their contents, buried artifacts, remains and evidence of ancient persons and peoples, commemorative plaques, and other objects of historic value and worth, remain property of the Crown. Protect and notify the Departmental Representative immediately of discovery of such objects.

1.10 ARCHAEOLOGICAL AND CULTURAL REQUIREMENTS AND RESTRAINTS

- .1 Site may contain possible cultural and archeological resources.

- .2 PCA Archeological Authority may monitor and record some or all aspects of excavations, site access routes, and disturbances to soil overburden due to equipment and general work operations.
- .3 Cease Work immediately in affected Work area and notify the Departmental Representative if cultural resources, suspected archaeological resources, or character-defining elements are uncovered or damaged during Work.
- .4 Do not resume Work until directed by the Departmental Representative.
- .5 Proceed with other work and wait further direction for work in affected area from the Contractor on how to proceed.
- .6 Allow the Departmental Representative and PCA Environmental and Archeological Authority Representatives full access to affected Work area and cooperate to provide reasonable facilities for such access.

1.11 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Before commencing construction activities or delivery of materials to site, submit site specific Environmental Management Plan (EMP) written by a qualified consultant, to the Departmental Representative who will coordinate review and acceptance by PCA Environmental Authority. The Contractor can not mobilize at site until the SSEMP is accepted and approved by the Departmental Representative or PCA Environmental Authority and Historic Canal Regulations Permit (HCRP) is issued. Upon receipt of HCRP, the Contractor can mobilize at site once instructed by the Departmental Representative.
 - .1 Environmental Management Plan (EMP) and its component plans must be prepared by qualified environmental professionals in accordance with Parks Canada Agency's Environmental Standards and Guidelines Document - Ontario Waterways, July 2017, and site-specific EMP and Basic Impact Assessment (BIA) and should include mitigation measures to be opted in order to protect the historical artifacts.
 - .2 Environmental Management Plan to detail frequency of monitoring and high-risk construction activities requiring environmental professional on site.
- .3 Environmental Management Plan to present comprehensive overview of known or potential environmental issues to be addressed during construction.
 - .1 Include a list of key project activities and phases and identify actual or potential environmental impacts associated with each activity.
 - .2 Site specific EMP must show considerations for navigational water levels as some of the works are to be performed within into this period. EMP must demonstrate that this condition is planned for and work activities will be halted or revised accordingly.
 - .3 The potential environmental issues associated with the construction activities include, but are not limited to the following:
 - .1 Introduction of fines or silt into waterways or water column during demolition of existing slab, work required on piers and abutment wall and construction of bridge deck.

- .2 Contamination of waterways due to spills during refueling; hydraulic line rupture; accidental spill of lubricants or other manufactured product used during construction.
- .4 Include measures to avoid causing harm to fish and fish habitat including aquatic species at risk in compliance with the Fisheries Act and Species at Risk Act in accordance with:
<http://laws-lois.justice.gc.ca/eng/acts/F-14/index.html>
- .5 Immediate downstream of the Hogs Back Dam is considered a fish spawning area between January 1 and June 30th. Any sediment release to waterbodies that can travel downstream is considered a risk for fish spawning at downstream. Site Specific Environmental Plan (EMP) must include mitigation measures to prevent sediment travel to downstream of Hogs Back Dam. EMP must also contain contingency action plan for the event of sediment or debris release to water bodies which will travel downstream and harm fish spawning.
- .6 Include details of monitoring plan that will verify that environmental performance objectives are met and protection of water quality in the Waterway is assured.
- .7 Site Specific Environmental Management Plan (EMP) to be prepared in accordance with requirements of Federal, Provincial, and Municipal laws and regulations including PCA's Environmental Standard Guidelines (ESG).
- .8 Site Specific Environmental Management Plan to follow baseline water and stream bed quality indicated in Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life:
<http://ceqg-rcqe.ccme.ca/en/index.html#void>
- .9 PCA Environmental Authority will outline prescribed mitigation measures during construction start-up meeting.
- .10 Notify the Departmental Representative of proposed changes to project plans or schedules affecting Environment Management Plan.
- .11 Contractor to ensure on-site personnel is aware of, and comply with prescribed mitigation measures in the Site Specific Environmental Management Plan.
- .4 Address topics at level of detail commensuration with environmental issue and required construction tasks.
- .5 Site Specific Environmental Management Plan to include:
 - .1 Names of Responsible Persons: persons responsible for ensuring adherence to Site Specific Environmental Management Plan.
 - .2 Names of Waste Handlers: names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
 - .3 Names of Instructors: names and qualifications of persons responsible for training site personnel.
 - .4 Training Program: description of environmental protection personnel training program.
 - .5 Erosion, Sediment and Dust Control Plan: plan which identifies type and location of erosion, sediment and dust controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with

- erosion, sediment, and dust control plan, Federal, Provincial, and Municipal laws and regulations.
- .6 Provisions for protection of stockpile material.
 - .1 For stockpile material that shall be inactive for periods exceeding 30 days, are to form part of the erosion and sediment control plan.
 - .7 Temporary Works: drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, lower reach basin access ramp, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
 - .8 Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.
 - .9 Work Area Plan: showing proposed activity in each portion of work area and identifying areas of limited use or non-use.
 - .1 Work Area Plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.
 - .2 Identify areas for storage of hazardous materials, cleaning hazardous materials, refueling, fuel storage, and other critical areas.
 - .10 Spill Prevention Plan: including location/procedures for storage and refueling of all fuel and fuel operated equipment located near waterways. Fuel containers are to have secondary containment, overflow and spill protection. Fueling area is to be contained to address potential spillage.
 - .11 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance or release of hydrocarbon sheens during the Work.
 - .12 Non-Hazardous Solid Waste Disposal Plan: identifying methods and locations for solid waste disposal including clearing debris.
 - .13 Air Pollution Control Plan: detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and are contained on project site.
 - .14 Contaminant Prevention Plan that identifies potential for unknown contaminants and potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
 - .15 Waste Water Management Plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water and water used in flushing of lines.
 - .16 Historical, Archaeological, Cultural Resources, Biological Resources, and Wetlands Plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.
 - .17 Pesticide treatment plan: to be included and updated, as required.

- .18 Noise Control Plan: including notifying local residents in advance of potential disruption from noise inducing activities. Establish a communication protocol/plan acceptable to Departmental Representative.
- .19 Waste Disposal Plan identifying methods and procedures for management and disposal of materials directly derived from construction activities, such as concrete waste, construction materials and or hazardous materials.
- .6 Water Quality Testing Reports: to be submitted before start of work for background levels, daily during construction activities, and immediately after spills or when changes in water quality observed.
- .7 Product Data: submit manufacturer's instructions, printed product literature, data sheets and WHMIS MSDS sheets.
- .8 Basic Impact Analysis includes environmental mitigation measures. Contractor to comply and meet stated measures.
- .9 If there any changes to project plans and /or scheduling or site conditions outside the assessed Basic Impact Analysis (BIA) reports, Contractor is to inform Departmental Representative.
 - .1 Changes not addressed by BIA will require additional mitigation measures to be approved by the Departmental Representative.
- .10 Meet or exceed the requirements of all environmental legislation or regulations, including all amendments up to the project date provided that in any case of conflict or discrepancy the more stringent requirements shall apply.

1.12 REGULATORY REQUIREMENTS

- .1 Comply with environmental requirements of Contract Documents, applicable federal, provincial and local statutes, acts, regulations, and ordinances of Agencies having jurisdiction.
- .2 Client Department, Parks Canada Agency, is main Environmental Authority for Rideau Canal Projects.
- .3 Departmental Representative will seek and obtain acceptance of PCA Environmental Authority of submittals or changes in scope of work or methodologies that may affect archaeological resources, cultural resources or environment prior to providing direction to Contractor.
- .4 Client Department, Parks Canada Agency, will not issue permit to authorize start of Work, under Historic Canal Regulations, before review and acceptance of Site Specific Environmental Management Plan.
- .5 Comply with and enforce compliance by employees of prescribed environmental mitigation measures outlined in Site Specific Environmental Management Plan and Basic Impact Assessment (BIA) and other federal, provincial, territorial or municipal acts or regulations applying to the National Parks and Historic Sites of Canada.
- .6 Changes to project scope of work not assessed under site-specific EMP and BIA will require review and acceptance by Owner's Representative and may require issuing revised permit.

- .7 Allow PCA Environmental Authority full access to affected Work area and cooperate to provide reasonable facilities for such access.
- .8 Comply with written orders and directions from PCA Environmental Authority to correct deficiencies or implement additional environmental mitigation measures.
- .9 PCA Environmental Authority may issue written stop Work order if elevated turbidity or suspended sediment concentrations are observed.
- .10 Submit copies of environmental orders and directions to Departmental Representative.

1.13 EXPLOSIVES

- .1 Use of explosives is not permitted.

1.14 FIRES

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

1.15 TURBIDITY CONTROL AND DRAINAGE

- .1 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .2 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.
- .3 Control turbidity of all water released during work.
- .4 Do not pump water directly into waterway. Send discharge to settling pond or filtration area before being released into waterway without releasing sediment or hazardous materials or causing additional erosion.
 - .1 Pumped water must meet water quality requirements prior to return to waterway.
 - .2 Water with harmful substances to be disposed in accordance with local authority, provincial and federal regulatory requirements.
- .5 In event of significant silting or escape of debris caused by construction activities, contractor to immediately stop work, notify Departmental Representative and take appropriate measures to confine work and modify Environmental Plan including installation of new environmental measures.
- .6 Sediment, debris and erosion control measures to be inspected daily to ensure that they are functioning properly and are maintained and upgraded as required.
- .7 If sediment, debris or erosion control measures are not functioning properly, no further work permitted until problem has been rectified.
- .8 Sediment, debris and erosion control measures to be left in place until disturbed areas within work area have been stabilized and sediments in water have settled. Removal permitted only after written approval from Departmental Representative.
- .9 Water containing a high level of silt or sediment will be treated by discharging to settling basins, vegetated areas or sediment traps prior to release to streams. Water quality downstream of construction activities and turbidity curtain if used to not exceed recommended DFO and CCME guidelines on water quality for the protection of aquatic life.

- .10 The following factors must be considered in determining the suitability of specific erosion control practices:
 - .1 Run-off quantity and velocity: dictates the suitability of products;
 - .2 Soil characteristics: Soil texture and chemistry can affect the performance of many erosion control practices. Grain size characteristics of concrete sediment must be considered when selecting filter fabric material. Filter fabric material shall be designed around the principles of maintaining sufficient hydraulic flow and preventing particle movement through the material.
 - .3 Topography: the selection and success of erosion control practices is dependent on the slope length and gradient of surrounding area. The ease or difficulty of diverting clean run-off around the site is dependent on the terrain and drainage patterns; Climate and season; Contingency measures for extreme water events including rainfall and flooding need to be considered in the plan.
 - .4 Temporary vs. permanent Controls: Some erosion control practices are intended as permanent measures;
 - .5 Accessibility: some practices require access for specialized equipment;
- .11 The Ministry of Environment has set a criteria wherein the allowable increase in total suspended solids (TSS) beyond background levels is 25mg/l for short-term exposure (24-hr period) and or maximum average increase of 5mg/l for long term exposures (>24-hr to 30d).
 - .1 Contractor shall provide protocol and methodologies for monitoring the TSS from any discharge point (treated or untreated) to the watercourse.
 - .2 Contractor to ensure that TSS levels at points of discharge and in the receiving environment never exceed an absolute value of 75 mg/L.

1.16 IN WATER WORK

- .1 Project may require in or on water work based on Contractor's construction plans. In a case in or on water work is performed:
 - .1 No in-water work is permitted between March 15th and June 30th of any year to protect fish populations.
 - .2 All work must comply with the Fisheries act, as regulated by the Department of Fisheries and Oceans.
 - .3 All in water work must comply with the Ministry of Natural Recourses and Forestry in water timing window.
 - .4 The Contractor shall make every effort to minimize time working in the waterway. Accordingly, all necessary materials and equipment should be on site before proceeding with removal such that delays waiting for materials or equipment do not occur once in-water activities have commenced.
 - .5 In-water work shall be performed in a manner that minimizes the disturbance of waterway bottom and dispersion of sediments.
 - .6 No acid-bearing (containing sulphides) rock shall be used for in-water works.

1.17 WORK ADJACENT TO WATERWAYS

- .1 Construction equipment to be operated on land only, unless approved by Departmental Representative.
- .2 Do not skid logs or construction materials across waterways, unless approved by Departmental Representative.
- .3 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .4 Do not release deleterious materials into waterway.
- .5 Do not use salt as deicer or sand for traction within 30 m of waterway.
 - .1 In areas where ice is safety concern, use environmentally acceptable de-icing or traction materials approved by Departmental representative.
 - .2 No de-icer or traction materials to be allowed to enter waterway.
- .6 Ensure equipment and temporary access structures such as scaffolding and work platforms placed in waterbodies are free of earth material, and excess, loose or leaking fuel, lubricants, coolant and other deleterious material that could enter waterway.
- .7 Do not use waterway beds for borrow material.
- .8 Do not dump excavated fill, waste material or debris in waterways.
- .9 Stockpiles of excavated or fill materials to be stored and stabilized no closer than 30 m from waterway. Runoff from excavated or fill material to be contained from entering waterway.
- .10 Contractor should take all precautions to prevent debris, sediment, and tools from falling into water body during demolition and reconstruction of the superstructure.
- .11 Contractor must install physical barriers to prevent debris and sediment from falling into the water body.
- .12 Contractor must have a plan in place for removal of any accidental debris/tools that fall into the water body.

1.18 WILDLIFE PROTECTION

- .1 Detail procedures for preventing snakes and turtle entry and nesting within disturbed project area and soil or granular stock pile area in Environmental Management plan.
- .2 Place temporary reptile exclusion fence around stockpiled material and construction areas that may attract turtle nesting activities.
 - .1 Reptile exclusion fencing must follow the guidance in the document titled Species at Risk Branch, Best Practices Technical Note, Reptile and Amphibian Fencing, Ver. 1.1, developed by the Ontario Ministry of Natural Resources and Forestry:
http://files.ontario.ca/environment-and-energy/species-at-risk/mnr_sar_tx_rptl_amp_fnc_en.pdf
- .3 Contractor to salvage and release outside of the work area any fish and/or amphibians observed within the work area. Moving of animals to be carried out as per the Ministry of Natural Resources and Forestry License to Collect Fish for scientific Purposes guidelines.

- .1 Notify Departmental Representative and PCA Environmental Authority 24hrs prior to fish rescue.
- .2 A qualified biologist should be on site during live transfer of fish and/or amphibians.
- .3 If unforeseen negative impacts to fish, wildlife or cultural resources are present, all work shall cease and the Contractor is to contact Departmental Representative immediately. Do not use synthetic plastic erosion control mats or blankets to prevent entrapment hazard for turtles.
- .4 All workers shall be made aware for the potential of species at risk (SAR) on site. Employees must be able to identify potential species at risk and follow prescribed procedures when species are encountered. The following are included but potentially not limited to:
 - .1 Blanding's Turtle, Eastern Musk turtle, Midland Painted Turtle and Snapping Turtle.
 - .2 Barn Swallow.
- .5 Should any suspected species at risk be encountered within the project limits, works must halt immediately and Contractor is to contact Departmental Representative immediately.

1.19 EROSION, SEDIMENT AND DUST PROTECTION

- .1 Prior to starting work that will create dust or debris, such as improvements to access, concrete sawing, removal, excavation or backfilling, install effective mitigation techniques for erosion, sediment, dust and debris control in accordance with Federal, Provincial and Municipal laws and regulations. Maintain these protective measures at all times, including during shut down periods.
- .2 Maintain effective surface drainage and direct runoff away from work areas and into adequately vegetated areas.
- .3 Provide one metre high silt fence barrier in areas where, due to construction activities, silt or debris may enter waterway. This includes, but is not limited to, silt barrier installed around staging and work areas.
- .4 Maintain standby supply of pre-fabricated silt fence barrier, or an equivalent ready-to-install sediment control device.
- .5 Excavation to cease during periods of heavy rainfall, unless runoff is contained from entering waterway.
- .6 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
- .7 Implement erosion and sediment control measures prior to Work and maintain during Work phase. The following principles should be considered:
 - .1 Diversions to limit run-off water.
 - .2 Reduction of erosional forces by surface water velocity reduction.
 - .3 Reduction of sediment development through sediment collection or anchoring.
 - .4 Sedimentation of mobilized sediments.
 - .5 Filtration of sediment carrying flows.
 - .6 Collection of captured or contained sediments.

- .7 Treatment of pH.
- .8 Consider particle size present in the sediment and native soils to select appropriate control options.
- .9 Environmental protection measures shall be checked after each extreme weather event. Avoid activities that could lead to erosion during excessively wet weather conditions; monitor forecasts for heavy rainfall watches and warnings.
- .10 Sediment control measures and exclusion fencing must be removed in a way that prevents the escape or re-suspension of sediments.
- .11 Stockpile excavated or fill materials must be stored and stabilized away from the water. Runoff from the excavated or fill material must be contained from entering the waterway.

1.20 PLANT AND TREE PROTECTION

- .1 Protect trees and plants on site and adjacent properties.
- .2 Limit clearing, grubbing, and tree-branch removal to areas of work or access indicated on approved shop drawings.
- .3 Provide barriers around trees which may be affected by work, including staging areas.
 - .1 Locate barrier 1 metre beyond Dripline.
 - .2 Barrier to consist of protective wood framework covered with plastic construction fence material, extending from grade level to a height of 2 metres.
 - .3 Maintain barriers in good repair throughout duration Work.
 - .4 Remove barriers upon completion of Work.
 - .5 Where these restrictions are not possible, seek acceptance of Departmental Representative for alternative solutions.
- .4 Damage to trees due to Contractor's operations:
 - .1 Broken branches 25 mm or greater in diameter: cut back cleanly at break, or to within 10 mm of their base, if substantial portion of branch is damaged Departmental Representative will direct.
 - .2 Exposed roots 25 mm or larger: cut back cleanly to soil surface within five calendar days of exposure.
 - .3 Damaged bark: neatly trim back to uninjured bark, without causing further injury, within five calendar days of damage.
- .5 Reduce soil displacement and compaction by using heavy machinery in designated areas, construction access roads and on existing vehicle paths.
- .6 Replace damaged lawn to pre-construction state with topsoil and sod in work.
- .7 Avoid using heavy machinery on saturated ground.
- .8 Use equipment of low bearing weight and low pressure tires wherever possible.
- .9 Migratory Birds: Vegetation removals.
 - .1 No vegetation clearing to occur between April 1st and August 28th. If vegetation clearing must take place during this period, an avian biologist must conduct a nest survey to identify active migratory bird nests in the area to be cleared.

- .2 If active nests are found, a buffer must be established and vegetation cannot be cleared within the buffered area until the nest is no longer in use.

1.21 OPERATION AND MAINTENANCE OF EQUIPMENT

- .1 Do not operate heavy equipment in waterway, except when operated from barge.
- .2 All equipment to be thoroughly cleaned prior to coming on site to reduce risk of invasive species introduction from outside sources. Clean equipment prior to entering waterway in designated area at least 30 m from waterway.
 - .1 Additional information and guidance on how to properly clean equipment can be found at:
Clean Equipment Protocol for industry - Developed by the Ontario Invasive Plant Council - https://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf.
- .3 Provide and use drip trays to prevent discharge of oil, grease, antifreeze, or other materials into ground or waterways.
 - .1 All lubricants, oils, fuels and other chemicals to be stored in secure and designated areas on impermeable pads.
- .4 Equipment and heavy machinery to meet or exceed applicable emission requirements.
- .5 Leave machinery running only while in actual use, except where extreme temperatures prohibit shutting machinery down.
- .6 All vehicle/equipment maintenance and refueling must be conducted in accordance to the environmental management plan and over impermeable/absorptive material situated at a designated site regardless of proximity to water body. Where space allows and can be designated, a minimum distance of at least 30 m away from the nearest water body is required for fueling stations. In the case of fuel heaters that will be located nearer than thirty (30) meters from the canal, a large drip pan to contain any leakage from heater or refueling operations. Absorptive material must also be placed at the bottom of drip pan for added measure.
 - .1 Refueling areas will have a spill containment kit immediately accessible.
- .7 There shall be no discharge of chemicals and cleaning agents in or near aquatic habitats; all such substances shall be disposed of at a facility licensed to receive them.
- .8 Where generators/fuel heaters/fossil fuel operating equipment must be located closer than fifteen (15) meters from waterway/canal, use large drip pan to contain possible leakage from operations or refueling activities.
 - .1 Absorptive material and clean up kits to be provided at all locations for added measures.

1.22 INVASIVE SPECIES

- .1 Clean mud, dirt, and vegetation off machinery and equipment before entering work site and before leaving work site. Inspect and clean in accordance with Clean Equipment Protocol for Industry:
https://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf.

- .2 Equipment and vehicles to be used in water to be cleaned before and after use. This includes any visible mud, vegetation, mussels.
 - .1 Drain off standing water.
 - .2 Clean with hot water (> 50 degrees Celsius) at high pressure (> 250 psi).
 - .3 Allow to dry for 2-7 days in sunlight before transporting between waterbodies.
 - .4 Conduct cleaning minimum 30 m from edge of waterbody.
- .3 Submit photo and report to Invading Species Hotline (1-800-563-7711) or online at EDDMapS Ontario, <https://www.eddmaps.org/ontario/> and to Departmental Representative and PCA Environmental Authority if an invasive species is suspected.
 - .1 Known invasive species already existing in the Rideau Canal system at the specified location:
 - .1 Eurasian Milfoil (aquatic plant)
 - .2 Zebra Mussels (aquatic Invertebrate)
 - .2 Known invasive terrestrial plants identified at the specified location:
 - .1 Common/European Buckthorn

1.23 REMOVED MATERIALS

- .1 Unless otherwise specified, materials designated for removal become Contractor's property. Remove these from site.

1.24 HAZARDOUS MATERIALS

- .1 Place materials defined as hazardous or toxic waste in designated containers.
- .2 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Human Resources Development Canada, Labour Program.
- .3 Store Hazardous Materials in secure areas on impermeable pads, provide berms if necessary.

1.25 POLLUTION CONTROL

- .1 Provide spill response materials including but not limited to, containers, absorbents, shovels, and personal protective equipment. Assure that Spill Response Equipment and materials are available at all times in which hazardous materials or wastes are being handled or transported and in which there is potential for release of hydrocarbon sheens as a result of the Work. Spill response materials to be compatible with the type and quantity of material being handled.
- .2 Manage release of hydrocarbon sheens during the work in the same manner as spills, as per Spill Control Plan. Maintain a spill containment kit on site and train workers in use. Prepare and post in an accessible location a spill response plan that includes contact information for the Departmental Representative and applicable spill response agencies.
- .3 Maintain temporary erosion and pollution control features installed under this Contract.
- .4 Control emissions from equipment and plant in accordance with local authorities' emission requirements.

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

1.26 CLEAN UP

- .1 Clean up work area continuously as work progresses.
- .2 At end of each work period, and more often if ordered by Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.
 - .1 Concrete debris to be placed into watertight container daily, and or more frequently as directed.
- .3 Permit no amount of debris, trash or garbage to accumulate on-site. Ensure public waterways and drainage courses remain free of waste and volatile materials disposal.
- .4 Do not bury rubbish on site.
- .5 Separate and recycle materials that can be recycled.
- .6 Dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner by taking them to special designated waste facility. Do not dump these into waterways, storm or sanitary sewers.
- .7 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .8 Spills:
 - .1 Report spills immediately to Departmental Representative, PCA Environmental Authority and Ontario Ministry of Environment Spills Action Centre (Telephone No. 1-800-268-6060) and National Capital Commission (NCC) Emergency line (613-239-5353).
 - .2 Secure source of spill to stop flow of spill and isolate area of spill.
 - .3 Using appropriate safety precautions, collect liquid or solidify liquid with an inert, non-combustible material, or absorbent pads.
 - .4 Clean-up, remove and dispose of contaminated materials in accordance with federal regulatory requirements, MSDS or as directed by Ontario Ministry of Environment and to the satisfaction of Departmental Representative.
 - .5 Be responsible for costs of cleaning up spills to satisfaction of Departmental Representative.
 - .6 Must have an environmental emergency response plan in place and a spill kit readily available.
 - .7 Further information on dangerous goods, emergency clean-up and precautions including a list of companies performing this type of work can be obtained from Transport Canada's (TC) 24-hr collect phone number 613-996-6666.
 - .8 Documentation, remediation, testing, and results as requested to be submitted to Departmental Representative.

- .9 Remove scaffolding, work platforms, temporary protection and surplus materials, tools, plant, rubbish and debris and dispose of them in an approved manner off-site at completion date of work for all other areas.
- .10 Clean areas under contract to condition at least equal to that previously existing and to approval of Departmental Representative.
- .11 All equipment, temporary structures, utilities, barriers or parts thereof, shall be removed from site after the completion of the work.

1.27 CLEANING OF CONCRETE EQUIPMENT

- .1 Employ measures to prevent entry of concrete wash water or leachate from uncured concrete into the water.
- .2 The Contractor to submit and obtain Departmental Representative approval for designated cleaning area and containment facilities on-site for equipment and tools to limit water use and runoff. The cleaning area will be sufficiently far away from the watercourse to prevent contamination. Where no safe cleaning area is available, contractor will be required to provide a settling pond to trap and contain all cementitious wash water from equipment can be cleaned and filtered. All alkali water, such as concrete wash water, to be collected and disposed off-site at a disposal facility licensed by the Ministry of the Environment, Conservation and Parks, in accordance with federal, provincial, and local authority requirements.
 - .1 Water pH should be neutral before any clarified water is released to the drainage system or allowed to percolate back into the waterway via any filtration system.
- .3 Cleaning area to be no closer than 30 m from waterway to prevent contamination.
- .4 Where no safe cleaning area is available, Contractor to provide settling pond for area where equipment to be cleaned.
- .5 Use only trigger operated spray nozzles for water hoses.
- .6 Ensure proper use of concrete, sealants, and other compounds in accordance with appropriate product technical data sheets and manufacturer's instructions.
- .7 All debris including unused aggregate/concrete rubble shall be completely removed and area restored to original state upon completion of work.
- .8 No cementitious or lime-containing material or cement by-products are to be deposited directly or non-directly into the watercourse.
 - .1 Contractor to ensure that Cast-in-place concrete materials shall remain contained in properly assembled seal tight formwork structures during curing phases.
 - .2 Cast-in-place concrete and other cementitious works are to be protected from exposure to fish-bearing waters for a minimum of 48 hours at ambient temperatures above 0 degrees Celsius and or minimum of 72 hours at ambient temperatures below 0 degrees Celsius.
- .9 In the event of a release of concrete, notify Departmental Representative, PCA Environmental Authority and Ontario Ministry of Environment Spills Action Centre (Tel: 1-800-268-6060) and the NCC Emergency line (613-239-5353).

- .1 Clean up and execute remediation immediately in accordance with provincial and federal regulatory requirements and as accepted by PCA Environmental Authority.
- .2 Install additional turbidity curtain or sediment barriers as necessary.
- .3 Document remediation, testing, and results to be submitted to Departmental Representative.
- .10 Contractor will measure and record baseline pH levels in the project the project area prior to commencement of work to set baseline (background) values.
- .11 Prior to commencement of operations the Contractor is to demonstrate satisfactory knowledge and use of pH monitoring equipment to departmental Representative.
- .12 Monitor the pH levels frequently in the waterway immediately under the bridge deck during concrete placement activities. Emergency measures shall be taken if pH change is more than 1.0 pH unit, measured to an accuracy of 0.2 pH units from the background level or is recorded to be below 6.0 or above 9.0 pH units.
 - .1 Water with pH >9 cannot be released directly into waterway without treatment. Water with pH \geq 12.5 is considered toxic and must be treated as a hazardous waste under Ontario Regulation 347 of the Environmental Protection Act and wastewater in this condition must be removed from site to an approved treatment facility.
- .13 The pH levels are to be maintained within the range of 6.5 -8.5 as per Provincial Water Quality Objectives (PWQO).
- .14 Contractor to keep a carbon dioxide (CO₂) tank with regulator hose and gas diffuser readily available during concrete work. Use it to release carbon dioxide gas into the affected area to neutralize pH levels should a spill occur. Train workers to use tanks.
- .15 Concrete Equipment cleaning: Direct concrete wash water to a collection site and treat effectively to remove all suspended solids, and dissipate flow to prevent deleterious substances from entering waterway.

1.28 DISPOSAL OF WASTE MATERIALS

- .1 Waste subject to Regulation 558 of the Ontario Environmental Protection Act to be transported with valid "Certificate of Approval for a Waste Management System" to site approved by Ontario Ministry of the Environment to accept that waste.
- .2 Obtain and submit Waste Generator Numbers, permits, manifests, and other paperwork necessary to comply.

1.29 AIR/NOISE CONTROL

- .1 Minimize noise levels from construction activities by using proper muffling devices, in addition to appropriate timing and location of these activities to reduce or minimize effect of noise on nearby residents, recreational users, and wildlife.
 - .1 Departmental representative or PCA Environmental Authority reserves the right to limit use or cease activity of mechanical equipment (vehicles, generators), if it is emitting excessive exhaust or suspect of faulty emission control equipment.
- .2 Comply with the City of Ottawa's Noise By-Law No. 2004-253: By-law to Regulate Noise for residential areas.

- .3 Document, record and monitor public complaints and provide mitigating measures to address raised issues.

1.30 HISTORICAL/ARCHAEOLOGICAL CONTROL

- .1 Provide historical, archaeological, cultural resources, biological resources, and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site and identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.
- .2 Provide protection for historical, archaeological, cultural, and biological/ vegetation resources in accordance with approved EMP.
- .3 Accommodate PCA Cultural Resource Management (CRM) representative's needs for documentation of existing structures after discovery.
- .4 Include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and the Contractor to address situations where such resources not known to be on site are discovered during construction.
- .5 Should any archaeological or cultural resource be discovered while excavation, stop work and contact the Departmental Representative for direction prior to continuing work.

1.31 NOTIFICATION

- .1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
 - .1 Take action only after receipt of written approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted, or equitable adjustments allowed to Contractor for such suspensions.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 CORRECTIVE ACTIONS FOR WATER

- .1 When water quality is not in compliance with the required water quality performance criteria limits, stop in-water work and adjust operations to minimize turbidity. Make no claims for delays or adjustment to operations resulting from water quality exceedances.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 Contractor is responsible for all Quality Control. Quality Assurance by Departmental Representative does not relax Contractor's responsibility to carry out Quality Control.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement of Quality Control.
- .2 Payment included in Lump Sum Price, as indicated in Section 01 22 01 – MEASUREMENT AND PAYMENT PROCEDURES:
 - .1 Item No. L17 - Quality Control.

1.3 INDEPENDENT INSPECTION AND TESTING AGENCIES

- .1 Contractor to engage independent Inspection and Testing Agencies for purpose of Quality Control to verify all work including work of sub-contractors and suppliers is in accordance with Contract Documents.
- .2 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.
- .3 Employment of inspection/testing agencies does not relax responsibility for the Contractor to have a quality assurance program to verify that the work is completed in accordance with the Contract requirements and to perform Work in accordance with Contract Documents.

1.4 ACCESS TO WORK

- .1 Allow Departmental Representative and Quality Control Agencies access to work whenever and wherever it is in progress. 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 Provide equipment required for access and execution of Quality Control Inspection and Testing such as, but not limited to; scaffolding, work platforms, ladders, heating and lights.
- .3 Co-operate to provide reasonable facilities for such access.

1.5 INSPECTION AND TESTING FOR QUALITY CONTROL

- .1 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative, or law of Place of Work.
- .2 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.
- .3 Ensure Quality Control Inspection and Testing Agencies carry out quality control inspection and testing program in accordance with accepted Quality Control Plan.

- .4 Correct defects and irregularities immediately as advised by Quality Control Inspection and testing Agencies and by Departmental Representative.
- .5 Pay costs for retesting and reinspection.
- .6 Departmental Representative may order part of work to be re-examined if work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such work is found in accordance with Contract Documents, Departmental Representative will authorize payment of the cost of examination and replacement.

1.6 INSPECTION AND TESTING BY THE DEPARTMENTAL REPRESENTATIVE

- .1 Departmental Representative will perform inspection/testing on a random basis for auditing purposes.
- .2 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection.

1.7 PROCEDURES

- .1 Carry out quality control inspection and testing program as specified and in accordance with accepted quality assurance inspection and testing plan.
- .2 Notify appropriate agency and Departmental Representative 48 hours in advance of requirement for tests, in order that attendance arrangements can be made.
- .3 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .4 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.8 INFORMATION AND SUBMITTALS

- .1 Prepare and submit Quality Control Inspection and Testing Plan describing;
 - .1 quality control inspection and testing to be carried out to industry standards, or as specified in individual sections for each stage of work.
 - .2 procedure for quality control and inspection.
 - .3 quantity of testing.
 - .4 a proposed schedule of testing.
- .2 Submit Quality Control Inspection and Test reports to Departmental Representative immediately and propose corrective action if required.

1.9 REJECTED WORK

- .1 Notify Departmental Representative if defective work is found through Contractor's Quality Control procedures.

- .2 Notify Departmental Representative of proposed corrective action for acceptance prior to executing corrective action.
- .3 Remove and replace or re-execute work in accordance with Contract Documents.
- .4 If Departmental Representative deems it is not expedient to correct defective Work or work not performed in accordance with Contract Documents, Departmental Representative may deduct from Contract Price difference in value between work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.10 REPORTS

- .1 Submit electronic copy of inspection and test reports to Departmental Representative.

1.11 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as requested.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

1.12 MILL TESTS

- .1 Submit all mill test certificates to Departmental Representative.

1.13 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for all electrical systems.
- .2 Refer to Section 26 56 19 Roadway Lighting.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section includes considerations and services related to temporary utilities, including, but not limited to:
 - .1 Connection and setup of temporary utilities.
 - .2 Monthly usage of temporary utilities.
 - .3 Heating of enclosures.
 - .4 Temporary multi-use pathway (pedestrians and cyclists)

1.2 MEASUREMENT AND PAYMENT

- .1 No measurements of temporary utilities will be taken.
- .2 Payment related to connection and setup of temporary utilities and temporary shoring as needed for tunnels to be included in Lump Sum Item, as set out in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L4 – Connect and Setup Temporary Utilities and Facilities.
- .3 Payment related to the monthly costs of using temporary utilities to be included in Lump Sum Item, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L5 - Usage of Utilities.
- .4 Payment related to the space heating of enclosures to be included in Lump Sum Item, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L6 - Heating and Hoarding.
- .5 Payment related to the temporary multi-use pathway (the temporary footbridge including any temporary backfill and any material required for its installation, the temporary pavement, and the removal and restoration at existing conditions) included in Lump Sum Item, as set out in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L4 – Connect and Set up Temporary Utilities and Facilities.

1.3 RELATED REQUIREMENTS

- .1 Section 01 20 01 – SITE ACCESS
Section 01 56 00 – TEMPORARY BARRIERS AND ENCLOSURES.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Submit design and erection drawings including the installation instructions for the temporary footbridge and temporary pedestrian pathways. Design, erection and installation drawings must be certified by professional engineer of the Contractor who is licence to practice in Province of Ontario.

1.5 TEMPORARY MULTI-USE PATHWAY

- .1 Contactor is responsible for providing, inspecting and maintaining the temporary multi-use pathway, including the following:
 - .1 Temporary footbridge connecting Hogs Back dam to existing Hogs Back Road on the west of the dam with the following characteristics:
 - .1 A minimum width of 2 m.
 - .2 Must meet pedestrian requirements for barrier on a bridge (openings, height, etc.).
 - .3 The barrier must have a minimum height of 1.2 m.
 - .4 Must support a live load of 4.8 kPa.
 - .5 Must support the Contractor snow removal and maintenance equipment.
 - .6 Must include necessary abutment and pier.
 - .7 Must have a non-skid surface.
 - .2 Temporary paved multi-use pathway connecting Colonel By Drive to Hogs Back Dam with the following characteristics:
 - .1 A minimum levelled and paved width of 3 m.
 - .3 Temporary paved multi-use pathway connecting Hogs Back Park with the South-east side of construction area (Pirate Adventures location) with the following characteristics:
 - .1 A minimum paved width of 3 m.
 - .4 Temporary lighting on Hogs Back dam, prior to road closure and removing existing lighting on Hogs Back fixed bridge with the following characteristics:
 - .1 Average value of 10 Lux /1 fc for illuminance should be maintained on the dam for high pedestrian and cyclist conflict areas, refer to the standard IES RP-8-14 Roadway Lighting.
 - .2 The lighting shall be positioned so as to illuminate the entire pathway on the dam during the work.
 - .3 the lighting will be positioned at both extremities of the dam in a manner that it is not interfering with dam operation.
 - .4 the height of poles for the temporary lighting to be selected by the Contractor so as to meet the required level of illuminance throughout the pathway on the dam.
 - .5 Temporary footbridge is to be designed, fabricated and installed, maintained and removed at the end of the work by the Contractor to allow uninterrupted access to pedestrian and cyclists traffic from the pathway located on the dam deck to west side of the Hogs Back Bridge. Work will include but not limited to:
 - .1 Design, fabrication, installation, maintenance and removal of the footbridge.
 - .2 Dismantling and reinstatement of the railing on the west end of the dam.
 - .3 Dismantling and reinstatement of the North West traffic barriers for temporary pathway.
 - .4 Removal of trees, shrubs, clearing and grubbing.
 - .5 Reinstatement of the removed trees, shrubs and vegetation.

- .6 Staircase located at the North West of the dam deck is to remain open to public use.
- .7 Temporary multi-use pathway (paving, temporary footbridge, temporary lighting, and all other temporary work related to the temporary pathway) must be removed or restored at existing conditions (width and location) at the end of construction, as approved by the Departmental Representative.

1.6 INSTALLATION AND REMOVAL

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Remove from site all such work after use.
- .3 Existing Hogs Back Bridge and Tunnel T2 located at the west side of the Hogs Back bridge is designed for live load of HS20-44. It is assumed that the Tunnel T3 located at the east side of the Hogs Back Bridge is also designed for live load of HS20. It is Contractor's responsibility to verify the loading of the construction equipment and material to be transported from east side of the Hogs Back Bridge over the tunnel T3. If the loading distribution of the construction equipment and vehicles to traveled over the tunnel T2 and T3 is greater than HS20-44, Contractor is to install appropriate temporary shoring under the crown of the tunnel to support the live loads. The temporary shoring is to be designed by the Engineer of the Contractor and must bare the seal of the Engineer. Temporary shoring is to be removed prior to December 31, 2020.

1.7 WATER SUPPLY

- .1 Provide supply of potable water.
- .2 Arrange for delivery and storage of potable water to site.

1.8 TEMPORARY HEATING/COOLING OFFICES

- .1 Provide heating and cooling for offices.

1.9 TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary heating as required during construction period, including monitoring, maintenance and fuel.
- .2 Construction heaters used inside enclosures must be indirect fire heating equipment and burners must be located outside of the enclosure. Solid fuel salamanders are not permitted.
- .3 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.

- .5 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Departmental Representative.
- .7 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.
- .8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.10 TEMPORARY POWER AND LIGHT

- .1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools.
- .2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.
- .3 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all work areas is not less than the requirements stated in: Canada Occupational Health and Safety Regulations SOR/86-304 part VI.
- .4 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

1.11 TEMPORARY COMMUNICATION FACILITIES

- .1 Provide and pay for temporary telephones, telephone lines, data lines and data hardware for use of Departmental Representative and own use.
 - .1 Wireless data may be provided through secure, shared wireless router.
 - .2 Wireless data may also be used for video monitoring hardware.

1.12 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

1.13 STATIONARY CAMERA

- .1 Provide and pay for a stationary camera and install within the Contractor area as directed by Departmental Representative for environmental mitigation measures monitoring and site progression.
- .2 The camera is to have the following specifications:
 - .1 Web hosting and archiving.
 - .2 Wireless access for local viewing.
 - .3 Administrator protocols for remote viewing
 - .4 4 megapixels (integrated 20 x 4mp pan tilt zoom camera)
- .3 Data Connectivity:
 - .1 LTE/3G data stick to transmit images to servers
- .4 Solar Power kit:
 - .1 2x 100W solar panels
 - .2 Battery backups with up to 3 days of power
- .5 Web Hosting and Archiving:
 - .1 Time lapse imaging for viewer and upload every 10 minutes.
- .6 The Departmental Representative will view images captured by a stationary camera for environmental mitigation measures monitoring and site progression. With images captured by the camera, no recognizable faces will be kept of public, contractor or Departmental Representative, in order to protect privacy rights.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to 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.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section includes a description and requirements of:
 - .1 Construction aids.
 - .2 Office and sheds.
 - .3 Parking.
 - .4 Project identification.

1.2 MEASUREMENT AND PAYMENT

- .1 There shall be no separate measurement for payment for the work under this Section. Include cost in the Contract Lump Sum Price.
- .2 Payment shall be made as set out in Section 01 22 01 - MEASUREMENT AND PAYMENT and shall be included in:
 - .1 Item No. L7 – General Work

1.3 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
 - .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .2 CSA Group (CSA)
 - .1 CSA-A23.1/A23.2-09 (R2014), Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-0121- M-08 (R2013), Douglas Fir Plywood.
 - .3 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.
 - .4 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Submit site plan drawing clearly identifying the site facilities and their locations as outlined in this Section.
- .3 Submit scaffolding, work platform and enclosure plan.
- .4 All plans must be prepared and certified by the engineer of Contractor licensed to practice in Province of Ontario.

1.5 INSTALLATION AND REMOVAL

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Identify areas which have to be gravelled to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Provide locations of environmental mitigation measures such as silt fences, truck wash, fuel storage, fueling areas, etc.
- .6 Remove from site all such work after use.

1.6 SCAFFOLDING AND WORK PLATFORMS

- .1 Scaffolding and platforms in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain ramps, swing staging, platforms, ladders, scaffolding, temporary stairs.

1.7 HOISTING

- .1 Provide, operate and maintain hoists cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
- .2 Hoists cranes to be operated by qualified operator.

1.8 SITE STORAGE/LOADING

- .1 Confine work and operations of employees as per Contract Documents. Do not unreasonably encumber the construction site with materials.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.9 CONSTRUCTION PARKING

- .1 Parking will be permitted on site in a designated area only.
- .2 Provide and maintain adequate access to project site.
- .3 Build and maintain temporary roads where indicated or as required and provide maintenance including snow removal during period of Work.
- .4 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

1.10 SECURITY

- .1 Pay for suitable security measures and methods to guard site and contents of site after working hours and during holidays. To be submitted and approved by Departmental Representative.
- .2 Contractor shall pay for monitoring of the site during periods of no construction activity and to maintain and service dewatering and heating equipment, if required.

1.11 RESTRICTIONS

- .1 Contractor staging area is restricted to the public vehicle park located at the south-east of the Hogs Back Bridge as shown on the drawings. Contractor shall maintain the site access during the contract period including snow ploughing and dust control. The contractor will remove the site access roads and laydown areas and restore the site to its original condition. No additional access road, or laydown area, or staging area, or work area will be allowed at site unless otherwise authorized by Departmental Representative.
- .2 Contractor to use only designated access roads to access the site and the staging area.
- .3 Public pedestrians, cyclists and vehicular traffic access to parking lot and Pirate Adventure Park located at the south-east of Hogs Back Bridge and to the Hogs Back Park located at the NE of Hogs Back Bridge is to remain uninterrupted for the duration of the project. No construction equipment can travel on these designated public roads.

1.12 OFFICES

- .1 Provide and maintain secure construction office for exclusive use of Departmental Representative as follows:
 - .1 Office of sound, lockable, insulated, weather-proof construction.
 - .2 Greater than 12 square metres in floor area.
 - .3 Equipped with electric light, minimum 4 electrical outlets and heat.
 - .4 Supply wireless data service for use by Contractor and Departmental Representatives.
 - .5 Supply office desk, 900 mm x 1200 mm reference table, 4 chairs, 1 drafting stool, and 1 lockable 4-drawer filing cabinet;
 - .6 Maintain minimum temperature of 21 degrees C during hours of work and 17 degrees during off-hours.
 - .7 Maintain office and utilities in good working order.
- .2 Pay all costs, including heating, lighting and data.
- .3 Office to remain property of Contractor.
- .4 Provide an office for contractor at site location, open during regular working hours.
 - .1 Provide dedicated meeting room large enough to accommodate site meetings for up to 10 people.
 - .2 Dedicated meeting room not to be used for contractor staff or for storage. Supply dedicated tables and chairs for 10 people.
- .5 Provide marked and fully stocked first-aid kit in a readily available location.

1.13 EQUIPMENT, TOOL AND MATERIALS STORAGE

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

1.14 SANITARY FACILITIES

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

1.15 CONSTRUCTION SIGNAGE

- .1 Erect, three (3) weeks before mobilization, project signs provided by third party, to locations identified by the Departmental Representative. A maximum of 4 signs will be provided.
- .2 Provide common-use signs and safety devices related to traffic control, information, instruction, use of equipment and public safety devices in both official languages or by use of commonly-understood graphic symbols to Departmental Representative's approval.
- .3 No other signs or advertisements, other than signs from the Ontario Traffic Manual, are permitted on site.
- .4 Signs and notices for safety and instruction in both official languages. Graphic symbols to CAN/CSA-Z321.
- .5 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

1.16 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Provide access and detours as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .3 Provide measures for protection and diversion of traffic, including provision of watchpersons and traffic control persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .4 Protect travelling public from damage to person and property.
- .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .7 Construct access and haul roads necessary.
- .8 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
- .9 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .10 Dust control: adequate to ensure safe operation at all times.

- .11 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.
- .12 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .13 Provide snow removal during period of Work.
- .14 Remove, upon completion of work, all temporary access roads and restore the site to original conditions.

1.17 CLEAN-UP

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.
- .5 All construction debris and garbage must be removed off site weekly or when not manageable at site within one week period.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED.

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section provided a summary of all requirements related to the traffic control of vehicles, pedestrians, cyclists and cross-country skiers.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement of Traffic Control.
- .2 Payment included in Lump Sum Prices, as set in Section 01 22 01 - Measurement and Payment:
 - .1 Item No. L8 - Site Access.
 - .2 Item No. L12 - Traffic control
 - .3 Item No. L13 - Construction Fencing.

1.3 RELATED REQUIREMENTS

- .1 Section 01 14 00 - WORK RESTRICTIONS
- .2 Section 01 20 01 - SITE ACCESS
- .3 Section 01 51 00 – TEMPORARY UTILITIES
- .4 Section 01 52 00 - CONSTRUCTION FACILITIES
- .5 Section 01 56 00 – TEMPORARY BARRIERS AND ENCLOSURES
- .6 Section 01 74 00 – CLEANING
- .7 Section 32 01 11.01 – PAVEMENT CLEANING AND MARKING REMOVAL
- .8 Section 32 12 16 – ASPHALT PAVING
- .9 Section 32 17 23 – PAVEMENT MARKINGS

1.4 REFERENCE STANDARDS

- .1 Ministry of Transportation, Ontario (MTO)
 - .1 Ontario Traffic Manual, Book 7: Temporary Conditions (2014).

1.5 TRAFFIC CONTROL AND MANAGEMENT PLAN

- .1 Submit Traffic Control and Management Plan to Departmental Representative for acceptance prior to starting work; a minimum of 3 weeks advance notice with an approved traffic control plan is required for any disruption to vehicular, pedestrians, cyclists or cross-country skiers traffic in order to allow proper timing to notify related authorities of the upcoming traffic disruption.
- .2 Traffic Control and Management Plan required for:
 - .1 Initial site setup.
 - .2 Long duration complete road closure of Hogs Back Road, including the detours.

- .3 Very short duration (maximum of 15 minutes delays outside of peak hours) of multi-use pathway closures, with a traffic control person at each end of Hogs Back dam (during the day and the night) to temporarily prevent passage on the dam deck, if there is any construction activity that will possess a safety risk to public utilizing the multi-use pathway on the dam. Longer delays for the pedestrians and cyclists on the multi-use pathway will not be accepted. Otherwise, Hogs Back dam pathway must be covered to protect pedestrians and cyclists from any projected debris or any construction material which could be dropped by accident on the opened multi-use pathway. Departmental Representative must be given at least 48hrs notice for the temporary closure of the pathway.
- .4 Management of pedestrians, cyclists and cross-country skiers.
- .5 All work approved by Departmental Representative that cannot be finished during the long duration complete road closure of Hogs Back Road.
- .6 Changes as required for work.
- .3 Do not mobilize until Traffic Control and Management Plan for initial site setup is accepted by Departmental Representative.
- .4 After Traffic Control and Management Plan is accepted by Departmental Representative, submit closures procedures from Traffic Control and Management Plan to local municipality for approval and permits with a copy to Departmental Representative.
- .5 Indicate methods and implementation schedule, and include all signage, equipment and personnel to be used for traffic control.
- .6 Copies of approved Traffic Control and Management Plans and permits to be submitted to Departmental Representative and one copy to be kept on-site at all time.
- .7 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .8 Notify Departmental Representative 2 weeks in advance of short-term closures of roadway or expected traffic delays due to construction activities.

1.6 PROTECTION OF PUBLIC TRAFFIC

- .1 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment.
- .2 When working on travelled way:
 - .1 Place equipment in position to prevent interference and hazard to travelling public in accordance with Section 01 14 00 WORK RESTRICTIONS.
 - .2 Do not leave equipment on travelled way.
- .3 Close lanes on travelled way only after receipt of written approval from Departmental Representative.
 - .1 Before re-routing traffic erect suitable signs and devices to Ontario Traffic Manual, Book 7: Temporary Conditions and as per design drawings and Traffic Control and Management Plan.
- .4 Keep travelled way paved, graded, free from pot holes and keep all existing traffic lanes width outside of construction area.

- .1 Provide 3 m wide minimum temporary multi-use pathway between Colonel By Drive and Hogs Back Park, also between South-east side of construction area (Pirate Adventures location) and Hogs Back Park.
- .5 Keep travelled way graded, free from pot holes and keep all existing traffic lanes width outside of Hogs Back Road complete closure.
 - .1 Provide 5.5 m wide minimum temporary roadway for traffic in two-way section between Hogs Back Road and the parking area to be used by recreational users on the South-east side of construction area (Pirate Adventures location).
- .6 Provide paved detours or temporary roads as indicated, as per design drawings and as directed by Departmental Representative to facilitate passage of pedestrians, cyclists and cross-country skiers traffic around restricted construction area:
 - .1 Place and compact asphalt pavement in accordance with Section 32 12 16-Asphalt Paving.
- .7 All fences adjacent to a multi-use pathway must have the following characteristics:
 - .1 Cannot be easily tipped over by pedestrians or cyclists.
 - .2 Without a base that pedestrians and cyclists could trip over.
 - .3 Minimum height of 1.4 m, unless a higher height is required in Section 01 20 01 Site Access.
- .8 Provide adequate lighting, at all time on the multi-use pathway detour on the Hogs Back Dam.
- .9 Keep the multi-use pathways free from snow and ice between Colonel By Drive and the parking area south-east of the construction area.
- .10 The staircase on the west side of the dam must remain open to the public.
- .11 If required, after approval from the Departmental Representative, adjust traffic control devices in Hogs Back Park to ensure that cyclists walk beside their bikes along the multi-use pathway detour.
- .12 The Contractor parking area at the South east side shall be kept tidy and in good condition for use and made available to recreational users.
- .13 Provide and maintain road access and egress to property fronting along Work under Contract, except where other means of road access exist that meet approval of Departmental Representative.

1.7 INFORMATIONAL AND WARNING DEVICES

- .1 Provide and maintain signs, and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project Work which requires road user response.
- .2 Erect, three (3) weeks before mobilization, project signs provided by third party, to locations identified by the Departmental Representative. A maximum of 4 signs will be provided.
- .3 Provide adequate lighting to all detour signs, barricades and temporary fencing.
- .4 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified in Ontario Traffic Manual, Book 7: Temporary Conditions.

- .5 Place signs and other devices in locations recommended in Ontario Traffic Manual, Book 7: Temporary Conditions.
- .6 Provide signs notifying public of upcoming Hogs Back Road complete closure in both directions 2 weeks in advance.
- .7 Installation of 4 portable variable message signs (PMVSs) are required 2 weeks in advance of the long duration complete road closure of Hogs Back Road, as shown on design drawing. Installation and messages must be approved by Departmental Representative. These PMVSs must be functional at all time during the complete closure of Hogs Back Road and must display the followings messages or other messages required by Departmental Representative:
 - .1 On the north and west approaches of Heron Road / Baseline Road / Prince of Wales Drive intersection:
 - .1 2 weeks in advance: “Hog’s Back Road Closure from May XX, 2020 / Hog’s Back Road Fermée dès le XX Mai 2020”.
 - .2 During the complete closure: “Hog’s Back Road Closed at Colonel By Dr / Hog’s Back Road Fermée à Colonel By Dr”.
 - .2 On the north and east approaches of Heron Road / Riverside Drive intersection:
 - .1 2 weeks in advance: “Hog’s Back Road Closure from May XX, 2020 / Hog’s Back Road Fermée dès le XX Mai 2020”.
 - .2 During the complete closure: “Hog’s Back Road Closed at the Park / Hog’s Back Road Fermée au Parc”.
- .8 Meet with Departmental Representative prior to commencement of Work to prepare list of signs and other devices required for project. All traffic signs and devices must conform to the approved Traffic Control and Management Plan. If situation on site changes, a revised list must be submitted for the approval of Departmental Representative.
- .9 Continually maintain traffic control devices in use:
 - .1 A competent person responsible for ensuring compliance of traffic control measures at all times must perform routine inspection of pedestrians, cyclists and vehicular traffic control devices.
 - .2 Check signs daily for legibility, damage, suitability and location.
 - .3 Clean, repair or replace all devices to ensure clarity and reflectance.
 - .4 Remove or cover signs which do not apply to conditions existing from day to day.
 - .5 Provide common-use signs and safety devices related to traffic control, information, instruction, use of equipment and public safety devices in both official languages or by use of commonly-understood graphic symbols to Departmental Representative's approval.

1.8 CONTROL OF PUBLIC TRAFFIC

- .1 Provide temporary fencing to separate the staging and work areas from the multi-use pathway.
- .2 Continually maintain the multi-use pathway clean and free of debris, to prevent issues with pedestrians, cyclists and cross-country skiers.

- .3 During the complete closure of Hogs Back Road, provide gates or fences to prevent pathway users access to Tunnel T2 and Tunnel T3.
- .4 Provide competent traffic control persons, trained in accordance with Infrastructure Health & Safety Association (ISHA), and properly equipped as specified in Ontario Traffic Manual, Book 7: Temporary Conditions, for situations as follows:
 - .1 When the workers or the equipment must cross the multi-use pathway between the staging and the work area.
 - .2 When the construction area is mobilized, at the 3 gates to construction area.
 - .3 When public traffic is required to pass working vehicles or equipment that block part of travelled roadway (Figure TL-20A from the Ontario Traffic Manual Book 7) for work approved by Departmental Representative that cannot be completed during the long duration complete road closure of Hogs Back Road.
 - .4 Where temporary protection is required while other traffic control devices are being erected or taken down.
 - .5 For emergency protection when other traffic control devices are not readily available.
 - .6 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.
- .5 Maximum delay to multi-use pathway traffic by traffic control persons due to contractor's operations if there is any construction activity that will possess a safety risk to public utilizing the multi-use pathway on the dam: 15 minutes.
 - .1 No other delays to pedestrians, cyclists and cross-country skiers on multi-use pathway due to contractor's operations, unless approved by Departmental Representative.
 - .2 No delay to public traffic, pedestrians, cyclists and cross-country skiers on multi-use pathway, on days when NCC or the city of Ottawa has special events happening near the construction area.

1.9 OPERATIONAL REQUIREMENTS

- .1 Maintain existing conditions for traffic, including vehicular, pedestrians, cyclists and cross-country skiers, throughout period of contract except when required for construction under contract and when measures have been taken as specified and approved by Departmental Representative to protect and control public traffic, in accordance with the approved Traffic Control and Management Plan.
- .2 Park only in staging area and construction work area.
- .3 Set construction fencing away from roadway to minimize visual obstructions and allow for snow plowing operations.
- .4 Install signs on the 3 gates to construction area and on fences, indicating public pedestrians, cyclists and cross-country skiers access is prohibited within limits of work areas.
- .5 Since commercial vehicles are prohibited on Colonel By Dr, access to Hogs Back Road from Colonel By Dr is forbidden.
- .6 Contractor to arrange for most deliveries from East.

- .7 For construction operations approved by Departmental Representative, short duration, night time closures of one lane on Hogs Back Road, between Colonel By Drive and Riverside Drive, are permitted from 19:30 hrs to 5:00 hrs; however, a written permission from the local city council will be required prior to any evening, night and weekend work.
- .8 Include provisions for snow removal and maintenance activities during road closures and removal of snow prior to opening road.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies requirements for designing, supplying, installing, inspecting, maintaining, and removing:
 - .1 Temporary barriers.
 - .2 Housing and containment systems.
 - .3 Heating and ventilating workspaces.
 - .4 Lighting of workspaces.
- .2 Work not included in this section:
 - .1 Provision of separate air supply for workers which is part of Contractor's responsibility under Health and Safety regulations for construction.
- .3 Intent: housing, heating and ventilating must be adequate to:
 - .1 ensure safe working environment.
 - .2 facilitate progress of work in an efficient manner.
 - .3 protect areas adjacent to work during procedures which may damage surrounding areas.
 - .4 protect work and products against dampness and cold.
 - .5 provide ambient temperatures and humidity levels for storage, installation and curing of materials.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement of Temporary Barriers and Enclosures.
- .2 Payment will be included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L6 - Heating and Hoarding.
 - .2 Item No. L9 - Barricades and Enclosures.

1.3 RELATED REQUIREMENTS

- .1 Section 01 33 00 - SUBMITTAL PROCEDURES.
- .2 Section 01 35 29.06 - HEALTH AND SAFETY REQUIREMENTS.
- .3 Section 01 35 46 - ARCHEOLOGICAL, CULTURAL, ENVIRONMENTAL PROCEDURES.
- .4 Section 01 51 00 – TEMPORARY UTILITIES
- .5 Section 01 55 26 – TRAFFIC CONTROL

1.4 REFERENCE STANDARDS

- .1 Province of Ontario:

- .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990 as amended, O. Reg. 213/91 as amended.
- .2 Air Pollution - Local Air Quality (O. Reg. 419/05)
- .2 CSA Group (CSA)
 - .1 CSA-O121-M1978(R2003) , Douglas Fir Plywood.

1.5 SUBMITTALS

- .1 Shop drawings showing:
 - .1 Type and construction of housing and enclosures, connections with scaffolding, stability system and method of sealing and egress.
 - .2 Ventilation fan location and capacity.
 - .3 Heater numbers, types, locations, and capacities. Size of drip trays provided with all liquid-fuelled heaters.
 - .4 Number and location of fire extinguishers associated with heating equipment.
 - .5 Number, type, strength, of all lighting provided within enclosure.
 - .6 Temporary connections to existing structures are not allowed.
 - .7 Staging plan and schedule.

1.6 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around deep excavations, open stair wells and open edges of floors.
- .2 Provide and install as indicated or as required by governing authorities.

1.7 DUST TIGHT SCREENS

- .1 Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Provide dust tight screens or platforms to underside of the bridge deck to prevent dust or debris from entering the water body during demolition and construction of bridge components.
- .3 Maintain and relocate protection until such work is complete.

1.8 ACCESS TO SITE

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work, unless stated otherwise in Section 01 55 26 TRAFFIC CONTROL
- .2 Maintain access to site as stated in Section 01 20 01 – SITE ACCESS.

1.9 PUBLIC TRAFFIC FLOW

- .1 Provide and maintain competent traffic control person, traffic signals, barricades and flares, lights as required to perform Work and protect public.

1.10 FIRE ROUTES

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

1.11 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

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

Part 2 Products

2.1 MATERIALS

- .1 Subject to approval by Departmental Representative as to type, materials and detail: Use:
 - .1 New materials;
 - .2 Salvaged/recycled materials in good condition;
 - .3 Prefabricated portable components in good, safe condition.

Part 3 Execution

3.1 GENERAL

- .1 Carry out all work to:
 - .1 Ontario Occupational Health and Safety Act and Regulations.
 - .2 Approved Site-Specific Safety Plan.
 - .3 Approved Site-Specific Environmental Protection Plan.

3.2 BARRIERS

- .1 Design, install, maintain and remove barriers around site to secure hazardous areas including but not limited to:
 - .1 Barriers to be installed along all edges of excavation along the public roads, pedestrian and cyclist pathways.
 - .2 Barriers to be installed around excavations.
 - .3 Barriers to be installed along the open edges.
 - .4 Barrier systems to be designed, inspected and certified by Contractor's Engineer.

3.3 SCAFFOLDING

- .1 Install scaffolding and work platforms to Section 01 20 01 SITE ACCESS.

3.4 ENCLOSURES

- .1 Provide strong and durable housing and containment enclosures for portions of work to be isolated, protected, heated, or ventilated during Work.
 - .1 Housing to be strong enough to withstand rain, wind and snow loads.

- .2 Tarps to be overlapped and sealed to prevent opening and to ensure waterproofing.
 - .3 Housing to be insulated against cold.
 - .4 Electrical wiring, lights, and other equipment located inside enclosure: explosion-proof type. Illumination shall be sufficient for safe execution of the work.
- .2 Design, install, maintain and remove enclosures as required for containment of dust and debris during operations or to provide heated enclosures during cold
 - .1 Enclosures will be subjected to wind, rain, ice, snow and flooding.
 - .2 Enclosures to be designed, inspected and certified by Contractor's Engineer.
 - .3 Enclosures to remain in place until removal accepted by Departmental Representative.
 - .4 Routinely maintain and immediately repair enclosure.

3.5 HEATING

- .1 Provide temporary heating required during construction period, including watch person attendance, maintenance, and fuel.
- .2 Be responsible for damage to work due to failure in providing adequate heat and protection during construction.
- .3 Fire protection requirements: to Section 01 35 29.06 - HEALTH AND SAFETY REQUIREMENTS.
- .4 Use only indirect fired heating equipment of types acceptable to Departmental Representative.
- .5 Heating fuel: Do not re-fuel near water body.
- .6 Fuel Storage: to requirements of Fire Commissioner of Canada and Section 01 35 46 - ARCHEOLOGICAL, CULTURAL, ENVIRONMENTAL PROCEDURES
- .7 Provide and maintain temporary fire protection equipment during performance of work commensurate with fuel source selected.
- .8 Ensure that heating requirements are met by providing, at optimum efficiency of equipment, a capacity of 125% of heat requirement and a sufficient number of standby heaters ready for use at the site.
- .9 Provide fans to circulate heating throughout enclosure. Circulate heat from top to bottom of enclosures. Do not direct fan onto fresh concrete surfaces.
- .10 Modify heating system if unable to achieve required temperatures consistently to meet heating requirements.
- .11 Immediately replace equipment that fails to perform consistently and meet heating requirements.
- .12 Vent exhausts of heating equipment outside of housing, well clear of combustible materials and fresh air intake

3.6 VENTILATING EQUIPMENT

- .1 Intent of ventilation:

- .1 To ensure required air temperature and quality in all parts of enclosure.
- .2 To enhance health and safety of workers.
- .2 Depending upon configuration of enclosure, it may be necessary to install both a mechanical supply and exhaust ventilation system to effect adequate air changes within confined space. Locate air-moving devices in a manner that assures that airflow is not restricted or short circuited and is supplied in proper direction and does not interfere with work.
- .3 Ventilate storage spaces containing hazardous or volatile materials.

3.7 LIGHTING

- .1 Provide electric lighting within enclosures to provide adequate lighting for safe work environment.

3.8 QUALITY CONTROL AND WATCHKEEPING

- .1 Provide and post at approved locations within housing, two maximum/minimum thermometers per 10 square metres of plan area or two per 50 square metres of wall elevation within housing. One thermometer to be at bottom and one at top of enclosure within this area. In areas of poor heat circulation, add extra thermometers as directed.
- .2 Ensure continuity of protection and heating by providing watchkeeper to make periodic checks at all times including when work is not in progress, nights, weekends and holidays.
- .3 Watchkeeper's qualifications to be sufficient to perform such duties as:
 - .1 Maintain strict supervision of operation of temporary heating and ventilating equipment and enclosures.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes due to mis-use of heating and ventilating equipment.
 - .5 Undertake preventive maintenance and re-fueling.
 - .6 Complete emergency repairs of minor complexity.
 - .7 Place standby items in service.
- .4 Record maximum and minimum temperature at each thermometer on daily basis, and re-setting thermometers as necessary.
 - .1 Make temperature records available to Departmental Representative on a daily basis.
 - .2 Provide certified written records to Departmental Representative on a weekly basis.
 - .3 During curing, measure and record humidity and time of application of water.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section presents instructions and requirements for:
 - .1 Field engineering survey services to measure and stake site.
 - .2 Layout and work.
 - .3 Recording existing conditions.
 - .4 Any associated survey works as specified in other sections of the Technical Specifications.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement of Examination and Preparation.
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L3 - Document Existing Site Conditions.

1.3 QUALIFICATIONS OF SURVEYOR

- .1 Qualified registered land surveyor (OLS), licensed to practise in Province of Ontario, acceptable to Departmental Representative.

1.4 SURVEY REFERENCE POINTS

- .1 Existing base horizontal and vertical control points are designated on drawings.
- .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.

1.5 SURVEY REQUIREMENTS

- .1 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.
- .2 Establish lines and levels, locate and lay out, by instrumentation.
- .3 Stake for grading, fill and topsoil placement and landscaping features.
- .4 Stake slopes and berms.
- .5 Establish pipe invert elevations.
- .6 Establish lines and levels for mechanical and electrical work.

- .7 Conduct survey of existing structures recording elevations and coordinates.
- .8 Conduct as-built survey of each component of the finish work recording elevations and coordinates

1.6 EXISTING SERVICES

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

1.7 LOCATION OF EQUIPMENT AND FIXTURES

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

1.8 RECORDS

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

1.9 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit name and address of Surveyor to Departmental Representative.
- .2 Submit pre-construction survey identifying the existing site features and structures.
- .3 Perform and submit topographic survey prior to any excavation, after bottom of excavation is reached and after backfilling is completed in a manner to accurately determine excavation and backfilling quantities.
- .4 Submit documentation to verify accuracy of field engineering work.
- .5 Submit certificate signed by surveyor certifying those elevations and locations of completed Work that conform and do not conform with Contract Documents.

1.10 SUBSURFACE CONDITIONS

- .1 Promptly notify the Departmental Representative in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.

- .2 After prompt investigation, should Departmental Representative determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

1.11 EXISTING SITE CONDITIONS

- .1 Survey and record existing site conditions.
- .2 Provide survey report of existing conditions prior to mobilizing and starting work.
- .3 Provide photos of existing conditions of sufficient quantity to record all site features that may be affected by work. Submit photos in JPG photo or other accepted file format.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies requirements for cleaning during the project including.
 - .1 Progressive cleaning.
 - .2 Final cleaning.
 - .3 Snow removal.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment for cleaning.
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L10 - Site Cleaning.
 - .2 Item No. L11 - Snow Removal.

1.3 RELATED REQUIREMENTS

- .1 Section 01 35 46 ARCHEOLOGICAL CULTURAL AND ENVIRONMENTAL PROCEDURES.

1.4 HERITAGE PROTECTION

- .1 Hogs Back Fixed Bridge and Dam is National Historic Site. Preserve heritage fabric of site by executing cleaning without damage to site features.

1.5 INFORMATION AND SUBMITTALS

- .1 Submit Snow Removal Plan including icing salt and grit materials datasheets and snow removal, salting and grit placement procedures for review concerns related to Health and Safety or Environmental Protection.

1.6 PROGRESSIVE CLEANING

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Clean up work area as work progresses. At end of each work day, and more often if ordered by Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.
- .3 Accumulation of debris and material from demolition work is not allowed at site and must be removed daily or at least weekly or when requested by Departmental Representative.
- .4 Do not burn waste materials on site.
- .5 Do not bury waste materials on site or incorporate into work.
- .6 Do not allow waste to become buried in snow.

- .7 Keep public roadway clean and routinely remove sediment and debris from roadway caused by construction activities.
- .8 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .9 Provide on-site containers for collection of waste materials and debris.
- .10 Provide and use marked separate bins for recycling.
- .11 Identify storage areas for waste and recycling in Site Layout Plan.
- .12 Do not allow waste to fall into or blow into canal or water body. Place light waste, that may blow away, immediately into closed containers.
- .13 Separate and process construction and demolition waste to Section 01 74 19 - WASTE MANAGEMENT AND DISPOSAL.
- .14 Remove waste material and debris from site and deposit in waste container at end of each work day.
- .15 Dispose of recyclable materials to recycling centre. Do not dispose of recyclable materials as waste materials.
- .16 Dispose of waste materials and debris off site.
- .17 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .18 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .19 Provide adequate ventilation during use of volatile or noxious substances.
- .20 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .21 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.7 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative.
- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .6 Clean and polish stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures.
- .7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, signs, benches and floors.

- .8 Clean lighting reflectors, lamps, lamp posts, lenses, and other lighting surfaces.
- .9 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .10 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .11 Remove dirt and other disfiguration from exterior surfaces.
- .12 Sweep and wash clean paved areas.
- .13 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .14 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .15 Upon completion remove scaffolding, work platforms, temporary protection and surplus materials. Make good defects noted at this stage.
- .16 Clean areas under contract to a condition at least equal to that previously existing and to approval of Departmental Representative.

1.8 **SNOW REMOVAL**

- .1 Remove snow and ice from within construction zone and Contractor staging area to allow execution of work.
- .2 Remove snow and ice from: work areas, storage areas, parking areas, construction access roads, access systems, scaffolding, hoarding, access road to PCA parking, multi-use pathway, and PCA parking.
- .3 Include provisions for snow removal and maintenance activities during lane closures, during complete closure of Hogs Back Road and prior to opening of road.
- .4 Remove snow that may contain deleterious materials from within 30 m of water body.
- .5 Do not dump snow directly on water body.
- .6 Apply salt and grit for traction in accordance with Section 01 35 46 - ARCHEOLOGICAL, CULTURAL, ENVIRONMENTAL PROCEDURES.
- .7 Keep work areas and access to work areas, scaffolding, walkways, stairs, ladders, construction access paths, and parking areas free of snow and ice for the duration of work.
- .8 Proceed to snow removal within National Capital Commission (NCC) property only after obtaining land access permit.

1.9 **WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling and reuse in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 De-icing Salt and Grit: To be environmentally approved by appropriate agency.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 MEASUREMENT AND PAYMENT

- .1 There shall be no separate measurement for payment for the work under this Section. Include cost in the Contract Lump Sum Price.
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L7 – General Work.

1.2 RELATED REQUIREMENTS

- .1 Section 01 35 46 – ARCHEOLOGICAL CULTURAL AND ENVIRONMENTAL PROCEDURES

1.3 SUBMITTALS

- .1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
 - .1 Submit Waste Management and Disposal plan as per Section 01 35 46 ARCHEOLOGICAL CULTURAL AND ENVIRONMENTAL PLAN

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.

1.5 CONSTRUCTION AND DEMOLITION WASTE

- .1 Carefully deconstruct and source separate materials/equipment and divert, from Demolition and Construction waste destined for landfill to maximum extent possible. Reuse, recycle, compost or anaerobic digest material for reuse except where indicated otherwise.
- .2 Source separate waste and maintain waste audits in accordance with the Environmental Protection Act, Ontario Regulation 102/94 and Ontario Regulation 103/94.
 - .1 Provide facilities for collection, handling and storage of source separated wastes.
 - .2 Source separate the following waste:
 - .1 Portland cement concrete.
 - .2 Wood, not including painted or treated or laminated wood.
 - .3 Steel.
 - .4 Electrical wiring.
- .3 Submit a waste reduction workplan indicating the materials and quantities of material that will be recycled and diverted from landfill.
- .4 Submit proof that all waste is being disposed of at a licensed land fill site or waste transfer site. A copy of the disposal/waste transfer site's license and a letter verifying that

said landfill site will accept the waste must be supplied to Departmental Representative prior to removal of waste from the demolition site.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 Method of inspection and acceptance of work through procedures that include specific task completions and correction of deficiencies and defects.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement of Closeout Procedures.
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L7: General Work.

1.3 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .2 Request Departmental Representative inspection.
 - .2 Departmental Representative Inspection:
 - .1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Completion Tasks: submit written certificates to Departmental Representative that tasks have been performed as follows:
 - .1 Work: completed and inspected for compliance with Contract Documents.
 - .2 Defects: corrected and deficiencies completed.
 - .3 Equipment and systems: tested, adjusted, balanced and fully operational.
 - .4 Certificates required by Utility companies: submitted.
 - .5 Operation of systems: demonstrated to Owner's personnel.
 - .6 Work: complete and ready for final inspection.
- .4 Final Inspection:
 - .1 When completion tasks are done, request final inspection of Work by Departmental Representative and Contractor.

- .2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.
- .5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
- .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .7 Final Payment:
 - .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
 - .2 Refer to Substantial Completion Deficiency List: when Work deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
- .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.5 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 00- Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for disposal in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section includes information regarding submittals for product and system information prior to project turnover. Includes information on:
 - .1 As-built, samples, and specifications.
 - .2 Product data, materials and finishes, and related information.
 - .3 Warranties and bonds.
 - .4 Final site survey.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no separate measurement for payment for the work under this section. Include cost in Contract Lump Sum Price.
- .2 Payment included in Lump Sum Price as set out in section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L7 – General Work.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-warranty Meeting:
 - .1 Convene meeting one week prior to contract completion with Departmental Representative, in accordance with Section 01 11 00 GENERAL INSTRUCTIONS to:
 - .1 Verify Project requirements.
 - .2 Review warranty requirements and manufacturer's installation instructions.
 - .2 Departmental Representative to establish communication procedures for:
 - .1 Notifying construction warranty defects.
 - .2 Determine priorities for type of defects.
 - .3 Determine reasonable response time.
 - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
 - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3 Copy will be returned with Departmental Representative's comments.

- .4 Revise content of documents as required prior to final submittal.
- .5 Provide evidence, if requested, for type, source and quality of products supplied.
- .6 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .7 Pay costs of transportation.

1.5 FORMAT

- .1 Organize data as instructional manual.
- .2 The Contractor is to make copies of all electronic records, which are produced for the submissions listed in this section. This includes, but is not limited to, drawings, documents, and spreadsheet files.
 - .1 All files are to be properly labeled and placed in a well-organized folder structure.
 - .2 The data is to be stored on CD or DVD and include a Jewel case with a front cover and an insert sleeve listing content.
 - .1 Cover and CD is to include project title and number, and date.
 - .3 The following are the preferred file formats:
 - .1 Drawings: AutoCad ver. 2015.
 - .2 Documents: MS Word or PDF
 - .3 Spreadsheet: MS Excel
 - .4 Product Sheets: Adobe PDF
 - .5 All files in the format indicated above are also to be saved as pdf files.
 - .4 Four copies of the electronic records on CD are to be submitted prior to the Certificate of Final Completion.
- .3 Text: manufacturer's printed data, or typewritten data.
- .4 Field Redline Drawings: provide with reinforced punched binder tab.
 - .1 Bind in with text; fold larger drawings to size of text pages.
- .5 Provide As-Built Drawings in AutoCAD files in *.dwg format on CD or USB drive .

1.6 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Table of Contents: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultant and Departmental Representative with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.

- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
 - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

1.7 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, at site for the Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
 - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
 - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.
- .6 Turn in one set electronic copy, of AS-BUILT drawings and specifications over to the Department Representative on completion of work.
- .7 If project is completed without significant deviations from Contract drawings and specifications submit to the Departmental Representative one set of drawings and specifications marked "AS-BUILT".

1.8 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of opaque drawings, and in copy of Project Specification.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:

- .1 Measured depths of elements of foundation in relation to established benchmark
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 Referenced Standards to related shop drawings and modifications.
- .5 Specifications: legibly mark each item to record actual construction, including:
- .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, field test records, required by individual specifications sections.
- .7 Provide digital photos, for site records.

1.9 FINAL SURVEY

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

1.10 EQUIPMENT AND SYSTEMS

- .1 For each item of equipment and each system include description of unit or system, and component parts.
 - .1 Give function, normal operation characteristics and limiting conditions.
 - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
 - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
 - .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Include manufacturer's printed operation and maintenance instructions.
- .7 Include sequence of operation by controls manufacturer.

- .8 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .9 Provide installed control diagrams by controls manufacturer.
- .10 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .11 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .12 Include test and balancing reports as specified in Section 01 45 00- Quality Control

1.11 MATERIALS AND FINISHES

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
 - .1 Provide information for re-ordering custom manufactured products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional requirements: as specified in individual specifications sections.

1.12 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to location as directed; place and store.
 - .4 Receive and catalogue all items.
 - .1 Submit inventory listing to Departmental Representative
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
 - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to location as directed; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
 - .1 Provide special tools, in quantities specified in individual specification section.

- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.

1.13 DELIVERY, STORAGE AND HANDLING

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by Departmental Representative.

1.14 WARRANTIES AND BONDS

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List Contractor's sub, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by Contractors, suppliers, and manufacturers, within ten (10) days after completion of the applicable item of work. Submit a schedule of warranties showing all products and their warranty periods.
- .4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Certificate 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

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies requirements for creation, maintenance and review of project record drawings.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no separate measurement for payment for the work under this section. Include cost in Contract Lump Sum Price.
- .2 Payment included in Lump Sum Price as set out in section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. 19 – Project Record Documents

1.3 RECORD DRAWING

- .1 Maintain project record drawings and record accurately all deviations from the Contract documents. Record information concurrently with construction progress. Keep work visible until required information is recorded.
- .2 Record changes in red ink. Mark ongoing changes on one set of prints. Then, at completion of project and before final inspection, neatly transfer notations to second set of prints. Submit both sets to Departmental Representative.

1.4 INFORMATION TO BE RECORDED

- .1 Record the following information:
 - .1 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
 - .2 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the structure.
 - .3 Field changes of dimension and detail.
 - .4 Changes made by Change Order or Field Order.
 - .5 Details not on original Contract Drawings.
 - .6 References to related shop drawings and modifications.
 - .7 Additional Requirements: as specified in individual specification sections.

1.5 REVIEW

- .1 Be prepared to review As-Built Drawings with Departmental Representative at least weekly, to ensure that level of detail being recorded is acceptable. Be advised that during periods of high activity, Departmental Representative may review As-Built Drawings even more frequently than weekly.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 Section includes descriptions for demolishing, salvaging, recycling and removing of asphalt paving identified in whole or in part.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment for paving removal.
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L28 – Road Work

1.3 RELATED REQUIREMENTS

- .1 Section 01 74 19 – Waste Management and Disposal
- .2 Section 02 41 13– Structure Demolition

1.4 REFERENCE STANDARDS

- .1 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
 - .2 Canadian Environmental Protection Act, 1999 (CEPA), c. 33.
- .2 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.5 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.
- .2 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.
- .3 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, include but not limited to: poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or materials that endanger human health or environment if handled improperly.
- .4 Waste Management Coordinator (WMC): Contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .5 Construction Waste Management Plan (CWM Plan): Written plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19- WASTE MANAGEMENT AND DISPOSAL.

1.6 ADMINISTRATIVE REQUIREMENTS

- .1 Convene pre-installation meeting 1 week before beginning work of this Section, with Departmental Representative, Contractor and Consultant to:
 - .1 Verify project requirements.
 - .2 Verify existing site conditions adjacent to demolition work
 - .3 Coordinate with other construction sub trades
 - .4 Examine existing site conditions adjacent to demolition work, prior to start of Work
 - .5 Waste reporting requirements

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES.
- .2 WMC is responsible for fulfilment of reporting requirements.
- .3 Prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Section 01 74 19 - WASTE MANAGEMENT AND DISPOSAL and indicate:
 - .1 Descriptions and anticipated quantities in percentages of materials to be salvaged reused, recycled and landfilled.
 - .2 Schedule of selective demolition.
 - .3 Number and location of dumpsters.
 - .4 Anticipated frequency of tipping.
 - .5 Name and address of waste receiving organizations, waste facilities and haulers.
- .4 Submit 1 copy of certified weigh bills from authorized disposal sites and reuse and recycling facilities for material removed from site on a weekly basis.
 - .1 Written authorization from Departmental Representative is required to deviate from, haulers, receiving organizations and facilities listed in Waste Reduction Workplan.
- .5 Shop Drawings:
 - .1 Submit for review and approval demolition drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.
 - .2 Submit demolition drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
- .6 Sustainable Design Submittals:
 - .1 Erosion and Sedimentation Control: Submit erosion and sedimentation control plan as per Section 01 35 46 – ARCHEOLOGICAL, CULTURAL AND ENVIRONMENTAL PROCEDURES.

1.8 SITE CONDITIONS

- .1 Protect existing site features to remain or identified for salvage or re use; make repairs and restore to a similar or better condition to existing where damage to these items occurs as directed by Departmental Representative at no cost to Owner:
 - .1 Remove and store salvaged materials to prevent contamination.

- .2 Store and protect salvaged materials as required for maximum preservation of material.
- .3 Handle salvaged materials same as new materials.
- .2 Perform pavement removal work to prevent adverse effects to adjacent watercourses, groundwater and wildlife, and to prevent excess air and noise pollution:
 - .1 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
 - .2 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with Authorities Having Jurisdiction.
- .3 Protect existing site features and structures, trees, plants and foliage on site and adjacent properties.

Part 2 Products

2.1 EQUIPMENT

- .1 Use cold milling, planing or grinding equipment with automatic grade controls capable of operating from stringline, and capable of removing part of pavement surface to depths or grades indicated.
- .2 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

Part 3 Execution

3.1 PREPARATION

- .1 Verify extent and location of asphalt identified for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities, preserve active utilities traversing site in operating condition.
- .3 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to: sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .4 Prior to beginning removal operation, inspect and verify with Departmental Representative areas, depths and lines of asphalt pavement to be removed.
- .5 Protection: protect existing pavement not designated for removal, light units and structures from damage. In the event of damage, immediately replace or make repairs to approval of Departmental Representative at no additional cost.

3.2 REMOVAL

- .1 Remove existing asphalt pavement to lines and grades established by Departmental Representative on site.
- .2 Demolition of pavements, curbs and gutters:
 - .1 Square up adjacent surfaces to remain in place by saw cutting or other method acceptable to Departmental Representative on site.
 - .1 Saw over-cutting outside of a removal area is not acceptable. The square removal shall be accepted by the Departmental Representative before starting the work.
 - .2 Protect adjacent joints and load transfer devices.
 - .3 Protect underlying and adjacent granular materials where they are exposed and identified to remain.
 - .4 Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving.
- .3 Use equipment and methods of removal and hauling which do not damage or disturb underlying pavement.
- .4 Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.
- .5 Suppress dust generated by removal process.

3.3 FINISH TOLERANCES

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

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- CLEANING.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- CLEANING.
- .3 Sweep remaining asphalt pavement surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.
- .4 Waste Management: separate waste materials for recycling-in accordance with Section 01 74 19- Waste Management and Disposal.
 - .1 Remove waste containers, recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This Section includes requirements for the following:
 - .1 Demolition and removal of bridge structures, pedestrian handrails, bridge traffic barriers and their foundations, sidewalks, curbs, pavement, waterproofing system, expansion joints, precast concrete slabs, prestressed concrete box girders and bearings, drainage systems, manholes, piping, approach slabs, and backfilling of trenches and excavated areas resulting from site demolition activities, demolition and removal of concrete foundations, removing below grade subcomponents, disconnecting, capping or sealing and removing site utilities.
 - .2 Demolition and removal of concrete foundations.
 - .3 Removal of below grade subcomponents.
 - .4 Disconnecting, capping or sealing, and removing site utilities.
- .2 Drawings contain details that suggest directions for some of the major demolition and removal requirements for this project; the Contractor is required to develop these details further by submitting a demolition plan prepared by a professional engineer.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement taken for the structure demolition work.
- .2 Payment related to structural demolition will be included in Lump Sum Item as set out in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L23 – Demolition of Existing Superstructure
 - .2 Lump Sum Item includes but not limited to: Demolition and removal of building and bridge structures, pedestrian handrails, bridge traffic barriers and their foundations, sidewalks, curbs, pavement, waterproofing system, expansion joints, precast concrete slabs, prestressed concrete box girders and bearings, drainage systems, manholes, piping, approach slabs, and backfilling of trenches and excavated areas resulting from site demolition activities, demolition and removal of concrete foundations, removing below grade subcomponents, disconnecting, capping or sealing and removing site utilities.

1.3 RELATED REQUIREMENTS

- .1 Section 01 11 00 – General Instructions
- .2 Section 01 14 00 – Work Restrictions
- .3 Section 01 35 46 – Archeological, Cultural and Environmental Procedures
- .4 Section 01 56 00 – Temporary Barriers and Enclosures
- .5 Section 02 41 13.13– Pavement removal
- .6 Section 26 05 05 – Selective Demolition for Electrical
- .7 Section 31 23 33.01 – Excavating, Trenching and Backfilling

1.4 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA S350-M1980 (R2003) , Code of Practice for Safety in Demolition of Structures.
- .2 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Assessment Act (CEAA), 2012.
 - .2 Canadian Environmental Protection Act (CEPA), 2012.
 - .1 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
 - .2 SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations.
 - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
 - .4 Motor Vehicle Safety Act (MVSA), 1993
 - .5 Hazardous Substances Information Review Act, 1985
- .3 National Fire Protection Association (NFPA)
 - .1 NFPA 241-2019, Standard for Safeguarding Construction, Alteration, and Demolition Operations
- .4 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).

1.5 DEFINITIONS

- .1 Demolition: rapid destruction of building following removal of Hazardous Substances.
- .2 Hazardous Substances: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.
- .3 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating related, required submittal and reporting requirements.
- .4 Waste Management and Disposal Plan (CWM Plan): Written plan prepared in accordance with Section 01 74 19 - Waste Management and Disposal.

1.6 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate with Departmental Representative for the material ownership as follows:
 - .1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner 's property, demolished materials shall become Contractor ' s property and shall be removed from Project site.
 - .2 Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques,

and other items of interest or value to Owner that may be encountered during demolition remain Owner's property:

- .1 Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.
 - .2 Coordinate with Departmental Representative, who will establish special procedures for removal and salvage operations.
- .2 Pre-Demolition Meetings:
- .1 Convene pre-demolition meeting 2 weeks prior to beginning work of this Section, with Departmental Representative to:
 - .1 Verify project requirements.
 - .2 Verify existing site conditions adjacent to demolition work.
 - .3 Co-ordination with other construction subtrades.
 - .2 Hold project meetings every 2 weeks.
 - .3 Ensure key personnel, subcontractor representatives, project manager, site supervisor and WMC attend.
 - .4 WMC must provide written report on status of waste diversion activity at each meeting.
 - .5 Departmental Representative will provide written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.
- .3 Scheduling:
- .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
 - .1 In event of unforeseen delay, notify Departmental Representative in writing.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Shop Drawings: Submit drawings stamped and signed by professional engineer registered or licensed in Ontario as follows:
 - .1 Submit for review and approval demolition drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.
 - .2 Submit in accordance with Section 01 33 00- Submittal Procedures and Section 01 74 19- Waste Management Disposal.
 - .3 WMC is responsible for fulfilment of reporting requirements.
 - .4 Schedule of Demolition Activities: Coordinate with Section 01 32 16.07- Construction Progress Schedule and indicate the following:
 - .1 Detailed sequence of demolition and removal work, with starting and ending dates for each activity
 - .2 Interruption of utility services
 - .3 Coordination for shutoff, capping, and continuation of utility services

- .4 Locations of temporary partitions and means of egress
- .5 Demolition Plan: Submit a plan of demolition area indicating extent of temporary facilities and supports, methods of removal and demolition prepared by a professional engineer in accordance with requirements of Authority Having Jurisdiction.
- .6 Noise Control and Dust Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation.
- .7 Inventory: Submit a list of items that have been removed and salvaged after demolition is complete.
 - .1 Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
 - .2 Pre-demolition Photographs: Submit photographs indicating existing conditions of adjoining construction and site improvements prior to starting Work. Include finish surfaces that may be misconstrued as damage caused by demolition operations.
- .2 Informational Submittals: Provide the following submittals when requested by the Departmental Representative:
 - .1 Qualification Data: Submit information for companies and personnel indicating their capabilities and experience to perform work of this Section including; but not limited to, lists of completed projects with project names and addresses, names and addresses of Consultant and Representative, for work of similar complexity and extent.

1.8 QUALITY CONTROL

- .1 Regulatory Requirements: Ensure Work is performed in compliance with TDGA, CEPA, CEAA, and applicable Provincial and Municipal regulations.
 - .1 Comply with hauling and disposal regulations of Authority Having Jurisdiction.
 - .2 Standards: Comply with ANSI A10.6 and NFPA 241
- .2 Regulatory Requirements: Perform work of this Section in accordance with the following:
 - .1 Federal Workers' Compensation Service and Provincial/Territorial Workers' Compensation Boards/Commissions.
 - .2 Provincial/Territorial Occupational Health and Safety Standards and Programs and Government of Canada, Labour Program: Workplace Safety .

1.9 SITE CONDITIONS

- .1 Environmental protection:
 - .1 Ensure Work is done in accordance with Section 01 35 46- Archeological, Cultural and Environmental Procedures.
 - .2 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
 - .3 Fires and burning of waste or materials is not permitted on site.
 - .4 Do not bury rubbish waste materials.

- .5 Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum-based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
- .6 Ensure proper disposal procedures are maintained throughout project.
- .2 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction as directed by Departmental Representative.
- .4 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .5 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.
- .6 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.
- .7 Conduct structure demolition in a manner that the dam operations will not be disrupted:
 - .1 Operation of Dam by PCA cannot be obstructed by demolition work. Contractor to plan and sequence the demolition work accordingly.
 - .2 Maintain access to existing walkways, exits, and other adjacent occupied or used facilities as set out with Section 01 11 00 – General Instructions and 01 14 00 – Work Restrictions.
 - .1 Contractor to establish detours for pedestrian and cyclists’ pathways prior to commencing any demolition work.
- .8 Departmental Representative assumes no responsibility for structures being demolished:
 - .1 Conditions existing at time of inspection for bidding purpose will be maintained by Departmental Representative as far as practical.
 - .2 Remove, protect and store salvaged items as directed by Departmental Representative before structure demolition.
 - .3 Salvage items as identified by Departmental Representative.
 - .4 Deliver to Owner as directed.

1.10 EXISTING CONDITIONS

- .1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition at the time of examination before tendering.
- .2 Hazardous Substances: Any hazardous materials encountered during demolition requires abatement as follows:
 - .1 Hazardous substances are as defined in Hazardous Products Act.
 - .2 Hazardous substances will be removed by Contractor as a part of Contract in accordance with work results described in Related Requirements listed above.
- .3 Contractor to include handling and disposal procedures of hazardous substances in their Site-Specific Environmental Protection Plan and waste management and disposal plan.

- .4 Discovery of Hazardous Substances: Immediately notify Departmental Representative if materials suspected of containing hazardous substances are encountered and perform the following activities:
 - .1 Hazardous substances will be as defined in the Hazardous Products Act.
 - .2 Stop work in the area of the suspected hazardous substances.
 - .3 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.
 - .4 Hazardous substances will be removed by Representative under a separate contract or as a change to the Work.
 - .5 Proceed only after written instructions have been received from Representative and Owner.

Part 2 Products

2.1 EQUIPMENT

- .1 Equipment and heavy machinery:
 - .1 On-road vehicles to: CEPA-SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations or CEPA-SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
 - .2 Off-road vehicles to: EPA CFR 86.098-10 or EPA CFR 86.098-11.
 - .3 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.
- .2 Contractor may choose to use a barge to access under the bridge deck for demolition work. Use of barge must be in accordance with requirements outlined with Section 01 11 00 – General Instructions.

2.2 TEMPORARY SUPPORT STRUCTURES

- .1 Design temporary support structures required for demolition work and underpinning and other foundation supports necessary for the project. The temporary supports must be design and certified by a qualified professional engineer licensed to practice in Province of Ontario.

2.3 SOIL MATERIALS

- .1 Provide soil and aggregates needed for demolition work in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

Part 3 Execution

3.1 EXAMINATION

- .1 Survey existing conditions and correlate with requirements indicated to determine extent of structure demolition required.
- .2 Review Project Record Documents of existing construction provided by Departmental Representative.

- .3 Consultant and Departmental Representative does not guaranty that existing conditions are the same as those indicated in Project Record Documents.
- .4 Inventory and record the condition of items being removed and salvaged.
- .5 When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element.
- .6 Promptly submit a written report to Departmental Representative.
- .7 Verify that Hazardous Substances have been remediated before proceeding with structure demolition operations.

3.2 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to: sediment and erosion control plan, specific to site as per site specific Environmental Protection Plan, that complies with EPA 832/R-92-005 and or requirements of authorities having jurisdiction, whichever is more stringent and of authorities having jurisdiction.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during demolition.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after completion of demolition work.
- .2 Protection of in-place conditions:
 - .1 Work in accordance with Section 01 35 46- Archeological, Cultural and Environmental Procedures.
 - .2 Prevent movement, settlement or damage of adjacent structures, properties paving, adjacent grades services, parts of existing building or structure to remain, sidewalks, trees, landscaping.
 - .1 Provide bracing, shoring and underpinning as required.
 - .2 Repair all damage caused by demolition
 - .3 Support affected structures and, if safety of structure being demolished adjacent structures or services appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.
 - .4 Prevent debris from blocking surface drainage system, mechanical and electrical systems which must remain in operation.
- .3 Surface Preparation:
 - .1 Disconnect, re-route, cap electrical, mechanical and communication service lines going through structure to be demolished in accordance with Section 26 05 05 – Selective Demolition for Electrical.
 - .2 Do not disrupt active or energized utilities designated to remain undisturbed.

3.3 DEMOLITION

- .1 Protect demolition work and adjacent watercourses in accordance with Section 01 56 00- Temporary Barriers and Enclosures.

- .2 Blasting operations not permitted during demolition.
- .3 Prior to start of Work, remove contaminated or hazardous materials as directed by Departmental Representative from site and dispose at designated disposal facilities in safe manner in accordance with Section 01 35 46 – Archeological, Cultural and Environmental Procedures.
- .4 Demolish items as indicated on drawings.
- .5 Demolish to sound concrete in a manner to permit construction of additions and as indicated.
- .6 Crush concrete generated due to demolition to size suitable for recycling.
 - .1 Identify markets which will accept crushed material as aggregate.
 - .2 For further information regarding acceptable uses contact Provincial aggregate producers associations and Ontario Ministry of Transportation.
- .7 Demolish foundation walls and footings, within areas of new construction.
- .8 Remove and protect existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces and replace as work progresses.
- .9 At end of each day's work, leave Work in safe and stable condition.
 - .1 Protect interiors of parts not to be demolished from exterior elements at all times.
 - .2 Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative.
- .10 Remove structural framing.
- .11 Contain fibrous materials to minimize release of airborne fibres while being transported.
- .12 Remove and dispose of demolished materials except where noted otherwise in accordance with Section 01 74 19 – Waste Management and Disposal.
- .13 Use natural lighting to do Work where possible.
 - .1 Shut off lighting except those required for security purposes at end of each day.
- .14 Removal of curbs, gutters and approach slab:
 - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.
 - .2 Protect adjacent joints and load transfer devices.
 - .3 Protect underlying and adjacent granular materials.
 - .4 Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving.
- .15 Excavate at least 300 mm below pipe invert, when removing pipes under existing or future pavement area.
- .16 Remove designated trees during demolition.
 - .1 Obtain written approval of Departmental Representative prior to removal of trees
- .17 Dispose trees after removal.
- .18 Stockpile topsoil for final grading and landscaping:

.1 Provide erosion control and seeding if not immediately used.

.19 Salvage:

.1 Dismantle items containing materials for salvage and stockpile salvaged materials at locations to be indicated by Departmental Representative.

3.4 SITE RESTORATION

- .1 Below Grade Areas: Rough grade below grade areas ready for further excavation or new construction.
- .2 Below Grade Areas: Completely fill below grade areas and voids resulting from structure demolition operations with satisfactory soil materials in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.
- .3 Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes.
- .4 Provide a smooth transition between adjacent existing grades and new grades.

3.5 REPAIRS

- .1 General: Promptly repair damage to adjacent construction caused by structure demolition operations.
- .2 Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
- .3 Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

3.6 CLEANING

- .1 Develop Waste Management and Disposal Plan related to Work of this Section and in accordance with Section 01 35 46 – Archeological, Cultural and Environmental Procedures and Section 01 74 19- Waste Management and Disposal.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19- Waste Management and Disposal.
 - .1 Label stockpiles, indicating material type and quantity.
- .3 Clean site and demolition debris in accordance with Section 01 74 00 – Cleaning.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This work includes the concrete forming and accessories for all work related to the cast in place concrete. This includes but not limited to the reconstruction of the abutment backwalls and wingwalls, bridge deck, the multi-use pathway, the tunnel, the lamppost base and concrete repairs.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment under this section.
- .2 Include costs in concrete items for which concrete formwork, falseworks and accessories are required.

1.3 RELATED REQUIREMENTS

- .1 Section 03 20 00 – CONCRETE REINFORCING.
- .2 Section 03 30 00 – CAST-IN-PLACE CONCRETE.

1.4 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA-A23.1-14 /A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-O86-14, Engineering Design in Wood.
 - .3 CSA O121-08(R2013), Douglas Fir Plywood.
 - .4 CSA O151-09(2014), Canadian Softwood Plywood.
 - .5 CSA O153-13, Poplar Plywood.
 - .6 CAN/CSA-O325.0-16, Construction Sheathing.
 - .7 CSA O437 Series-93(R2011), Standards for OSB and Waferboard.
 - .8 CSA S269.1-16, Falsework and Formwork.
 - .9 CAN/CSA-S269.3-M92(R2003), Concrete Formwork.
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in formwork liners and coatings and include product characteristics, performance criteria, physical size, finish, and limitations.
 - .2 Submit copies of WHMIS MSDS in accordance with Section 01 35 29.06- Health and Safety Requirements and 01 35 46- Archeological, Cultural and Environmental Procedures.

- .3 Submit shop drawings for formwork and falsework.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
 - .2 Prepare Shop Drawings in accordance with CSA S269.1 for formwork and falsework.
 - .3 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
 - .4 Indicate sequence of erection and removal of formwork/falsework.
 - .5 When slip forming are used, submit details of equipment and procedures for review by Departmental Representative.
 - .6 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.
 - .7 Indicate sequence of erection and removal of formwork and falsework.
 - .8 Include the following information on falsework Shop Drawings:
 - .1 Longitudinal, lateral, vertical, dead, live and impact loads used in design.
 - .2 Safe bearing capacity of soil underneath mud sills.
 - .3 Maximum column, post and support loads.
 - .4 Deflection diagrams for beams with deflection of 10 mm or more.
 - .5 Deflection diagrams indicating initial and final elevation of deck surfaces, roofs and soffits.
 - .6 Grade of structural steel.
 - .7 Indicate steel posts, girders, beams, connections, bracing and welding, providing sufficient detail for safe performance of falsework.
 - .8 Fully detailed steel frame shoring.
 - .9 Species, grades and sizes of wood.
 - .10 Type and weight of equipment (moving or stationary) supported by falsework.
 - .11 Sequence, methods and rate of concrete placement.
 - .12 Proprietary equipment adequately identified for checking purposes.
 - .13 Full details and locations of splices.

1.6 QUALITY CONTROL

- .1 Quality Control: in accordance with Section 01 45 00- Quality Control.
- .2 Retain a professional engineer registered or licensed in Ontario, Canada, with experience in formwork and falsework design of comparable complexity and scope, to perform following services as part of Work of this Section:
 - .1 Design of formwork and falsework:
 - .2 Review, stamp, and sign fabrication and erection Shop Drawings, design calculations and amendments.
 - .3 Conduct on-site inspections and prepare and submit inspection reports verifying this part of Work is in accordance with Contract Documents and reviewed Shop Drawings. Perform inspections a minimum of twice per month.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store, and handle materials in accordance with manufacturer's written instructions and in accordance with Section 01 35 46 – ARCHEOLOGICAL, CULTURAL, ENVIRONMENTAL PROCEDURES.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect formwork from damages.
 - .3 Replace defective or damaged materials with new.
- .4 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 74 19 - WASTE MANAGEMENT AND DISPOSAL.
 - .2 Place materials defined as hazardous or toxic in designated containers.
 - .3 Divert wood materials from landfill to a recycling/reuse facility as approved by Departmental Representative.
 - .4 Divert plastic materials from landfill to a recycling/reuse facility as approved by Departmental Representative.
 - .5 Divert unused form release material from landfill to an official hazardous material collections site as approved

Part 2 Products

2.1 MATERIALS

- .1 Formwork materials:
 - .1 For not apparent concrete and concrete without special architectural features, use wood and wood product formwork materials to CAN/CSA-O86, CSA-O121, CSA-O153, and CSA O437 Series.
 - .2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.
 - .3 Rigid insulation board: to CAN/ULC-S701.
- .2 Form ties:
 - .1 For not apparent concrete, use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
 - .2 For apparent concrete, use snap ties complete with plastic cones and light grey concrete plugs.
- .3 Form liner:
 - .1 Plywood should be with square edge. Plywood: high density overlay Douglas Fir to CSA O121, Poplar to CSA O153 or Canadian Softwood Plywood to CSA O151

- .2 Waferboard: to CAN/CSA-O325.0 and CAN/CSA-O437
- .4 Form release agent: Proprietary, colourless mineral oil, non-volatile, low VOC, non-toxic, biodegradable, free of kerosene, with viscosity between 70 and 110s Saybolt Universal at 40 degrees C, flashpoint minimum 150 degrees C, open cup
- .5 Falsework materials: 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 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .8 Align form joints and make watertight.
 - .1 Keep form joints to minimum.
- .9 Use 25 mm chamfer strips on external corners and 25 mm fillets at interior corners, joints, unless specified otherwise.
- .10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .11 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
 - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .12 Line forms for following surfaces:
 - .1 Outer face of and vertical edge of bridge sidewalk slab.
 - .2 Soffit of girders and underside of bridge decks if exposed.
 - .3 Exposed faces of abutments, wingwalls, piers and pylons: do not stagger joints of form lining material and align joints to obtain uniform pattern.
 - .4 Secure lining taut to formwork to prevent folds.
 - .5 Pull down lining over edges of formwork panels.
 - .6 Ensure lining is new and not reused material.
 - .7 Ensure lining is dry and free of oil when concrete is poured.

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

3.2 REMOVAL AND RESHORING

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 7 days for walls.
 - .2 28 days for beams, slabs, decks and other structural members, or 14 days when replaced immediately with adequate shoring to standard specified falsework.
 - .3 3 days for footings and abutments.
- .2 Remove formwork when concrete has reached 70 % of its 28 day design strength after the minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .4 Space reshoring in each principal direction at not more than 2 000 mm apart.
- .5 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.
- .3 Waste Management: separate waste materials for recycling or reuse in accordance with Section 01 74 19- Waste Management and Disposal.
 - .1 Remove waste containers, recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section includes requirements for reinforcing bars for all reinforced concrete including the dowels and anchors.

1.2 MEASUREMENT AND PAYMENT

- .1 Measurement of reinforcing steel to be paid at unit rate in kilograms of steel incorporated into 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, except for the dowels.
- .2 Measurement of reinforcing steel for dowels in cast-in-place concrete to be paid in unit incorporated into Work, as indicated or authorized in writing by Departmental Representative. The price must include the drilling, epoxy adhesive anchoring system and labour for installation for the dowels.
- .3 Payment must be done as specified in Section 01 22 01 – MEASUREMENT AND PAYMENT. Include reinforcement costs in:
 - .1 Item No. U7 – Reinforcing steel.
 - .2 Item No. U10 – Dowels.
 - .3 Dowels used in concrete repairs will not be measured separately and will be paid under Item No. U9 – Concrete Repair.

1.3 RELATED REQUIREMENTS

- .1 Section 03 10 00 - CONCRETE FORMING AND ACCESSORIES
- .2 Section 03 30 00 – CAST IN PLACE CONCRETE
- .3 Section 03 35 00 - CONCRETE FINISHING

1.4 REFERENCE STANDARDS

- .1 American Concrete Institute (ACI)
 - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 ASTM International (ASTM)
 - .1 ASTM A143/A143M-07(2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - .2 ASTM A641/A641M09a(2014), Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - .3 ASTM A775/A775M-16, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - .4 ASTM A 884/A 884M-14 Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.

- .5 ASTM A 1064/A 1064M-16b, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .3 CSA Group (CSA)
 - .1 CSA-A23.1-14 /A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A23.3-14, Design of Concrete Structures.
 - .3 CSA-G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement.
 - .4 CSA-G40.20/G40.21-13(R2014), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .6 CSA W186-M1990(R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: Convene pre-installation meeting one week prior to beginning concrete works.
 - .1 Ensure key personnel, site supervisor, testing laboratories and Departmental Representative attend.
 - .1 Verify project requirements.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in Cast-In-Place Concrete and additives and include product characteristics, performance criteria, physical size, finish, and limitations.
 - .2 When Chromate solution used as replacement for galvanizing non-prestressed reinforcement, provide product description for review by Departmental Representative prior to its use.
 - .3 Submit 1 electronic copy of WHMIS MSDS in accordance with Section 01 35 46- Archeological, Cultural and Environmental Procedures and 01 35 29.06- Health and Safety Requirements.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario of Canada.
 - .1 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and SP-66.
 - .2 Indicate placing of reinforcement and:

- .1 Bar bending details.
- .2 Lists.
- .3 Quantities of reinforcement.
- .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
- .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
- .3 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.
 - .1 Provide type B unless otherwise indicated.
- .4 Indicate position and size of openings in slabs and walls. Coordinate with trades requiring openings.
- .4 Quality Assurance Submittals:
 - .1 Submit in accordance with Section 01 45 00- Quality Control.
 - .2 Mill Test Report: submit to Departmental Representative certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
 - .3 Upon request submit in writing to Departmental Representative proposed source of reinforcement material.
 - .4 Upon request submit to Departmental Representative epoxy coating applicator certificates identified in Quality Assurance.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .4 Handle, transport, store and install epoxy coated reinforcing steel bars to prevent damage to coating. Prevent bar-to-bar abrasion and excessive sagging. Do not drop or drag bars. Store on suitable non-metallic supports. For lifting use nylon lifting slings, padded slings, separators or other means recommended by epoxy coated reinforcing steel supplier.
- .5 Develop Construction Waste Reduction Workplan related to Work of this Section.

Part 2 Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .2 Reinforcing steel: billet steel, grade 400W, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.
- .4 Cold-drawn annealed steel wire ties: to ASTM 1064/A 1064M.
- .5 Deformed steel wire for concrete reinforcement: to ASTM 1064/A 1064M.
- .6 Welded steel wire fabric:
 - .1 Plain in accordance ASTM A 1064/A 1064M, fabricated from as drawn steel wire into flat sheets; sizes as indicated on Drawings.
 - .2 Finish:
 - .1 Galvanized: Hot dip galvanized after welding having Class A coating in accordance with ASTM A641.
 - .3 Provide in flat sheets only.
- .7 Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164, minimum zinc coating 610 g/m
 - .1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.
 - .2 If chromate treatment carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.
 - .1 Temperature of solution minimum 32 degrees and galvanized steels immersed for minimum 20 seconds.
 - .3 If galvanized steels at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.
 - .1 No restriction applies to temperature of solution.
 - .4 Chromate solution sold for this purpose may replace solution described above, provided if of equivalent effectiveness.
 - .1 Provide product description as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .8 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .9 Tie wire: 1.5 mm diameter annealed wire, epoxy coated.
- .10 Mechanical splices: subject to approval of Departmental Representative.
- .11 Plain round bars: to CSA-G40.20/G40.21.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

- .1 Provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
- .2 Upon request, inform Departmental Representative of proposed source of supplied material.

Part 3 Execution

3.1 PREPARATION

- .1 Galvanizing to include chromate treatment.
 - .1 Duration of treatment 1 hour per 25 mm of bar diameter.
- .2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A143/A143M.

3.2 FIELD BENDING

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
- .2 When field bending authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

3.3 PLACING REINFORCEMENT

- .1 Cutting or puncturing vapour retarder is not permitted.
- .2 Place reinforcing steel as indicated on placing drawings in accordance with CSA-A23.1/A23.2.
- .3 Use plain round bars as slip dowels in concrete.
 - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
 - .2 Apply thick even film of mineral lubricating grease when paint is dry.
- .4 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .5 Maintain cover to reinforcement during concrete pour.
- .6 Protect epoxy and paint coated portions of bars with covering during transportation and handling.

3.4 FIELD TOUCH-UP

- .1 Touch up damaged and cut ends of galvanized reinforcing steel with compatible finish to provide continuous coating.

3.5 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 Reinforcing steel and welded wire fabric.
- .2 Inspection and testing of reinforcing and reinforcing materials carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
 - .1 Ensure testing laboratory certified to CSA A283.
- .3 Ensure test results distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.
- .4 Contractor to appoint and pay for costs of inspection and testing services for field quality control, as specified in Section 01 11 00 – General Instructions.
- .5 Inspection or testing by Departmental Representative not to augment or replace Contractor quality control nor relieve Contractor of contractual responsibility.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.
 - .1 Leave work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with 01 74 19- Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section includes technical data for all cast-in-place concrete.

1.2 MEASUREMENT AND PAYMENT

- .1 Measurement Procedures: in accordance with Section 01 22 01- Measurement and Payment.
- .1 Item No. U8 – Cast-in-place Concrete: Measure cast-in-place concrete at unit rate in cubic metres calculated from neat dimensions:
- .1 Item includes cast-in-place concrete for abutment back walls, top sections of Pier 2 and Pier 5 including the bearing pad seating, top sections of North East and North West wingwalls, top sections of South West and South East wingwall extension, extension of Tunnel T2, approach slabs and foundations of traffic barriers, multi-use pathway outside of the bridge deck.
- .2 Concrete placed beyond dimensions indicated will not be measured.
- .2 Item No. U9 – Concrete Repair: Measure all Concrete repairs at unit rate in square meter calculated from neat surface of repair accepted. Unit Price to include: concrete removal and disposal, surface preparation, dowels, formwork, reinforcement, cast-in-place concrete (including drilling and sealing).
- .3 Measurement for installation of cast-in-place concrete for the bridge superstructure including, bridge deck, multi-use pathway and curb; supply and installation of embedded steel items such as anchors, expansion joints and joint cover assemblies, pipe sleeves and drainage, joint sealant, deck waterproofing; reinforcement, formwork, shoring and all miscellaneous items to complete the work; test slabs for high strength concrete will be paid under:
- .1 Lump Sum Item L25 – Bridge Deck and Multiuse Pathway.
- .2 Include work described in Section 03 10 00 - CONCRETE FORMING AND ACCESSORIES in the unit prices of concrete.
- .3 Include bonding agent in unit price of concrete.
- .4 No deductions made for volume of concrete displaced by reinforcing steel, structural steel, or piles.
- .5 No deductions made for volume of concrete less than 0.1 m³ in volume displaced by individual drainage openings.
- .6 Supply and installation of anchor bolts, nuts and washers, bolt/dowel grouting/epoxy and waterstops not measured but considered incidental to work.
- .7 Unit and Lump Sum price to include all labour, material, equipment and incidentals to execute the work in full.

1.3 RELATED REQUIREMENTS

- .1 Section 03 10 00 – CONCRETE FORMING AND ACCESSORIES.

.2 Section 03 20 00 – CONCRETE REINFORCING

1.4 REFERENCE STANDARDS

.1 ASTM International

- .1 ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.
- .2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- .3 ASTM C494/C494M-16, Standard Specification for Chemical Admixtures for Concrete.
- .4 ASTM C 881/C881M-15, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- .5 ASTM C1017/C1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- .6 ASTM C C1059/C1059M-13, Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete.
- .7 ASTM D412-16, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
- .8 ASTM D624-2012, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
- .9 ASTM D1751-04(2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .10 ASTM D1752-04a(2013), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.2 CSA Group

- .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA A283-06-R2016, Qualification Code for Concrete Testing Laboratories.
- .3 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005),

1.5 ABBREVIATIONS AND ACRONYMS

.1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement types:

- .1 GU, GUb and GUL - General use cement.

.2 Fly ash types:

- .1 F - with CaO content maximum 8%.
- .2 CI - with CaO content 15 to 20%.
- .3 CH - with CaO minimum 20%.

1.6 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with Section 01 32 16.07 – CONSTRUCTION PROGRESS SCHEDULES, convene pre-installation meeting one week prior to beginning concrete works.
 - .1 Ensure key personnel attend.
 - .1 Verify project requirements.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in Cast-In-Place Concrete and additives and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit WHMIS MSDS in accordance with Section 01 35 46- Archeological, Cultural and Environmental Procedures and 01 35 29.06- Health and Safety Requirements.
- .3 Submit concrete mix design for review and approval.
- .4 Site Quality Control Submittals:
 - .1 Provide testing and inspection results reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
 - .2 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
 - .3 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete delivered to site of Work and discharged after batching.
- .5 Samples:
 - .1 Upon request by Departmental Representative, submit 2 samples for review and acceptance of materials proposed for use as follows:
 - .1 5 L of curing compound.
 - .2 2 m length of each type of joint filler.
 - .3 3 kg of each type of supplementary cementing material.
 - .4 10 kg of each type of blended hydraulic cement.
 - .5 5 kg of each admixture.
 - .2 Samples returned for inclusion into work.
- .6 Submit survey report signed by registered OLS surveyor or professional engineer registered to practice in Province of Ontario confirming elevations, locations (Coordinates), anchor bolt locations, and plumbness of the formwork prior to concrete pour.
- .7 Submit survey report signed by registered OLS surveyor or professional engineer registered to practice in Province of Ontario confirming elevations, locations

(Coordinates), anchor bolt locations, and plumbness of the constructed cast-in-place concrete items.

1.8 QUALITY CONTROL

- .1 Quality Control: in accordance with Section 01 45 00- Quality Control.
- .2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
 - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture meet specified requirements.
- .3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
 - .1 Falsework erection.
 - .2 Hot weather concrete.
 - .3 Cold weather concrete.
 - .4 Curing.
 - .5 Finishes.
 - .6 Formwork removal.
 - .7 Joints.
- .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.
- .5 Cast test slab to verify conformity of characteristics for placing concrete with a pump: air content, slump, temperature, compressive strength and characteristics of air network.
- .6 Test slab:
 - .1 Mix sample quantity of each typical mix, in amount of 3 m³ of concrete.
 - .2 Cover equivalent of 20 m² of surface of main structure deck slab, under same conditions as those planned for placing concrete at work site.
- .7 Do work in evening: placement material, transport of concrete.
- .8 Do not pour test slab on bridge.
 - .1 Perform pour under conditions similar to those of actual concrete placement, but elsewhere than on bridge.
- .9 Carry out test at least 14 days prior to planned date for concrete placement Work.
 - .1 Acceptance of high performance concrete mix is conditional upon obtaining satisfactory results from test slab pour.
 - .2 Once results of 14 day lab tests are known, then mix and procedure will be accepted.
- .10 Proceed with placement of concrete at site once Departmental Representative reviews and approves data sheet on mix before results of 28 day tests are known.
 - .1 Provide concrete that meets specified requirements.

- .11 Carry out at own expense new test slab pour if test results do not meet specified requirements.
- .12 Hold co-ordination meeting on high performance concrete pours seven days before test slab pour to ensure that similar conditions are reproduced as for regular concrete pours.
 - .1 Departmental Representative must be in attendance.
 - .2 Submit in writing report for review by Departmental Representative in accordance with Section 01 33 00- Submittal Procedures.
- .13 Perform 1 test slab pours for following:
 - .1 Deck slab of main structure.
 - .2 All structure using a pump for placing concrete.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
- .2 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
 - .1 Modifying maximum time limit without receipt of prior written agreement from Departmental Representative, laboratory representative and concrete producer as described in CSA A23.1/A23.2. is prohibited.
 - .2 Deviations submitted for review by Departmental Representative.
 - .3 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .3 Packaging Waste Management: remove for reuse by manufacturer and return of crates, packaging materials, padding and pallets in accordance with Section 01 74 19- Waste Management and Disposal.

1.10 SITE CONDITIONS

- .1 Placing concrete during rain or weather events that could damage concrete is prohibited.
- .2 Protect newly placed concrete from rain or weather events in accordance with CSA A23.1/A23.2.
- .3 Cold weather protection:
 - .1 Maintain protection equipment, in readiness on Site.
 - .2 Use such equipment when ambient temperature below 5°C, or when temperature may fall below 5°C before concrete cured.
 - .3 Placing concrete upon or against surface at temperature below 5°C is prohibited.
- .4 Hot weather protection:
 - .1 Protect concrete from direct sunlight when ambient temperature above 27°C.
 - .2 Prevent forms of getting too hot before concrete placed. Apply accepted methods of cooling not to affect concrete adversely.
- .5 Protect from drying.

Part 2 Products

2.1 DESIGN CRITERIA

- .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: Normal GU to CSA A3001.
- .2 Blended hydraulic cement binder: GUb-SF, GUb-S/SF or GUb-F/SF to CSA A3001.
- .3 Portland-limestone cement: Type GUL to CSA A3001.
- .4 Water used to mix and cure concrete shall be fresh, clean, potable water, free of oil and chemical or organic impurities, and in compliance with provisions set forth in section 4 of the CAN/CSA A23.1 standard.
- .5 Aggregates shall be clean, durable, free of deleterious materials and meet requirements set forth in the CAN/CSA A23.1 standard that apply to the appropriate exposure class.
- .6 Total mass of supplementary cementing materials (fly ash, finely ground granulated blast furnace slag and silica fumes) shall not exceed 30% of the total cementitious material mass.
- .7 Silica fumes shall be in accordance with the CAN/CSA A3000, type U standard.
- .8 When required, fly ash shall be in accordance with the CAN/CSA A3000, type F standard requirements, and more specifically, the section in standard A3001 – Cementitious Materials for Use in Concrete.
- .9 Admixtures:
 - .1 Air entraining admixture shall be in accordance with the ASTM C260 standard.
 - .2 Chemical admixture: to ASTM C1017 and ASTM C494. Departmental Representative and to approve accelerating or set retarding admixtures during cold and hot weather placing.
 - .3 Corrosion-inhibiting admixture: to C 494 Type S
 - .4 Lithium-based admixture: to C 494 Type S
 - .5 Shrinkage-reducing admixture (SRA): to C 494 Type S
 - .6 Viscosity-modifying agent (VMA): to C 494 Type S
- .10 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: 35 MPa at 28 days.
 - .2 Net shrinkage at 28 days: maximum

- .11 Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 50 MPa
- .12 Post-Tensioning Ducts: to CSA A23.1/A23.2.
- .13 Compounds used to cure concrete shall meet the following requirements: to CSA A23.1/A23.2, ASTM C309, Type 1-D with fugitive dye, Type 1-chlorinated rubber, ASTM C171 and AASHTO M182 standards.
- .14 Mechanical waterstops: labyrinth or ribbed extruded PVC Arctic Grade of sizes indicated with shop welded corner and intersecting pieces with legs minimum 150 mm long :
 - .1 Tensile strength: to ASTM D412, method A, Die "C", minimum 15 kN
 - .2 Elongation: to ASTM D412, method A, Die "C", minimum 250%.
 - .3 Tear resistance: to ASTM D624, method A, Die "B", minimum 30 kN/m.
- .15 Premoulded joint fillers:
 - .1 Bituminous impregnated fibre board: to ASTM D1751.
 - .2 Sponge rubber: to ASTM D1751, Type I, flexible grade.
 - .3 Standard or Self-expanding cork: to ASTM D1752, Type III or II.
- .16 Weep hole tubes: plastic or galvanized steel.
- .17 Polyethylene film: 3 mm thick
- .18 Concrete Bonding Agents: Epoxy to ASTM C881/C881M, Type V and Latex to ASTM C1059/C1059M.
- .19 Crack injection grout: High performance, zero bleed, sand-free, cementitious grout meeting the requirements of CRD C 621 and ASTM C1107 (type 1).
- .20 Epoxy adhesive for anchor and dowel installation: Acceptable product is Hilti HIT-HY-200 or approved equivalent.

2.4 MIXES

- .1 Alternative - Performance Method for specifying concrete: to meet Departmental Representative and 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 Workability: free of surface blemishes, loss of mortar, segregation and colour variations.
 - .2 Set time: 2 hours maximum
 - .3 Provide concrete mix to meet following hard state requirements:

The characteristics and concrete mixes to be used in this project are defined in the following table.

Type	Strength at 28 days (MPa)	Minimum binder weight (kg/m ³)	Type of binder ⁽¹⁾	Max. water/binder ratio or interval	Slump (mm) ± 30	Large aggregates (mm)	Air content (%) ⁽²⁾	Max. chloride ion permeability (Coulombs)
V-S	35	340	GUb-SF	0.38 to 0.42	130	5-20	5-8	1000
		365	GUb-F/SF, GUb-S/SF					
V	35	340	GUb-SF	0.45	80	5-20	5-8	1500
		365	GUb-F/SF, GUb-S/SF					
XIII	50	410	GUb-SF, GUb-F/SF, GUb-S/SF	0.34 to 0.38	170	5-14	5-8	1000
XIV-R	35 ⁽⁴⁾	460	GUb-F/SF, GUb-S/SF	0.35 - 0.40 ⁽⁵⁾	0	2.5 - 10 ⁽⁶⁾	6-9	1000

- (1) The GUb-SF type binder shall contain at least 8% silica fumes.
 The GUb-F/SF and GUb-S/SF type binders shall contain at least 5% silica fume and at least 15% fly ash or slag. The total mass of supplementary cementitious materials (fly ash, silica fumes and slag) shall not exceed 30% of the total cementitious material mass.
- (2) The air content shall be according to the specifications stipulated in the table, regardless of whether or not superplasticizer has been added.
- (3) At the pump outlet, the spacing factor shall be less than or equal to 230 µm.
- (4) Minimum compressive strength 10 MPa at 48 hours
- (5) The ratio sand / (binder + water + air) must be between 0.6 and 0.8
- (6) The maximum volume of large aggregate of 330 litres of the total volume of the mixture
 - .1 Concrete mix for deck slab, abutment and pier: type V-S
 - .2 Concrete mix for MUP, curb, concrete base (new barrier and existing guardrail), top of existing retaining wall and top of existing wingwall : type XIII
 - .3 Concrete mix for bearing seat and concrete repairs: type XIV-R
 - .4 Concrete mix for transition slab: type V
 - .5 Concrete mix for concrete repairs: type XIV-R
 - .6 Durability and class of exposure: C-1.
 - .7 Intended application: Concrete exposed to chlorides, freezing and thawing.
 - .8 Volume stability: acceptable volume change range
 - .9 Admixture: lithium-bases and corrosion-inhibiting 10 kg/m³ of concrete.

- .10 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.

Part 3 Execution

3.1 PREPARATION

- .1 Obtain Departmental Representative's written approval before placing concrete.
 - .1 Provide 48 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00- Concrete Reinforcing.
- .3 Provide the Departmental Representative at least ten (10) working days before the concrete work, the method of placement of concrete for approval.
- .4 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitate placing with minimum of re-handling, and without damage to existing structure or Work.
- .5 Pumping of concrete permitted only after approval of equipment and mix.
- .6 Disturbing reinforcement and inserts during concrete placement is prohibited.
- .7 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .8 Protect previous Work from staining.
- .9 Clean and remove stains prior to application for concrete finishes.
- .10 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, workability, air content, temperature and test samples taken.
- .11 In locations where new concrete dowelled to existing work, drill holes in existing concrete.
 - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout or shrinkage compensating grout to anchor and hold dowels in positions as indicated.
- .12 Do not place load upon new concrete until authorized by Departmental Representative.
- .13 Provide enclosures and heating when air temperature is at or below 5°C or when temperatures are expected to fall below 5°C during upcoming work.
- .14 Pre-heat repair/concreting areas for minimum period of three days at temperature of not less than 15°C but not more than 27°C.
- .15 Substrate minimum temperature of 5°C is required 36 hours prior to placing concrete and to be maintained for duration of placing and curing.
- .16 Provide heating for duration of curing period.

3.2 INSTALLATION/APPLICATION

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.

- .2 Sleeves and inserts:
 - .1 Do not permit penetrations, sleeves, pipes or other openings to pass through joists, 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 to be reviewed by Departmental Representative.
 - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.
 - .5 Confirm locations and sizes of sleeves and openings shown on drawings.
 - .6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor bolts:
 - .1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
 - .2 Grout or epoxy anchor bolts 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: to manufacturers' recommendations.
 - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
 - .4 Set bolts and fill holes with epoxy grout and shrinkage compensating grout.
 - .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .4 Drainage holes and weep holes:
 - .1 Form weep holes and drainage holes in accordance with Section 03 10 00- Concrete Forming and Accessories. If wood forms used, remove them after concrete has set.
 - .2 Install weep hole tubes and drains as indicated.
- .5 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.
- .6 Finishing and curing:
 - .1 Finish concrete to CSA A23.1/A23.2.
 - .2 Use procedures as submitted and reviewed by Departmental Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface not damaged.
 - .3 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible.
 - .4 Provide float, swirl-trowelled and screed finish unless otherwise indicated.
 - .5 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.
- .7 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 required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
- .3 Locate and form expansion and construction joints as indicated.
- .8 Deck waterproofing:
 - .1 Deck waterproofing is to be done in accordance with Section 32 12 16 – Asphalt Paving and Bridge Deck Waterproofing.

3.3 CONSTRUCTION

- .1 Do concrete Work in accordance with Section 03 30 00- Cast-in-Place Concrete.
- .2 Place concrete at temperatures limits to CSA-A23.1/A23.2.
- .3 Avoid concrete placement:
 - .1 When air temperature is above 22 degrees C.
 - .2 During rain or excessive wind or dust.
 - .3 When conditions, as reviewed by Departmental Representative seem detrimental to concrete.
- .4 When air temperature falls below 5 degrees C, comply with cold weather requirements
- .5 Maintain temperature of concrete during discharge between 10 degrees C and 18 degrees C unless permitted otherwise by Consultant and Departmental Representative.
 - .1 Maintain temperature of mix below maximum temperature of 18 degrees C by adding ice to mix which does not alter design water-cement ratio.
- .6 Immediately prior to placing concrete, thoroughly wet down substrates with clean water.
- .7 Consolidate deck concrete with mechanical vibration even when vibratory drum type finishing machines are used.
- .8 Cast and finish deck with mechanical bridge deck finisher, approved by Departmental Representative.
- .9 Ensure that rate of placing is sufficient to complete proposed placing, finishing and curing operations within scheduled time.
- .10 Ensure that experienced finishing machine operators and concrete finishers are provided to finish deck.
- .11 Do not place concrete until rails for support and operation of finishing machines and headers for hand operated strike-off devices are in place and firmly secured.
 - .1 Rails or headers to be of type, and so installed, that no springing or deflection will occur due to weight of finishing equipment and so located that finishing equipment can operate without interruption over entire bridge roadway deck being finished.
 - .2 Extend rails for finishing machines beyond both ends of scheduled length of concrete placement sufficient distance to permit float of finishing machine to fully clear concrete to be placed.

- .3 Set rails or headers to elevations, with allowance for anticipated settlement, camber, and deflection of falsework, as required to produce bridge roadway deck true to required grade and cross section.
- .12 Immediately prior to placing, check falsework and wedges and make necessary adjustments.
 - .1 Provide suitable means, such as telltales, to readily permit measurement by Departmental Representative of settlement and deflection.
- .13 Place concrete in uniform heading approximately normal to structure centreline, or in case of screed supported on transverse headers, parallel to centreline.
 - .1 Limit rate of placing to that which can be finished before beginning of initial set.
- .14 Immediately after concrete has been placed and consolidated, strike off surface.
 - .1 Correct immediately improper adjustment and operation which results in unsatisfactory consolidation and smoothness.
 - .2 Unsatisfactory performance may be cause for rejection of equipment and removal of concrete in place.
- .15 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.
- .16 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
- .17 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.
- .18 Finishing bridge deck slab: when concrete has hardened sufficiently to prevent dislodgement of coarse aggregate particles, give surface uniform broom finish free from porous spots, irregularities, depressions, small pockets or rough spots.
- .19 Finishing bridge sidewalk slab and curb: after concrete has been placed, compact and strike off surface with strike board and float with wood or cork float.
 - .1 Use edging tool on edges at control and expansion joints.
 - .2 Finish surface to granular or matte texture.

3.4 PROTECTION

- .1 Protection and curing for concrete placed:
 - .1 Protect concrete with windproof shelter of canvas or other material to allow free circulation of inside air around fresh concrete.
 - .2 Do not let walls of shelter touch formwork.
 - .3 Provide sufficient space for removal of formwork for finishing.
 - .4 Use heating equipment approved by Departmental Representative.
 - .5 Vent products of combustion outside protective shelter: equipment to be capable of keeping inside air at constant temperature sufficiently high to maintain concrete at following curing temperatures:
 - .1 For initial 3 days: minimum temperature of 15 degrees C, maximum of 27 degrees C at concrete surfaces.
 - .2 For concrete abutments, solid piers, footings: cure at 10 degrees C for additional 4 days.
 - .3 For bridge 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 150 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 PROTECTION OF WEATHERING STEEL GIRDERS

- .1 When steel girders are fabricated of "weathering" steel, ensure uniformity of rust formation is not adversely affected by operation.
- .2 Prevent marking or staining of girders.
 - .1 Seal joints between deck formwork and steel members including interior girders, and diaphragms to prevent leakage of cement paste or concrete.
 - .2 Use caulking, duct tape, Ethafoam, or other suitable means or material, to achieve seal.

- .3 If foreign material spills onto girders despite protection provided, clean off, wash, and sandblast contaminated areas, as reviewed by Departmental Representative
- .4 If exterior face of exterior girder becomes stained or marked, sandblast lightly and "weather" entire exterior face of girder line so that uniformity of girder colour is achieved as reviewed by Departmental Representative
- .5 Achieve "Weathering" by repeatedly fogging exterior girder faces with clean water and allowing them to dry.
 - .1 Fogging should leave girders wet but not "running wet", and repeat when girders are completely dry.

3.6 SURFACE TOLERANCE

- .1 Concrete tolerance to CSA A23.1-14 Concrete materials and methods of concrete construction.

3.7 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 carried out by testing laboratory designated by the Contractor for review to CSA A23.1/A23.2.
 - .1 Ensure testing laboratory certified to CSA A283.
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.
- .4 Contractor to appoint and pay for costs of inspection and testing services for field quality control, as specified in Section 01 11 00 – General Instructions.
- .5 Departmental Representative will appoint and pay for costs of inspection and testing services for quality assurance purposes, unless indicated otherwise.
- .6 Departmental Representative will take additional test cylinders during concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .7 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .8 Inspection or testing by Departmental Representative do not to augment or replace Contractor quality control nor relieve Contractor of contractual responsibility.

3.8 CLEANING

- .1 Clean in accordance with Section 01 74 00- Cleaning.

- .2 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 74 19- Waste Management and Disposal.
 - .1 Prepare Construction Waste Management plan in accordance with Section 01 74 19- Waste Management and Disposal.
 - .2 Divert unused concrete materials from landfill to local quarry and facility after receipt of approval from Departmental Representative.
 - .3 Provide appropriate area on job site where concrete trucks and be safely washed.
 - .4 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by Departmental Representative.
 - .5 Disposal of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location to pose health or environmental hazard is prohibited.
 - .6 Prevent admixtures and additive materials from entering drinking water supplies or streams.
 - .7 Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal.
 - .8 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Divert unused plasticizers, water-reducing agents and air-entraining agents materials from landfill to official hazardous material collections site as reviewed by the Departmental Representative

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section contains all criteria for the finishing of cast in place concrete.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment under this section. Include costs in concrete items for which concrete finishing is required.

1.3 RELATED REQUIREMENT

- .1 Section 03 30 00 – CAST-IN-PLACE CONCRETE

1.4 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM C309-03, Liquid Membrane-Forming Compounds for Curing Concrete.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20-95, Surface Sealer for Floors.
- .3 CSA Group (CSA)
 - .1 CAN/CSA-A23.1-14 /A23.2-14, Concrete Materials and Methods of Concrete Construction//Methods of Test for Concrete.
- .4 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-A2016, Architectural Coatings.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide one electronic copy of WHMIS MSDS in accordance with Section 01 35 46- Archeological, Cultural and Environmental Procedures and 01 35 29.06- Health and Safety Requirements. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content in g/L.
- .3 Samples:
 - .1 Upon request, submit 2 samples for review and acceptance of materials proposed for use as follows:
 - .1 5 L of chemical hardeners.
 - .2 5 L of sealing compounds.
 - .3 5 L of curing compound.

1.6 QUALITY CONTROL

- .1 Quality Assurance: in accordance with Section 01 45 00- Quality Control.
- .2 Minimum 4 weeks prior to starting concrete finishing work, provide proposed quality control procedures for review by Departmental Representative on following items:
 - .1 Hardening.
 - .2 Sealing.
 - .3 Curing.
 - .4 Finishes.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of crates, packaging materials, padding and pallets in accordance with Section 01 74 19- Waste Management and Disposal.
- .4 Prepare Construction Waste Management plan in accordance with Section 01 74 19- Waste Management and Disposal.

1.8 SITE CONDITIONS

- .1 Temporary lighting: Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
- .2 Electrical power: Provide sufficient electrical power to operate equipment normally used during construction
- .3 Work area: Make work area water tight protected against rain and detrimental weather conditions.
- .4 Temperature: Maintain minimum 10 degrees C ambient temperature for 7 days before installation and minimum 48 hours after completion of work and maintain relative humidity maximum 40% during same period.
- .5 Moisture: Ensure concrete substrate within moisture limits prescribed by manufacturer.
- .6 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .7 Ventilation:
 - .1 Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.
 - .2 Ventilate enclosed spaces in accordance with Section 01 51 00- Temporary Utilities.
 - .3 Provide continuous ventilation during and after coating application.

Part 2 Products

2.1 CHEMICAL HARDENERS

- .1 Type 2 - Magnesium fluosilicate
- .2 Water: potable.

2.2 CURING COMPOUNDS

- .1 Waterborne membrane forming curing membrane to ASTM C309, Type 1 Clear Class B.
 - .1 Verify compatibility with subsequent finishes and concrete.

2.3 MIXES

- .1 Mixing ratios in accordance with manufacturer's written instructions.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify site conditions, substrate and slab surfaces ready to receive work and elevations as recommended by manufacturer's written instructions and indicated on shop drawings.

3.2 PREPARATION OF EXISTING SLAB

- .1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges unless otherwise indicated.
- .2 Use mechanical stripping to remove chlorinated rubber or existing surface coatings.
- .3 Use respiratory equipment, protective clothing and eye protection during stripping of chlorinated rubber or existing surface coatings.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 74 19- Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Protect finished installation in accordance with manufacturer's instructions.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section includes the fabrication, coating and installation of structural steel, which includes but is not limited to girders, diaphragms, bracing, and bearings used in the bridge construction.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment under this section. Include cost in the Contract Lumps Sum Price.
- .2 Payment included under lump sum price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L21 – Fabrication of Structural Steel for Bridge and Bearings: Item Includes but not limited to fabrication, surface preparation and coating of structural steel for bridge, diaphragms, bracing, cable support beams, bearings, bearing pads; nuts, bolts, washers and all other materials needed for the structural steel; radiographic and any other testing of the fabricated components. Measurement for payment will be considered after all tests required had been completed, finished products had been inspected and results had been reviewed and accepted by Departmental Representative.
 - .2 Ensure lump sum price includes optional shop splices and additional field splices.
 - .3 Item No. L22 – Installation of Structural Steel for Bridge and bearings: Item includes but not limited to installation of structural steel, bearings and all other items related to installation of the structural steel components. Measurement for payment will be considered for installed in place, tested, inspected and accepted product by Departmental Representative.
- .3 Include materials and work required under this section in lump sum price tender for structural steel for bridges includes:
 - .1 Ensure lump sum price includes splices and stud for girders
 - .2 Ensure lump sum price includes diaphragms and bracings
 - .3 Ensure lump sum price includes stiffeners for diaphragms and bracings
 - .4 Ensure lump sum price includes frames for bearing
 - .5 Ensure lump sum price includes temporary assembly and bracing for the steel structure
- .4 Lump Sum item includes miscellaneous items to CISC Code of Standard Practice including nuts, bolts and washers.
 - .1 Ensure lump sum price includes radiographic examination of optional shop splices and additional field splices

1.3 REFERENCE STANDARDS

- .1 American Association for State Highway and Transportation Officials (AASHTO)

- .1 AASHTO Standard Specifications for Highway Bridges- 17th Edition 2002.
- .2 ASTM International
 - .1 ASTM F3125/F3125M-18, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength Metric.
- .3 CSA Group CSA
 - .1 CSA G40.20/G40.21-04(R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA S6-14, Canadian Highway Bridge Design Code.
 - .4 CSA S16- 09, Design of Steel Structures.
 - .5 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
 - .6 CSA W48- 18, Filler Metals and Allied Materials for Metal Arc Welding.
 - .7 CSA W59-13, Welded Steel Construction, (Metal Arc Welding).
- .4 Ontario Provincial Standard Specification
 - .1 Construction Specification for Coating Structural Steel Systems, OPSS. PROV 911, November 2014
- .5 SSPC, American Welding Society (AWS) and NACE Joint Publications
 - .1 SSPC-CS 23.00 / AWS C2.23M/ NACE No.12-2003 Application of Thermal Spray Coatings (Metalizing) of Aluminum, Zinc, and their Allows and Composites for Corrosion Protection of Steel

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Fabrication Meeting:
 - .1 Convene pre-fabrication meeting upon selection of the fabricator with fabricator, Departmental Representative and the Contractor's representative to:
 - .1 Verify project requirements
 - .2 Review fabrication requirements
 - .3 Review quality control requirements
 - .4 Review site delivery details
- .2 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section on-site installation with Departmental Representative and Contractor's Representative in accordance with Section 01 11 00 General Instructions:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Review manufacturer's written installation instructions and warranty requirements.
- .3 Prior to start of Work arrange for site visit with Departmental Representative to examine existing site conditions adjacent to demolition work.

- .4 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for structural steel and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit WHMIS MSDS in accordance with Section 01 35 29.06- Health and Safety Requirements.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
 - .2 Indicate shop and erection details including shop splices, cuts, copes, connections, holes, bearing plates, threaded fasteners, rivets and welds. Indicate welds by CSA W59, welding symbols.
 - .3 Proposed welding procedures to be approved by Canadian Welding Bureau, division 1.
 - .4 Submit description of methods, temporary bracing and strengthening, sequence of erection and type of equipment proposed for use in erecting structural steel.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle in accordance with fabricators instructions.
- .2 Provide Departmental Representative with delivery schedules minimum 7 days prior to shipping.
- .3 Storage and Handling Requirements:
 - .1 Provide protective blocking for lifting, transportation and storing.
 - .1 Exercise care during fabrication, transportation and erection of girders and beams.
 - .2 Do not notch edges of members.
 - .3 Do not cause excessive stresses.
 - .2 Mark mass on members weighing more than 3 tonnes.
 - .3 Protect unpainted weathering steel, before erection, with waterproof covering.
 - .4 Ensure that no portion of steel comes into contact with ground.
 - .1 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan and Waste Reduction Workplan related to Work of this Section and in accordance with Section 01 74 19 – Waste Management and Disposal.
- .5 Packaging Waste Management: remove for reuse by manufacturer and return of crates, pallets, padding, packaging materials as specified in Construction Waste Management Plan and Waste Reduction Workplan.

1.7 QUALITY CONTROL

- .1 Fabrication:
 - .1 Steel manufacturer qualifications: in accordance with CSA G40.20/G40.21.
 - .2 Submit Departmental Representative 2 copies of certified test reports for Charpy V-notch test.
 - .3 Provide suitable facilities and co-operate with Departmental Representative and inspection organization in carrying out inspection and tests required.
 - .4 The welding Quality Control Inspection shall be carried out by a certified CSA W178.2 inspector Level 2 or 3.
 - .5 The welding Quality Control Inspection (girder, diaphragm, bracing, lifting beam and barrier) shall include:
 - .1 Visual inspection of all welds
 - .2 Radiographic inspection:
 - .1 100% of web and flange butt, transversal and longitudinal weld
 - .3 Magnetic particle inspection
 - .1 25% total length of web and flange fillet weld. The inspection should be done on all end of the weld
 - .2 100% of stiffener, web and flange fillet and full penetration weld
 - .3 100% of bearings and flange fillet weld
 - .4 100% of barrier post and base plate fillet weld. Inspection should be done on 10% of the post or a minimum of two post for the bridge. Post checked are selected by the Departmental representative
 - .4 Ultrasonic inspection
 - .1 100% of stiffener, web and flange full penetration weld
- .2 Coatings:
 - .1 Quality Control Inspection for the coatings shall be carried out by a certified NACE 2 or 3 inspector having experience in bridge inspection.
 - .2 The hold points for inspection by the Departmental Representative shall occur, as a minimum, following:
 - .1 Surface preparation metallization
 - .2 Metallization
 - .3 Epoxy Application
 - .4 Top Coat Application
 - .5 Prior to installation
- .3 All principal girder with joints must be preassembly in the factory. All sections of the girder must be pre-assembled and adjusted according to drawings and specifications with the web in horizontal position. Every preassembly should be done with at least two sections.
- .4 At a main girder joint, the holes shall be drilled using one of the pre-drilled flange and web joint plates to form a template.

Part 2 Products

2.1 MATERIALS

- .1 Fabrication:
 - .1 Structural steel: to CSA G40.20/G40.21, grade and types 350AT Category 2.
 - .1 Leave atmospheric corrosive resistant steel and connections material uncoated where assembly surfaces are needed, include bolts, nuts, washers and weld deposits of compatible weathering characteristics.
 - .2 High strength bolts, nuts and washers: to ASTM F3125/F3125M-18 approved by Departmental Representative.
 - .3 Barrier and bearing seat anchor bolts, washers and nuts: to CSA G40.20/G40.21, galvanized grade 55
 - .4 Bearings: frame to CSA G40.20/G40.21 Grade 350, elastomer bearing pads of neoprene grade 50 or 60 to CAN/CSA S6.
 - .5 Welding electrodes: to CSA W48 series.
 - .6 Shear stud connectors: to CSA W59
 - .7 Shrinkage compensating grout: premixed compound consisting of aggregate, Portland cement, water reducing and plasticizing agents.
- .2 Coatings:
 - .1 Thermal spray (metalization):
 - .1 Comply with SSPC-CS 23.00 / AWS C2.23M/ NACE No.12-2003.
 - .2 The metalized surfaces shall be painted with a polyamide epoxy sealer and an aliphatic polyurethane topcoat. Painting shall take place no more than 12 hours after the completion of the metalizing.
 - .2 Metalizing Epoxy Sealer:
 - .1 Apply with a mist coat of epoxy sealer (1.0 - 2.0 mils dft) reduced 10 to 30% with appropriate solvent. Allow solvent to flash off and the epoxy coating to penetrate the porosity of the substrate. Apply a full coat of the epoxy sealer to achieve a minimum of 3.0 mils DFT.
 - .2 Multi-purpose polyamide high build epoxy to achieve a dry film thickness between 3.0 and 10.0 mils.
 - .3 Performance Criteria:
 - .1 Adhesion ASTM D4541 Results: > 1000 psi (6.9 MPa)
 - .2 Hardness ASTM D3363 Results: 3H
 - .3 Flexibility ASTM D522, ASTM D522, 180° bend, 3/4" mandrel. Resultat: Passes
 - .4 Water Vapor Permeance ASTM D1653, Method B 1.16 US perms
 - .5 Solids by volume: min 72%
 - .6 Humidity Resistance ASTM D4585, 6000 hours. Results: No blistering, cracking, or rusting
 - .7 Abrasion Resistance ASTM D4060, CS17 wheel,1000 cycles, 1 kg load. Results: ≤ 84 mg loss

- .4 Acceptable product: Macropoxy 646
- .5 Color: Gray, Finish: Semi-Gloss to be approved by Departmental Representative
- .3 Aliphatic Polyurethane Topcoat:
 - .1 Apply one coat of aliphatic polyurethane finish coat to achieve a dry film thickness between 3.0 and 6.0 mils.
 - .2 High-build aliphatic polyurethane,
 - .1 Performances criteria's:
 - .1 Adhesion ASTM D4541 Results: > 1000 psi (6.9 MPa)
 - .2 Direct Impact resistance ASTM D2794, results 50 in. lb.
 - .3 Hardness ASTM D3363 Results: 3H
 - .4 Flexibility ASTM D522, ASTM D522, 180° bend, 1/8" mandrel: Passes
 - .5 Solids by volume: min 65%
 - .6 SSPC PAINT 36 LEVEL 3. Result: Passes
 - .3 Acceptable product: ACROLON 218HS
 - .4 Color: Gray. Finish: Semi-Gloss, to be approved by Departmental Representative.
- .4 The metalizing sealer and topcoat shall be from same manufacturer to ensure compatibility.

2.2 SOURCE QUALITY CONTROL

- .1 Steel manufacturer qualifications: in accordance with CSA G40.20/G40.21.
- .2 Submit Departmental Representative certified test reports for Charpy V-notch test.
- .3 Provide suitable facilities and co-operate with Departmental Representative and inspection organization in carrying out inspection and tests required.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for structural steel installation in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Fabrication:

- .1 For CSA G40.20/G40.21, grade 350AT steel, deposited weld metal to have Charpy V-Notch value not lower than that of steel.
 - .2 Do welding in accordance with CSA W59, except where specified otherwise.
 - .3 Do welding in shop unless otherwise permitted by Departmental Representative.
 - .4 Weld only at locations indicated.
 - .5 All principal girder with joints must be preassembly in the factory. All sections of the girder must be pre-assembled and adjusted according to drawings and specifications with the web in horizontal position. Every preassembly should be done with at least two sections.
 - .6 At a main girder joint, the holes shall be drilled using one of the pre-drilled flange and web joint plates to form a template.
- .2 Coating:
- .1 Thermal Spray
 - .1 Girder Surfaces receiving a thermal sprayed metal coating shall be abrasive blast cleaned as per OPSS 911. The surface preparation is addressed in the SSPC CS23.00 standard.
 - .2 The surface preparation and application of thermal spray shall be done according to SSPC-CS 23.00 / AWS C2.23M/ NACE No.12-2003 to provide a minimum thickness of 200 μm , applied in two separate coats.
 - .2 Hot Dip Galvanization:
 - .1 Steel components: hot dip galvanize to ASTM A123/A123M. Hot dip galvanize to CAN/CSA G164, minimum zinc coating of 600 g/m^2

3.3 INSTALLATION

- .1 Do falsework in accordance to CSA S269.1.
- .2 Do fabrication and erection of structural steel in accordance with CAN/CSA S6, Design of Highway Bridges, Ontario Highway Bridge Design Code.
- .3 Clean steel surfaces as directed by Departmental Representative when staining or defacing occurs.
- .4 Verify location of substructure units, elevations of bearing seats and location of anchor bolts before erection of structural steel; report discrepancies to Departmental Representative.
- .5 Work near river banks or embankments in accordance with written instructions from Departmental Representative.
- .6 Restrict drifting during assembly to minimum required to bring parts into position without enlarging or distorting holes, and without distorting, kinking or sharply bending metal of any unit.
- .7 Enlarge holes if necessary by reaming only after receipt of written approval from Departmental Representative.
- .8 Ensure reamed holes are 2 mm maximum larger than bolt size used.
- .9 Fabricate and install bearings as indicated.

- .10 High strength bolting: in accordance with CAN/CSA S6, CSA S16. Use 'turn-of-nut' tightening method.
- .11 Finish: members true to line, free from twists, bends, open joints, sharp corners and sharp edges.
- .12 Allowable tolerance for bolt holes:
 - .1 Matching holes for bolts to line up so that dowel 2 mm less in diameter than hole passes freely through assembled members at right angles to such members.
 - .2 Finish holes not more than 2 mm in diameter larger than diameter of rivet or bolt unless otherwise specified by Departmental Representative.
 - .3 Centre-to-centre distance between any two holes of group to vary by not more than 1 mm from dimensioned distance between such holes.
 - .4 Centre-to-centre distance between any two groups of holes to vary not more than maximum of the following:

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

- .5 Correct mispunched or misdrilled members only as directed by Departmental Representative and Consultant.
- .13 Span length tolerances:
 - .1 Girders and beams: plus or minus 6 mm
 - .2 Centre-to-centre of bearing stiffeners and bearing plates: plus or minus 3 mm.
- .14 Girder support requirements:
 - .1 Support top and bottom flanges of ends of girders and intermediate bearing locations of continuous girders parallel to each other at 90 degrees to girder web.
 - .2 Install flat and smooth except as otherwise indicated.
 - .3 Install bearing stiffeners and bracing after girder support requirements have been met.
 - .4 Correct irregularities of flanges of girders as permitted by Departmental Representative.
- .15 Shop splices:
 - .1 Use complete joint penetration groove welds finished flush.
 - .2 Details of butt joints to CSA W59.
 - .3 Use only as approved by Departmental Representative.
- .16 Camber:
 - .1 Camber tolerances for plate girders to be to CSA W59 and as indicated.
 - .2 Record measurements of camber of each girder, at points indicated.
 - .3 Fabricate field splices to conform to required camber.
 - .4 Submit diagram to Departmental Representative showing camber for each girder fabricated.

- .5 Advise Departmental Representative immediately when camber of fabricated girder is greater than specified tolerances.
- .6 Submit proposal for corrective measures.
- .7 Undertake remedial measures as approved by Departmental Representative.
- .17 Shop erection:
 - .1 Support each girder on its bearing points and measure and record deflection at same points indicated for measurement of camber.
 - .2 Measure deflections in plane of girder web.
 - .3 Submit diagram to Departmental Representative showing deflection measurements for each girder before delivery.
 - .4 Shop erection is not required for single span girders with no field splices.
- .18 Field splices: to approval of Departmental Representative.
- .19 Mark members in accordance with CSA G40.20/G40.21.
 - .1 Do not use die stamping.
 - .2 Place marking at locations hidden when viewed from exterior after erection when steel is to be left in unpainted condition.
- .20 Match marking: shop mark bearing assemblies and splices.
- .21 Place anchor bolts at elevations and locations indicated.
 - .1 Protect holes against entry of water and foreign material.
 - .2 Provide heating and protection as directed by Departmental Representative and completely fill space around anchor bolts with grout.
- .22 Protect exposed concrete surfaces of substructures from staining due to weathering of unpainted steel as follows:
 - .1 Apply two coats of resin to concrete surfaces prior to erection of steel.
 - .1 Resin: quick drying clear co-polymer resin, based on methyl methacrylate formulation.
 - .2 Apply resin in accordance with manufacturer's instructions.
 - .2 Protect top surfaces of concrete with waterproof cover and drain away from vertical faces.
 - .1 Install drain pipe to water level to discharge water.
 - .3 Use galvanized anchors for anchorage to concrete.
 - .4 Submit details of installation and methods of support to Departmental Representative for review prior to commencing protection work.
 - .5 Repair tears or holes in protective cover immediately.
- .23 Maintain protection of concrete
 - .1 Remove waterproof covers and drains and holding structures when steel erection complete.

3.4 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:

- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, protecting and cleaning of steel.
- .2 Do tightening test on 20% of the bolts of each spliced girder in presence of the Departmental Representative.
- .3 Perform strength tests on 3 bolts per box received in presence of the Departmental Representative.
- .4 Submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .5 Ensure manufacturer's representative is present before installation, during critical periods of installation and during construction of field joints.
- .6 Schedule site visits:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of the Work, after cleaning is carried out.
- .7 Location, plumbness, and straightness of erected steel components must be determined by a survey conducted by a OLS certified surveyor confirming the structural members are installed within the specified tolerances.
- .8 Submit certified survey report to the Departmental Representative for review and approval of installation plumbness.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.
- .3 Waste Management: separate waste materials for recycling, or reuse in accordance with Section 01 74 19- Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section includes but is not limited to:
 - .1 Removing, salvaging, refurbishing, refabricating, repainting and reinstalling barriers and handrails that are identified as to be removed and reinstalled or as needed to complete the work.
 - .2 Fabrication and installation of the barriers and handrails which are damaged and not salvageable.
 - .3 Fabrication, installing and painting sleeves for existing dam deck handrail repair.
 - .4 Fabrication and installation of all miscellaneous steel components and fittings that are needed to complete the work as described.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no separate measurement for payment for the work related to this section.
- .2 Payment included in Lump Sum Price as set out in section 01 22 01 – MEASUREMENT AND PAYMENT.
 - .1 Item No. L20 – Metals Fabrication and Installation
- .3 Items that are not specified in this section but needed to complete the Work will be considered incidentals to the Work and will be included in Lump Sum Price:
 - .1 Item No. L7 – General Work

1.3 RELATED REQUIREMENTS

- .1 Section 09 01 90.62 - Exterior Repainting

1.4 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM A 53/A 53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .3
- .2 CSA Group
 - .1 CSA G40.20-18 /G40.21-18, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA G164-2018, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA S16-14, Design of Steel Structures.
 - .4 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59-18, Welded Steel Construction (Metal Arc Welding).

- .3 Green Seal Environmental Standards (GS)
 - .1 GS-11-2011, Paints and Coatings.
- .4 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.
- .5 ULC Standards
 - .1 UL 2768-2011, Architectural Surface Coatings.
 - .2 UL 2760-2011, Surface Coatings - Recycled Water-borne.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for sections, bolts, plates and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 43- Archeological, Cultural and Environmental Procedures and 01 35 29.06- Health and Safety Requirements.
 - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.
- .3 Shop Drawings:
 - .1 Submit shop drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.6 QUALITY CONTROL

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

1.7 DELIVERY, STORAGE AND HANDLING

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

- .4 Packaging Waste Management: remove for reuse and return by manufacturer of packaging materials, crates, padding, pallets, as specified in Waste Reduction Workplan and Construction Waste Management Plan in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 All materials should respect the standard below unless otherwise specified in the plan.
- .2 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W for plates, 350W for all other items.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A325.
- .6 Headed studs: to ASTM A108.
- .7 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof flat oval or round headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Exposed welds continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to CAN/CSA-G164.
- .2 Chromium plating: chrome on steel with plating sequence of 0.009 mm thickness of copper 0.010 mm thickness of nickel and 0.0025 mm thickness of chromium.
- .3 Shop coat primer: in accordance with chemical component limits and restrictions requirements and VOC limits of GS-11.
- .4 Zinc primer: zinc rich, ready mix to MPI-INT, EXT 5.2C in accordance with chemical component limits and restrictions requirements and VOC limits of CCD-048, CCD-047a, GS-11.
- .5 Finishing of the existing steel components to be salvaged, refabricated and reinstalled to original location to match to those existing.

2.4 SHOP PAINTING

- .1 Shop painting to Section 09 01 90.62 – Exterior Repainting.

2.5 ANGLE LINTELS

- .1 Steel angles: galvanized, prime painted, sizes indicated for openings. Provide 150 mm minimum bearing at ends.
- .2 Weld or bolt back-to-back angles to profiles as indicated.
- .3 Finish: shop painted.
 - .1 Primer: VOC limit 250 g/L maximum to GS-11 when applied onsite.

2.6 PIPE RAILINGS

- .1 Steel pipe: to CSA G40.20/G40.21, Grade 350W.
- .2 Galvanize interior and exterior pipe railings after fabrication except for the salvaged items that are not galvanized.
- .3 For existing items that are not galvanized, match finishing to those existing.

2.7 CORNER GUARDS, REPAIRS TO RAILING

- .1 Steel angle: CSA G40.20/G40.21, Grade 350W
- .2 Paint and Galvanized finish for exterior, Zinc primer paint for interior.
 - .1 Primer: maximum VOC limit 250 g/L to GS-11 when applied onsite.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions remedied and after receipt of written approval to proceed from Departmental Representative

3.2 ERECTION – GENERAL

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.

- .6 Make field connections with bolts to CSA S16.
- .7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion of:
 - .1 Primer: maximum VOC limit 250 g/L to GS-11.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
 - .1 Primer: maximum VOC limit 250 g/L to GS-11.

3.3 PREPARATION

- .1 Clean steel surfaces as directed by Departmental Representative when staining or defacing occurs.
- .2 Verify location of substructure units, elevations of bearing seats and location of anchor bolts before erection of structural steel; report discrepancies to Departmental Representative.
- .3 Work near river banks or embankments in accordance with written instructions from Departmental Representative.
- .4 Restrict drifting during assembly to minimum required to bring parts into position without enlarging or distorting holes, and without distorting, kinking or sharply bending metal of any unit.
 - .1 Enlarge holes if necessary by reaming only after receipt of written approval from Departmental Representative.
 - .2 Ensure reamed holes are 2 mm maximum larger than bolt size used.
- .5 Place anchor bolts at elevations and locations indicated.
 - .1 Protect holes against entry of water and foreign material.
- .6 Provide heating and protection as directed by Departmental Representative and completely fill space around anchor bolts with grout or epoxy adhesive.

3.4 INSTALLATION

- .1 Do falsework in accordance to CSA S269.1.
- .2 Do fabrication and erection of structural steel in accordance with CSA S6, Design of Highway Bridges.
- .3 Do welding in accordance with CSA W59, except where specified otherwise.
 - .1 Weld only at locations indicated.
- .4 Finish: members true to line, free from twists, bends, open joints, sharp corners and sharp edges.
- .5 Allowable tolerance for bolt holes:
 - .1 Matching holes for bolts to line up so that anchor bolts 2 mm less in diameter than hole passes freely through assembled members at right angles to such members.

- .2 Finish holes not more than 2 mm in diameter larger than diameter of bolt unless otherwise specified by Departmental Representative.
- .3 Centre-to-centre distance between any two holes of group to vary by not more than 1 mm from dimensioned distance between such holes.
- .4 Centre-to-centre distance between any two groups of holes to vary not more than maximum of the following:

Centre-to-Centre distance in metres	Tolerance in plus or minus mm
less than 10	1
10 to 20	2
20 to 30	3
- .5 Correct mispunched or misdrilled members only as directed by Departmental Representative.
- .6 Span length tolerances:
 - .1 Pipes: plus or minus 6 mm
- .7 Field splices:
 - .1 Use complete joint penetration groove welds finished flush.
 - .2 Details of butt joints to CSA W59.
 - .3 Use only as approved by Departmental Representative.
- .8 Mark members in accordance with CSA G40.20/G40.21.
 - .1 Do not use die stamping.
 - .2 Place marking at locations hidden when viewed from exterior after erection when steel is to be left in unpainted condition.
- .9 Match marking: shop mark bearing assemblies and splices.
- .10 Protect exposed concrete surfaces of substructures from staining due to weathering of unpainted steel as follows:
 - .1 Apply two coats of resin to concrete surfaces prior to erection of steel.
 - .1 Resin: quick drying clear co-polymer resin, based on methyl methacrylate formulation.
 - .2 Apply resin in accordance with manufacturer's instructions.
 - .2 Protect top surfaces of concrete with waterproof cover and drain away from vertical faces.
 - .1 Install drain pipe to ground surface to discharge water.
 - .3 Use galvanized anchors for anchorage to concrete if the connecting steel is galvanized. Use stainless steel anchors for nongalvanized items.
 - .4 Submit details of installation and methods of support to Departmental Representative for review prior to commencing protection work.
 - .5 Repair tears or holes in protective cover immediately.
- .11 Maintain protection of concrete for 28 days after completion of steel erection.
 - .1 Remove waterproof covers and drains and holding structures when steel erection is complete.

3.5 REMOVAL AND REFURBISHMENT OF HANDRAILS AND BARRIERS

- .1 Remove, salvage and refurbish handrails located on Hogs Back Dam and barriers on Hogs Back Road as indicated.
- .2 If needed for site access, other barriers and handrails can be removed as approved by Departmental Representative. Any additional barriers and handrails removed must be salvaged.
- .3 Remove existing anchors/anchor bolts using procedure accepted by Departmental Representative.
- .4 Deliver barriers and handrails to shop for blast cleaning, inspection, repair and repainting.
- .5 Blast clean guardrails to SSPC-SP10 to Section 09 91 13.01 – EXTERIOR RE-PAINTING.
- .6 Prepare shop drawing proposing repairs as directed.
- .7 Repair damaged sections of barriers and handrails to accepted shop drawings.
- .8 Store barriers and handrails at secure location approved by Departmental Representative.
- .9 Reinstall barriers and handrails using new anchors.
- .10 When existing steel of barriers and handrails are not salvageable, replace the steel with new matching existing upon approval from Departmental Representative.

3.6 REPARATION OF EXISTING DAM DECK HANDRAILS

- .1 Deteriorated/damaged sections of the existing handrails of the dam deck is to be repaired prior to implementing new temporary pathways as follows;
 - .1 Surface clean the existing handrails repair areas to SSPC-SP11 and Power Tool to bare steel and SSPC-SP2, hand tool cleaning at locations where power tool cannot access.
 - .2 Install and weld steel sleeves fitting over the existing top rail extending 50mm passed the damaged area or to the sound steel at each end.
 - .3 Weld in accordance with CSA W59.
 - .4 Do the surface preparation and paint in accordance with Section 09 01 90.62 – Exterior Repainting.

3.7 MISCELLANEOUS STEEL

- .1 This includes all miscellaneous steel items required to complete the work as per drawings including but not limited to drainage, sleeves, fittings, cover plates, etc.
- .2 Fabrication, coating, preparation and installation of the miscellaneous steel items is in accordance with this specification section and as outlined on the drawings.

3.8 PIPE RAILINGS

- .1 Install pipe railings as indicated.
- .2 Set railing stands in concrete. Use grout or epoxy adhesive to fill hole. Trowel surface smooth and flush with adjacent surfaces.

3.9 CORNER GUARDS

- .1 Install corner guards in locations as indicated.

3.10 ACCESS LADDERS

- .1 Install access ladders in locations as indicated.
- .2 Erect ladders

3.11 TRENCH COVERS

- .1 Install trench covers in locations as indicated.

3.12 CHANNEL FRAMES

- .1 Install steel channel frames to openings as indicated.

3.13 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19- Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.14 PROTECTION

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

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section includes requirements for supply, treatment and installation of new traffic barriers.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment for traffic barriers.
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L26 – Bridge Traffic Barriers
 - .2 Lump Sum Item includes fabrication, coating, delivery and installation of the traffic barrier including all necessary hardware.

1.3 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A307-10, Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
 - .3 ASTM C618-08a, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 - .4 ASTM D6386 – Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
- .2 Canadian Institute of Steel Construction (CISC)
- .3 CSA Group (CSA)
 - .1 CSA A3000-08, Cementitious Materials Compendium.
 - .1 CAN/CSA-A23.5-14, Supplementary Cementing Materials.
 - .2 CSA G40.20/G40.21-13(C2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .4 Ontario Provincial Standards for Roads and Public Works
 - .1 OPSS.PROV 911 (Nov 2014), Ontario Provincial Standard Specification, Construction Specification for Coating Structural Steel Systems.
- .5 Society for Protective Coatings (SSPC) and the National Association of Corrosion Engineers International (NACE)
 - .1 SSPC – SP1 Solvent Cleaning
 - .2 SSPC – SP 16 (2010) Brush Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non Ferrous Metals,

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for traffic barriers, concrete and coatings and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.

1.5 QUALITY CONTROL

- .1 Quality Control Inspection for the treatments to the traffic barrier systems shall be carried out by a certified NACE 2 or 3 inspector having experience in bridge inspection.
- .2 The hold points for inspection by the Departmental Representative shall occur, as a minimum, following:
 - .1 Surface preparation for galvanisation
 - .2 Galvanization: The Contractor shall submit two copies of the galvanizer's coating thickness readings to the Departmental Representative prior to the installation of the component in the structure
 - .3 Surface treatment of galvanisation prior to painting
 - .4 Epoxy application
 - .5 Polyurethane application
 - .6 Prior to installation

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect traffic barriers from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Fabrication
 - .1 Steel box beam traffic barrier:

- .1 All materials should respect the standards below unless otherwise specified in the plan.
 - .2 Steel rail beams: welded or seamless structural tubing to CSA G40.20/G40.21, grade 350W.
 - .3 Steel posts:
 - .1 To: W 150 x 37 Canadian Institute of Steel Construction.
 - .2 To: CSA G40.20/G40.21, grade 350G.
 - .4 Bolts, nuts and washers: to ASTM A449 and A307 as indicated.
 - .5 Paddles, brackets, base plates, anchorage assemblies and splice plates: to CSA G40.20/G40.21, grade 350W.
- .2 Coatings
- .1 Hot Dip Galvanized Steel Components: hot dip galvanize to ASTM A123/A123M. The galvanization applicator shall be advised of the requirement to also paint the galvanized surfaces. The components shall not be quenched as part of the galvanization treatment.
 - .2 Coating System over galvanization- Apply one coat of Zinc Rich Primer, one coat of epoxy and one coat polyurethane:
 - .1 Surface Preparation for Painting: Surface preparation for painting galvanized steel to ASTM D6386.
 - .3 Primer: One coat of a 2-components, epoxy polyamide, high solids, to achieve a dry film thickness between 3.0 and 10.0 mils
 - .1 Performance Criteria:
 - .1 Adhesion ASTM D4541
 - .1 Required: Results: > 1000 psi (6.9 MPa)
 - .2 Hardness ASTM D3363
 - .1 Required Results: 3H
 - .3 Flexibility ASTM D522, ASTM D522, 180° bend, 3/4" mandrel:
 - .1 Required Result: Passes
 - .4 Water Vapor Permeance ASTM D1653, Method B 1.16 US perms
 - .5 Solids by volume: min 72%
 - .2 Humidity Resistance ASTM D4585, 6000 hours
 - .1 Required Results: No blistering, cracking, or rusting
 - .3 Abrasion Resistance ASTM D4060, CS17 wheel, 1000 cycles, 1 kg load
 - .1 Required Results: ≤ 84 mg loss
 - .4 Acceptable product: Macropoxy 646
 - .1 Color: Black, Finish Semi-Gloss, to be approved by Departmental Representative.
 - .4 Topcoat: One coat of a two-component, polyester modified acrylic polyurethane to achieve a dry film thickness between 3.0 and 6.0 mils.
 - .1 Performances criteria's:
 - .1 Adhesion ASTM D4541

- .1 Required Result: > 1000 psi (6.9 MPa)
- .2 Direct Impact resistance ASTM D2794
 - .1 Required Result: 50 in. lb.
- .3 Hardness ASTM D3363
 - .1 Required Result: 3H
- .4 Flexibility ASTM D522, ASTM D522, 180° bend, 1/8" mandrel
 - .1 Required Result: Passes
- .5 Solids by volume: min 65%
- .6 SSPC PAINT 36 LEVEL 3
 - .1 Required Results: Passes
 - .2 Acceptable product: Acrolon 218HS
 - .3 Color: Black, Finish: Semi-Gloss, to be approved by Departmental Representative.
- .5 Note: Primer and topcoat shall be from the same manufacturer to ensure compatibility.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for traffic barrier installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative and.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Coatings:
 - .1 Galvanization:
 - .1 Steel components: hot dip galvanize to ASTM A123M. Hot dip galvanize to CAN/CSA G164, minimum zinc coating of 600 g/m²
 - .2 The galvanization applicator shall be advised of the requirement to also paint the galvanized surfaces. The components shall not be quenched as part of the galvanization treatment.
 - .2 Surface preparation before painting over galvanized steel:
 - .1 Surface preparation to ASTM D6386.
 - .2 Perform solvent cleaning in accordance with SSPC-SP1, as required to remove deposits of oil, grease or similar contaminants followed by SSPC SP-16.

.3 Surface Profile required of 50-75 μm .

3.3 INSTALLATION

- .1 Set posts by instrument for alignment and grade at locations as indicated and with tops parallel to grade of pavement edge.
- .2 Install posts plumb and square and to depths as indicated. Permissible tolerance for plumb and grade to be 6 mm maximum.
- .3 Do concrete work in accordance with Section 03 30 00- Cast-in-Place Concrete. In porous or caving soil use forms for placing concrete.
- .4 Leave or make depression approximately 150 mm deep around posts until painting is completed, then fill and compact to ground elevation.
- .5 Construct anchorages to details indicated. Place and compact backfill for anchor blocks from excavated material as directed by Departmental Representative.
- .6 Erect steel box beam to lines and grades as indicated. Tighten splice plate bolt to 100 Nm torque after rail is erected and aligned in each run.
- .7 Touch up damage to galvanized finish by wire brushing loose and cracked finish.
 - .1 Apply 2 coats of organic zinc-rich coating to damaged areas in accordance with Section 09 01 90.62 – Exterior Repainting.
 - .2 Pre-treat damaged surfaces according to manufacturer's instructions for zinc-rich coating.
- .8 Treat galvanized steel, after installation, with metal conditioner.
 - .1 Apply one coat of primer and two coats of finish paint to exposed surfaces in accordance with Section 09 01 90.62 – Exterior Repainting.
 - .2 Ensure each coat is dry before applying next.
- .9 Clean shop primed steel surfaces scratched during installation and touch up with primer.
- .10 Apply paint when relative humidity is less than 85% and when ambient temperature is above 5 degrees C.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with 01 74 19- Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.

- .2 Repair damage to adjacent materials caused by traffic barrier installation.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section includes the design, fabrication, and installation of bridge expansion joints.

1.2 MEASUREMENT AND PAYMENT

- .1 No measurement of expansion joints to be made.
- .1 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L25 – Bridge Deck and Multi-Use Pathway

1.3 RELATED REQUIREMENTS.

- .1 Section 03 10 00 Concrete Forming and Accessories
- .2 Section 03 20 00 Concrete Reinforcing
- .3 Section 03 30 00 Cast-in-Place concrete

1.4 REFERENCE STANDARDS

- .1 Aluminum Association (AA)
 - .1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.
- .2 ASTM International
 - .1 ASTM A167-99(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension.
 - .3 ASTM D2240-05(2010), Standard Test Method for Rubber Property - Durometer Hardness.
 - .4 ASTM D2628-91(2011), Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for expansion joint cover assemblies and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit shop drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
 - .2 Indicate on drawings:

- .1 Lengths, fasteners, accessories, anchors, seals, butt joints and locations finishes and profiles required for each condition.

.4 Samples:

- .1 Submit: 1 sample of each color
- .2 Submit 150 mm long samples of each colour expansion joint cover assemblies.

1.6 QUALITY ASSURANCE

.1 Certificates:

- .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.2 Manufacturer's Instructions:

- .1 Submit manufacturer's installation instructions.

.3 Manufacturers Field Services:

- .1 Submit manufacturers field reports.

1.7 DELIVERY, STORAGE AND HANDLING

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

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

- .1 Store materials in dry location, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect expansion joint cover assemblies from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Joint movement: design to permit unrestricted omnidirectional, lateral and vertical movement of up to +/-50% of joint width.
- .2 Service Temperature: design exterior expansion joint cover assemblies to accommodate joint movements within service temperature range of -35 degrees C to 65 degrees C.

2.2 MATERIALS

- .1 Aluminum extrusions: alloy and temper to suit project requirements.
- .2 Stainless steel brake formed or roll formed sections: to ASTM A167, type 304
- .3 Vinyl-acrylic extrusions: high impact vinyl acrylic in integral selected by Representative from manufacturer's standard range
- .4 Flexible inserts:

- .1 Factory-bonded, reinforced, elastomer: durometer hardness 50 - 60
- .2 Extruded filler strips: flexible neoprene to ASTM D2628 to manufacturer's standard. Colour selected by Departmental Representative from manufacturer's standard range.
- .5 Primer: to MPI #80, 95, 79.
- .6 Primer: VOC limit 250 g/L maximum to GS-11 SCAQMD Rule 1113.
- .7 Paints and Coatings: VOC limit 50 g/L maximum to SCAQMD Rule 1113, GS-11.
- .8 Accessories:
 - .1 Substrate seal: continuous, flexible vinyl seals to provide watertight juncture along base of joint covers.
 - .2 Butt joint seal: to provide watertight seal between lengths of joint covers.
 - .3 Spring clips: stainless steel.
 - .4 Waterstop: continuous flexible vinyl.
 - .5 Exposed fasteners: A325
 - .6 Concealed fasteners and anchors: galvanized steel.
 - .7 Extruded filler strip, adhesives and water stops.
 - .8 Chemical fasteners and anchors: provide chemical anchoring as per manufacturers specifications to avoid joint face spalling.
 - .9 Elastomeric concrete: shop poured filler to allow multidirectional movement and maintain cohesion and adhesion.

2.3 FABRICATION

- .1 Fabricate expansion joint covers, square, true, straight and accurate to required sizes and profiles.
- .2 Fabricate in maximum practical lengths to minimize joints.
- .3 Shop assemble covers ready for installation where practicable.
- .4 Fabricate joint cover assemblies with anchors, levelling nuts, filler inserts, shop applied protection as required for a complete installation to suit installation and project requirements.
- .5 Fabricate acceptable means of anchorage, such as anchor clips, expansion bolts and shields, welded studs or toggles.
- .6 Factory fabricate terminations and transitions.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for expansion joint cover assembly's installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.

- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 MANUFACTURER'S RECOMMENDATIONS

- .1 Comply with manufacturer's written data, including product technical bulletins, product catalogue installation recommendations, product carton installation recommendations and data sheets.

3.3 INSTALLATION

- .1 Set work plumb, square, level, free from distortion.
- .2 Secure work accurately to structure in manner not restricting joint movement.
- .3 Maintain continuity of vapour retarder, air barrier.
- .4 Seal butt joints in accordance with manufacturer's written recommendations to provide light tight, watertight joints using sealant.
- .5 Protect cover plates during construction. Remove shop protection prior to final inspection.
- .6 Ensure sound and clean substrates before installation.

3.4 FIELD QUALITY CONTROL

- .1 Have manufacturer of products supplied under this Section review Work involved in handling, installation/application, protection and cleaning of its products, and submit written reports in acceptable format to verify compliance of Work with Contract.
- .2 Manufacturer's field services: provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits to review Work at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work on which Work of this Section depends is complete, but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.
- .4 Obtain reports within three days of review and submit.

3.5 CLEANING

- .1 Progress and final cleaning: clean in accordance with Section 01 74 00 - Cleaning.
- .2 Remove traces of primer, caulking, epoxy and filler materials; clean expansion joint covers.
- .3 Waste Management: separate waste materials for reuse, recycling in accordance with Section 01 74 19- Waste Management and Disposal.

- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by control and expansion joint cover assembly installation.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section includes the requirement for painting replaced, reused, and salvaged sections of the existing barriers and handrails, field touch ups and new brackets over damaged handrailing.

1.2 MEASUREMENT AND PAYMENT

- .1 No measurement of exterior repainting to be made.
- .1 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L20 – Metals Fabrication and Installation

1.3 RELATED REQUIREMENTS

- .1 Section 05 50 00 - Metal Fabrications

1.4 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 The Master Painters Institute (MPI)
 - .1 Maintenance Repainting Manual 2004, Master Painters Institute (MPI), including Identifiers, Evaluation, Systems, Preparation and Approved Product List.
- .3 National Research Council Canada (NRC)
 - .1 National Fire Code of Canada 2015 (NFC).
- .4 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).
- .5 Society for Protective Coatings (Formerly known as Steel Structures Painting Council abbreviated SSPC).

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Contractor: to have a minimum of five years proven satisfactory experience. When requested, provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.
 - .2 Qualified journey persons as defined by local jurisdiction to be engaged in painting work.
 - .3 Apprentices: may be employed provided they work under direct supervision of qualified journey persons in accordance with applicable trade regulations.

- .2 Conform to latest MPI requirements for exterior repainting work including cleaning, preparation and priming.
- .3 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, and solvents) to be in accordance with the latest edition of the MPI Approved Product List and to be from a single manufacturer for each system used.
- .4 Paint materials such as linseed oil, shellac, and turpentine, to be the highest quality product of an approved manufacturer listed in MPI Maintenance Repainting Manual and shall be compatible with other coating materials as required.
- .5 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.
- .6 Mock-ups:
 - .1 Provide a mock-up in accordance with requirements of Section 01 45 00- Quality Control to Departmental Representative.
 - .2 Prepare and repaint mock-up designated exterior surface or item to requirements specified herein, with specified paint or coating showing selected colours, number of coats, gloss/sheen, textures and workmanship to MPI Maintenance Repainting Manual standards for review and approval.
 - .3 When approved, repainted surface and/or item shall become acceptable standard of finish quality and workmanship for similar on-site exterior repainting work.

1.6 PERFORMANCE REQUIREMENTS

- .1 Environmental Performance Requirements:
 - .1 Provide paint products meeting MPI "Environmentally Friendly" E1 E3 E2 ratings based on VOC (EPA Method 24) content levels.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Provide samples in accordance with Section 01 33 00- Submittal Procedures.
 - .1 Submit full range colour sample chips for review and selection. Indicate where colour availability is restricted.
- .3 Provide product data and manufacturer's installation/application instructions for paints and coating products to be used.
- .4 Provide WHMIS Material Safety Data Sheets (MSDS) for Hazardous Materials in paints and coating materials to be used.
- .5 Quality Control Submittals:
 - .1 Manufacturer's Instructions: manufacturer's installation instructions.
- .6 Closeout Submittals:
 - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00- Closeout Submittals.
 - .2 Provide records of products used. List products in relation to finish system and include following:

- .1 Product name, type and use (i.e. materials and location).
- .2 Manufacturer's product number.
- .3 Colour code numbers.
- .4 MPI Environmentally Friendly classification system rating.
- .5 Manufacturer's Material Safety Data Sheets.

1.8 MAINTENANCE

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00- Closeout Submittals.
 - .2 Provide one can of each type and colour of one. Identify type and colour in relation to established colour schedule and finish system.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials as follows:
 - .1 Deliver and store materials in original containers, sealed, with labels intact.
 - .2 Labels to indicate:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Colour number in accordance with established colour schedule.
 - .3 Remove damaged, opened and rejected materials from site.
 - .4 Store and handle in accordance with manufacturer's recommendations.
 - .5 Store materials and equipment in secure, dry, well-ventilated area with temperature range between 7 degrees C to 30 degrees C. Store materials and supplies away from heat generating devices and sensitive products above minimum temperature as recommended by manufacturer.
 - .6 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Departmental Representative. Upon completion of operations, return areas to clean condition to approval of Departmental Representative.
 - .7 Remove paint materials from storage in quantities required for same day use.
 - .8 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
 - .9 Fire Safety Requirements:
 - .1 Provide 9 kg dry chemical Type ABC fire extinguisher adjacent to storage area.

- .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site daily.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada.
- .2 Waste Management and Disposal:
- .1 Separate waste materials for reuse or recycling in accordance with Section 01 74 19- Waste Management and Disposal.
 - .2 Paint, stain and wood preservative finishes and related materials are hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
 - .3 Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
 - .4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
 - .5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:
 - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
 - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
 - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
 - .6 Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.
 - .6 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.
 - .7 Set aside and protect surplus and uncontaminated finish materials for verifiable re-use or re-manufacturing.

1.10 AMBIENT CONDITIONS

- .1 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer.
 - .2 Do not perform repainting work when:

- .1 Ambient air and substrate temperatures are below 10 degrees C.
- .2 Substrate temperature is over 32 degrees C unless paint is specifically formulated for application at high temperatures.
- .3 Substrate and ambient air temperatures are expected to fall outside MPI, and paint manufacturer's prescribed limits.
- .4 Relative humidity is above 60 % or when dew point is less than 3 degrees C variance between air/surface temperature.
- .5 Rain or snow is forecast to occur before paint has thoroughly cured.
- .6 It is foggy, misty, raining or snowing at site.
- .3 Conduct moisture tests using properly calibrated electronic Moisture Meter, except test existing painted concrete floors for moisture using simple "cover patch test" on failed areas.
- .2 Application Requirements:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind conditions are such that airborne particles will affect quality of finished surface.
 - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted.
 - .3 Apply paint when previous coat of paint is dry or adequately cured, unless otherwise pre-approved by specific coating manufacturer.
 - .4 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.
 - .5 Do not apply paint when:
 - .1 Temperature is expected to drop below 10 degrees C before paint has thoroughly cured.
 - .2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.
 - .3 Surface to be painted is wet, damp or frosted.
 - .6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.
 - .7 Schedule repainting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.
 - .8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

Part 2 Products

2.1 MATERIALS

- .1 Paint materials listed in latest edition of MPI Approved Product List (APL) are acceptable for use on this project.
- .2 Where required by authorities having jurisdiction, paints and coatings to provide fire resistant rating.

- .3 Paint materials for repaint systems: products of single manufacturer.
- .4 Only qualified products with MPI "Environmentally Friendly" rating are acceptable for use on this project.
- .5 Use only MPI listed L rated materials.
- .6 Paints, coatings, thinners, solvents, cleaners and other fluids used in repainting to be as follows:
 - .1 Not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
 - .2 Be manufactured without compounds which contribute to ozone depletion in upper atmosphere.
 - .3 Be manufactured without compounds which contribute to smog in lower atmosphere.
 - .4 Be manufactured where matter generating 'Biochemical Oxygen Demand' (BOD) in undiluted production plant effluent discharged to natural watercourse or sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.
 - .5 Be manufactured where total suspended solids (TSS) content in undiluted production plant effluent discharged to natural watercourse or sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.
- .7 Paints and coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).
- .8 Paints and coatings must not be formulated or manufactured with formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
- .9 Coating:
 - .1 Hot Dip Galvanized Steel Components: Hot dip galvanize to ASTM A123/A123M. The galvanization applicator shall be advised of the requirement to also paint the galvanized surfaces. The components shall not be quenched as part of the galvanization treatment.
 - .2 Coating system over the galvanization where required: Apply one coat of Zinc Rich Primer, one coat of epoxy and one coat of polyurethane:
 - .3 Primer: One coat of 2-components, epoxy polyamide, high solids, to achieve a dry film thickness between 3.0 and 10.0 mils.
 - .1 Performance Criteria:
 - .1 Adhesion ASTM D4541
 - .1 Required result: > 1000 psi (6.9 MPa)
 - .2 Hardness ASTM D3363
 - .1 Required result: 3H
 - .3 Flexibility ASTM D522, 180° bend, 3/4" mandrel:
 - .1 Required result: Passes
 - .4 Water Vapor Permeance ASTM D1653, Method B 1.16 US perms

- .5 Solids by volume: min 72%
- .2 Humidity Resistance ASTM D4585, 6000 hours Results: No blistering, cracking, or rusting
- .3 Abrasion Resistance ASTM D4060, CS17 wheel, 1000 cycles, 1 kg load
 - .1 Required Results: ≤ 84 mg loss
- .4 Acceptable product: Macropoxy 646
 - .1 Color: Black, Finish Semi-Gloss, to be approved by Departmental Representative.
- .4 Topcoat: One coat of a two-component, polyester modified acrylic polyurethane to achieve a dry film thickness between 3.0 and 6.0 mils.
 - .1 Performances criteria's:
 - .1 Adhesion ASTM D4541
 - .1 Required result: > 1000 psi (6.9 MPa)
 - .2 Direct Impact resistance ASTM D2794,
 - .1 Required results: 50 in. lb.
 - .3 Hardness ASTM D3363:
 - .1 Required result: 3H
 - .4 Flexibility ASTM D522, ASTM D522, 180° bend, 1/8" mandrel:
 - .1 Required result: Passes
 - .5 Solids by volume: min 65%
 - .6 SSPC PAINT 36 LEVEL 3:
 - .1 Required result: Passes
 - .7 Acceptable product: Acrolon 218HS
 - .8 Color: Black, Finish: Semi-Gloss, to be approved by Departmental Representative.
- .5 For non-galvanized steel components:
 - .1 Surface clean to SSPC-SP10 and Power Tool to bare steel and SSPC-SP2, hand tool cleaning at locations where power tool cannot access.
 - .2 apply same Primer and Topcoat as outlined above.
- .6 Note: Primer and topcoat shall be from the same manufacturer to ensure compatibility.

2.2 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed with Departmental Representative's written permission.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Where thinner is used, addition not to exceed paint manufacturer's recommendations. Do not use kerosene or such organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Departmental Representative.

- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 PREPARATION

- .1 Perform preparation and operations for exterior painting in accordance with MPI Maintenance Repainting requirements except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.
- .3 Clean and prepare exterior surfaces to be repainted in accordance with MPI Maintenance Repainting Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and surface debris by brushing, wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent (and bleach where applicable) and clean warm water using a stiff bristle brush to remove dirt, oil and surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Use trigger operated spray nozzles for water hoses.
 - .5 Allow surfaces to drain completely and to dry thoroughly.
- .4 Where required, pressure wash exterior surfaces prior to repainting in accordance with MPI standards for type of surfaces and recommended pressures to ensure complete removal of loose paint, stains, dirt, and foreign matter. This work to be carried out by qualified workers experienced in pressure water cleaning. Use of spray equipment such as water hose cleaning will not be considered satisfactory unless specified. Allow sufficient drying time and test surfaces using an electronic moisture metre before commencing work.
- .5 Clean metal surfaces to be repainted by removing rust, dirt, oil, grease and foreign substances in accordance with MPI requirements. Remove such contaminants from surfaces, pockets and corners to be repainted by brushing with clean brushes, blowing with clean dry compressed air, or brushing/vacuum cleaning as required.
- .6 Prevent contamination of cleaned surfaces by salts, acids, alkalis, corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats. Touch-up, spot prime, and apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.
- .7 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

- .8 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects from previously painting (e.g. runs, and sags) that are visible from distance up to 1000 mm.

3.3 EXISTING CONDITIONS

- .1 Prior to commencing work, examine site conditions and existing exterior substrates to be repainted and report in writing to Departmental Representative and General Contractor damages, defects, unsatisfactory or unfavourable conditions of surfaces that will adversely affect this work.
- .2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Departmental Representative. Maximum moisture content not to exceed specified limits.
- .3 No repainting work to commence until such adverse conditions and defects have been corrected and surfaces and conditions are acceptable to Painting Subcontractor and Inspection Agency.
- .4 Degree of surface deterioration (DSD) to be assessed using MPI Identifiers and Assessment criteria indicated in the MPI Maintenance Repainting Manual. MPI DSD ratings and descriptions are as follows:

Condition	Description
DSD-0	Sound Surface (includes visual (aesthetic) defects that do not affect film's protective properties).
DSD-1	Slightly Deteriorated Surface (indicating fading; gloss reduction, slight surface contamination, minor pin holes and scratches).
DSD-2	Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, and staining).
DSD-3	Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges).
DSD-4	Substrate Damage (repair or replacement of surface required).

3.4 PROTECTION

- .1 Protect existing surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Departmental Representative.
- .2 Protect factory finished products and equipment.
- .3 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas to approval of Departmental Representative.

3.5 APPLICATION

- .1 Apply paint by method that is best suited for substrate being repainted using airless sprayer or air sprayer and/or roller or brush. Conform to manufacturer's application

instructions unless specified otherwise. In each case method of application to be as pre-approved by Departmental Representative before commencing work.

- .2 Brush and Roller Application:
 - .1 Apply paint in a uniform layer using roller or brush and/or of types suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces to be free of roller tracking and heavy stipple unless approved by Departmental Representative.
 - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray Application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently necessary.
 - .3 Apply paint in uniform layer, with overlapping at edges of spray pattern.
 - .4 Back roll spray applications and brush out runs and sags immediately.
 - .5 Use brushes to work paint into cracks, crevices and places that are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by Departmental Representative.
- .5 Apply paint coats in a continuous manner and allow surfaces to dry and cure between coats for minimum time period as recommended by manufacturer. Minimum dry film thickness of coats not less than that recommended by manufacturer. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Sand and dust between coats to remove visible defects.
- .7 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as projecting ledges.

3.6 MECHANICAL / ELECTRICAL EQUIPMENT

- .1 Unless otherwise noted, repainting to include exposed to view/previously painted exterior mechanical and electrical equipment and components (panels, conduits, piping, hangers, and ductwork).
- .2 Touch up scratches and marks and repaint such mechanical and electrical equipment and components with colour and finish to match existing finish unless otherwise noted or scheduled.
- .3 Do not paint over name plates or instruction labels.

- .4 Standard of Acceptance: when viewed using natural prevailing sunlight at peak period of the day (mid-day) on surface viewed, surfaces to indicate following:

.1 Final coat to exhibit uniformity of colour and sheen across full surface area.

3.7 FIELD QUALITY CONTROL

- .1 Advise Departmental Representative when each surface and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

3.8 CLEANING

- .1 Proceed in accordance with Section 01 74 00- Cleaning.
- .2 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
- .3 Keep work area free from unnecessary accumulation of tools, equipment, surplus materials and debris.
- .4 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.
- .5 Clean equipment and dispose of wash water used for water borne materials, solvents used for oil based materials as well as cleaning and protective materials (e.g. rags, drop cloths, and masking papers), paints, thinners, paint removers/strippers in accordance with the safety requirements of authorities having jurisdiction and as specified.
- .6 Clean painting equipment in leak-proof containers that will permit particulate matter to settle out and be collected. Sediment remaining from cleaning operations to be disposed of in manner acceptable to authorities having jurisdiction.
- .7 Recycle paint and coatings in excess of repainting requirements as specified.

3.9 RESTORATION

- .1 Clean and re-install hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashing on affected exposed surfaces. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative
- .5 Avoid scuffing newly applied paint.
- .6 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies requirements for all electrical work. It refers to several sections to describe the work to be done.

1.2 SCOPE OF WORK

- .1 Supply, install and connect lampposts for bridge lighting and multiuse pathway.
- .2 Supply, install and connect network of underground conduits and cables for streetlights power supply.
- .3 Supply and install section of underground conduits for future use.

1.3 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment for electrical work.
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L24 – Selective Demolition for Electrical
 - .2 Item No. L27 – Electrical Work

1.4 RELATED REQUIREMENTS

- .1 Section 01 51 00 – Temporary utilities
- .2 Section 01 32 16.19 – Construction Progress Schedule
- .3 Section 01 33 00 – Submittal Procedures
- .4 Section 01 35 46 – Archeological Cultural Environmental Procedures
- .5 Section 01 74 00 – Cleaning
- .6 Section 01 74 19 – Waste Management and Disposal
- .7 Section 02 41 13.13 – Paving Removal
- .8 Section 02 41 16 – Structure demolition
- .9 Section 26 05 05 – Selective Demolition for Electrical
- .10 Section 26 05 20 – Wire and Box Connectors (0-1000 V)
- .11 Section 26 05 21 – Wires and Cables (0-1000 V)
- .12 Section 26 05 22 – Connectors and Terminations
- .13 Section 26 05 31 – Junction and Pull Boxes
- .14 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings
- .15 Section 26 05 43.01 – Installation of Cables In Trenches and In Ducts
- .16 Section 26 56 19 – Roadway Lighting

- .17 Section 33 65 76 – Direct Buried Underground Cable Ducts

1.5 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA Group)
- .1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24rd Edition), Safety Standard for Electrical Installations.
 - .2 CAN/CSA-C22.3 No.1-15, Overhead Systems.
 - .3 CAN3-C235-83(R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
 - .4 CSA C22.2 No 206-17, Lighting Poles.
- .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
- .1 IEEE Std 100-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.
 - .3 CSA C22.2 No. 0 General Requirements - Canadian Electrical Code - Part 2
 - .4 National Electrical Manufacturers Association (NEMA)
 - .5 Underwriters Laboratories Canada (ULC)
 - .6 American National Standards Institute (ANSI)
 - .7 Ontario Electrical Safety Code (OESC)
 - .8 Certified Ballast Manufacturer (CBM).
 - .9 Illuminating Engineering Society of North America (IESNA).

1.6 DEFINITIONS

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE Std 100-2000.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for equipment and accessories of lighting system and its supply and distribution network, including product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
 - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
 - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

- .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .5 If changes are required, notify Departmental Representative of these changes before they are made.
- .6 Submit lamppost drawings including the installation instructions of manufacturer.
- .4 Certificates:
 - .1 Provide CSA certified material.
 - .2 Where CSA certified material is not available, submit such material to inspection authorities for approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.
- .5 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.8 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Submit as-build drawings upon completion of work.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 The Contractor shall protect, at all times, all materials, structures and equipment, installed or not, from loss, theft, damage caused by dirt, paint, construction material, corrosive substances, rust, tools, adverse weather or extreme temperatures. Depending on circumstances, make provisions for enclosure, tarpaulin or special protection devices.
 - .3 The Contractor must maintain all materials, structures and equipment in good conditions until acceptance of Work and must also replace all materials, structures and equipment, accessories damaged from insufficient protection, lost or stolen, at no additional cost.

- .4 Management of Construction and Demolition Waste: separate waste for reuse and recycling in accordance with Section 01 74 19 –Waste Management and Disposal.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification labels and nameplates for control items in English and French.
- .4 Use one nameplate for both languages.

2.2 MATERIALS AND EQUIPMENT

- .1 Equipment and material to be CSA certified. Where CSA certified equipment and material are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .2 Factory assembled control panels and component assemblies.

2.3 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper conductors.

2.4 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates as follows:
 - .1 Nameplates on street lamp poles: identification plate made of aluminum alloy 3003-H14 0.8mm thick. Chromate treated plate covered in DURACRON, serie 630 thermosetting enamel of colour black, with 15% sheen for all structures. Firing of enamel is done at 232°C.

- .2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Wording on nameplates to be approved by Departmental Representative prior to manufacture.

- .3 Inscriptions on nameplates shall be in English and French.
- .4 Nameplates for junction boxes to indicate system and/or voltage characteristics.
- .5 Pull boxes: indicate system and voltage.

2.5 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.

2.6 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Type	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify prior to installation of lighting system and supply and distribution points.
 - .1 Visually inspect site in presence of Departmental Representative and identify location of equipment.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

3.3 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.4 CONDUIT AND CABLE INSTALLATION

- .1 Install conduits prior to pouring of concrete.
 - .1 The conduits that go up to the lampposts in the structure and the road under the bridge must be installed prior to pouring of concrete and be rigid PVC.
 - .2 All exterior conduits passing under the bridge, attached to the beam must be made of PVC coated steel (Ocal) between North and South guard-strike.
 - .3 Installation of cables and conduits to existing junction box located at immediate north west end of the Tunnel T2 is to be conducted in presence of Departmental Representative and utility owner. Contractor must notify Departmental Representative at least 2 weeks in advance of this work so that the information can be coordinated with related parties.

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.
- .2 Perform coordination study to ensure circuit protective devices such as overcurrent trips, relays and fuses are installed and configured to required values and settings.
- .3 Limits of coordination study shall be from primary substation to farthest downstream device that is affected by modifications to the electrical system. Coordination study for primary substation breakers shall be provided to Contractor.
- .4 The study shall cover normal conditions, alternate operations, emergency power conditions, any other operations, which could result in maximum fault and arch flash conditions.
- .5 Coordination study shall be based on actual equipment specified and shall not use generic settings or equipment specifications.
- .6 Coordination study shall be sealed by a Professional Engineer, licensed in the Province of Ontario, Canada and qualified to undertake such studies.
- .7 Submit results.

3.6 FIELD QUALITY CONTROL

- .1 The work and quality control must be conducted by;
 - .1 Electrical Contractor with valid license issued by ESA.
 - .2 Master electrician with valid license issued by ESA.
- .2 Load Balance:

- .1 Measure phase current to panel boards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 3% of rated voltage of equipment.
 - .3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .3 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
- .1 Tests must be conducted by qualified personnel.
 - .1 Provide necessary instruments and material.
 - .2 Power distribution system including phasing, voltage, grounding and load balancing.
 - .3 Circuits originating from branch distribution panels.
 - .4 Lighting and its control.
 - .5 Verify phase order and locate individual conductors of each phase of each supply line.
 - .6 Tests:
 - .1 Insulation resistance test (MEGGER type)
 - .1 Lighting must be disconnected at the base of poles. A voltage is applied between distribution cables and ground, as well as between cables according to manufacturer's instructions. Resistance value must be at minimum 100 megohms.
 - .2 Leakage current test
 - .1 Lighting must be disconnected from system. Voltage in direct current is applied between conductors and ground, as well as between conductors according to manufacturer's instructions. Leakage current must be below 100 microamperes.
 - .3 Earthing resistance test
 - .1 Resistance must be measured between neutral of Hydro-Ottawa system and earthing rod, between neutral of Hydro-Ottawa system and ground wire system, and between earthing rod and ground wire system. The resistance value must be below 25 ohms.
 - .4 Voltage test
 - .1 The Contractor must measure the voltage drop at each lamppost and ensure this value respects the maximum voltage drop specified by the Ontario Electrical Safety Code. A table regrouping the values measured at each lamppost and the electrical input voltage shall be provided to the Departmental Representative.
 - .5 Measurement of loads

- .1 Different measures of current intensity, actual power, harmonic distortion and power factor are performed for each circuit. The results obtained must comply with the technical data provided by the manufacturer. Carry out tests in presence of Departmental Representative.
- .4 Provide to Departmental Representative a list of test results with location of each test point, circuit tested and result of each test. The written report, signed by an engineer of Ontario, must be provided to the Departmental Representative.
- .5 Remove and replace entirely any cable that does not meet test requirements.
- .6 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .7 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.7 SYSTEM STARTUP

- .1 Instruct operating personnel and Departmental Representative in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.
- .4 Notify Departmental Representative at least two weeks in advance of initial startup.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This Section includes but not limited to requirements for selective demolition and removal of electrical components including removal of conduit, junction boxes, and pullboxes (home run removal) and incidentals required to complete work described in drawings and this Section ready for new construction.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment for demolition
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L24 – Selective Demolition for Electrical
- .3 Lump sum item includes, but is not limited to: the removal, disposal, relocation, loading, transportation and unloading of electrical equipment, conduit, wiring, hardware and accessories. as well as any incidental expenses for a complete execution of the works. The price also includes excavation and backfilling, as well as surface refurbishment.

1.3 RELATED REQUIREMENTS

- .1 Section 01 32 16.19 – Construction Progress Schedule
- .2 Section 01 33 00 – Submittal Procedures
- .3 Section 01 35 46 – Archeological, Cultural, Environmental Procedures
- .4 Section 01 74 00 – Cleaning
- .5 Section 01 74 19 – Waste Management and Disposal
- .6 Section 02 41 13.13 – Paving Removal
- .7 Section 02 41 16 – Structure Demolition
- .8 Section 26 05 00 – Common Work Results for Electrical

1.4 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA)
 - .1 CSA S350 M1980, Code of Practice for Safety in Demolition of Structures.
- .2 CSA C22.2 No. 0 General Requirements - Canadian Electrical Code - Part 2
- .3 CAN3-C235 Preferred Voltage Levels for AC Systems, 0 50,000 V
- .4 National Electrical Manufacturers Association (NEMA)
- .5 Underwriters Laboratories Canada (ULC)
- .6 American National Standards Institute (ANSI)
- .7 Ontario Electrical Safety Code (OESC)

- .8 Certified Ballast Manufacturer (CBM).

1.5 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .3 Remove and Salvage: Detach items from existing construction and deliver them to Representative ready for reuse.
- .4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.
- .6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide in accordance with Section 01 33 00 - Submittal Procedures before starting work of this Section:
- .1 Construction Waste Management Plan (CWM Plan): Submit plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Landfill Records: Indicate receipt and acceptance of selective demolition waste and hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.7 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.
- .2 Scheduling: Account for Departmental Representative continued occupancy requirements during selective demolition and schedule staged occupancy and worksite activities as a defined Activity item in accordance with Section 01 32 16.19 - Construction Progress Schedule.

1.8 QUALITY CONTROL

- .1 Regulatory Requirements: Perform work of this Section in accordance with:
- .1 Provincial/Territorial Workers' Compensation Boards/Commissions.
- .2 Provincial/Territorial Occupational Health and Safety Standards and Programs.

- .2 The work and quality control must be conducted by;
 - .1 Electrical Contractor with valid license issued by ESA.
 - .2 Master electrician with valid license issued by ESA.

1.9 SITE CONDITIONS

- .1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition at time of site examination before tendering.
- .2 Hazardous Substances: Any hazardous materials encountered during demolition requires abatement as follows:
 - .1 Hazardous substances are as defined in Hazardous Products Act.
 - .2 Hazardous substances will be removed by Contractor as a part of Contract in accordance with work results described in Related Requirements listed above.
- .3 Contractor to include handling and disposal procedures of hazardous substances in their site-specific environmental protection plan and waste management and disposal plan.
- .4 Discovery of Hazardous Substances: Immediately notify Departmental Representative if materials suspected of containing hazardous substances are encountered and perform following activities:
 - .1 Refer to Section 01 35 46 - Archeological, Cultural, Environmental Procedures for directives associated with hazardous materials.
 - .2 Hazardous substances will be as defined in Hazardous Products Act.
 - .3 Stop work in area of suspected hazardous substances.
 - .4 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.
 - .5 Proceed only after written instructions have been received from Departmental Representative.

Part 2 Products

2.1 NOT USED REPAIR MATERIALS

- .1 Electrical Repair Materials: Use only new materials, CSA or ULC labelled as appropriate and matching components remaining after work associated with components identified for removal or demolition are completed.
- .2 Firestopping Repair Materials: Use firestopping materials compatible with existing firestopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

2.2 SALVAGE AND DEBRIS MATERIALS

- .1 Material Ownership: Demolished materials become Contractor 's property and will be removed from Project site; except for items indicated as being reused, salvaged, reinstalled, or otherwise indicated to remain Departmental Representative 's property.
- .2 Salvaged Materials: Carefully remove materials designated for salvage and store in a manner to prevent damage or devaluation of materials as follows:

- .1 Main electrical distribution panel is property of NCC and is to remain in place.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect work of this Section before tendering Bid; Departmental Representative will not consider claims for extras for work or materials necessary for proper execution and completion of contract that could have been determined by a site visit.

3.2 PREPARATION

- .1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
 - .1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.
 - .2 Notify Departmental Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.
 - .3 Prevent debris from blocking drainage inlets.
 - .4 Protect mechanical systems that will remain in operation.
- .2 Protection of Occupants: Sequence demolition work so that interference with use of the site by Owner, Departmental Representative and users is minimized and as follows:
 - .1 Prevent debris from endangering safe access to and egress from occupied premises.
 - .2 Notify Departmental Representative and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

3.3 EXECUTION

- .1 Demolition: Execute demolition work as follows:
 - .1 Notify Departmental Representative at least 2 weeks prior to start of demolition work and clearly indicating the date and time when the electrical power will be disconnected.
 - .2 Disconnecting the electrical circuits from the distribution panel is to be conducted in presence of Departmental Representative. Departmental Representative will coordinate with utility owner and arrange their presence as per the date and time of work provided by the contractor.
 - .3 Prior to disconnecting power, the Contractor to establish temporary power where required by related sections of the project specification and drawings.
 - .4 Disconnect electrical circuits and panel feeders; maintain electrical service and main distribution panel as is, ready for subsequent Work.

- .5 Remove existing luminaires, electrical devices and equipment including associated conduits, boxes, wiring, and similar items unless specifically noted otherwise.
- .6 Perform demolition work in a neat and workmanlike manner:
 - .1 Remove tools or equipment after completion of work and leave site clean and ready for subsequent work.
 - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.
- .7 Place weatherproof blank cover plates on exterior outlet boxes remaining after demolition and removal activities.
- .8 Remove existing conduits, boxes, cabling and wiring associated with removed luminaires, electrical devices and equipment.
- .9 Grind off conduits and make flush with surface of concrete where conduits are cast into concrete; seal open ends of conduit with silicone sealant and leave in place.
- .10 Seal open ends of conduit with silicone sealant and leave in place where they are inaccessible or cannot be removed without damaging adjacent construction.

3.4 CLOSEOUT ACTIVITIES

- .1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for re use in new construction.
- .2 Hazardous Substances Disposal: Arrange for disposal of hazardous substances in accordance with requirements of Section 01 74 19 – Waste Management and Disposal.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove waste containers, recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section includes requirements for materials and for installation of wire and box connectors.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment for wires and box connectors.
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L27 - Electrical Work.

1.3 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 74 00 – Cleaning
- .3 Section 01 74 19 – Waste Management and Disposal
- .4 Section 01 78 00 – Closeout Submittals
- .5 Section 26 05 00 – Common Work Results for Electrical
- .6 Section 26 05 21 – Wires and Cables (0-1000V)

1.4 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA Group)
 - .1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No.65, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
 - .3 CSA C22.2 No. 0 General Requirements - Canadian Electrical Code - Part 2
 - .4 CAN3-C235 Preferred Voltage Levels for AC Systems, 0 to 50 000 V
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)
- .4 Underwriters Laboratories Canada (ULC)
- .5 American National Standards Institute (ANSI)
- .6 Ontario Electrical Safety Code (OESC)

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.6 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse by manufacturer of packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MARKERS

- .1 Continuous marker tape warning of buried power cables.
- .2 Concrete type cable markers: 600 x 600 x 100 mm with words: cable, joint or conduit impressed in top surface, with arrows to indicate change in direction of cable and duct runs.
- .3 Continuous buried tape with Black text on a bright Red background along underground ducts/cables as indicated on Contract Drawings.

2.2 MATERIALS

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper or copper alloy sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper or copper alloy sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to NEMA to consist of:
 - .1 Connector body and stud clamp for copper conductors.
 - .2 Clamp for round copper conductors.
 - .3 Stud clamp bolts.

- .4 Bolts for copper conductors.
- .5 Sized for conductors and bars as indicated.
- .4 Clamps or connectors for armoured cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

2.3 CONDUCTORS AND CABLES

- .1 Low Voltage Unarmoured Wire and Cable (1000 V and Below)
 - .1 Acceptable manufacturers: Phillips Cables Limited, Alcatel Canada Wire Inc., Pirelli Cables Inc., United Wire of Canada.
 - .2 Construction: Stranded, annealed copper conductors, 600 V minimum rating for #14, #12 and #10 AWG and 1000 V rating for conductors larger than #10 AWG, RWUI90 cross-linked polyethylene (XLPE) insulation, suitable for handling at minus 40°C ambient, 90°C maximum conductor temperature, limited flame spread.
 - .3 Standard: CSA C22.2 No. 38.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant Departmental Representative.

3.2 INSTALLATION

- .1 Entry Into Existing Panel (PP-W & PP-X)
 - .1 Disconnect and reconnect cables as required so as to maintain operation of existing circuits at all times.
 - .2 Underground cable splices not acceptable.
- .2 Cable Installation in Conduits
 - .1 Install cables as indicated in conduits.
 - .2 Do not pull spliced cables inside conduits. Splices are permitted in surface mount weatherproof splice boxes for inbound barrier gates.
 - .3 Use approved lubricants of type compatible with cable jacket to reduce pulling tension.
 - .4 Before pulling cable into conduits and until cables properly terminated, seal ends of cables with moisture seal tape.

- .5 After installation of cables, seal conduit ends with sealing compound.
- .3 Remove insulation carefully from ends of conductors (cables) and:
 - .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
 - .2 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.
 - .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests on power cables in accordance with Section 16010 - Electrical
- .2 General Requirements:
 - .1 Do not apply high voltage to coaxial cables.
 - .2 Perform tests using qualified personnel. Provide necessary instruments and equipment.
 - .3 Check phase rotation and identify each phase conductor of each feeder.
 - .4 Check each feeder for continuity, short circuits and grounds.
- .3 Pre-acceptance tests.
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .4 Acceptance Tests
 - .1 Ensure that terminations and accessory equipment are disconnected.
 - .2 Ground shields, ground wires, metallic armor and conductors not under test.
- .5 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.
- .6 Remove and replace entire length of cable if cable fails to meet any of test criteria.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove waste containers, recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies the power supply wiring requirements of the lighting systems and reconstructed electrical circuits.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment for wires and cables (0-1000V).
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L27 - Electrical Work
- .3 The lump sum price includes, but is not limited to, the supply, installation and connection of the necessary conductors, hardware and accessories and all other inherent expenses.

1.3 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 74 00 – Cleaning
- .3 Section 01 74 19 – Waste Management and Disposal
- .4 Section 26 05 00 – Common Work Results for Electrical
- .5 Section 26 05 20 – Wire and Box Connectors (0-1000 V)
- .6 Section 26 05 43.01 – Installation of Cables in Trenches and in Ducts

1.4 REFERENCE STANDARDS

- .1 Canadian standards Association (CSA)
 - .1 CSA C22.1-18, Ontario Electrical Safety Code (OESC), 2018 Edition
 - .2 CAN/CSA C22.2 n°0, General Requirements – Canadian Electrical Code, Part II
 - .3 CSA C22.2 n°0.3-09, Test Methods for Electrical Wires and Cables
 - .4 CSA C22.2 n°38, Thermoset-Insulated Wires and Cables
- .2 CSA C22.2 No. 0 General Requirements - Canadian Electrical Code - Part 2
- .3 CAN3-C235 Preferred Voltage Levels for AC Systems, 0 to 50 000 V
- .4 National Electrical Manufacturers Association (NEMA)
- .5 Canadian Standards Association (CSA)
- .6 Underwriters Laboratories Canada (ULC)
- .7 American National Standards Institute (ANSI)
- .8 Ontario Electrical Safety Code (OESC)

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data
 - .1 Submit product data, as well as specifications and documentation from manufacturer. These must include product characteristics, performance criteria, physical size, finish and limitations.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Material Delivery Schedule: provide Departmental Representative with schedule within (2) weeks of mobilization.
- .2 Protect materials and equipment from damage and provide adequate and proper storage facilities during progress of the Work. Damaged materials and/or equipment shall be replaced. No power shutdowns and/or isolations shall be permitted without the express written consent of the Owner.
- .3 Packaging Waste Management: remove for reuse by manufacturer of packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 ROADWAY LIGHTING WIRES

- .1 This Section specifies wiring for underground conduit installations, internal wiring of lampposts, internal wiring of cabinets, wiring of power supply and distribution connection and other wiring required for the operation of the bike path lighting system.
- .2 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .3 Copper conductors: size as indicated, with 1000 V insulation of cross-linked thermosetting polyethylene material rated RWU90 XLPE.
- .4 Colour code compliant with CSA C22.1: green for grounding wires; white for neutral wires; red, black and blue for live wires.
- .5 At regular intervals, each wire must bear indications of rating, type of insulation and manufacturer name.
- .6 Twisted wire caps for splices.
- .7 All wiring does not appear on the drawings. The wiring in plans represented in schematic form and serves as an indication of the circuit number to be used. The contractor must provide all the required wiring.

2.2 THREADS

- .1 The number of threads and their size are indicated on the drawings. If no size is indicated, the contractor must never take a smaller size than the electrical code allows, C22.1-15 Section 4 conductors and the smallest wire can not be less than No. 12.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical and Section 26 05 43.01 – Installation of cables in trenches and in ducts.
- .2 Perform Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Entrust the execution of the tests to a competent staff and provide the necessary instruments and equipment.
- .5 Check the order of the phases and individually identify the conductors of each phase of each supply circuit.
- .6 Check the continuity of all power circuits, establish that they are free of short circuits and ground leakage, and ensure that the resistance between the ground and each circuit is not less than 50 megohms.
- .7 After laying the cables, but before splicing and connecting, measure the insulation resistance of each phase conductor of the panel arteries, with a 1000 V megohmmeter.
- .8 After the completion of each splice or connection, check the insulation resistance.
- .9 Provide the Departmental Representative with a list of test results showing the location, circuit and result of each test.
- .10 Remove and completely replace any length of cable that does not meet the requirements.

3.2 GENERAL CABLE INSTALLATION

- .1 Install wiring in conduit systems in accordance with the Ontario Electrical Safety Code.
- .2 All conductors shall be copper.
- .3 Voltage drop: maximum 3% to furthest device on a loaded circuit.
- .4 Run conductors #6 AWG and larger in continuous run between power supply and load. Splices in feeder cables are not permitted.
- .5 Install conductors in conduit without subjecting to excess strain or kink. Provide fish paper, where required, to prevent conductors from resting against metal enclosures.
- .6 Use only lubricants approved by cable manufacturer for the specified cable.
- .7 Train branch circuit neatly in panels and pull boxes. Hold together with nylon ties.
- .8 Cable Colour Coding in accordance with the Ontario Electrical Safety Code.
- .9 Unless otherwise indicated on plans and specifications, do not splice cables.
- .10 It is forbidden to pull spliced cables into the conduits.
- .11 Install cable in trenches in accordance with Section 26 05 43.01 - Installation of Cables in Trenches and in Ducts.
- .12 Terminate cables in accordance with plans and Section 26 05 20 - Wire and Box Connectors (0-1000 V).

- .13 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .14 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 WIRING CONNECTIONS

- .1 Connect branch circuit conductors and fixtures using Marrette type wirenut.
- .2 Provide 150 mm pigtail at all outlets for fixtures and wiring devices. Neutrals and branch circuits shall be connected in each outlet box using a pigtail in order to avoid breaking the neutral or line when disconnecting a circuit.
- .3 Use solderless type lugs when connecting feeder cables. Ensure lugs have sufficient contact area and a large enough screw to apply suitable pressure for feeder cables used.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove waste containers, recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section includes requirements for connectors and terminations.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment for connectors and terminations.
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L27 - Electrical Work

1.3 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 74 00 – Cleaning
- .3 Section 01 74 19 – Waste Management and Disposal
- .4 Section 01 78 00 – Closeout Submittals
- .5 Section 26 05 00 – Common Work Results for Electrical

1.4 REFERENCE STANDARDS

- .1 Association Canadienne de Normalisation (Groupe CSA)
 - .1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No.65, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
 - .3 CSA C22.2 No. 0 General Requirements - Canadian Electrical Code - Part 2
 - .4 CAN3-C235 Preferred Voltage Levels for AC Systems, 0 to 50 000 V
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)
- .4 Insulated Cable Engineers Association (ICEA)
- .5 Canadian Standards Association (CSA)
- .6 Underwriters Laboratories Canada (ULC)
- .7 American National Standards Institute (ANSI)
- .8 Ontario Electrical Safety Code (OESC)

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for connectors and terminations and include product characteristics, performance criteria, physical size, finish and limitations.

1.6 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for connectors and terminations for incorporation into manual.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and as follows.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect connectors and terminations from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 CONNECTORS AND TERMINATIONS

- .1 Copper compression connectors to CSA C22.2 No.65 as required sized for conductors.

2.2 INSTALLATION TOOLS

- .1 Include with the material one complete set of installation tools. Tools to include all fittings, cutting tools and measuring devices necessary to install all components.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for connectors and terminations installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.
- .2 Bond and ground as required to CSA C22.2No.41.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove waste containers, recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies requirements for handholes and pull boxes.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment for Handholes and pull boxes.
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L27 - Electrical Work
- .3 The lump sum price includes, but is not limited to, the supply of handholes and pull boxes, installation and connection of the boxes, mounting brackets, matching connectors, hardware and necessary accessories as described in the drawings and specifications as well as all other incidental expenses, which includes transportation.

1.3 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 74 00 – Cleaning
- .3 Section 01 74 19 – Waste Management and Disposal
- .4 Section 26 05 00 – Common Work Results for Electrical

1.4 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA Group)
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24rd Edition), Safety Standard for Electrical Installations.
- .2 CSA C22.2 No. 0 General Requirements - Canadian Electrical Code - Part 2
- .3 CAN3-C235-83(R2015) Preferred Voltage Levels for AC Systems, 0 to 50 000 V
- .4 National Electrical Manufacturers Association (NEMA)
- .5 Canadian Standards Association (CSA)
- .6 Underwriters Laboratories Canada (ULC)
- .7 American National Standards Institute (ANSI)
- .8 Ontario Electrical Safety Code (OESC)

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:

- .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario province, Canada.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Delivery, storage and handling to manufacturer's instructions.

Part 2 Products

2.1 HANDHOLE

- .1 Precast concrete handhole
- .2 Size handhole in accordance with the quantity of conduits (6 conduits)
- .3 Covers shall be traffic rated and in stainless steel
- .4 Load capacity to HS20-44.
- .5 Conforming to OPSS 2401 – Material Specification for Electrical Handholes
- .6 Final selection to be agreed with Departmental Representative

2.2 PULL BOXES

- .1 Protection rating: NEMA 4X
- .2 Material: L316 Stainless Steel
- .3 Lids with neoprene gasket and 4 x M6 captive hexagon headed screws
- .4 Minimum dimensions : 305 mm x 305 mm x 180
- .5 Easy access and multiple fixing points

Part 3 Execution

3.1 PULL BOXES AND HANDHOLE INSTALLATION

- .1 The Contractor shall install pull boxes and Handholes as indicated on plans.
- .2 Install pull boxes and Handhole in inconspicuous but accessible locations.
- .3 Pull boxes installation includes installation of support pad.
- .4 No splice is allowed inside pull boxes.
- .5 Only main pull boxes are indicated on drawings. Install additional pull boxes as required by CSA C22.1.
- .6 The Contractor must provide for connection to underground conduits and minimum 3m winding of pull rope in accordance with Section 33 65 76 – Direct Buried Underground Cable Ducts.

3.2 IDENTIFICATION

- .1 Equipment Identification: refer to Section 26 05 00 - Common Work Results for Electrical (Equipment Identification).
- .2 Identification Labels: size 2 indicating system name with the mention “ LIGHTING”.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove waste containers, recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section describes requirements for conduits to be installed.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment for conduits, conduit fastenings and conduit fittings.
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
- .1 Item No. L28 - Electrical Work
- .3 Lump sum price includes supply and installation, accessories, conduit hardware, penetrations and all labor, materials and equipment including the temporary connections. The price also includes connections to the equipment and the circuit network.

1.3 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 74 00 – Cleaning
- .3 Section 01 74 19 – Waste Management and Disposal
- .4 Section 26 05 00 – Common Work Results for Electrical.

1.4 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA Group)
- .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
- .2 CSA C22.2 No. 45, Rigid Metal Conduit.
- .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83, Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.
- .6 CAN/CSA C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).
- .2 National Electrical Manufacturers Association (NEMA)
- .3 Underwriters Laboratories Canada (ULC)
- .4 American National Standards Institute (ANSI)
- .5 Ontario Electrical Safety Code (OESC)

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .3 Quality control submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling and reuse in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

Part 2 Products

2.1 CABLES AND REELS

- .1 Provide cables on reels or coils.
 - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without splices.
- .3 Identify cables for exclusively dc applications.

2.2 CONDUITS

- .1 All conduits to be:
 - .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.
 - .2 PVC coated rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.
 - .3 Rigid PVC conduit: to CSA C22.2 No. 211.2.
 - .4 Flexible metal conduit: to CSA C22.2 No. 56, steel liquid-tight flexible metal.
 - .5 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3
- .2 Applications: for use in direct burial, encased and/or concrete reinforced conduit bank, underground, above ground, encased or exposed applications.
- .3 Fittings: connectors, couplings, straps, elbows, expansion joint fittings shall be of the same material and manufacturer as tubing.

2.3 CONDUIT FASTENINGS

- .1 Acceptable Manufacturer: CHAMPION HANGERS or equivalent product
- .2 Intermediate bridge hanger (suspension supports) used to support the electrical conduits from bridge structures.

- .3 The hangers shall be shipped fully assembled with all necessary components.
- .4 The support rods, intermediate rods, and all metallic hardware shall be 316L stainless steel
- .5 Intermediate bridge hanger shall be designed and fabricated in such a manner as to eliminate the possibility of crushing the conduits by tightening the nuts on the suspension or intermediate rods.

2.4 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified.
Coating: same as conduit.
- .2 Factory "ells" where 90°, 45° or 22.5° bends are required for 25 mm and larger conduits.
- .3 Ensure conduit bends other than factory "ells" are made with an approved bender.
Making offsets and other bends by cutting and rejoining 90 degrees bends are not permitted.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

- .1 Polypropylene (water proof) 4-6 mm diameter.

2.7 CONCRETE ENCASEMENT CONDUIT BANK

- .1 20MPa concrete complete with four (4) 20M continuous rebar and minimum stirrup requirements.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Install all conduit, conduit fittings and accessories in accordance with the latest edition of the Canadian Electrical Code in a manner that does not alter, change or violate any part of the installed system components or the CSA/UL certification of these components.

- .2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .3 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.
- .4 Surface mount conduits except in finished areas or as indicated.
- .5 Use rigid galvanized steel threaded conduit except where specified otherwise.
- .6 Use epoxy coated conduit underground in corrosive areas and where exposed to exterior elements.
- .7 Use PVC coated rigid metal conduit, underneath bridge deck as shown on drawing R.079166.029
- .8 Use rigid PVC conduit underground and buried in or under concrete slab on grade.
- .9 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .10 Mechanically bend steel conduit over 19 mm diameter.
- .11 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .12 Install fish cord in empty conduits.
- .13 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .14 Dry conduits out before installing wire.

3.3 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.4 CONDUITS IN CAST-IN-PLACE CONCRETE

- .1 Use rigid PVC conduit.
- .2 Protect conduits from damage where they stub out of concrete. Use rigid steel conduit for stub-up and adapt to in floor rigid PVC conduit.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Do not place conduits in slabs in which slab thickness is less than 4 times conduit diameter.
- .5 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- .6 Organize conduits in slab to minimize cross-overs.

3.5 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove waste containers, recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This Section covers the installation of the roadway lighting system cables, reconstructed electrical circuits and installed conduits for future use in underground conduits.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment for installation of cables in trenches and in ducts.
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L27 - Electrical Work
- .3 Lump sum price includes but not limited to excavation and backfilling of trenches, demolition and removal of pavement, excavation and removal of overburden material, compaction and quality control of the backfill material, bracing and shoring, trench shielding, surface repairs, manpower, material and equipment needed to perform the work, and any downtime inquired for utility providers if any.

1.3 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 74 00 – Cleaning
- .3 Section 01 74 19 – Waste Management and Disposal
- .4 Section 26 05 00 – Common Work Results for Electrical

1.4 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA Group)
- .2 CSA C22.2 No. 0 General Requirements - Canadian Electrical Code - Part 2
- .3 CAN3-C235 Preferred Voltage Levels for AC Systems, 0 50,000 V
- .4 National Electrical Manufacturers Association (NEMA)
- .5 Insulated Cable Engineers Association (ICEA)
- .6 Underwriters Laboratories Canada (ULC)
- .7 American National Standards Institute (ANSI)
- .8 Ontario Electrical Safety Code (OESC)

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:

- .1 Submit shop drawings, manufacturer's instructions, printed product literature and data sheets for roadway lighting and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Submit trenching, excavation and backfilling design and drawings prepared and certified by the Contractor's professional engineer registered to practice in the Province of Ontario.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect conduits from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse by manufacturer of packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products

2.1 CABLE PROTECTION

- .1 38 x 140 mm planks pressure treated with copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

2.2 MARKERS

- .1 Concrete type cable markers: 600 x 600 x 100 mm with words: cable, joint or conduit impressed in top surface, with arrows to indicate change in direction of cable and conduit runs.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for cable installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 CABLE INSTALLATION IN CONDUITS

- .1 Install cables as indicated in conduits.
- .2 Do not pull spliced cables inside ducts.
- .3 Install multiple cables in duct simultaneously.
- .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .6 Before pulling cable into conduits and until cables are properly terminated, seal ends of non-leaded cables with moisture seal tape.
- .7 After installation of cables, seal duct ends with duct sealing compound.

3.3 MARKERS

- .1 Mark cable every 150 m along cable runs and changes in direction.
- .2 Mark underground splices.
- .3 Where markers are removed to permit installation of additional cables, reinstall existing markers.
- .4 Install cedar post type markers.
- .5 Lay concrete markers flat and centred over cable with top flush with finish grade.

3.4 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using qualified licensed personnel.
 - .1 Provide necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds.
 - .1 Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance tests:
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Acceptance Tests:
 - .1 Ensure that terminations and accessory equipment are disconnected.

- .2 Ground shields, ground wires, metallic armour and conductors not under test.
- .3 High Potential (Hipot) Testing.
 - .1 Conduct hipot testing at 100% of original factory test voltage in accordance with manufacturer's recommendations.
- .4 Leakage Current Testing:
 - .1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.
 - .2 Hold maximum voltage for specified time period by manufacturer.
 - .3 Record leakage current at each step.
- .7 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test. Include results in Commissioning Manual.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19- Waste Management and Disposal.
 - .1 Remove waste containers, recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

- .1 Repair damage to adjacent materials caused by cables installation.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This Section specifies the supply and installation of steel street light for roadway lighting and the dismantling of 2 existing street lights on the bridge as per drawings.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment for roadway lighting.
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L27 - Electrical Work
- .3 The lumps sum price includes but not limited to the supply and installation of materials, labor and equipment, pole, fixtures, wiring, consoles, tenon, access door, door -fuses, fuses, connectors, identification plate, bolts, hardware, accessories, decorative accessories, etc., as well as all the inherent expenses necessary for a complete and functional installation, as described in the drawings and quote.

1.3 RELATED REQUIREMENTS

- .1 Section 01 74 00 – Cleaning
- .2 Section 01 74 19 – Waste Management and Disposal
- .3 Section 26 05 00 – Common Work Results for Electrical
- .4 Section 26 05 21 – Wires and Cables (0-1000V)

1.4 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA Group)
 - .1 CSA C22.2 No 206-17, Lighting Poles.
- .2 CSA C22.2 No. 0 General Requirements - Canadian Electrical Code - Part 2
- .3 CAN3-C235 Preferred Voltage Levels for AC Systems, 0 50,000 V
- .4 National Electrical Manufacturers Association (NEMA)
- .5 Underwriters Laboratories Canada (ULC)
- .6 American National Standards Institute (ANSI)
- .7 Ontario Electrical Safety Code (OESC)
- .8 Certified Ballast Manufacturer (CBM).
- .9 Illuminating Engineering Society of North America (IESNA).

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:

- .1 Submit shop drawings, manufacturer's instructions, printed product literature and data sheets for roadway lighting and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Departmental Representative.
- .4 Shop drawings to be certified by a professional engineer registered to practice in the province of Ontario.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect roadway lighting from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 STEEL LIGHT POLES

- .1 The term “Steel light pole” referred in these contractual documents includes the light pole, nameplate, anchoring components, fasteners, access trap, hook, cap and other required accessories.
- .2 Steel light poles: to CSA C22.2 No.206, designed for underground wiring with following characteristics:
 - .1 Mounting on concrete anchor base.
 - .2 Style: monotube, Round shape. Made from a 4"(10cm) Ø round, high tensile strength steel tubing, welded to a 6 5/8"(17cm) Ø base. The wall thickness of the pole is 1/4" (6.3mm) (PM49). The pole is welded to both the top and the bottom of an anchor plate.
 - .3 Height: 14 ft (4.26 m) with hand opening 20 in (51cm) above ground.
 - .4 Access Door: Covering a 4"x9" (10cmx22cm) opening with a sealing joint. Giving access to the copper ground lug.
 - .5 Steel watertight access door and grounding terminal.
 - .6 Decorative base cover: Round shape. A two-piece base cover and joint cover, made of cast aluminum, mechanically secured together.
 - .7 Anchor bolts: Supplied by Cyclone: 3/4" x 20"(17+3) Fully galvanized anchor bolts c/w nuts & washers for levelling.
 - .8 Bolt circle: 11 1/2" (29cm) Ø. Available from 9 1/2" to 12"(24cm to 30cm) Ø.

- .9 Hardware: All exposed hardware is stainless steel. EPDM and/or silicone gasketing is applied.
- .10 Finish: Textured Finish, Polyester powder coating meeting AAMA 2604, ASTM G7, B117, D1654 and D2247 requirements.
- .11 Colour: black RAL9005 (BK).
- .12 Banner arm: Removable banner arm, made of 1"(2.5cm) Ø aluminum rods with decorative finials, welded on a cast aluminum clamp.
- .13 Eyelet support: Adjustable clamp with eye bolts.

2.2

LUMINAIRES

- .1 Square black luminaire, aluminum, weatherproof IP66 housing and equipped with:
 - .1 Lamp type: LED: 40 Watts, 3000K (Warm white). 20LED Super high flux output and high luminance, design for high current operation. LED board is mechanically mounted on heatsink for easy replacement. Minimum color rendering index (CRI) 70.
 - .2 Optical assembly:
 - .1 For LED lamps:
 - .1 Optic: Made of acrylic and designed to light only where it's needed, while obtaining excellent uniformity with maximum pole spacing.
 - .2 Heatsink: Die cast aluminum alloy optimized to keep LED temperature down and increase their longevity and efficacy.
 - .3 Driver module: Auto-adjustable 120-277VAC Class I driver. Primary voltage at 120 volts. 50/60 Hz. THD max 20%. High power factor of 90%. Operating temperature: -40°F (-40°C) to 130°F (55°C). ROHS compliant. Assembled on a tool-free removable tray with quick connectors. Complete with a 3-Pole 10kA surge protector for Line-Ground, Line-Neutral and Neutral-Ground according to IEEE/ANSI C62.41 2002 C. Maintenance and luminaire codification labels are located inside the fitter. Complete with a 0-10 volt dimming.
 - .3 Light Distribution:
 - .1 IES distribution Type II (2) according to the IES.
 - .4 Luminaire components:
 - .1 Head module: Square shape. A cast aluminum hood with a decorative aluminum cupola, top a tapered cast aluminum guard. Four (4) clear acrylic (FLAC) lenses are installed.
 - .2 Opening system: Two built-in hinges on head module allowing easy access inside the luminaire, to the driver tray. Made with cast aluminum parts. This entire luminaire is IP66 certified, thanks to the one piece "V" shape injection molded weatherproof gasket, made of heat resistant silicone (2870C (5500F)).
 - .3 Fitter module: Round shape, self-leveling cast aluminum fitter, secured to the pole with set screws. Slip-fits on a 4"(10cm) outside diameter x 3"(7cm) long tenon.

- .5 General/Options:
 - .1 Wiring/hardware: Type TEW 14-7. 12" (30cm) minimum exceeding from luminaire. All electrical connections between modules are made with quick-disconnect connectors for easy maintenance. All exposed hardware is stainless steel. Silicone gaskets are used for a weather seal.
 - .2 Finish: textured, black RAL9005 (BK).
 - .3 Complete with a decorative frosted chimney inside the seal optical chamber to replicate the oil burning lamp style.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for roadway lighting installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 DISMANTLING

- .1 Remove all wires and splices in base cover and pole before remove the street light
- .2 Remove the luminaires type cobra cooper
- .3 Remove the steel pole

3.3 INSTALLATION

- .1 Locate and install luminaires as indicated.
- .2 Install poles true and plumb, on concrete bases in accordance with manufacturer's instructions.
- .3 Install luminaires on pole and install lamps in accordance with manufacturer's instructions.
- .4 Check luminaire orientation, level and tilt.
- .5 Connect luminaire to lighting circuit in accordance with plans and section 26 05 21 – Wires and Cables (0-1000V).
- .6 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove waste containers, recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This Section includes but is not limited to:
 - .1 Clearing and grubbing of surface;
 - .2 Tree felling and grubbing;

1.2 MEASUREMENT AND PAYMENT

- .1 There shall be no separate measurement for payment for the work under this Section. Include cost in the Contract Lump Sum Price.
- .2 Payment to be included in the Lump Sum Price, in accordance with Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item L15 – Clearing and Grubbing.

1.3 RELATED REQUIREMENTS

- .1 Section 01 35 46 - ARCHEOLOGICAL, CULTURAL, ENVIRONMENTAL PROCEDURES.

1.4 REFERENCES

- .1 Federal Species at Risk Act (SARA), most current.
- .2 Ontario Endangered Species Act (ESA), most current.
- .3 Ontario Provincial Standard Specifications (OPSS).
- .4 Environmental Standards and Guidelines (ESG) Document, Ontario Waterways, most current.

1.5 DEFINITIONS

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

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES.

1.7 QUALITY ASSURANCE

- .1 Follow construction occupational health and safety requirements in accordance with Section 01 35 29.06 - HEALTH AND SAFETY REQUIREMENTS.

1.8 STORAGE AND PROTECTION

- .1 Prevent damage to fencing, trees, landscaping, natural features, benchmarks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, root systems of trees which are to remain.
 - .1 Repair damaged items to approval of Departmental Representative.
 - .2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

1.9 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 WASTE MANAGEMENT AND DISPOSAL.
- .2 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.
 - .1 Trim limbs and tops, and saw into saleable lengths.
 - .2 Stockpile as authorized by Departmental Representative.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 PREPARATION

- .1 Inspect site and verify with Departmental Representative, items designated to be removed.
- .2 Locate and protect utility lines: preserve in operating condition active utilities crossing site.
 - .1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.
 - .2 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.
- .3 Notify utility authorities before starting clearing and grubbing.
- .4 Keep roads and walks free of dirt and debris.

3.2 CLEARING

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

- .2 Clear areas as indicated on drawings by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.
- .3 Cut off branches and cut down trees overhanging area cleared as directed by Departmental Representative.
- .4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.
- .5 Only the areas of excavation required for concrete works be cleared of trees, bushes and vegetation, grubbed and stripped to perform required work. Departmental Representative is to identify the areas to be cleared of trees.

3.3 GRUBBING

- .1 Grubbing areas will be limited to the tree removal locations.
- .2 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.
- .3 Grub out stumps and roots to not less than 200 mm below ground surface.
- .4 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension.
- .5 Fill depressions made by grubbing with suitable material and to make new surface conform to existing adjacent surface of ground.
- .6 Existing topsoil on excavation areas should be removed and stock piles at site for reuse.
- .7 No grubbing when frozen ground depth exceeds stripping depth.

3.4 REMOVAL AND DISPOSAL

- .1 Remove cleared and grubbed materials off site and dispose at approved appropriate site.

3.5 FINISHED SURFACE

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

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - CLEANING.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 Earthwork, stockpiling and grading.

1.2 MEASUREMENT AND PAYMENT

- .1 There shall be no separate measurement for payment for soil stripping and stockpiling or for any double handling.
- .2 Include cost in Contract Lump Sum Price. Payment of this Section shall be as set out in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L7 – General Work

1.3 RELATED REQUIREMENTS

- .1 Section 01 35 46 - ARCHEOLOGICAL, CULTURAL, ENVIRONMENTAL PROCEDURES.
- .2 Section 31 11 00 - CLEARING AND GRUBBING.

1.4 REFERENCES

- .1 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.
- .2 Ontario Provincial Standard Specifications (OPSS).
- .3 Environmental Standards and Guidelines (ESG) Document, Ontario Waterways, most current.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 STRIPPING OF TOPSOIL

- .1 Ensure that procedures are conducted in accordance with applicable Provincial, Territorial and Municipal requirements.
- .2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.
- .3 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by composting.

- .4 Remove brush from targeted areas by non-chemical means and dispose of through mulching.
- .5 Strip topsoil by scraper to depths as indicated on drawings or as directed by Departmental Representative.
 - .1 Avoid mixing topsoil with subsoil.
- .6 Dispose of contaminated topsoil at approved off-site location. Salvage as much top soil as possible for reuse.
- .7 Before disposal, stockpile may be allowed in locations as indicated or as directed by Departmental Representative.
- .8 No stripping when frozen ground depth exceeds stripping depth.

3.2 STOCKPILING

- .1 Stockpile onsite or off site material only at designated areas and locations approved by Departmental Representative.
- .2 Soil or aggregate excavated from site which are designated to be reused for backfilling must be protected from weather events by covering the stockpiles with impervious membrane.

3.3 PREPARATION OF GRADE

- .1 Verify that grades are correct and notify Departmental Representative if discrepancies occur. Do not begin work until instructed by Departmental Representative.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - CLEANING.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 02 41 16 Structure Demolition
- .2 Section 31 32 19.01- Geotextile Soil Stabilization
- .3 Section 32 11 16.01 Granular Sub-base
- .4 Section 32 01 90.33- Tree and Shrub Preservation

1.2 MEASUREMENT AND PAYMENT PROCEDURES

- .1 Measurement Procedures are to be in accordance with Section 01 22 01 – MEASUREMENT AND PAYMENT. Payment included in Unit Price:
 - .1 Item No. U1 – Common Excavation
 - .2 Item No. U2 – Common Backfilling
 - .3 Item No. U3 – Backfilling with Granular A
 - .4 Item No. U4 – Backfilling with Granular B Type I and Type II
- .2 Excavated materials will be measured in cubic metres in their original location determined by a qualified surveyor as per Section 01 71 00 – EXAMINATION AND PREPARATION.
 - .1 Common and Unclassified excavation quantities measured will be actual volume removed within following limits:
 - .1 Width for trench excavation as indicated.
 - .2 Width for excavation for structures as indicated.
 - .3 Depth from ground elevation immediately prior to excavation, to elevation as directed by Departmental Representative.
 - .3 Backfilling to authorized excavation limits will be measured at Unit Rate in cubic metres compacted in place for each type of material specified.

1.3 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C117-17, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422-63-07, Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .5 ASTM D1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).

- .6 ASTM D4318-17e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-13, Cementitious Materials for Use in Concrete.
 - .2 CSA-A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .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.

1.4 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock: solid material in excess of 1.00 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
 - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:
 - .1 Weak, chemically unstable, and compressible materials.
 - .2 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM C136 and ASTM D422: Sieve sizes to CAN/CGSB-8.2.

.2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 – 100
0.02 mm	10 – 80
0.005 mm	0 - 45

.3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES.

.2 Quality Control: in accordance with Section 01 45 00 - Quality Control:

.1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.

.2 Submit for review by Departmental Representative proposed heave prevention as described in PART 3 of this Section.

.3 Submit to Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.

.4 Submit to Departmental Representative written notice when bottom of excavation is reached.

.5 Submit to Departmental Representative testing and inspection results report as described in PART 3 of this Section.

.3 Preconstruction Submittals:

.1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.

.2 Submit records of underground utility locates, indicating: clearance record from utility authority, location plan of relocated and abandoned services, as required and location plan of existing utilities as found in field.

.4 Samples:

.1 Submit samples in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES.

.2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.

.3 Submit 70 kg samples of type of fill specified including representative samples of excavated material to Departmental Representative in tightly closed containers to prevent contamination and exposure to elements.

1.6 QUALITY CONTROL

.1 Qualification Statement: submit proof of insurance coverage for professional liability.

.2 Where Departmental Representative is employee of Contractor, submit proof that Work by Departmental Representative is included in Contractor's insurance coverage.

.3 Submit design and supporting data at least 2 weeks prior to beginning Work.

- .4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Ontario, Canada.
- .5 Keep design and supporting data on site.
- .6 Engage services of qualified professional Engineer who is registered or licensed in Ontario, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .7 Do not use soil material until written report of soil test results are reviewed by Departmental Representative.
- .8 Health and Safety Requirements:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - HEALTH AND SAFETY REQUIREMENTS.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 19 - WASTE MANAGEMENT AND DISPOSAL.
- .2 Divert excess materials from landfill to local facility for reuse as directed by Departmental Representative.

1.8 EXISTING CONDITIONS

- .1 Examine existing Bridge and Dam As-Built drawings prepared by C.C. Parker and Associates and dated from 1977 and As-Built drawings of Bundle 1 construction.
- .2 Buried services:
 - .1 Before commencing work, establish location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
 - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .5 Prior to beginning excavation Work, notify Departmental Representative or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Departmental Representative or authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
 - .6 Confirm locations of buried utilities by careful soil hydrovac methods or test excavations.
 - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing. Costs for such Work to be paid by the contractor.
 - .9 Record location of maintained, re-routed and abandoned underground lines.
 - .10 Confirm locations of recent excavations adjacent to area of excavation.

- .3 Existing structures, buildings and surface features:
 - .1 Conduct, with Departmental Representative, condition survey of existing structures, buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing structures, buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative
 - .3 Where required for excavation, cut roots or branches as directed by Departmental Representative in accordance with Section 32 01 90.33 - TREE AND SHRUB PRESERVATION.

Part 2 Products

2.1 MATERIALS

- .1 Granular A, Granular B Type I and Granular B Type II fill: properties to Section the following requirements:
 - .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.2.
 - .3 Table:

Sieve Designation	Granular A	Granular B Type I	Granular B Type II
	% Passing	% Passing	% Passing
150 mm	-	100	-
106 mm	-	-	100
37.5 mm	-	-	-
26.5 mm	100	50-100	50-100
19 mm	85-100	-	-
13.2 mm	65-90	-	-
9.5 mm	50-73	-	-
4.75 mm	35-55	20-100	20-55
1.18 mm	15-40	10-100	10-40
0.300 mm	5-22	2-65	5-22
0.150 mm	-	-	-
0.075 mm	2-8	0-8	0-10
 - .2 Type 4 fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.
 - .3 Unshrinkable fill: proportioned and mixed to provide:
 - .1 Maximum compressive strength of 0.4 MPa at 28 days.
 - .2 Maximum cement content of 25 kg/m³ with 40 by volume fly ash replacement: to CSA-A3001, Type GU.
 - .3 Minimum strength of 0.07 MPa at 24 h.
 - .4 Concrete aggregates: to CSA-A23.1/A23.2.
 - .5 Cement: Type GU.

.6 Slump: 160 to 200 mm.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

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

3.2 SITE PREPARATION

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

3.3 PREPARATION/PROTECTION

- .1 Protect existing features in accordance with Section 01 56 00 - TEMPORARY BARRIERS AND ENCLOSURES and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .4 Borrowed native soil or aggregates excavated from site which are designated to be reused for backfilling must be protected from weather events by covering the stockpiles with impervious membrane.
- .5 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .6 Protect buried services that are required to remain undisturbed.

3.4 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Strip topsoil to depths as directed by Departmental Representative.
 - .1 Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Departmental Representative.
 - .1 Stockpile height not to exceed 2 m and should be protected from erosion.
- .4 Dispose of unused topsoil off site as directed by Departmental Representative.

3.5 STOCKPILING

- .1 Stockpile fill materials in areas designated by Departmental Representative.
 - .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.6 COFFERDAMS, SHORING AND BRACING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Health and Safety Act for the Province of Ontario and the Section 01 35 29.06 - HEALTH AND SAFETY REQUIREMENTS.
 - .1 Where conditions are unstable, Departmental Representative to verify and advice methods.
- .2 Obtain permit from authority having jurisdiction for temporary diversion of water course.
- .3 Construct temporary Works to depths, heights and locations as required.
- .4 During backfill operation:
 - .1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.
 - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
 - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.
- .5 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .6 Upon completion of substructure construction:
 - .1 Remove Shoring and bracing.
 - .2 Remove excess materials from site as directed by Departmental Representative.

3.7 HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for review Departmental Representative details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
 - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 01 35 46 - ARCHEOLOGICAL, CULTURAL, ENVIRONMENTAL PROCEDURES and in manner not detrimental to public and private property, or portion of Work completed or under construction.
 - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.8 EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as required.
- .3 Remove demolished foundations and rubble, paving, concrete and other obstructions encountered during excavation.
- .4 Excavation must not interfere with bearing capacity of adjacent foundations.
- .5 Do not disturb soil within branch spread of trees or shrubs that are to remain.
 - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .6 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .8 Restrict vehicle operations directly adjacent to open trenches.
- .9 Dispose of surplus and unsuitable excavated material off site.
- .10 Do not obstruct flow of surface drainage or natural watercourses.
- .11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .12 Notify Departmental Representative when bottom of excavation is reached.
- .13 Obtain Departmental Representative approval of completed excavation.
- .14 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .15 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings.
 - .2 Fill under other areas with Granular B Type II fill compacted to not less than 98 % of corrected Standard Proctor maximum dry density.
- .16 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
 - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

3.9 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D1557.
 - .1 All areas except under the road beds, use Granular B Type II fill to subgrade level and compact to 98 %.
 - .2 Around concrete foundations outside of the road bed: As indicated on drawings, backfill using Granular A and compact to %98 SPD
 - .3 For backfilling requirements under the road bed, see Section 32 11 16.01 – GRANULAR MATERIAL FOR ROAD.

3.10 BACKFILLING

- .1 Vibratory compaction equipment.
- .2 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
 - .2 Departmental Representative has inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of underground utilities.
 - .4 Removal of concrete formwork.
 - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or over cast-in-place concrete within 3 days after placing of concrete.
 - .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 0.3 m.
 - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 Permit concrete to cure for minimum 14 days or reach to %70 of its compressive strength to withstand earth and compaction pressure and approval obtained from Departmental Representative.
 - .2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.
- .7 Install drainage system in backfill as directed by Departmental Representative.

3.11 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 19 - WASTE MANAGEMENT AND DISPOSAL, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
- .7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies requirements for supply and installation of geotextile material. Polymeric geotextiles may be used in revetments, filtration, drainage structures, and roadbeds for separation purposes to prevent mixing of granular materials of different grading; as hydraulic filters permitting passage of water while retaining soil strength of a granular structure.

1.2 MEASUREMENT AND PAYMENT

- .1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.
 - .1 Item No. U5 - Geotextile

1.3 RELATED REQUIREMENTS

- .1 Section 31 23 33.01 - Excavating, Trenching and Backfilling
- .2 Section 32 11 16.01 – Granular Material for Road

1.4 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM D4491-17, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - .2 ASTM D4595-17, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - .3 ASTM D4716-14, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
 - .4 ASTM D4751-16, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 - .5 ASTM D 6241-14, Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2 No. 11.2-2004, Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
 - .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
 - .1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
 - .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
 - .3 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.

- .4 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.
- .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 1860-2018, Material Specification for Geotextiles.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Provide following samples 4 weeks prior to beginning Work.
 - .1 Minimum length of 2 m of roll width of geotextile.
 - .2 Methods of joining.
- .4 Test and Evaluation Reports:
 - .1 Submit copies of mill test data and certificate at least 4 weeks prior to start of Work.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect geotextiles from direct sunlight and UV rays.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIAL

- .1 Geotextile: synthetic fibre fabric, supplied in rolls.
 - .1 Width: 4.69 m minimum
 - .2 Composed of: minimum 85% by mass of polypropylene and resistant to ultraviolet degradation and to biological and chemical environments normally found in soils.
- .2 The plastic yarn of the geotextile and the threads used in sewing operations shall consist of a long chain synthetic polymer composed of at least 85% by mass of propylene, ethylene, ester, amide or vinylidene-chloride, and shall contain stabilizers or inhibitors added to the base plastic to make the filaments resistant to deterioration by ultraviolet and heat exposure.

- .3 Thread for the seams shall be equal to or better than the geotextile in resistance to chemical and biological degradation and both factory and field sewn or sealed seams shall have a grab tensile strength equal to 90% of that of the geotextile.
- .4 Synthetic fibers must be rot-resistant and resist the action of oil and salt water as well as deterioration due to insect and rodent attack.
- .5 Seams shall be factory made.
- .6 Polyester membranes shall not be used in the case where the membranes are in direct contact with concrete structures or in contact with crushed concrete. In these cases, use only polyethylene or polypropylene membranes
- .7 Geotextile: Non-woven synthetic fiber, needle punched.
- .8 Properties of geotextile membrane for drains (Type 1):

Properties	Standard	Value
Physical		
Traction Resistance	ASTM D 4595 or	Min 600 N
Elongation at tear	CGSB 148.1 No 7.3	Min 50 %
Hydraulic		
Filtration opening size		Under 140 µm
Coefficient of permeability	CAN/CGSB-148.1	min. 0.4 cm/s
Permittivity	CGSB 148.1 No.4	min. 1.4 s ⁻¹

- .9 Properties of geotextile membrane for separation (Type 2):

Properties	Standards	Value
Physical		
Thickness	CAN/CGSB-148.1, n°3	1.3 mm
Traction Resistance	ASTM D 4595	Minimum 800 N
Elongation at tear		minimum 50 %
Hydraulics		
Filtration opening size (FOS)		Less than 150 µm
Permittivity	ONGC 148.1 No.4	min. 0.9 s ⁻¹

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for geotextile material installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.

- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position.
- .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 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .6 After installation, cover with overlying layer within 4 hours of placement.
- .7 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- .8 Place and compact soil layers in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.

3.4 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.
- .2 Do not overload soil or aggregate covering on geotextile.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies the materials for pavement cleaning as well as the methods for the removal of pavement markings and surface cleaning.

1.2 MEASUREMENT AND PAYMENT

- .1 No measurement of Pavement Cleaning and Marking removal to be made.
- .2 Payment related to the removal of temporary pavement marking included in Lump Sum Item, as set out in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L28 – Road work.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for each type of abrasives and solvent used on project.
 - .2 Submit 1 copy of WHMIS MSDS in accordance with Section 01 35 29.06- Health and Safety Requirements and 01 35 46- Archeological, Cultural and Environmental Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 MATERIALS

- .1 Abrasives and solvents used for removal of paint, oil, grease, rubber deposits: proprietary products specially designed for pavement cleaning, subject to approval by Departmental Representative.

Part 3 Execution

3.1 REMOVING PAVEMENT MARKINGS

- .1 Remove rubber tire deposits and paint markings, in areas as directed by Departmental Representative, by water blasting, rotary grinding, heater planning or other method approved in writing by Departmental Representative.
- .2 Exercise care to avoid dislodging of coarse aggregate particles, excessive removal of fines, damage to bituminous binder or damage to joint and crack sealers.

- .3 Do not heat pavement surfaces above 120 degrees C, when using heater planning equipment.

3.2 PAVEMENT SURFACE CLEANING

- .1 Remove sealing compound which has protruded excessively, where directed by Departmental Representative.
 - .1 Dispose of removed material as directed by Departmental Representative.
- .2 Remove dust, contaminants, loose and foreign materials, oil and grease, in areas as directed by and by method approved in writing by Departmental Representative.
- .3 Use vacuum sweepers or rotary power brooms supplemented by hand brooming.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 Protection and maintenance of existing plant materials to be retained.

1.2 MEASUREMENT AND PAYMENT

- .1 Work covered by this section will not be considered separately for payment, but will be considered incidental to the work of the specifications.

1.3 RELATED SECTIONS

- .1 Section 32 94 00 – GENERAL LANDSCAPING

1.4 REFERENCE

- .1 Canadian Standards Association (CSA International).
 - .1 CSA G30.5, Welded Steel Wire Fabric for Concrete Reinforcement.
- .2 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .2 Fertilizers Act (R.S. 1985, c. F 10).
 - .3 Fertilizers Regulations (C.R.C., c. 666).
 - .4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .3 Health Canada Pest Management Regulatory Agency (PMRA).
 - .1 National Standard for Pesticide Education, Training and Certification in Canada (1995).

1.5 DEFINITION

- .1 Mycorrhiza : association between fungus and roots of plants. This symbiosis enhances plant establishment in newly landscaped and imported soils.

1.6 SCHEDULING

- .1 Establish schedule of work as outlined herein.
- .2 Notify Departmental Representative at least seven days prior to commencement of work.
- .3 Review work with Departmental Representative on site prior to commencement of work.
- .4 Obtain approval of Departmental Representative as outlined herein before commencing work.

1.7 DOCUMENTS /SAMPLES TO BE SUBMITTED

- .1 Submit in accordance with Section 01 33 00- SUBMITTAL PROCEDURES.
- .2 Submit a tree preservation plan identifying the isolated trees and groups of trees to be preserved and provide fencing/hoarding to protect the trees. The Contractor must ensure that in protected areas there is no:

- .1 Construction.
- .2 Change in content by adding backfill, trenches, scrapings or disturbances of any kind.
- .3 Storage of construction materials, equipment, soil, construction waste or debris.
- .4 No liquid disposal, e.g. petroleum products, paint, concrete.
- .5 Movement or parking of vehicles, machinery and equipment

1.8 MAINTENANCE DURING WARRANTY PERIOD

- .1 From the time the Departmental Representative accepts the work through to the end of the warranty period, perform the following maintenance operations:
 - .1 Water soil to maintain optimum moisture conditions for plant growth and health without causing erosion.
 - .2 Apply pesticides in accordance with national pesticide education, training and certification standard, federal, provincial and municipal regulations as required and as often as necessary to control insects, fungi and diseases. Before proceeding, submit the products to the Departmental Representative for review.
 - .3 Apply fertilizer in early spring according to manufacturer recommended doses.
 - .4 Remove dead, broken or hazardous branches of vegetation. Dispose of debris using an ecological method of disposal, composting, shredding or as prescribed for trees with diseases or viruses.

Part 2 Products

2.1 MATERIALS

- .1 Snow Fence: Plastic regular fence or approved equivalent in good condition 1.2 m high vertically supported by steel T-bars and horizontally to the top of the fence by a wooden bar 39 x 89 mm, bolted to steel T-bars. The T-bars should be straight and 1.8 m in length.
- .2 Shaft protection: 28 x 89 mm wooden boards, not less than 1 500 mm in length, secured by two strips of metal sheet.
- .3 Geotextile Membrane: Geotextile approved by the Departmental Representative with the following characteristics:
 - .1 Non-woven synthetic roller consisting of at least 85% by mass of polypropylene with inhibitors incorporated in the base plastic for improved UV and heat resistance.
 - .2 Physical properties:
 - .1 Thickness: 1.1 mm according to CAN / GSB-148.1, No. 3.
 - .2 Tear Resistant: at least 450N wet according to CAN / GAS-148.1, No. 7.3.
 - .3 Elongation at break: not more than 45% wet according to CAN / GSB-148.1, No. 7.3
- .4 Water: drinkable.

- .5 Temporary protection: Temporary cover for the roots of uncovered trees shall consist of a filter cloth consisting of a non-woven geotextile and retained by stakes or piles. It must be placed in less than an hour after the roots are exposed.
- .6 Peat Moss:
 - .1 Derived from various species of partially decomposed sphagnum moss.
 - .2 Elastic and homogeneous.
 - .3 Free from wood and other materials that may affect plant growth.
 - .4 Composed of shredded particles of at least 5 mm.
- .7 Fertilizers:
 - .1 Meets the requirements of the Fertilizers Act and the Fertilizers Regulations of Canada.
 - .2 Complete, commercial type, slow acting, containing 35% nitrogen in a water-insoluble form.
- .8 Anti-desiccant:
 - .1 Wax-like emulsion.

Part 3 Execution

3.1 IDENTIFICATION AND PROTECTION

- .1 Identify plants to be kept and delineate their root devices as directed by Departmental Representatives.
- .2 Protect plants and root apparatus from damage, compaction and contamination caused by construction work as directed by the Departmental Representative.
- .3 Compaction of soil within the tree area should be avoided, except with the prior approval of the Departmental Representative. Placing plywood, metal plates, sand, etc. should be considered. Before allowing heavy equipment access to the unprotected area under the branches of the trees in the construction area.
- .4 Do not cut roots below foliage boundary. However, if necessary, consult a recognized nursery or horticultural technician in Canada as instructed by the Departmental Representative.

3.2 TREE PROTECTION

- .1 Protect trees during excavation operations.
- .2 Protect trunk from trees in work area by 38 mm x 89 mm x 1500 mm wooden boards secured with two strips of metal sheets.
- .3 Place wooden boards around trunk base with center spacing of 150 mm or less to ensure integral shock and abrasion protection.
- .4 Do not puncture or damage bark with wooden boards or fasteners.
- .5 Place wooden planks around branches or other irregularities to provide protection without damaging the tree.

- .6 Leave tree guards during construction. Remove them only when there is no longer any risk of damage and with the permission of the Departmental Representative.

3.3 SNOW FENCE

- .1 Protect trees in existing lawns or backfill areas by pushing T-bars vertically to 60 cm in the ground, spaced 4.5 m apart. Attach the snow fence using wire at three places to each T-bar.
- .2 Stretch snow fence to prevent sagging. Bolt a 38 x 89 mm wooden bar to the T-bars horizontally on the top of the barrier.
- .3 Place snow fence to ensure continuous barricade between target trees and worksite prior to construction.
- .4 Place the snow fence at the edge of the area under tree branches unless it provides a buffer zone of 1.5 m with the construction line. With the permission of the Departmental Representative, the fence may be placed under the branches of the trees to form a buffer zone of up to 1.5 m but this should not be less than 1 m from the circumference outside the trunk.
- .5 Area under the tree branches: surface of the soil directly below the end of the outermost branches. It must be at least 3 m radius from the trunk of the tree or more as directed by the Departmental Representative.
- .6 Do not operate, park, repair equipment or replenish fuel, store building materials or stack land in barricades or within 2 m of the outer edge of the area under the branches of a tree.
- .7 Do not cause flooding or sediment deposits where trees are planted.
- .8 Leave barricades in place during construction and remove them only after inspection by Departmental Representative. The provisional removal of the barricades should be considered only after having examined this requirement with the Departmental Representative.

3.4 DRILLING OF TRENCHES AND GALLERIES FOR PIPELINE OR UNDERGROUND UTILITIES

- .1 The location of the centreline and the boundaries of the trench / gallery shall be reviewed by the Departmental Representative prior to the beginning of excavation. The gallery must extend 2 000 mm on either side of the trunk of the tree.
- .2 Inside root canal area, dig by hand. Do not cut roots more than 40 mm in diameter unless they are more than 500 mm below the existing ground level. Carefully cut the roots with a clean cut using disinfected cutting tools.
- .3 Digging gallery below center of tree trunk using methods and tools approved by Departmental Representative.
- .4 The minimum acceptable depth from the top of the gallery shall be 1 000 mm.
- .5 Backfill for galleries and trenches shall be compacted to a density of 85% on the normal Proctor test. Avoid damage to the trunk and roots of trees.
- .6 Complete excavation of trenches and galleries near trees within two weeks of the commencement of work.

3.5 EXCAVATION OF THE ROOTS AREA (RHIZOSPHERE)

- .1 Where specified by the Departmental Representative, carefully excavate under the existing ground underneath the branches of existing trees by hand to determine the extent to which the roots extend within the excavation area.
- .2 Cut or preserve roots as prescribed by Departmental Representative. Do not start without obtaining approval of the Departmental Representative.
- .3 Excavate according to the approved methods at depths indicated on drawings and as prescribed by the Departmental Representative. Be prepared to excavate the rhizosphere by hand or by other techniques that may be prescribed by the Departmental Representative to protect existing roots.
- .4 Temporary cover for the exposed roots shall consist of a geotextile and retained by stakes or piles. It must be placed in less than an hour after the roots have been exposed.

3.6 IRRIGATION

- .1 During the period between May 15 and September 15 of each year, all plants must be irrigated at least three times a week in accordance with a weekly watering schedule submitted to the Departmental Representative for his approval.
- .2 Keep uncovered roots wet during excavation in accordance with section 3.5 of this section.
- .3 The Contractor shall uniformly soak the areas to a depth of 300 mm using a spray to prevent compaction and damage to the vegetation.

3.7 PRUNING

- .1 Prune in accordance with the Departmental Representative directives.
- .2 Prune crown to compensate for root loss while maintaining general form and character of plant. Dispose of debris using an ecological disposal method

3.8 ANTI-DESICCANT

- .1 Apply anti desiccant to foliage where applicable according to the Departmental Representative directives

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section includes requirements for supplying, producing and placing gravel or quarried stone as a granular sub-base and base course to lines, grades and typical cross sections indicated on plans or as directed by Departmental Representative.

1.2 MEASUREMENT AND PAYMENT

- .1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment:
 - .1 Item No. U3 – Backfilling with Granular A
 - .2 Item No. U4 – Backfilling with Granular B Type I and Type II

1.3 RELATED REQUIREMENTS

- .1 Section 31 23 33.01 – Excavating Trenching and Backfilling
- .2 Section 31 32 19.16 – Geotextile Soil Stabilization

1.4 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C117, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
 - .5 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- .4 Ministry of Transportation of Ontario (MTO)
 - .1 OPSS.MUNI 501, Construction Specification for Compacting, November 2017.
 - .2 LS-614, Method of Test for Freezing and Thawing of Coarse Aggregate
 - .3 LS-602, Sieve Analysis of Aggregates
 - .4 OPSS.MUNI-1010, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES.
- .2 Quality Control: in accordance with Section 01 45 00 - Quality Control:
 - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
 - .2 Submit for review by Departmental Representative proposed heave prevention and dewatering methods as described in PART 3 of this Section.
 - .3 Submit to Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.
 - .4 Submit to Departmental Representative written notice when bottom reached.
 - .5 Submit to Departmental Representative testing and inspection results report as described in PART 3 of this Section.
- .3 Preconstruction Submittals:
 - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
 - .2 Submit records of underground utility locates, indicating: clearance record from utility authority, location plan of relocated and abandoned services, as required and location plan of existing utilities as found in field.
- .4 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES.
 - .2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of materials and provide access for sampling.
 - .3 Submit 70 kg samples of type of granular specified to departmental representative in tightly closed containers to prevent contamination and exposure to elements.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
 - .1 Store materials in accordance with erosion and sedimentation control plan.
 - .2 Replace defective or damaged materials with new. **Product**

2.1 MATERIALS

- .1 Granular sub-base and base course material: in accordance with the following requirements:
 - .1 Crushed stone, gravel or sand.

- .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.2. Table of gradation requirements – Percent Passing (MTO Test LS-602):

Sieve Designation	% Passing		
	Granular A	Granular B, type I	Granular B, type II
150 mm	-	100	-
106 mm	-	-	100
37.5 mm	-	-	-
26.5 mm	100	50-100	50-100
19.0 mm	85-100	-	-
13.2 mm	65-90	-	-
9.5 mm	50-73	-	-
4.75 mm	35-55	20-100	20-55
1.18 mm	15-40	10-100	10-40
0.300 mm	5-22	2-65	5-22
0.150 mm	-	-	-
0.075 mm	2.0-8.0	0-8.0	0-10.0

- .4 Other properties as follows:
- .1 Physical property requirements as per OPSS.MUNI 1010, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for granular sub-base and base course installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION TEMPORARY EROSION AND SEDIMENTATION CONTROL:

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

- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 PLACING

- .1 Place granular sub-base and base course after subgrade is inspected and approved by Departmental Representative.
- .2 Construct granular sub-base and base course 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 spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
- .6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
 - .1 Departmental Representative may authorize thicker lifts if specified compaction can be achieved.
- .7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .8 Remove and replace portion of layer in which material has become segregated during spreading.
- .9 Each lift of Granular Sub-Base and Base Course shall be bladed, shaped and compacted to produce the required profile and cross section.
- .10 The final grade after shaping and compaction shall be to the specified tolerances.
- .11 Spreading, shaping and compacting operations shall proceed simultaneously with the dumping operations and the Contractor shall, at the completion of any day, ensure that all material placed is shaped and compacted to the specified density.
- .12 Crawler tractors and scrapers shall not be permitted for hauling or placing of Granular Sub-Base or Base Course.
- .13 The foreslope in the Granular Sub-Base and Base Course layer shall be constructed to be free of ruts, ridges and/or undulations, to form a straight line slope in cross section.
- .14 Granular Sub-Base and Base Course materials shall not be bladed onto the subgrade foreslope.
- .15 Any deterioration of the placement grade which appears during the course of the work and is directly or indirectly attributable to the Contractor shall be repaired to the satisfaction of the Departmental Representative before any work may continue over this area.
- .16 The Contractor shall remove, from the work site, excess material and oversize stones which have been bladed to the sides of the layer
- .17 The Contractor shall maintain the finished grade to the specified tolerances and to the specified density until the completion of the Contract.

- .18 If the Contractor's methods result in segregation of the materials, as defined by ASTM C125 and tested in accordance with ASTM C136, the Contractor shall cease work immediately
- .19 If segregation of materials occurs, then the Contractor shall submit a work plan to scarify and remedy the work in place or shall remove the segregated materials from the work.

3.4 COMPACTION

- .1 Compaction equipment to be capable of obtaining required material densities. Compact to density of not less than 100 % maximum dry density in accordance with method B of OPSS 501.
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base and base course.
- .4 Apply water as necessary during compaction to obtain specified density.
- .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.
- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 PROOF ROLLING

- .1 For proof rolling use standard roller.
- .2 Obtain written approval from Departmental Representative to use non standard proof rolling equipment.
- .3 Proof roll at level in sub-base as indicated.
 - .1 If non-standard proof rolling equipment is approved, Departmental Representative will determine 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 sub-base and subgrade material to depth and extent as directed by Departmental Representative.
 - .2 Backfill excavated subgrade with sub-base material and compact in accordance with this section
- .6 Where proof rolling reveals areas of defective sub-base, excavate and replace sub-base material and compact in accordance with this section at no extra cost.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.

3.7 SITE TOLERANCES

- .1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.8 PROTECTION

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

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section covers the supply, placement and compaction of hot mix asphalt on the bridge deck and roadway approaches, saw cutting in asphalt pavements, pavement cleaning, prime and tack coats. It also covers the construction of other required asphalt work, such as, but not limited to:
 - .1 Temporary access;
 - .2 Temporary multi-use pathway;
 - .3 Paving repair.
- .2 This section also includes the requirements for the supply and installation of waterproofing on the bridge deck and the supply and installation of sealant at saw cut joints as indicated on the drawings.

1.2 MEASUREMENT AND PAYMENT

- .1 Measure permanent road pavement in square meter placed.
- .2 Measurement and payment procedures: in accordance with Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. U12 – Asphalt Paving - Surface Course
 - .2 Item No. U13 – Asphalt Paving - Lower Course
 - .3 Item No. U14 – Asphalt Paving – Multi-use and Pedestrian Pathways
- .3 There will be no measurement for payment for temporary pavement. Payment related to the temporary pavement included in Lump Sum Item, as set out in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L4 – Connect and Setup Temporary Utilities and Facilities for temporary pathways. Ensure lump sum price includes geotextile.
 - .2 Item No. L7 – General Works. Includes repairs to asphalt pavement affected by construction activities.
 - .3 Item No. L8 – Site Access.
 - .4 Item No. L28 – Road Work, for the pavement marking.
- .4 The following shall be included in the above Contract unit prices, no additional payment shall be made for.
 - .1 Sawcutting
 - .2 Pavement cleaning
 - .3 Prime Coat and sand blotter
 - .4 Tack coat
 - .5 Precision Planing to fully tie and place the asphalt.
 - .6 The supply and installation of hot poured rubberized asphalt joint sealant at sawcut joints.

- .5 No measurement for payment will be made for the Bridge Deck Waterproofing. Payment shall be under included in Lump Sum Item, as set out in Section 01 22 01 – MEASUREMENT AND PAYMENT:
- .1 Item No. L25 – Bridge Deck and Multi-use Pathway.
 - .2 All costs for labour, materials and equipment necessary to do the work of this item, shall be included in the lump sum price bid for this item.
- .6 If the paving and pavement markings of the Hogs Back Road cannot be completed before the temperatures drop below allowable limits to comply with the Construction Specification for Hot Mix Asphalt, Ontario Provincial Standard Specification, OPSS 310, Contractor is to place temporary paving and temporary pavement markings to allow vehicular traffic until temperatures are favorable in spring. Temporary pavement and marking are to be removed in spring and permanent pavement and marking is to be installed by the Contractor. There will be no separate payment for the installation of temporary pavement, removal of the temporary pavement, installation of permanent paving and permanent pavement markings in spring.

1.3 RELATED REQUIREMENTS

- .1 Section 02 41 13.13 Paving Removal
- .2 Section 32 11 16.01 Granular sub-base
- .3 Section 32 17 23 Pavement Markings

1.4 REFERENCE STANDARDS

- .1 Ministry of Transportation, Ontario (MTO)
 - .1 OPSS 302, Construction specification for priming granular base, November 2016,
 - .2 OPSS 310, Construction Specification for Hot Mix Asphalt, Ontario Provincial Standard Specification November 2010.
 - .3 OPSS 1101 Asphalt Cement
 - .4 OPSS 1103, Material specification for emulsified asphalt, November 2012
 - .5 OPSS 1150 Material Specification for Hot Mix Asphalt, Ontario Provincial Standard Specification, November 2008.
 - .6 OPSS 1212, Hot Poured Rubberized Asphalt Joint Sealing Compound.
- .2 City of Ottawa BY-LAW NO. 2001
- .3 American Association of State Highway and Transportation Officials (AASHTO)
 - .1 AASHTO M081-92-UL-04, Standard Specification for Cutback Asphalt (Rapid-Curing Type).
 - .2 AASHTO M320-10, Standard Specification for Performance Graded Asphalt Binder.
 - .3 AASHTO R29-02, Standard Specification for Grading or Verifying the Performance Graded of an Asphalt Binder.
 - .4 AASHTO T245-97(2004) , Standard Method of Test for Resistance to Plastic flow of Bituminous Mixtures Using Marshall Apparatus.

- .4 Asphalt Institute (AI)
 - .1 AI MS-2-1994 Sixth Edition, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.
- .5 ASTM International
 - .1 ASTM C88-13, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
 - .2 ASTM C117-13, Standard Test Method for Material Finer Than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .3 ASTM C123-04, Standard Test Method for Lightweight Particles in Aggregate.
 - .4 ASTM C127-15, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - .5 ASTM C128-15, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
 - .6 ASTM C131-14, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .7 ASTM C136-14, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .8 ASTM D140-15, Practice for Sampling Bituminous Materials.
 - .9 ASTM D633-11, Standard Volume Correction Table for Road Tar.
 - .10 ASTM D995--95b(2002) , Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
 - .11 ASTM D1250-08, Standard Guide for Use of the Petroleum Measurement Tables.
 - .12 ASTM D2419-14, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
 - .13 ASTM D3203-11, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
 - .14 ASTM D4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
 - .15 ASTM D5147, Standard Test Method for Sampling and Testing Modified Bituminous Sheet Material.
 - .16 ASTM D6164-00, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Material Using Polyester Reinforcement.
- .6 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.
 - .2 CAN/CGSB-16.1-M89, Cutback Asphalts for Road Purposes.
 - .3 CAN/CGSB-16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.
 - .4 CAN/CGSB-16.3-M90, Asphalt Cements for Road Purposes.
 - .5 CAN/CGSB-37-GP-56M, Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.
- .7 U.S. Environmental Protection Agency (EPA) / Office of Water

- .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 The Contractor shall provide the mix design to the Departmental Representative 2 weeks in advance of the commencement of the production of the asphalt concrete mix along with testing results for this mix.
- .3 The Contractor shall submit, in writing, the proposed source(s) of supply of coarse aggregate and fine aggregate for approval by the Departmental Representative.
- .4 The Contractor shall submit in writing, the proposed supplier of the asphalt binder.
 - .1 The Contractor shall supply, upon request, a sample of the asphalt binder (2L/mix) and a sample of any proposed admixtures, in a volume proportional to the asphalt binder sample.
 - .2 The Contractor shall supply, upon request, the optimum mixing and compaction temperature, for Performance Grade (PG) asphalt binders.
 - .3 The Contractor shall submit at the time of delivery to the plant the refinery certification and delivery slip for each tanker load of asphalt binder.
 - .4 If the source of supply of the asphalt binder changes during the work, the Contractor shall submit in writing, this proposed change prior to using the new asphalt binder supply in the work.
- .5 Other submittals are required for this Item and are contained within the sections applicable to the specific phase of the work being undertaken.
- .6 Submittals are required in accordance with any cross-referenced Item forming part of this Item.
- .7 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for asphalt mixes and aggregate and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit viscosity-temperature chart for asphalt cement to be supplied showing either Saybolt Furol viscosity in seconds or Kinematic Viscosity in centistokes, temperature range 105 to 175 degrees C, 4 weeks prior to beginning Work.
- .8 Samples:
 - .1 Provide to Departmental Representative access to source of aggregates for sampling 4 weeks prior to beginning Work.
 - .2 Upon Request submit samples of following materials proposed for use 4 weeks prior to beginning Work.
 - .1 One - 4 L container of asphalt cement if specifically requested by Departmental Representative.
 - .2 Two - 4 L samples of asphalt tack coat material proposed for use in new, clean, airtight, sealed, wide mouth jars. Sample asphalt tack coat material to: ASTM D140.

- .3 Four - two L samples of asphalt prime proposed for use in new, clean, air tight sealed, wide mouth, plastic lined cans jars or bottles made with plastic. Sample asphalt prime coat materials in accordance with ASTM D140.

1.6 QUALITY CONTROL

- .1 Quality control is as per 01 45 00 – QUALITY CONTROL
- .2 Upon request from Departmental Representative, submit manufacturer's test data and certification that asphalt materials meet requirements of this Section.
- .3 Any contamination of the emulsified asphalt and/or deviation from this specification shall be corrected to the satisfaction of the Departmental Representative and at no cost to the Owner.
- .4 Such deficiencies may be noted from samples of emulsified asphalt taken by the Departmental Representative. Any necessary remedial measures shall be done by the Contractor at no expense to the Owner and to the satisfaction of the Departmental Representative.
- .5 Testing of the asphalt paving to be as per OPSS 310. The Contractor to engage independent testing and inspection agency to perform asphalt paving testing.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and in accordance with ASTM D140.
- .2 Submit to Departmental Representative copies of freight and waybills for asphalt cement as shipments are received.
 - .1 Departmental Representative reserves right to check weights as material is received.

Part 2 Products

2.1 ASPHALT MATERIALS AND MIX DESIGN

- .1 Asphalt cement shall meet the requirements of OPSS 1101, Material Specification for Asphalt Cements and shall be in accordance with the MTO Guide for the use of Performance Grade Asphalt Cement (PGAC); a PGAC grading of 58-28 will be used for this roadway.
- .2 Asphalt surface course HL 3 and lower course Medium Duty Binder Course (MDBC) shall meet the requirements of OPSS 310 and OPSS 1150.
- .3 Mix designs will be the responsibility of the Contractor.
- .4 Marshall stability shall be a minimum of 8900 for HL 3, as per OPSS 1150.
- .5 No recycled material will be permitted for this project.

2.2 ASPHALT PRIME COAT

- .1 Asphalt material: to CAN/CGSB-16.2 grade: SS-1.

- .2 Water: clean, potable, free from foreign matter.

2.3 ASPHALT TACK COAT

- .1 Anionic emulsified asphalt: to CAN/CGSB-16.2, grade: SS-1.
- .2 Cut-back asphalt; to AASHTO M081-92-UL, grade RC-70 or RC-250.
- .3 Water: clean, potable, free from foreign matter.

2.4 BRIDGE DECK WATERPROOFING

- .1 Bridge deck waterproofing materials shall be in accordance with CAN/CGSB-37-GP-56M.
- .2 Physical Properties:
 - .1 Top face of the membrane must be covered with mineral granules.
 - .2 Minimum thickness: 4.5mm
 - .3 Selvege width: 75mm
 - .4 Reinforcement: Non-woven Polyester
 - .5 Stain energy to CAN/CSGB 37-GP-56: 9kN/m
 - .6 Breaking strength to CAN/CSGB 37-GP-56: 17kN/m
 - .7 Tensile Strength to ASTM D5147: 17kN/m
 - .8 Ultimate Elongation to CAN/CSGB 37-GP-56: %60
 - .9 Elongation at maximum load to ASTM D5147: %50
 - .10 Cold bending to CAN/CSGB 37-GP-56: -30 Degrees Celsius
 - .11 Low temperature flexibility to ASTM D5147: -20 Degrees Celsius
 - .12 Static Puncture to CAN/CSGB 37-GP-56: 400N
 - .13 Granule Embedment to ASTM D5147: 1.5g avg
- .3 Acceptable product: ANTIROCK

2.5 SAWCUT JOINT SEALANT

- .1 Hot poured rubberized asphalt joint sealant shall be in accordance with OPSS 1212.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of existing substrate are acceptable for asphalt paving in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PLANT AND MIXING REQUIREMENTS

- .1 Plant to be in accordance with OPSS 1150.
- .2 Plant to be MTO approved.

3.3 EQUIPMENT

- .1 Equipment to be in accordance with OPSS 310.

3.4 PREPARATION

- .1 Clean pavement surface in accordance with Section 32 01 11.01- Pavement Cleaning and Marking Removal.
 - .1 When levelling course is not required, patch and correct depressions and other irregularities to approval of Departmental Representative before beginning paving operations.
 - .2 Dilute asphalt emulsion with water at 1:1 ratio for application.
 - .1 Mix thoroughly by pumping or other method approved by Departmental Representative.
 - .3 Apply tack coat and prime coat where applicable evenly to clean dry pavement surface, at least 0.125L/m² but not exceeding 0.5 L/m² prior to paving on existing asphalt surface or prior to surface course paving.
 - .1 Apply asphalt tack coat and prime coat only on unfrozen surface.
 - .2 Apply asphalt tack coat only when air temperature greater than 10 degrees C and when rain is not forecast within 2 hours minimum of application.
 - .3 Paint contact surfaces of curbs, gutters, manholes and like structures with thin, uniform coat of asphalt tack coat material.
 - .4 Permit prime and tack coat to set before placing asphalt paving.
 - .5 Prior to laying mix, clean surfaces of loose and foreign material.
 - .6 Mill existing asphalt and concrete surface, as indicated by Departmental Representative, and clean milled surfaces from dust.

3.5 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 as directed by Departmental Representative.
- .3 Apply second application of sand blotter as required.
- .4 Do not roll blotter sand.
- .5 Sweep and remove excess blotter material.

3.6 TRANSPORTATION OF MIX

- .1 Transport mix to job site in vehicles cleaned of foreign material.

- .2 Paint or spray truck beds with limewater, soap or detergent solution, or non petroleum based commercial product, at least daily or as required.
 - .1 Raise truck bed and thoroughly drain, and ensure no excess solution remains in truck bed.
- .3 Schedule delivery of material for placing in daylight, unless Departmental Representative approves artificial light for night placing.
- .4 Deposit mix from surge or storage silo to trucks in multiple drops to reduce segregation.
 - .1 Do not dribble mix into trucks.
- .5 Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.
- .6 Deliver loads continuously in covered vehicles and immediately spread and compact.
 - .1 Deliver and place mixes at temperature within range as directed by Departmental Representative, but not less than 135 degrees C.

3.7 PLACING

- .1 Place asphalt concrete to thicknesses, grades and lines as indicated on the drawings.
- .2 Placing conditions:
 - .1 Permanent and temporary paving shall comply with relevant standards including city of Ottawa BY-LAW NO. 2001 and MTO OPSS 310.
 - .2 If the paving of the Hogs Back Road cannot be completed before the temperatures drop below allowable limits for paving and pavement markings, Contractor is to place temporary paving and temporary pavement markings to allow vehicular traffic until temperatures are favorable in spring. Temporary pavement is to be removed in spring and permanent pavement and marking is to be installed by the Contractor. There will be no separate payment for the installation of temporary pavement, removal of the temporary pavement, installation of permanent paving and permanent pavement markings in spring.
 - .3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.
- .3 Place asphalt concrete in compacted lifts of thickness as indicated on the drawings or in case where paving is occurring over existing asphalt shall have a minimum lift thickness of 40 mm.
- .4 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm.

3.8 COMPACTING

- .1 Roll asphalt continuously to density not less than 98 % of maximum density determined in the lab. Compaction is to be as per OPSS 310 and AASHTO T245.
- .2 General:
 - .1 Use static compaction for levelling above the tunnel.

3.9 JOINTS

- .1 General:
 - .1 Remove surplus material from surface of previously laid strip.
 - .1 Do not deposit on surface of freshly laid strip.
 - .2 Construct joints between asphalt concrete pavement and Portland cement concrete pavement as indicated.
 - .3 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.
- .2 Transverse joints:
 - .1 Offset transverse joint in succeeding lifts by at least 600 mm.
 - .2 Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.
 - .3 Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.
- .3 Longitudinal joints:
 - .1 Offset longitudinal joints in succeeding lifts by at least 150 mm.
 - .2 Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100 degrees C prior to paving of adjacent lane.
 - .1 If cold joint can not be avoided, cut back by saw cutting previously laid lane, by at least 150 mm, to full depth vertical face, and tack face with thin coat of hot asphalt of adjacent lane.
 - .3 Overlap previously laid strip with spreader by 25 to 50 mm.
 - .4 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.
 - .5 Roll longitudinal joints directly behind paving operation.
 - .6 When rolling with static or vibratory rollers, have most of drum width ride on newly placed lane with remaining 150 mm extending onto previously placed and compacted lane.

3.10 FINISH TOLERANCES

- .1 Finished asphalt surface tolerance shall be in accordance with OPSS 310.
- .2 Finished asphalt surface to be within 5 mm of design elevation but not uniformly high or low.
- .3 Finished asphalt surface not to have irregularities exceeding 5 mm when checked with 4.5 m straight edge placed in any direction.

3.11 DEFECTIVE WORK

- .1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required.
 - .1 If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form true and even surface and compact immediately to specified density.

- .2 Repair areas showing checking, rippling, or segregation.
- .3 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

3.12 ASPHALT AND WATERPROOFING ON DECK

- .1 Install bridge waterproofing in strict conformance with waterproof membrane manufacturer's instructions and CAN/CGSB-37-GP-56.
 - .1 Membrane must be heat welded.
 - .2 Side overlap of each membrane section must be minimum 75mm.
 - .3 End lap of each membrane section must be minimum 150mm.
 - .4 Surface preparation of the deck for waterproofing with membrane must conform to specified surface profile (CSP) of 3-5.
- .2 Prepare deck, for installation of asphalt base course, and install base course of asphalt in accordance with OPSS 310.
- .3 Place surface course of asphalt in conformance with OPSS 310.

3.13 SEALANT APPLICATION

- .1 Sawcut asphalt at locations and to the dimensions indicated on the drawings.
- .2 Thoroughly clean out the sawcut joint and prepare and install sealant in accordance with OPSS 1212 and manufacturer recommendations. Finish top of sealant flush to slightly convex with respect to sides of joint.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies requirements for constructing cement concrete sidewalks, curbs and gutters. It describes materials used, and includes grade preparation, granular base, concrete, tolerances, expansion, contraction and isolation joints, curing, backfill and linseed oil treatment option.

1.2 MEASUREMENT AND PAYMENT

- .1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment. Payment included in Unit Price:
 - .1 Item No. U11 – Curbs: Measure all curbs at unit rate in linear meter calculated from curbs accepted. Unit Price to include: subgrade preparation, dowels, formwork, reinforcement, cast-in-place concrete (including drilling and sealing), curing and expansion/connection joint sealant/sealing.
 - .2 Include work described in Section 03 10 00 - CONCRETE FORMING AND ACCESSORIES in the unit prices of concrete.
 - .3 Include bonding agent in unit price of concrete.
 - .4 No deductions made for volume of concrete displaced by reinforcing steel, structural steel, or piles.
 - .5 No deductions made for volume of concrete less than 0.1 m³ in volume displaced by individual drainage openings.
 - .6 Supply and installation of anchor bolts, nuts and washers and bolt/dowel grouting/epoxy not measured but considered incidental to work.

1.3 RELATED REQUIREMENTS

- .1 Section 03 10 00 – Concrete Forming and Accessories
- .2 Section 03 20 00 – Concrete Reinforcing
- .3 Section 03 30 00- Cast-in-Place Concrete
- .4 Section 31 23 33.01- Excavating, Trenching and Backfilling

1.4 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C117, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136/C136M, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM C 309, Liquid Membrane Forming Compounds for Curing Concrete.
 - .4 ASTM D1751, Standard Specification For Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

- .5 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600 kN-m/m³).
- .2 CSA Group
 - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete, Including Update No. 1 2015.
 - .2 CSA B651-2012 Accessible Design for the Built Environment.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Submit plans and shop drawings at least 15 days prior to commencing work for fabrication and installation of the curbs, gutters and sidewalks clearly identifying the material, dimensions and locations. Shop drawings and plans must bear the seal of a professional engineer registered to practice in the Province of Ontario.
- .3 Provide testing and inspection results reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .4 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken.
- .5 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.
- .6 Survey report signed by registered OLS surveyor or Professional Engineer registered to Ontario confirming elevations, location (coordinates), and plumbness of curb, sidewalk and gutters. Survey must be conducted by registered OLS surveyor.
- .7 Provide copy of WHMIS MSDS in accordance with Sections 01 35 29.06 - HEALTH AND SAFETY REQUIREMENTS and 01 35 46 - ARCHEOLOGICAL, CULTURAL, ENVIRONMENTAL PROCEDURES

1.6 QUALITY CONTROL

- .1 Quality Control: in accordance with Section 01 45 00 - QUALITY CONTROL.
- .2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
 - .1 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 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in this specification.
- .4 Survey the newly constructed concrete components confirming elevations, location (coordinates), and plumbness. Survey must be conducted by registered OLS surveyor.

- .5 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.
- .6 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by contractor for review to CSA A23.1/A23.2.
 - .1 Ensure testing laboratory is certified to CSA A283.
- .7 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.
- .8 Contractor will pay for costs of tests as specified in Section 01 45 00 – QUALITY CONTROL.
- .9 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .10 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .11 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal: in accordance with Section 01 74 19 – Waste Management and Disposal
- .2 Delivery Storage and Handling to be as outline in Section 03 30 00 – CAST-IN-PLACE CONCRETE.

Part 2 Products

2.1 MATERIALS

- .1 Concrete mixes and materials: in accordance with Section 03 30 00- Cast-in-Place Concrete.
- .2 Reinforcing steel: in accordance with Section 03 20 00- Concrete Reinforcing.
- .3 Granular base and fill material: material to Section 31 23 33.01 – Excavating, Trenching and Backfilling
 - .1 Granular A, Granular B Type I and II
 - .2 Crushed stone or gravel.
 - .3 Gradations: within limits specified when tested to ASTM C136 and ASTM C117.

- .4 Non-staining mineral type form release agent: chemically active release agents containing compounds reacting with free lime to provide water-soluble soap.
- .5 Curing Agent: to ASTM C309, Type 1.
- .6 Expansion Joint Filler: Premoulded bituminous fibre board, conforming to ASTM D1751.

Part 3 Execution

3.1 GRADE PREPARATION

- .1 Do grade preparation work in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.
- .2 Construct embankments using excavated material free from organic matter or other objectionable materials.
 - .1 Dispose of surplus and unsuitable excavated material off site.
- .3 Place fill in maximum 150 mm layers and compact to minimum 98% of SPD maximum dry density to ASTM D698.

3.2 GRANULAR BASE

- .1 Obtain as directed by Departmental Representative approval of subgrade before placing granular base.
- .2 Place granular base material to lines, widths, and depths as indicated.
- .3 Compact granular base in maximum 150 mm layers to minimum 98% of SPD maximum density to ASTM D698.

3.3 CONCRETE

- .1 Obtain as directed by Departmental Representative approval of granular base and reinforcing steel prior to placing concrete.
- .2 Do concrete work in accordance with Section 03 30 00- Cast-in-Place Concrete.
- .3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom side to side across sidewalk.
- .4 Provide edging as indicated with 10 mm radius edging tool.
- .5 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to as directed by Departmental Representative can be demonstrated. Hand finish surfaces when directed by as directed by Departmental Representative.

3.4 TOLERANCES

- .1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

3.5 EXPANSION AND CONTRACTION JOINTS

- .1 Install tooled transverse contraction joints after floating, when concrete stiff, but still plastic, at intervals as directed by Departmental Representative.
- .2 Install expansion joints as shown on design drawings and as directed by Departmental Representative.
- .3 When sidewalk adjacent to curb, make joints of curb, gutters and sidewalk coincide.

3.6 ISOLATION JOINTS

- .1 Install isolation joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.
- .2 Install joint filler in isolation joints as indicated and in accordance with Section 03 30 00-Cast-in-Place Concrete.
- .3 Seal isolation joints with sealant approved by Departmental Representative.

3.7 TACTILE WALKING SURFACE INDICATORS

- .1 Install tactile walking surface indicators at curb ramp edges, where indicated on drawings and in accordance with local municipal bi-laws.

3.8 CURING

- .1 Cure concrete by adding moisture continuously in accordance with CSA-A23.1/A23.2 to exposed finished surfaces for minimum 3 day after placing or sealing moisture in by curing compound as directed by Departmental Representative.
- .2 Where burlap used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.
- .3 Apply curing compound evenly to form continuous film, in accordance with manufacturer's requirements.

3.9 BACKFILL

- .1 Allow concrete to cure for 7 days prior to backfilling.
- .2 Backfill to designated elevations with material as directed by Departmental Representative.
 - .1 Compact and shape to required contours as directed by Departmental Representative.

3.10 LINSEED OIL TREATMENT

- .1 Apply two coats of linseed oil mixture uniformly to surfaces of curbs, walks and gutters, after concrete has cured for specified curing time and when surface of concrete clean and dry.
- .2 Linseed oil mixture to consist of 50% boiled linseed oil and 50% mineral spirits by volume.
- .3 Apply treatment when air temperature above 10 degrees C.
- .4 Apply first coat at 135 mL/m².

- .5 Apply second coat at 90 mL/m²when first coat has dried.

3.11 CLEANING

- .1 Proceed in accordance with Section 01 74 00- Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section describes pavement marking materials including but not limited to paint and markings, thinner, requirements for equipment, application, and tolerances.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement of pavement marking.
- .2 Payment related to the temporary and permanent pavement marking included in Lump Sum Item, as set out in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L28 – Road Work.

1.3 RELATED REQUIREMENTS

- .1 Section 32 01 11.01- Pavement Cleaning and Marking Removal

1.4 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM E1360 90 2000 e1, Standard Practice for Specifying Color by Using the Optical Society of America Uniform Color Scales System.
 - .2 ASTM D4797 88 2004 Standard Test Methods for Chemical and Gravimetric Analysis of White and Yellow Thermoplastic Traffic Marking Containing Lead Chromate and Titanium Dioxide.
- .2 Environment Canada (EC)
 - .1 Volatile Organic Compound (VOC) Concentration Limits for Architectural Coatings Regulations, SOR/2009-264.
- .3 Green Seal (GS)
 - .1 GS-11-Edition 3.2 (2015), Standard for Paints and Coatings.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.
 - .1 MPI #32, Traffic Markings Paint, Alkyd.
 - .2 MPI #97, Latex Traffic Marking Paint.
- .6 South Coast Air Quality Management District (SCAQMD)
 - .1 SCAQMD Rule 1113-16, Architectural Coatings.
- .7 Transportation Association of Canada, Manual of Uniform Traffic Control Devices for Canada.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature and data sheets for pavement markings and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit copies of WHMIS MSDS in accordance with Section 01 35 29.06- Health and Safety Requirements.
- .3 Samples:
 - .1 Submit to Departmental Representative following material sample quantities at least 4 weeks prior to commencing work.
 - .1 Two 1 L samples of each type of paint.
 - .2 Sampling to MPI Painting Manual.
 - .2 Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, MPI specification number and formulation number and batch number.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect specified materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
 - .4 Disposal of empty containers according to Environmental Regulations shall be the responsibility of the Contractor.

1.7 SITE CONDITIONS

- .1 Sustainable Design Provisions:
 - .1 Seasonal restriction for high VOC content traffic marking coatings.
 - .1 Traffic marking coating application between May 1st and October 15th subject to seasonal use restriction and have VOC concentration maximum 150 g/L.
 - .2 After seasonal use restriction, between October 16th and November 30th, the VOC concentration can be increased to a maximum of 450 g/L, as per manufacturer's application temperature requirements, but must be approved prior to execution by Departmental Representative.

Part 2 Products

2.1 MATERIALS

- .1 Alkyd Traffic Paint and Markings:
 - .1 To MPI #32, Alkyd traffic marking meeting requirements of ASTM D4797.
 - .2 Traffic Marking Coatings: maximum VOC limit 450 g/L to SOR/2009-264 Schedule 1
 - .3 Colour: to ASTM E1360, white and yellow in accordance with MPI Architectural Painting Specification Manual.
 - .4 Contractor to supply qualified product list of paints applicable to work for review and approval. Qualified paints may be used but Departmental Representative reserves right to perform further tests.
- .2 Latex traffic Paint and Markings:
 - .1 To MPI #97, Latex traffic marking meeting requirements of ASTM D4797.
 - .2 Traffic Marking Coatings: maximum VOC limit 450 g/L to SOR/2009-264 Schedule 1.
 - .3 Colour: to ASTM E1360 yellow and white in accordance with MPI Architectural Painting Specification Manual.
 - .4 Contractor to supply qualified product list of paints applicable to work for review and approval. Qualified paints may be used but Departmental Representative reserves right to perform further tests.
- .3 Thinner: to MPI listed manufacturer.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates and surfaces to receive pavement markings acceptable for product installation in accordance with MPI instructions prior to pavement markings application.
 - .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Pavement surface: dry, free from water, frost, ice, dust, oil, grease and other deleterious materials.
- .3 Proceed with Work only after unacceptable conditions rectified.

3.2 EQUIPMENT REQUIREMENTS

- .1 The Contractor shall supply a mobile highway striping truck which is capable of striping centre, lane and edge line markings to the required thickness and at widths of 100 or 200 mm, as a uniform stripe with sharp edges.
- .2 The truck shall have a glass bead dispenser and shall be capable and of applying overlay-type glass beads to the wet painted line uniformly at the recommended rate by means of pressurized bead dispensers.

- .3 The truck shall be fitted with a paint heater capable of heating paint to any temperature up to 80°C and maintaining a constant temperature during spraying operations.
- .4 The truck shall have a metering device to measure the number of litres of paint applied.
- .5 Equipment shall be made available for removal of Pavement markings as ordered by the Departmental Representative, or as required to correct markings applied in error or nonconformance as per this Section. The equipment shall be capable of removing markings with minimal damage to the pavement surface.

3.3 APPLICATION

- .1 Pavement markings: laid out by Contractor.
- .2 Unless otherwise approved by Departmental Representative, apply paint when air temperature minimum 10 degrees C, wind speed maximum 60 km/h and no rain forecast within next 4 hours.
- .3 Apply traffic paint evenly at rate of 3 m²/L to form minimum 8 mil dry film thickness, in accordance with MPI Architectural Painting Specification Manual “Preparation of Surfaces” and “Application” for “Approved Product” listing.
- .4 Do not thin paint unless approved by Departmental Representative.
- .5 Symbols and letters to dimensions indicated.
- .6 Paint lines of uniform colour and density with sharp edges.
- .7 Thoroughly clean distributor tank before refilling with paint of different colour.

3.4 TOLERANCE

- .1 Paint markings: within plus or minus 12 mm of dimensions indicated.
- .2 Remove incorrect markings in accordance with Section 32 01 11.01- Pavement Cleaning and Marking Removal.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.
 - .1 Remove insulation material spilled during installation and leave work area ready for application of wall board.

3.6 PROTECTION

- .1 Protect pavement markings until dry.
- .2 Repair damage to adjacent materials caused by pavement marking application.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This Section includes but is not limited to:
 - .1 Planting trees and shrubs
- .2 Without limitation, the related work required in this section is the following:
 - .1 Stripping, excavation, excavation and preparation of pits and plant beds;
 - .2 Topsoil;
 - .3 Mulch: ramial chipped wood;
 - .4 Stakes and harness;
 - .5 Maintenance during the establishment and warranty period;
 - .6 Winter protection;
 - .7 Off-site disposal of non-reusable materials.
 - .8 Materials, equipment and products associated with planting plants, and methods of planting, staking, mulching and maintenance.

1.2 MEASUREMENT AND PAYMENT

- .1 There shall be no separate measurement for payment for the work under this Section.
- .2 Payment to be included in the Lump Sum Price, in accordance with Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L16 - Landscaping.
- .3 Maintenance during the establishment and warranty periods is to be included in this item. The price must include the supply of all labor and all materials and equipment required for the specified maintenance work to be performed during the establishment and warranty periods, including fertilization, watering and repair.

1.3 RELATED SECTIONS

- .1 Section 31 14 13 – SOIL STRIPPING AND STOCKPILING
- .2 Section 32 01 90.33 TREE AND SHRUB PRESERVATION
- .3 Section 32 94 00 – GENERAL LANDSCAPING

1.4 DEFINITION

- .1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

1.5 REFERENCE

- .1 Agriculture and Agri-Food Canada (AAFC).
 - .1 Plant Hardiness Zones in Canada-2000.
- .2 Canadian Nursery Landscape Association (CNLA).

- .1 Canadian Standards for Nursery Stock 2001
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .4 Ministry of justice
 - .1 Canadian Environmental Protection Act. 1999 (CEPA)
 - .2 Transportation of Dangerous Goods Act.
- .5 U.S. Environmental Protection Agency (EPA) /Office of Water.
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.6 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling: obtain approval from Departmental Representative of schedule seven days in advance of shipment of plant material.
- .2 Schedule to include:
 - .1 Quantity and type of plant material.
 - .2 Shipping dates.
 - .3 Arrival dates on site.
 - .4 Planting Dates.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – SUBMITTAL PROCEDURES.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for trees, shrubs, ground cover, fertilizer, mycorrhiza, anti-desiccant, anchoring equipment, and anti-erosion mattress. Include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit copy of WHMIS MSDS, according to Section 01 35 29.06 – HEALTH AND SAFETY and 01 35 46 - ARCHEOLOGICAL, CULTURAL, ENVIRONMENTAL PROCEDURES.
- .3 Documents/Samples to submit relative to sustainable design:
 - .1 Construction Waste Management
 - .1 Submit project Waste Management Plan and Waste Reduction Workplan highlighting recycling and salvage requirements.
- .4 Documents / samples to be submitted
 - .1 Submit fact sheets for the following products.
 - .1 Mycorrhiza.
 - .2 Anti-desiccant agent.
 - .3 Bracing system including cable ties, clamps, guy wires, anchors and tensioners.
 - .4 Mulch.

- .2 Proof of plants order: The Contractor must provide a firm evidence of plant orders from suppliers. He must send a copy of the order form to each of his suppliers to the Departmental Representative. The voucher must include at least the following information.
 - .1 Date of order confirmation.
 - .2 List of plants ordered and reserved.
 - .3 Provider contact information (telephone, representative name and company name).

1.8 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Landscape Contractor: to have a college education certificate of a Horticultural Trades Association.
 - .2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.
 - .3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Ornamental Maintenance designation.
- .2 Quality Control at Source
 - .1 Approval of plants prior to planting.
 - .2 Imported plants must be accompanied by all necessary permits and in accordance with federal and provincial regulations.
 - .3 Departmental Representative reserves the right to approve the plants at the source of supply.
 - .4 The Contractor shall notify the Departmental Representative of the source of supply at least 15 days prior to the delivery of the plants and obtain its approval prior to commencing the work described in this section.
 - .5 Plants provisionally approved at the source of supply may be refused at the site prior to planting due to their condition following delivery or damage caused during delivery or handling.
 - .6 Plants that have not been provisionally approved at the source of supply will be inspected directly on the site.
 - .7 Plants must be formally inspected by the Departmental Representative prior to planting and must have been definitively approved for use for planting purposes.
 - .8 Final approval for use for planting purposes does not preclude the possible refusal of plants due to failure to resume during the warranty period.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .1 Protect plant material from frost, excessive heat, wind and sun during delivery.
 - .2 Protect plant material from damage during transportation:
 - .1 Delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.

- .2 Delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
- .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.
- .3 Storage and Handling Requirements:
 - .1 Immediately store and protect plant material which will not be installed within 1 hour in accordance with supplier's written recommendations and after arrival at site in storage location approved by Departmental Representative.
 - .2 Protect stored plant material from frost, wind and sun and as follows:
 - .1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in sand or topsoil and watering to full depth of root zone.
 - .2 For pots and containers, maintain moisture level in containers.
 - .3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.
- .2 Store and manage hazardous materials in accordance with manufacturer's written instructions.
- .3 Develop a Construction Waste Management Plan and a Waste Reduction Workplan related to Work of this Section.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in the Construction Waste Management Plan and the Waste Reduction Workplan in accordance with Section 01 74 19 – WASTE MANAGEMENT AND DISPOSAL.

1.10 WARRANTY

- .1 For plant material as itemized on plant list the warranty period is 24 months.
- .2 End-of-warranty inspection will be conducted by Departmental Representative.
- .3 Departmental Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

1.11 WASTE MANAGEMENT AND DISPOSAL

- .1 Sort waste for recycling in accordance with Section 01 74 19 – WASTE MANAGEMENT AND DISPOSAL.
- .2 Evacuate all packaging materials from site and route to appropriate recycling facilities.
- .3 Route unused metal parts to metal recycling facility.
- .4 Route unused plastic containers to a plastic recycling facility if these containers are not intended for reuse by Contractor or returned to plant suppliers.
- .5 Place in designated containers substances that meet the definition of toxic or hazardous waste.

- .6 Transport unused disinfectants, fertilizers and anti-desiccants to an approved hazardous waste collection site authorized by the Departmental Representative.
- .7 Ensure that empty containers are sealed and stored in a safe place.
- .8 Dispose of wood waste according to waste sorting program for wood material.

1.12 MAINTENANCE OF TOOLS

- .1 Ensure tools are kept clean and sharp throughout work. It is forbidden to use tools that rush or tear the bark.
- .2 Disinfect tools before cutting new trees.
- .3 In case of diseased trees, disinfect tools before each cut.

Part 2 Products

2.1 PLANT

- .1 Root preparation, size, grade and quality: Canadian Standards for Nursery Stock.
 - .1 Source of Plant Supply: Plants Grown by Plant Hardiness Zones in Canada.
 - .2 The plants must belong to species suitable for the hardiness zone of the land where they are to be planted.
 - .3 Plants must belong to species suitable for their intended use.
- .2 Plants: free from disease, insects, defects or bruises, with a healthy structure and a strong, fasciculate radicular system.
- .3 Trees: trees having a straight trunk and a branch provided and characteristic of the species.
 - .1 Trees greater than 70 mm in size must have had a root precut in the previous year prior before the removal in the field.
- .4 Native plants: not more than 40 mm in diameter, with well-developed crown and characteristic branch of the species. The height of the barrel must not exceed 40% of the total height of the plant.

2.2 TOPSOIL

- .1 Type 1 topsoil mix for tree planting
- .2 Type 2 topsoil mix for planting shrubs, grasses and perennials.

2.3 WATER

- .1 Free of impurities that would inhibit plant growth.

2.4 STAKES AND HARNESS

- .1 T-bar, steel, 40 x 40 x 5 x 2440 mm.
- .2 Harnesses

- .1 For trees with a diameter of 70 mm or less (diameter at stump height), use a rubber collar (garden hose).
- .2 For shafts greater than 70 mm DHS (diameter at stump height), a harness with a nylon webbing (seat belt type), 50 mm wide by a variable length depending on the diameter of the tree or use a rubber collar (garden hose).
- .3 Guying
 - .1 Galvanized wired (gauge no. 12) with protective hose rings 100% rubber, 12.5 mm diameter.

2.5 ANCHORS

- .1 In Wood with tapered end:
 - .1 Type 1: 38 x 38 x 460 mm.
- .2 T-bar, steel
 - .1 Type 2: 40 x 40 x 850 mm

2.6 TRUNK PROTECTION

- .1 Protection material:
 - .1 Perforated spiralled strip;
 - .2 Perforated drain pipe, Ø150 mm;
 - .3 Wire mesh Ø110 mm, 550 mm minimum height.

2.7 FERTILIZER

- .1 Chemical commercial type as recommended by manufacturer and only based on the results of soil tests.

2.8 ANTI-DESICCANT

- .1 Wax-like emulsion.

2.9 MYCORRHIZA

- .1 Inoculant: mycorrhiza mushroom that contains:
 - .1 15 spores/g of *Glomus intraradices*,
 - .2 1x10⁵ spores/g of *Pisolithus tinctorius*,
 - .3 7,5x10³ spores/g of *Scleroderma cepa*,
 - .4 7,5x10³ spores/g of *Scleroderma citrinii*,
 - .5 3,75x10³ spores/g of *Rhizopogon roseolus*,
 - .6 3,75x10³ spores/g of *Rhizopogon subscaerelescens*,
 - .7 3,75x10³ spores/g of *Rhizopogon villosulus*,
 - .8 3,75x10³ spores/g of *Rhizopogon vulgaris*, and
 - .9 2,25x10³ spores/g of *Laccaria laccata*.
- .2 The inoculant is used for all trees and shrubs. The amount of inoculant required for planting shrubs in 2 gallon pots is 125 mL while for trees it will be 250 mL.

- .1 Ensure new roots are in contact with mycorrhiza.
- .2 Use mycorrhiza according to manufacturer's written recommendations.

2.10 RODENT REPELLENT

- .1 Thiram based, specifically prepared to prevent mice from gnawing trees.

2.11 FENCING

- .1 Must be new and of wood, green, height 1200 mm.

2.12 MULCH

- .1 Mulch: Ramial chipped wood
 - .1 A 100 mm (4 inch) layer of mulch should cover the entire surface of the planting beds.
 - .2 Resulting from fragmentation of live woody parts of predominantly leafy trees and shrubs (minimum 80% of the mixture) with a diameter before fragmentation equal to or less than 70 mm.
 - .3 Mass of fragmented woody material must not contain more than 10% softwood. pH between 6.5 and 7.5 (water pH "ratio 1: 1" and buffer pH "method S.M.P".
 - .4 Organic matter content between 25 and 40% (modified Walkley-Black method or fire loss).

2.13 ROPE

- .1 Binding cord no. 111-018070.

2.14 TAPE FOR FANIONS

- .1 Red or orange fluorescent ribbon.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other sections or contracts are acceptable for planting.
 - .1 Visually inspects substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PRE-PLANTING PREPARATION

- .1 Proceed only after receipt of written acceptability of plant material from Departmental Representative.
- .2 Remove damaged roots and branches from plant material.

- .3 Apply anti-desiccant to conifers and deciduous trees in leaf in accordance with manufacturer's instructions.
- .4 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 the sediment and erosion control plan, specific to site.

3.3 EXCAVATION AND PREPARATION OF PLANTING BEDS

- .1 Preparation of planting beds.
- .2 For individual planting holes:
 - .1 Stake out location and obtain approval from Departmental Representative prior to excavating.
 - .2 Excavate to depth and width as indicated.
 - .1 Perennials: make a hole twice the size of the pot.
 - .2 Potted Shrubs: Dig a hole twice the size of the pot.
 - .3 Trees: dig a hole twice the size of the pot or root ball.
 - .3 Remove the subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
 - .4 Scarify sides of planting hole.
 - .5 Remove water which enters excavations prior to planting. Notify Departmental Representative if water source is ground water.

3.4 PLANTING

- .1 For bare root stock, remove burlap completely, taking care not to damage the root ball.
- .2 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.
- .3 Plant vertically in locations as indicated.
- .4 Extend the roots to the bottom of the planting pit and cut the root system of plants in 2-3 locations around the root, if it has rolled up.
- .5 Cut dead, broken, dried or long roots of shrubs or small shrubs in containers.
- .6 Cut branches or portions of dead, dried or damaged branches and stalks.
- .7 For trees and shrubs:
 - .1 Add planting soil and the required amount of mycorrhiza inoculant to the bottom of the hole and directly to the bottom half of the root ball. The inoculant must be in contact with the root ball before filling. Backfill in successive layers.
- .8 Make sure the plant is straight and the collar is level with the ground.
- .9 Tamp each lift to eliminate air pockets.

- .10 When two thirds of depth of planting pit has been backfilled, fill remaining space with water.
- .11 After water has penetrated into soil, backfill to finish grade.
- .12 Only for trees, form watering saucer as indicated.
- .13 Water plant material thoroughly.
- .14 After soil settlement has occurred, fill with soil to finish grade.

3.5 TRUNK PROTECTION

- .1 Install trunk protection on deciduous trees as indicated.
- .2 Install trunk protection before installation of tree supports.

3.6 TREE SUPPORT

- .1 For trees less than 70 mm DHS (diameter at stump height):
 - .1 Install guards on the dominant wind side.
 - .2 Use 2 supports per tree.
 - .3 Push the guard 1,150 mm inside the floor (1,250 mm outside).
 - .4 Apply guardians during planting.
 - .5 Connect the trunk of the tree to the truss with a gauge 12 steel wires and a rubber hose (garden hose).
- .2 Place an agricultural drain hose at the base of each tree (cut the hose along its length for installation).
- .3 For trees over 70 mm DHS (diameter at stump height):
 - .1 Install three guy wires attached to anchors around deciduous trees over 3m and around evergreen trees over 3 m in height.
 - .1 Use Type 1 guy wire with wire clamps for trees less than 70 mm in diameter and guy wire with wire clamps for trees greater than 70 mm in diameter.
 - .2 Install guy clamps above branches to prevent slippage, approximately 2/3 of the total height for evergreen trees and half the height in the case of Deciduous trees. The clamps must not be mounted more than 2.5 m from the ground.
 - .3 Cable ties shall be of sufficient circumference to encircle the trunk and allow a clearance of 50 mm between the collar and the trunk. Insert a bracing wire into the collar encircling the trunk of the tree, and attach it to the main wire with a wire clamp or twist it; Cut the wire near the twist. Arrange the guy wire also around the trunk, at intervals of about 120 degrees.
 - .4 Plant the stakes at equal intervals around the shaft so that the stay wire is at an angle of 45 degrees to the ground. Install them at the angle that will provide maximum resistance to the wire.
 - .5 Attach the stay wires to the anchors and secure them by twisting them with wire clamps.

- .6 Install the tensioners and tension the shrouds with the clearance required to allow a slight movement of the shaft.
- .7 Saw top of wooden anchor pegs 100 mm above grade or at height determined by Departmental Representative.
- .8 Install fluorescent tape as pennants on stays, as indicated.

3.7 MULCH

- .1 Before applying mulch, add soil, if necessary, to compensate for soil compaction.
- .2 Spread mulch according to directions.

3.8 FERTILIZATION AND MYCORRHIZE

- .1 Mycorrhize: follow manufacturer's specifications but at least the following quantities:
 - .1 Trees: Incorporate 500 ml of mycorrhiza into the planting pit per tree.
 - .2 Shrubs: Incorporate 100 ml of mycorrhiza per shrub into the planting hole.
 - .3 Perennials: Incorporate 30 ml of perennial mycorrhiza into the planting hole.

3.9 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following maintenance operations from time of planting to acceptance by Departmental Representative.
 - .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
 - .1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
 - .2 Remove weeds monthly.
 - .3 Place disturbed mulch as needed. For non-mulched areas, cultivate monthly to keep top layer of soil friable.
 - .4 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, provincial and municipal regulations. Obtain product approval from departmental representative prior to application.
 - .5 Remove dead or broken branches from plant material.
 - .6 Keep trunk protection and guy wires in proper repair and adjustment.
 - .7 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

3.10 MAINTENANCE DURING WARRANTY PERIOD

- .1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.
 - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
 - .1 Reform damaged watering saucers.
 - .2 Remove weeds monthly.
 - .3 Place disturbed mulch as needed. For non-mulched areas, cultivate monthly to keep top layer of soil friable.

- .4 If required to control insects, fungus and disease, use appropriate control methods in accordance with federal, provincial and municipal regulations. Obtain product approval from departmental representative prior to application.
- .5 Remove dead, broken or hazardous branches from plant material.
- .6 Keep trunk protection and tree supports in proper repair and adjustment.
- .7 Remove trunk protection, tree supports and level watering saucers at end of warranty period.
- .8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
- .2 Submit monthly written reports to Departmental representative identifying:
 - .1 Maintenance work carried out.
 - .2 Development and condition of plant material.
 - .3 Preventative or corrective measures required which are outside contractor's responsibility.

Schedule of maintenance

Interventions	Date
Remove snow fences, stakes and geotextile	From April 1 st to April 10
Detach shrubs	From April 1 st to April 10
Clean the Site (s)	From April 17 to May 15
Remove dead or damaged branches	From April 17 to May 15
1 st Weeding and cleaning	From May 23 to 27
2 ^e Weeding and cleaning	From 19 June to 23
3 ^e Weeding and cleaning	From July 17 to 21
4 ^e Weeding and cleaning	August 14 to 18
5 ^e Weeding and cleaning	September 1 st to 15
Installation of winter protection	October 5 to November 13

3.11 SNOW PROTECTION

- .1 Deciduous trees of any size: Tree trunks must be wrapped with jute or waxed cardboard as winter protection.
- .2 The jute or tarred paper spirals from the bottom up to the second branch and must be removed at the beginning of spring.
- .3 Trees along fast-moving axes: They must have their tops covered with a Texel "Arbotex" type membrane, or other approved product to protect them against salt spray.
- .4 Conifers less than 1.2 m high: They must be protected with light windbreaks consisting of a 213-gram snow-covered fence. The fence is unrolled around the conifers and attached to the stakes.
- .5 Conifers over 1.2 m in height: High strength windbreak screens must be used. They are well anchored on the ground and strongly braced to withstand heavy winter squalls. They can consist of wooden frames 1.2 m wide and up to five (5) m high, always 30 cm higher than the height of the tree. They are mounted in 50 mm x 50 mm rafters partitioned every 60 cm and covered with jute stapled.

- .6 Long-branched shrubs: Shrubby long-limbed shrubs and shrubs likely to be damaged by snow removal or snow accumulation must be tied together with jute ropes.
- .7 Hurdles: The hedges are protected by light wooden structures, for the duration of the winter.
- .8 Perennials and grasses: The planting beds are covered with pine branches or any other material accepted by the Departmental Representative fulfilling the same conditions.

3.12 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 – 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.

3.13 CLOSEOUT ACTIVITIES

- .1 Submit maintenance reports for trees, shrubs, and other plantings.

3.14 CONDITIONS OF ACCEPTANCE

- .1 Planting work will be accepted by the Departmental Representative, provided that the plants show well-developed foliage, vigorous growth and conform to the requirements of the plans, details and specifications.
- .2 Plantings carried out in the fall will be approved the following spring, one month after the start of the growing season, provided that the conditions for acceptance have been met.

3.15 FINAL ACCEPTANCE

- .1 Final acceptance will be at the end of the warranty period if all plants are in good growth.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies the requirements for reinstating damaged landscaped areas within the work areas, staging areas, access routes and areas disturbed by the work including but not limited to:
 - .1 Supplying, placing and finish grading of topsoil bed.
 - .2 Supplying and placing nursery sod.
 - .3 Restoring lawn by sodding grass.
 - .4 Maintaining sodded areas until acceptance.
- .2 All disturbed sodded areas, within or outside of the limits of the construction zone, to be covered with topsoil, smoothed to finish grade, and re-sodded at Contractor's expense.
- .3 Work specified elsewhere:
 - .1 Protection of mature trees and other plant materials during construction: to Section 01 35 46 – ARCHEOLOGICAL, CULTURAL, ENVIRONMENTAL PROCEDURES and 31 01 90.33 – TREE AND SHRUB PRESERVATION.
 - .2 Planting of trees shrubs and ground cover: Section 32 93 10 – TREES SHRUBS AND GROUND COVER PLANTING.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement of General Landscaping.
- .2 Payment of General Landscaping will be included in the Lump Sum Price, as set out in Section 01 22 01 – Measurement and Payment:
 - .1 Item No. L16 - Landscaping.
- .3 Maintenance during the warranty period is to be included in this item. The price must include the supply of all labor and all materials and equipment required for the specified maintenance work to be performed during the warranty period, including fertilization, watering and repair.

1.3 RELATED SECTIONS

- .1 Section 01 11 00 - GENERAL INSTRUCTIONS.
- .2 Section 01 35 46 - ARCHEOLOGICAL, CULTURAL, ENVIRONMENTAL PROCEDURES.
- .3 Section 32 01 90.33 - TREE AND SHRUB PRESERVATION
- .4 SECTION 32 93 10 –TREES, SHRUBS AND GROUND COVER PLANTING

1.4 REFERENCE STANDARDS

- .1 Comply with Federal and Provincial Legislation (Environmental Quality Act and Pesticides Act) regarding the use of pesticides.

1.5 PRELIMINARY INSPECTION

- .1 Establish condition of sodded areas in conjunction with Departmental Representative before starting work.
- .2 Departmental Representative will inspect the sodded areas that are outside of the construction limits but damaged due to construction activities or as a result of temporary works and determine the areas that need to be sodded.

1.6 DOCUMENTS/SAMPLES TO BE SUBMITTED

- .1 Documents and samples: submit required samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit one sample of each type of sod and earth mixture.
- .3 Samples must be approved by the Departmental Representative.
- .4 Submit all documents required under subsections of this section of the specification.

1.7 SOURCE QUALITY CONTROL

- .1 At least 2 weeks before starting final topsoil work, advise Departmental Representative of proposed sources of topsoil and sod.
- .2 When proposed sources are approved, use no other sources without written authorization from Departmental Representative.

1.8 QUALITY CONTROL

- .1 Test reports: submit test reports certifying that the products and materials meet the requirements for physical characteristics and performance criteria.
- .2 Certificates: submit documents signed by the manufacturer certifying that the products, materials and materials meet the requirements for physical characteristics and performance criteria.
- .3 Pre-Implementation Meeting: Hold meeting to review work requirements, implementation instructions and warranty terms.

1.9 DELIVERY AND STORAGE

- .1 Schedule deliveries in order to minimize storage at job site without causing delays.
- .2 Deliver, unload and store rolled sod on pallets only.
- .3 Deliver sod to site within 24 hours of being lifted and lay sod within 36 hours of being lifted.
- .4 Do not deliver small, irregular, or broken pieces of sod. Departmental Representative will reject these.
- .5 During wet weather, allow sod to dry sufficiently to prevent tearing during lifting and handling.
- .6 During dry weather, protect sod and from drying. Water sod as necessary to ensure its vitality and prevent dropping soil when handling. The Departmental Representative will reject dried-out sod.

- .7 Supply sod in standard-sized units and of a uniform thickness, rolled for easy handling.

1.10 SCHEDULING OF SODDING WORK

- .1 Schedule sod laying to coincide with final topsoil operations.
- .2 Obtain Departmental Representative's approval of the schedule for sodding before proceeding.
- .3 Schedule dependant on availability of sod.
- .4 Protect grass slabs from heat, drying out and frost from collection to installation.
- .5 Place grass slabs within 48 hours of sampling except in cool, rainy weather.
- .6 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.

1.11 DEFINITIONS

- .1 Compost:
 - .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
 - .2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
 - .3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth, and contain no toxic or growth inhibiting contaminants.
 - .4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B) published in 1996.

1.12 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with the Departmental Representative specifications.
- .2 Divert unused soil amendments from landfill to official hazardous material collections site approved by the 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

1.13 WARRANTY

- .1 Guarantee grassed areas for one year from date of provisional acceptance of work. Recovery of defective work will be warranted for an additional period equivalent to the original warranty.

Part 2 Products

2.1 TOPSOIL

- .1 New topsoil, according to the earth mixture, to be a friable sandy-clayish loam of good humus content, suitable for supporting growth, free from:
 - .1 Debris and stones over 50 mm diameter.

- .2 Coarse vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
- .2 Type 1 - Seeding and Sod
 - .1 Use a mixture of black soil, coarse sand and two parts of loam.
 - .2 Characteristics of mixtures:
 - .1 Organic matter between 4% and 7%.
 - .2 pH between 6 and 7.
 - .3 Cationic exchange capacity (C.E.C.) between 10 and 20 MEQ / 100 g.
 - .4 Water retention capacity: maximum 20%.
 - .5 Phosphorus: 200 kg / ha.
 - .6 Potassium: 400 kg / ha.
 - .7 Calcium: 4,500 kg / ha.
 - .8 Magnesium: 640 kg / ha
- .3 Type 2 - Tree trenches and continuous trenches, planting beds for shrubs, perennials and grasses.
 - .1 Use a mixture consisting of three parts of black earth, one part of coarse sand, two parts of loam and one part of manure and / or compost completely decomposed.
 - .2 Characteristics of mixtures:
 - .1 Organic matter between 10% and 15%.
 - .2 pH between 6 and 7.
 - .3 Cationic exchange capacity (C.E.C.) between 10 and 20 MEQ / 100 g.
 - .4 Water retention capacity: maximum 20%.
 - .5 Phosphorus: 200 kg / ha.
 - .6 Potassium: 400 kg / ha.
 - .7 Calcium: 4,500 kg / ha.
 - .8 Magnesium: 640 kg / ha
- .4 The topsoil must meet the CCME residential and parks standard contractor shall proceed an ecotoxicological analysis to prove the conformity.
- .5 Advise the Departmental Representative of supply sources of proposed topsoil and aquatic clay soil to be utilized with sufficient lead time for testing.
- .6 Approval of topsoil material subject to soil testing and analysis. Testing of topsoil will be carried out by testing laboratory of the Contractor. The Contractor will pay for cost of tests. Soil sampling, testing and analysis to be in accordance with Provincial standards.
- .7 Soil testing by recognized testing facility for PH, P and K, and organic matter. The laboratory should recommend amendments to make the land conform to the specifications.

2.2 FERTILIZER

- .1 Complete synthetic commercial fertilizer containing not less than 65% insoluble nitrogen.

- .2 Composition to be determined based on analyzes, generally for sod (fertilizers 10-6-4) and for trees and shrubs (10-52-16).
- .3 Bone powder: fine ground and containing at least 20% phosphoric acid and 3% nitrogen.

2.3 SOIL AMENDMENT

- .1 Peat moss
 - .1 Consisting of stems and cellular leaves, partly composed mainly of sphagnum moss. The minimum pH value should be 4.5 and the maximum value of 6.0.
 - .2 Consist of elastic and homogeneous brown consistency.
 - .3 Free from wood and harmful materials that may inhibit growth.
 - .4 Composed of shredded particles measuring at least 5 mm.
- .2 Lime
 - .1 Ground agricultural lime containing not less than 85% carbonates.
 - .2 Particle size: 90% by weight passing through the 1 mm mesh screen; 50% by weight passing through the 0.125 mm mesh screen.
- .3 Organic constituents (manure and / or compost)
 - .1 Organic constituents must be derived from a biological process that decomposes by-products of plant and / or animal origin (excluding poultry manure) into a stable organic product rich in humic compounds. The material will be homogeneous, will have the appearance of a potting soil and will not give off any foul odor.

2.4 NURSERY SOD

- .1 Nursery sod: Commercial grade turf grass nursery sod, Kentucky Bluegrass/Fine Fescue, to "Canadian Standards for Nursery Stock" by the Canadian Nursery Landscape Association(<http://www.canadanursery.com>).
- .2 Grass: in slabs or rolls over 750 mm in width, mostly grown from certified Kentucky bluegrass seed and registered cultivars. Soil
- .3 Sod establishment support:
 - .1 Geotextile fabric: biodegradable, 40 mm square mesh.
 - .2 Wooden pegs: 20x20x300 mm.

Part 3 Execution

3.1 PREPARATION OF TOPSOIL SUB-GRADE

- .1 Verify that grades are correct. If discrepancies occur, notify Departmental Representative and do not start other landscape work in that area until instructed to do so in writing by Departmental Representative.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring that new sodded surface will be faired-off to the existing sodded areas with no sharp transition.

- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials. Remove debris which protrudes more than 50 mm above surface. Dispose of removed material off site.
- .4 Coarse cultivate entire area which is to receive topsoil to depth of 75 mm. Coarse cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.2 PLACING AND SPREADING OF TOPSOIL

- .1 Place topsoil after Departmental Representative has accepted sub-grade.
- .2 Spread the topsoil in uniform layers not exceeding 150 mm, of the following minimum thickness after settlement and 80% compaction:
 - .1 150 mm for areas to be seeded.
 - .2 300 mm for flowerbeds and flower clumps.
 - .3 450 mm for shrub beds.
- .3 Keep final elevation 15 mm below finished grade to allow room for sod.
- .4 Manually spread topsoil around trees, shrubs and obstacles.
- .5 Grade to eliminate rough spots and low areas and ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.
- .6 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative. Leave surfaces smooth, uniform and firm enough to resist deep footprints.

3.3 ACCEPTANCE OF TOPSOIL GRADING

- .1 Level the soil to eliminate troughs and rough edges and promote good drainage. Make a layer of friable soil by loosening the soil and raking it.
- .2 Replenish the topsoil to achieve the prescribed bulk density using equipment approved by the Departmental Representative. Leave the surfaces smooth, even and firm so that no deep traces are formed under the weight of a person.
- .3 Departmental Representative will inspect topsoil in place and determine acceptance of depth of topsoil and finish grading.

3.4 SURPLUS TOP SOIL MATERIAL

- .1 Dispose of materials not required off-site.

3.5 SODDING

- .1 Obtain Departmental Representative's approval of topsoil grade and depth before starting sodding.
- .2 Loosen surface of topsoil where it has become compacted.
- .3 Protect sodded areas against any damage until lawn has been fully established. Supply and install required protective apparatus.

3.6 SOD PLACEMENT

- .1 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.

- .2 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .3 Roll sod as directed by Departmental Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted. If the surface soil is dry, the lawn should be watered before rolling.
- .4 On slopes greater than 3:1 (run/rise) lay sod perpendicular to slope and secure sod with stakes. Place stakes 3 per sq.m., 100 mm below top edge to prevent shifting of sod and drive stakes flush with top of sod soil.
- .5 As soon as the turf is in place, it must be watered, in fine rain, to ensure a wetting of up to 100 mm in the soil.

3.7 SOD PLACEMENT ON SLOPES AND PEGGING

- .1 Place geotextile in designated locations or on slopes that are more inclined than 2: 1 and secure in accordance with manufacturer's instructions.
 - .1 Extend mesh before lawn placement on fertilized soil layer. Care must be taken not to damage the prepared surface during installation. Overlap strips of mesh of about 15 cm, fix with stakes inserted in these overlaps. Extend the sod sheets on this frame and secure them with stakes.

Note: The first digit represents the length and the second digit the height (eg 3: 1).
- .2 Start laying sod at bottom of slopes.
- .3 Plant stakes in lawn slabs on steep slopes with gradients greater than 3: 1 to 2: 1 and in slabs less than 1 m from sewer inlets and within 1 m of canals and evacuation ditches. Arrange the stakes as follow:
 - .1 100 mm below top edge at 200 mm on centre for first sod sections along contours of slopes.
 - .2 Not less than 5pegs per square metre.
 - .3 Not less than 6-9 pegs per square metre in drainage structures. Adjust pattern as directed by Departmental Representative.
 - .4 Drive pegs to 20 mm above soil surface of sod sections.

3.8 MAINTENANCE OF SODDED AREAS

- .1 Maintain sodded areas until accepted by Departmental Representative.
- .2 Patch bare and dead spots immediately.
- .3 Apply water daily to ensure establishment and continuous growth of grass. Apply sufficient water to ensure moisture penetration of 100 mm into soil below sod.
- .4 Cut grass when it reaches a height of 80 mm. Cut grass thereafter frequently enough to be kept at a height of 80 to 100 mm. Allow clippings to remain.
- .5 The grass cutting should be done when the lawn is dry.
- .6 Maintain sodded areas weed free 95%.

- .7 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at perpendicularly and water in well to allow the fertilizer to penetrate into the soil.

3.9 ACCEPTANCE OF SODDED AREAS

- .1 Approval of material at its source does not prevent subsequent rejection on job site.
- .2 Sod to be approved when:
 - .1 Growth of sodded areas has been properly established;
 - .2 Turf is free of bare and dead spots;
 - .3 No surface soil is visible when grass has been mowed to a height of 60 mm; and,
 - .4 Grass has been cut a minimum of 2 times.
- .3 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.
- .4 If the sod dies/dries, after it had been provisionally accepted, it is contractor's responsibility to reinstate or maintain the sod. Departmental Representative reserves the right to request contractor to water and maintain the sod until warranty period is over.

3.10 CLEANING

- .1 Dispose of surplus materials, except the offsite topsoil in accordance with the Departmental Representative and disposal of construction waste.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This Section describes the installation of underground electric cable conduits for exterior services such as lighting, reconstructed electrical circuits and installed conduits for future use.

1.2 MEASUREMENT AND PAYMENT

- .1 There will be no measurement for payment for direct buried underground cable ducts.
- .2 Payment included in Lump Sum Price, as set in Section 01 22 01 – MEASUREMENT AND PAYMENT:
 - .1 Item No. L27 - Electrical Work

1.3 RELATED REQUIREMENTS

- .1 Section 01 74 00 – Cleaning
- .2 Section 01 74 19 – Waste Management and Disposal
- .3 Section 26 05 00 – Common Work Results for Electrical

1.4 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No 211.2, Rigid PVC Conduits

1.5 DRAWINGS

- .1 The number of conduits and the size of conduits are indicated on the drawings. If no dimension is indicated, consider a minimum interior diameter of 78 mm.
- .2 All conduit dimensions indicated on plans refer to the interior diameter of conduits.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.7 QUALITY CONTROL

- .1 Quality control submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Certificates: signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.
 - .2 Manufacturer's Instructions: for installation and special handling criteria, installation sequence, cleaning procedures.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse by manufacturer of packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

1.9 RECORD DRAWINGS

- .1 Provide record drawings, including details of cable duct materials, maintenance and operating instructions.

Part 2 Products

2.1 PVC CONDUITS AND FITTINGS

- .1 Rigid PVC conduit: to CSA C22.2 No. 211.1, type rigid PVC for direct burial, 3-inch (78 mm interior diameter) with minimum wall thickness at any point of 2.8 mm. Nominal length: 3.0 m or more. Type DB2 (thin wall) PVC conduits unacceptable. Trade size as indicated on plans.
- .2 Rigid PVC split conduits required.
- .3 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as conduit, to make a complete installation.
- .4 Rigid PVC 90 degrees, 45 degrees and 22.5 degrees angle couplings bend as required.
- .5 Rigid PVC 5° angle couplings as required.
- .6 Expansion joints as required.
- .7 Preformed, interlocking intermediate conduit spacers for duct size as indicated.

2.2 SOLVENT WELD COMPOUND

- .1 Solvent cement for PVC conduits joints.

2.3 CABLE PULLING EQUIPMENT

- .1 6 mm stranded nylon pull rope tensile strength 5 kN.

2.4 MARKERS

- .1 Concrete type cable markers: as indicated, with words: "Cable", "Joint" or "Conduit" impressed in top surface, with arrows to indicate change in direction of conduits runs.
- .2 150 mm wide, 4 mil, polyethylene marker tape in all trenches. Use red colored tape. Install at depth as per drawings.

2.5 WARNING TAPE

- .1 Standard 4-mil polyethylene 76 mm wide tape, yellow with black letters, imprinted with "CAUTION BURIED ELECTRIC CABLE BELOW".

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Install conduits in accordance with manufacturer's instructions and as elevations on plans.
- .2 Clean inside of conduits before pulling cables and conductors.
- .3 Install plastic conduits spacers and ensure full, even support every 1.5 m and smooth transition throughout duct length.
- .4 Install plugs and cap both ends of conduits to prevent entrance of foreign materials during and after construction.
- .5 Pull through each duct wooden mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter.
 - .1 Pull stiff bristle brush through each duct immediately before pulling-in cables.
- .6 Install a pull rope continuous throughout each conduit run with 3 m spare rope at each end.
- .7 Place continuous strip of warning tape 300 mm above duct before backfilling trenches.
- .8 Install markers as required.
- .9 Notify the Departmental Representative for field review upon completion of direct buried conduits and obtain acceptance prior to backfill.

3.3 TOLERANCES

- .1 Installation of conduits must comply with elevations indicated on plans and avoid conflicts with existing utilities such as National Capital Commission (NCC), BELL and Hydro-Ottawa conduits.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove waste containers, recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 1General

1.1 DESCRIPTION

- .1 This section specifies the precautions that should be considered to preserve the watercourse.

1.2 MEASUREMENT AND PAYMENT

- .1 The work covered by this section will not be considered separately for payment but will be considered as incidental to Work of the specification.

1.3 RELATED REQUIREMENTS

- .1 Section 01 22 01 - MEASUREMENT AND PAYMENT.
- .2 Section 01 33 00 - SUBMITTAL PROCEDURES.
- .3 Section 01 35 46 - ARCHEOLOGICAL, CULTURAL, ENVIRONMENTAL PROCEDURES.
- .4 Section 01 71 00 - EXAMINATION AND PREPARATION.
- .5 Section 01 78 00 - CLOSEOUT SUBMITTALS.
- .6 Section 31 11 00 - CLEARING AND GRUBBING.
- .7 Section 32 01 90.33 - TREE AND SHRUB PRESERVATION.

1.4 ENVIRONMENTAL REQUIREMENTS

- .1 Circulation of construction equipment in water is prohibited.
- .2 Do not use borrow material from watercourse beds.
- .3 Design and construct temporary crossings to minimize environmental impact to watercourse and wetland.
- .4 Ensure construction activities do not impact spawning beds.
- .5 Dumping excavated fill, waste material, or debris in watercourse or wetland is prohibited.
- .6 Underwater blasting is prohibited.
- .7 Carry out work to requirements of any work permits.
- .8 Obtain work permits from governing Federal, Provincial, Municipal and/or Conservation Authority.

1.5 REFERENCE STANDARDS

- .1 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 EXISTING CONDITIONS

- .1 Maintain existing flow pattern in natural watercourse systems.

3.2 SITE CLEARING AND PLANT PROTECTION

- .1 Temporary Erosion and Sedimentation Control:
- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control 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 once disturbed areas have been restored and stabilized.
- .2 Undertake site clearing to Section 31 11 00 – CLEARING AND GRUBING.
- .3 Undertake plant protection to Section 32 01 90.33 – TREE AND SHRUB PRESERVATION.
- .4 Conduct work to minimize disturbance to vegetated buffer zones. Protect trees and plants on site and adjacent properties where indicated.
- .5 Protect roots of designated trees to dripline or as instructed by Departmental Representative during excavation and site grading to prevent disturbance or damage.
- .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .6 Remove only trees that may offer future blockage problems after obtaining approval by Departmental Representative.
- .7 Maintain temporary erosion and pollution control features installed under this contract.

3.3 DRAINAGE

- .1 Pumping water containing suspended materials into watercourse is prohibited.
- .2 Establish silt control measures to accommodate safe surface water entry to watercourse as directed by Departmental Representative.
- .3 Remove sediment and erosion control measures with approval of Departmental Representative.

3.4 SITE RESTORATION

- .1 Upon completion of Work, install erosion protection on river and banks and re-establish vegetation along edge of watercourse banks as approved by Departmental Representative.
- .2 Protect new planting material from disturbance by construction activities.
- .3 Remove sediment and erosion control measures with approval of Departmental Representative.

3.5 MITIGATION MEASURES

- .1 Fish / Fish Habitat:
 - .1 Restrict in-water works to approved timing windows.
 - .2 Should conditions at the work site indicate that there are unforeseen negative impacts to fish or their habitat, all work shall cease until the problem has been corrected and/or DFO are consulted.
 - .3 To prevent fish from being killed by the placement of rockfill in watercourses measures should be taken to move fish away from the immediate area before placement of rockfill. Methods could include: 1) the combination of noise and bubbles from an air compressor could be utilized for a sufficient amount of time to direct fish away from the area where rockfill will be placed underwater; 2) place both turbidity curtains side by side across Cut, then pull one away pushing fish away from corridor; 3) Capture fish stranded behind turbidity curtains and release in safe area.
 - .4 Fish trapped in area to be dewatered must be captured alive and relocated outside areas to be dewatered before commencement of pumping.
 - .5 Implement mitigation measures in accordance with Fisheries and Oceans Canada recommendations, "Measures to avoid causing harm to fish and fish habitat".
- .2 Surface Water:
 - .1 Refuel equipment off slopes, and minimum of 30 m away from waterbodies/aquatic habitats. Refuel heavy equipment in staging area designated for refueling with spill mitigating measures in place. Refuel machinery and follow spill avoidance procedures as specified above in Soil section.
 - .2 Store oils, lubricants, fuels, and chemicals in secure areas on impermeable pads, 30 m away from a waterbody, and provide containment berms as necessary.
 - .3 All materials placed in the water must meet applicable regulations governing placement of fill in water bodies.
 - .4 Any small tools and equipment operating in waterbodies must be cleaned prior to entering the water and inspected daily for leaks. Equipment should never be left in water overnight. Do not skid construction material across area and inspect daily for leaks.
 - .5 Do not pump water that flows/seeps through cofferdam or seeps into construction excavation work area directly into waterways. Send all discharge to sediment traps in order to satisfy discharge requirements. Install sediment trap as required to treat surface water runoff in the construction area and prevent sediment from entering waterways. Water quality downstream of construction site and/or released to watercourses not to exceed background turbidity readings of 8

nephelometric turbidity units (NTU) or change of 25 mg/l for suspended solids.
Dispose of water so that it does not create a safety or health hazard, or cause damage to the environment, to adjacent property or cause erosion.

- .6 Install sediment and erosion control structures in waterbodies (e.g., silt curtains, cofferdams) before construction and inspect devices daily.

END OF SECTION