PROJECT TITLE REPLACEMENT OF LOWER BREWERS SWING BRIDGE

PROJECT NUMBER 30037015

PROJECT DATE October 29, 2021

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END OF TABLE

Part 1 General

1.1 PRECEDENCE

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

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Note throughout this specification the Related Sections portion of each specification does not limit the interrelationship between all of the specification and dependence of all sections in any way. The listing of a related section only highlights a particular relationship and all other sections still apply to the work of each specification section.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises the replacement and rehabilitation of the Lower Brewers Swing Bridge, abutments, roadway, and associated facilities in order to deliver a working swing bridge replicating the current swing bridge in general form.

.2 The contractor will be responsible as per the general conditions, specifications, and drawings for the timely completion of the work associated with this contract, completing the work in a workman like manner, and ensuring the quality of the work of their own forces and the work and delivery of all subcontractors.

.3 The intent of the project is to replicate the original bridge as close as possible with modifications only as specified in the contract drawings and specification.

.4 There is significant structural timber work. The timber work must be completed in a manner that replicates the existing bridge allowing the modern modifications specified in the drawings and must be treated and coated (where specified) with the treatment and coating systems specified in the contract documents.

.5 There is significant concrete work to be completed to construct a new west abutment, pivot pier. east abutment, and ancillary components. The concrete work must be completed in a manner that replicates the existing foundations allowing the modifications specified in the drawings. Care must be taken to ensure quality workmanship which results in a high-quality structure and match the degree of detail in formwork to that of the existing or better.

.6 The project milestones set out in the contract is of critical importance to Parks Canada (“The Owner”). The completion of work, and intermediate milestones shall be monitored and adhered to in order to ensure the work is completed by the dates specified.

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 MINIMUM STANDARDS

.1 Execute work to meet or exceed:

.1 The provisions of the CAN/CSA S6:19 Canadian Highway Bridge Design Code.

.2 National Building Code of Canada 2015, National Fire Code of Canada 2015, Ontario Building Code 2015 and any other relevant code of provincial or local application, including all amendments up to the project completion date, provided that, in any case of conflict or discrepancy, the more stringent requirements shall apply.

.3 Rules and regulations of authorities having jurisdiction.

.4 Fire Commissioner of Canada, No. 301, Standard for Construction Operations, and No. 302, Standard for Welding and Cutting, June 1982

.5 Occupational Health and Safety Act and Regulations for Construction Projects, Revised Statutes of Ontario 1990, Chapter O.1 as amended, O. Reg. 213/91 as amended, R.R.O. 1990, Reg. 834. O. Reg. 629/94 as amended, Diving Operations.

.6 Environmental Protection Act, O. Reg. 102/94, O. Reg. 103/94, and Regulation 347.

1.2 TAXES

.1 Pay applicable Federal, Provincial, and Municipal taxes.

1.3 FEES, PERMITS AND CERTIFICATES

.1 Provide authorities having jurisdiction with any and all information requested.

.2 Pay fees and obtain certificates and permits required.

.3 Furnish certificates and permits to the owner.

1.4 EXAMINATION

.1 Before submitting tender, examine existing conditions and determine conditions affecting work.

.2 Obtain all information which may be necessary for proper execution of the Contract.

1.5 SITE

.1 Confine work, including temporary structures, plant, equipment, and materials to the minimum required to complete construction. An area will be agreed upon, based on the equipment and methods to be employed. The parking lot area to the east of the bridge will be available to the contractor and it is anticipated that this area and the roadway will be sufficient for a work area. The contractor shall minimize the time when this area is in use and be responsible for any damage to the surfaces and features.

.2 Contractor Parking is to be confined to the site and is to not interfere with the adjacent properties, driveways, etc. including the portion of the road beyond the actual Parks

Canada Property. Areas used for parking shall be cleaned at the end of their use. If areas of asphalt are damaged in any way, they shall be replaced at the contractors expense.

.3 Make adjustments, at the direction of the Departmental Representative, to correct any issues which may affect neighbouring properties.

.4 Off site work that is required to complete the work shall be completed at a facility arranged and paid for by the contractor.

.5 Locate temporary buildings, roads, walks, drainage facilities, and services as directed and maintain in a clean and orderly manner.

1.6 CONSTRUCTION & STORAGE AREA

.1 The limits of the Construction Area and Storage Area are shown on the drawings. Should the contractor require additional area for work and storage, the contractor will be responsible for arranging for permission to use these areas and for obtaining releases from the affected owners at the end of the project, indemnifying the contract and the owner from any claim from the owner of the land used in the form acceptable to the Departmental Representative.

1.7 DOCUMENTS

.1 Keep on site one copy of contract documents and reviewed shop drawings.

1.8 DEPARTMENTAL REPRESENTATIVE

.1 Parks Canada will appoint or designate a Departmental Representative for this contract. The contractor will be informed, in writing, of the designated individual or individuals. Should it be required to change the Departmental Representative, the contractor will be informed in writing.

.2 The Departmental Representative may designate a person or persons to complete specific inspections but all decisions that affect cost and final acceptance of each item of work must be completed and approved by the Departmental Representative.

1.9 ADDITIONAL DRAWINGS

.1 Departmental Representative may furnish additional drawings to clarify work.

.2 Such drawings become part of the Contract Documents.

1.10 REPRODUCTION OF CONTRACT DOCUMENT

.1 Reproduce and distribute contract documents and all drawings to all subcontractor and contractor employees required to adequately control the work and provide information to all trades.

1.11 LAYOUT OF WORK

.1 Immediately upon entering site for purpose of beginning work on this project, locate all general reference points and take proper action necessary to prevent their disturbance.

.2 Supply stakes and other survey markers required for this work. Employ competent personnel to lay out work in accordance with lines and grades provided.

.3 Maintain all reference points and markers for duration of contract.

1.12 CO-OPERATION & PROTECTION

.1 Execute work with minimum disturbance to occupants, public and normal use of site. Make arrangements with Departmental Representative to facilitate execution of work.

.2 Maintain access and exits.

.3 Provide necessary barriers, warning lights, and signs. Replace damaged existing and new signs and work with material and finish to match work of similar nature specified elsewhere in the contract or to match the original in good condition if no similar work is specified.

1.13 EXISTING UTILITIES

.1 Establish location, protect, and maintain existing utility lines. Note that there are overhead power lines on site and all precautions during lifting shall be taken to protect workers and the integrity of the lines and service.

.2 Connect to existing utilities with minimum disturbance to pedestrian and vehicular traffic.

.3 Contractor shall arrange and pay for all temporary heating, power, water connection, supply, and reinstatement for use on the Contract.

.4 No electrical power is available to the contractor from the building or lock. The contractor shall provide all connections and power required to complete the work.

1.14 MATERIAL AND EQUIPMENT

.1 Use new products and materials unless otherwise specified.

.2 Deliver and store material and equipment to manufacturer's instructions with manufacturer's labels and seals intact.

.3 When material or equipment is specified by standard or performance specifications, upon request of Departmental Representative, obtain from manufacturer an independent testing laboratory report, stating that material or equipment meets or exceeds specified requirements.

1.15 INSPECTION AND TESTING

.1 The Departmental Representative may employ an Inspection and Testing company to ensure work conforms with Contract Documents.

.2 When initial tests and inspections reveal work that does not conform to contract requirements, the contractor shall pay for tests and inspections required by Departmental Representative on corrected work.

1.16 FIRES

.1 Burning any material or rubbish on site is not permitted.

1.17 PROGRESS PHOTOGRAPHS

.1 As soon as work commences, take progress photographs every two weeks from four locations.

.2 View points, which will best illustrate progress of work, will be selected by the Departmental Representative.

.3 Forward duplicate (200 mm x 250 mm) glossy mounted prints of each progress photograph to Departmental Representative each month. Provide white patch in lower right-hand corner marked with project name and date of exposure.

.4 Every two weeks forward digital copies of the existing photos to the list of recipients provided by the Departmental Representative.

1.18 DATUM

.1 Elevations and soundings shown on Drawings are expressed in metres relative to the established benchmark.

1.19 SITE MEETINGS

.1 Site meetings will be held at a maximum interval of every two weeks.

.2 Ensure that all key site personnel and a Representative from the Contractor, who are designated to speak on behalf of the Contractor and can commit the contractor to action and price, are present at the meetings.

.3 At the sole discretion of the Departmental Representative the meetings will be held either on site or by teleconference as appropriate relative to the most appropriate location.

1.20 WASHROOM FACILITIES

.1 Existing washroom facilities on site will not be available for the Contractor's use.

.2 The Contractor shall supply an acceptable chemical toilet and locate it as directed by the Departmental Representative. The toilet shall be thoroughly cleaned at least once per week and shall be a minimum of 10 metres from the water.

.3 No waste or chemical will be allowed to stain or wet the ground or be washed by rain into the waterway. The Contractor will have a spill kit on site capable of preventing such an occurrence.

1.21 OPSS AND OPSD

.1 Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD) are quoted in these specifications. Generally, they are available online at https://www.library.mto.gov.on.ca/SydneyPLUS/TechPubs/Portal/tp/TechnicalPublications.aspx

1.22 PROTECTION OF THE STRUCTURE AND SITE FEATURES

.1 Prevent overloading of any part of the structure.

.1 Do not cut, drill or sleeve any structural member, unless specifically indicated, on the drawings without written approval of the Departmental Representative.

.2 Review construction loading including wind and snow loading from scaffold and ensure that loads are applied to members that are capable of supporting the addition of the applied forces.

.3 During the disassembly the pivot bearing will be salvaged and reused. Recover the pivot bearing and allow inspection of the complete parts forming the bearing surfaces and associated parts by the Departmental Representative. Allow a minimum of three weeks in the schedule for repairs to these parts before reassembly into the bridge and painting.

.4 Prevent damage to the existing heritage features and assets at the Lower Brewers Site. The canal wall shall not be used to anchor temporary supports and scaffold. All access shall be provided for using alternate methods unless approved by the Departmental Representative. If, in the course of work, a cultural resource or character-defining element is damaged, the project lead should take photos and consult with CRM immediately for advice on how to proceed.

.2 Prevent Damage to protective Coatings, Grease, and surfaces of locks and mechanisms.

.1 Do not place or allow any foot or other traffic on locks etc.

1.23 COMMISSIONING THE BRIDGE

.1 To ensure that the bridge will be fully operational at the time that the Contractor hands over control to Parks Canada, a commissioning period of two weeks after the contractor's commissioning period is required and shall be shown in the work schedule. During the commissioning period, Parks Canada staff must access, adjust, and grease components of the bridge even though the contractor will have proven the bridges function during the contractor commissioning period. This infers that all work and access platforms must be removed or adjusted to allow access during this period and that all work is complete.

Part 2 Products

2.4 NOT USED

.1 Not Used

Part 3 Execution

3.4 NOT USED

.1 Not Used

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This section covers the measurement of work for payment purposes and the items of work included in the pay items in the Unit Price Table. Additional information and scope of work is provided in the various sections.

1.2 CONTRACT FORM

.1 This Contract is prepared on the basis of a Contract lump sum price for all works as described on the Contract drawings and in these specifications and specific unit price items. For the items with no specific unit price item the Contractor shall be responsible for determining quantities to be supplied and removed to fully complete the work. No claims for adjusting the compensation for such work shall be considered unless the scope of work is altered due to changed conditions or significantly decreased or increased as directed by the Departmental Representative.

.2 In the Contract Lump Sum price, all costs associated with the project specified in these documents, shown or indicated on the drawings, or necessary to complete the work shall be included. Where a specific unit price is not provided the cost of all work shall be included in the Contract Lump Sum.

.3 Within 10 days of award, provide a breakdown of the Contract lump sum price in accordance with this and other sections of this specification. The breakdown shall include a breakdown for general costs into at least 10 items as well as further breakdowns as described in the specification or any additional breakdowns requested by the Departmental Representative.

.4 No measurement for payment will be made for any work incidental to completion of this Contract (such as roadway signage and protection, etc.). Such work is considered to be incidental to the contract and costs are to be included in the contract lump sum which includes General Sitework.

1.3 APPLICATIONS FOR PROGRESS PAYMENT

.1 Make applications for payment on account as provided in the general conditions and based on agreement as to the amount of work completed as work progresses.

.2 Date applications for payment the last day of payment period. Ensure the amount claimed is for a value proportionate to the amount of work performed and products delivered to the site at that date.

.3 Submit to Departmental Representative, at least 14 days before first application for payment, a breakdown (referred to as Schedule of Values) for parts of the Work completed, aggregating total amount of the Contract Amount, so as to facilitate evaluation of applications for payment.

1.4 SCHEDULE OF VALUES

.1 Make Schedule of Values out in such form, and supported by such evidence, as Departmental Representative may reasonably direct, and, when accepted by

Departmental Representative, it shall be used as the basis for applications for payment. Lump Sum items that are projected as monthly payments based on the scheduled completion dates will be reassessed relative to actual progress of the total contract and the likely completion date of the contract.

.2 Include statement based on Schedule of Values with each application for payment.

.3 Support-claims for products delivered to place of work, but not yet incorporated into Work, by such evidence, as Departmental Representative may reasonably require establishing value and delivery of products relative to the total work to incorporate them into the work and functioning.

1.5 PREPARING SCHEDULE OF UNIT PRICE TABLE ITEMS

.1 Submit separate schedule of unit price items of Work requested in Bid and Acceptance Form.

.2 Make form of submittal parallel to Schedule of Values, with each line item identified in the same form as the line item in Schedule of Values. Include in tendered unit prices all costs associated with providing all labour, equipment, and materials, including:

.1 Cost of material.

.2 Delivery and unloading at site.

.3 All cost specifically listed for the items in the various portions of the contract.

.4 Sales taxes.

.5 Installation, overhead, and profit.

.3 Ensure unit-prices multiplied by quantities given equal the aggregate cost of the breakdown of that item in Schedule of Values multiplied by the same quantity.

1.6 MEASUREMENT AND PAYMENT PROCEDURES

.1 Lump Sum Price - For all work which is not designated in the Unit Price Table, there shall be no measurement for payment and all work shall be paid at the contract Lump Sum Price. This item includes all costs associated with performing the work including, but not limited to, material, equipment, personnel, overhead, etc. Items also included in the Lump Sum Price are:

.1 Mobilization.

.2 Demobilization.

.3 Connecting to existing utilities and services.

.4 Abandon existing monitoring well by a licenced well contractor.

.5 Designing and installing all temporary access routes and temporary ramps required to access the Work areas.

.6 Providing construction fence and perimeter security measures around the work area.

.7 Silt Mitigation and erosion control fence.

.8 Geotechnical Testing.

.9 Supplying, installing, and maintaining luminated detour/warning signs.

.10 Traffic Control

.11 Maintaining the work/storage area for the duration of the Work.

.12 Removal of the temporary access routes and temporary ramps and restoration.

.13 Developing, submitting, maintaining, updating and following the Environmental Management Plan (EMP).

.14 Environmental Procedures, including control work to provide effective environmental, waterbody, and fish habitat protection, Protection of historic assets, etc.

.15 Environmental Protection, Lead Paint.

.16 Temporary Utilities.

.17 Construction Facilities.

.18 Access and Housing, Heating and Humidification.

.19 Temporary Barriers and Enclosures.

.20 Construction Demolition Waste Management and Disposal.

.21 Selective Site Demolition.

.22 Lead – Based Paint Abatement

.23 Decommissioning.

.24 Concrete Forming and Accessories.

.25 Concrete Reinforcing.

.26 Cast-in-Place Concrete and Patch Repairs.

.27 Structural Steel for Bridges.

.28 Fabrication and Installation of Steel Counterweights

.29 Wood Treatment.

.30 Rough Carpentry.

.31 Elastomeric Coating.

.32 Painting Exterior Metal Surfaces.

.33 Commissioning.

.34 Traffic Signage.

.35 Mechanical

.36 New Mature Trees

.37 Progressive and final Site cleaning.

.38 Landscaping and site restoration.

.39 Tasks of all sections designated as part of Contract Lump Sum or not specifically designated as part of a unit price item.

.2 The following item titles, units, and the respective associated sections list work included in each item. Further description of the work is found in the sections listed and associated sections. All work that is not specifically addressed and covered in the Unit Price Item but, is indicated to be completed or is required to be completed in order to complete the Work, shall be included in the Contract Lump Sum Price.

.3 The four items listed below shall be paid at the Contract unit rate by the unit square metre.

.1 Item No. 1 - "Roadway Partial Depth Asphalt Removal (50mm)" (Section 31 23 10).

.2 Item No. 2 - "Roadway Asphalt Removal (Full Depth)" (Section 31 23 10).

.3 Item No. 12 – “Concrete Sidewalk” (Section 31 16 15)

.4 Item No. 20 – “Topsoil & sod (100mm)” (Section 32 91 21)

.4 The three items listed below shall be paid at the Contract unit rate by the unit cubic metre.

.1 Item No. 3 – "Common Excavation" (Section 31 23 10).

.2 Item No. 21 – “Full Depth Concrete Removal” (Section 02 41 23)

.3 Item No. 22 – “Partial Depth Concrete Removal” (Section 02 41 23)

.5 The four items listed below shall be paid at the Contract unit price rate by the unit metre.

.1 Item No. 4 - "Swale with 150mm Subdrain" (Section 33 46 16).

.2 Item No. 16 - "600mm Wide Durable White Pavement Markings" (Section 32 17 23).

.3 Item No. 17- “100mm Wide Solid Yellow Pavement Markings” (Section 32 17 23).

.4 Item No. 23 – “Micropiles” (Section 31 63 19)

.6 The seven items listed below shall be paid at the Contract unit price rate by the tonne.

.1 Item No. 5 – “Roadway Granular A (300mm)” (Section 32 11 23)

.2 Item No. 6 – “Roadway Granular B Type II (450 min.)” (Section 32 11 19)

.3 Item No. 7 – “Parking Granular A” (Section 32 11 23)

.4 Item No. 8 – “Parking Granular B Type II” (Section 32 11 19)

.5 Item No. 9 – “1.0m Shoulder Granular A” (Section 32 11 23)

.6 Item No. 10 – “Asphalt – HL8 (50mm)” (Section 32 12 16)

.7 Item No. 11 – “Asphalt – HL3 (40mm)” (Section 32 12 16)

.7 The four items listed below shall be paid at the Contract unit price rate by the item each.

.1 Item No. 14 – “Remove and Reinstate Existing Wooden Post” (Section 10 14 53)

.2 Item No. 15 – “300mm diameter Nyloplast Catchbasin” (Section 33 41 00)

.3 Item No. 18 – “Accessible Parking Stall Symbols” (Section 32 17 23)

.4 Item No. 19 – “Precast Concrete Curb” (Section 33 05 14)

.8 The item listed below shall be paid at the Contract unit price rate by the item “set.”

.1 Item No. 13 – “Tactile Walking Surface Indicators” (Section 32 16 15)

1.7 AFFECT OF SCHEDULE ON PAYMENT

.1 The work of scheduling and staying on schedule described in Section 01 32 16.07 is considered integral to the work and a condition of payment. If the progress does not match the schedule, or the schedule is not produced, accepted, updated, re-accepted, maintained, and distributed, a portion up to 10% (at the Departmental Representative's sole discretion) of all work will be considered incomplete. Disregard for schedule,

particularly at key milestones and project completion, or, disregard for providing scheduling information, will be considered incomplete work in the calculation of the final payment. If one item of work is affected by an unknown all other items of work shall be scheduled based on an assumption regarding the unknown submitted to and reviewed by the Departmental Representative. It is unacceptable to not produce a schedule at anytime during the project.

1.8 PROGRESS PAYMENT

.1 Departmental Representative will issue to Owner, no later than 10 days after receipt of an application for payment, certificate for payment in the amount applied for, or in such other amount, as Departmental Representative determines to be properly due. If Departmental Representative amends the application, Departmental Representative will give notification, in writing, stating reasons for amendment.

1.9 SUBSTANTIAL PERFORMANCE OF WORK

.1 Contractor to prepare and submit to Departmental Representative a comprehensive list of items to be completed, or corrected, and apply for a review by Departmental Representative to establish Substantial Performance of Work, or substantial performance of designated portion of Work, when Work is substantially performed (if permitted by lien legislation applicable to Place of Work designated portion thereof) which Departmental Representative agrees to accept separately, is substantially performed. Failure to include an item on list does not alter responsibility to complete the Contract.

.2 Submit an application for final payment when Work is completed.

.3 Departmental Representative will, no later than 10 days after receipt of an application for final payment, review Work to verify validity of application. Departmental Representative will give notification that application is valid or give reasons why it is not valid, no later than 7 days after reviewing Work.

.4 Departmental Representative will issue a Certificate of Completion and a Certificate of Measurement when application for final payment is found valid.

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 SECTION INCLUDES

.1 Inspecting and testing by inspection firms or testing laboratories designated by Departmental Representative.

1.2 PRECEDENCE

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

1.3 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

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

1.4 APPOINTMENT AND PAYMENT

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

- .1 Inspection and testing required by laws, ordinances, rules, regulations, or orders of public authorities.
- .2 Inspection and testing performed exclusively for Contractor's convenience or for the contractors own quality control program. The contractor must have a quality control program which would include testing of such items as concrete quality, etc.
- .3 Testing, adjustment, and balancing of mechanical, hydraulic and electrical equipment and systems of the bridge. All systems shall be fully tested and certified by the contractor as fully functional.
- .4 Mill tests and certificates of compliance for all materials.
- .5 Tests specified to be carried out by Contractor under the supervision of the Departmental Representative.
- .6 Testing specified to be completed by the contractor to verify quality control of the coating system.
- .7 Concrete testing will be arranged and paid for by the Contractor using an independent CSA Certified Testing Company and field personnel. Representative samples from each concrete pour shall be taken and tested. The Departmental Representative may run parallel tests at their discretion.
- .8 Additional tests specified in the following paragraph.

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

1.5 CONTRACTOR'S RESPONSIBILITIES

.1 Provide labour, equipment, and facilities to:

.1 Provide access to Work to be inspected and tested.

.2 Facilitate inspections and tests.

.3 Make good, Work disturbed by inspection and testing completed by Parks Canada or their representatives at no additional cost to the Contract.

.4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.

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

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

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

Part 2 Products

2.1 NOT USED

.1 Not Used

Part 3 Execution

3.1 NOT USED

.1 Not Used

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

.1 Project meetings will be scheduled at a maximum of two-week intervals throughout the progress of the work and at the call of Departmental Representative. Meetings will be run by the Departmental Representatives designated appointee.

.2 Representative of Contractor, Subcontractor, and suppliers must attend the meetings and the individual attending the meetings must be qualified, and authorized, to act on behalf of the Contractor, Sub-contractor, or supplier(s) they represent.

1.2 PRECONSTRUCTION MEETING

.1 Within the 5 days following award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Departmental Representative, Contractor, major Subcontractors, field inspectors, and supervisors and any PCA staff shall be in attendance.

.3 The time and location of the meeting will be established, and notification of the parties concerned will occur a minimum of 5 days before the meeting.

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

.5 Agenda to include:

.1 Appointment of official representative of participants in the Work.

.2 Schedule of Work: in accordance with Section 01 32 16.07.

.3 Environmental Protection issues and concerns.

.4 Historical Canals Regulation permitting requirements.

.5 Environmental Management Plan.

.6 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00.

.7 Schedule for providing and the general location of temporary facilities, site sign, offices, storage sheds, utilities, and fences in accordance with Section 01 52 00.

.8 Site security in accordance with Section 01 56 00.

.9 Procedures for: proposed changes, change orders, approvals, time extensions, overtime, and administrative requirements.

.10 Record drawings in accordance with Section 01 33 00.

.11 Take-over procedures, acceptance, and warranties in accordance with Section 01 78 00.

.12 Schedule and Progress.

.13 Monthly progress claims, administrative procedures, photographs, and hold backs.

.14 Appointment of inspection and testing agencies or firms.

.15 Insurances, and transcript of policies.

1.3 PROGRESS MEETINGS

.1 During course of Work, schedule progress meetings at a maximum of two-week intervals.

.2 Contractor, and major Sub-contractors involved in Work, and Departmental Representative are to be in attendance.

.3 Agenda will include the following:

.1 Site Safety
.2 Conformance with Environmental Requirements
.3 Review minutes of previous meeting.
.4 Review of Work progress since previous meeting.
.5 Environmental Protection and Concerns.
.6 Field observations, problems, and conflicts.
.7 Problems which will impede construction schedule.
.8 Review of off-site fabrication delivery schedules.
.9 Corrective measures and procedures to regain projected schedule.
.10 Revision to construction schedule.
.11 Progress schedule during succeeding work period (Clear two week look ahead).
.12 Review submittal schedules (expedite as required).
.13 Maintenance of quality standards.
.14 Review proposed changes for affect on construction schedule and on completion date.
.15 Other business.

Part 2 Products

2.1 NOT USED

.1 Not Used

Part 3 Execution

3.1 NOT USED

.1 Not Used

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 77 00 - Closeout Procedures.

1.2 PROGRESS PHOTOGRAPHS

.1 Print Size: 200 x 250 mm.

.2 Type: glossy colour with binding margin at one end.

.3 Paper: single weight.

.4 Number of prints required: One (1) plus electronic file.

.5 Identification: typewritten name and number of project and date of exposure on white patch in upper right-hand corner.

.6 Viewpoints: determined by Departmental Representative.

.7 Frequency: at two-week intervals, as directed by Departmental Representative.

1.3 ELECTRONIC COPY

.1 Submit electronic copy in addition to hard copy of colour digital photography in jpg format, fine resolution.

.2 Email photographs every two weeks and provide one set transferred with the electronic maintenance manual at the end of the project. The Departmental Representative will confirm access and transfer of the files. If the files cannot be accessed, resubmit in an accessible form.

.3 Identification: The name of each file shall include the project number, the name of the bridge, the name of subject, and the date of exposure.

.4 Number of viewpoints: Locations of viewpoints determined by Departmental Representative.

.5 Frequency: Every two weeks before project meetings, as directed by Departmental Representative.

Part 2 Products

2.1 NOT USED

.1 Not Used

Part 3 Execution

3.1 NOT USED

.1 Not Used

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 Activity: Element of Work performed during course of Project. An activity normally has expected duration, expected cost, and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart): Graphic display of schedule-related information. In a typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally, Bar Charts should be derived from commercially available computerized project management system.

.3 Baseline: Original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, will provide five-day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: Number of work periods (not including holidays or other nonworking periods) required to complete activity or another 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 or change in activity level at the site or at another work place.

.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.

1.2 REQUIREMENTS

.1 Ensure Master Plan and Detailed Schedules are practical, and remain within specified Contract duration, and ensure that specific key milestones are met.

.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. Increase the number of tasks and sub-tasks when requested to stay within the 10-day limit for each task.

.4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, meeting critical Milestones, Certificate of Substantial Performance, and Certificate of Completion at defined times of completion are of essence of this contract.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Submit to Departmental Representative, within 5 working days of Award of Contract, Bar (GANTT) Chart as Master Plan for planning, monitoring, and reporting of project progress.

.3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

1.4 PROJECT MILESTONES

.1 Project milestones forming interim targets for Project Schedule are to be as follows:

.1 Within 5 days of award, schedule the pre-construction meeting and submit work schedule for review.

.2 Submit EMP and mobilize within 20 working days of Award.

.3 OPERATING SEASON- The 2021 hours of operation for the Rideau Canal lockstations can be found at the following link: https://www.pc.gc.ca/en/lhn-nhs/on/rideau/visit/heures-hours. It is assumed that the schedule will have a similar relationship to the two holidays at the start and end and that the operation hours will be the same. The contractor is responsible for checking with Parks Canada for the most up to date information pertaining to the 2022 operating season prior to submission of the work schedule.

.4 CONSTRUCTION SEASON SHUTDOWN- It is of critical importance that the Work of this contract does not impede navigation or the operation of the canal during the operating season. It is possible that some construction activities that do not affect both the navigation and the public use of site may run into the operating season. No construction activities shall occur from May 2nd, 2022 to September 6th, 2022. During this time the Contractor shall demobilize from the site and may choose to store equipment and/or materials in the east parking lot as shown on the contract drawings.

.5 Work that may cause impediment to navigational traffic in the canal and/or to users of the site shall be completed by May 2nd, 2022, including the following:

.1 All excavation for concrete placement.

.2 All concrete work, except for casting the top of the ballast walls on both abutments. The top of the ballast walls on both abutments should not be cast prior to the shutdown as the swing bridge will need to be in place to determine the final elevation of the deck after balancing, which will determine the final elevation of the top of the ballast walls.

.3 All work that precedes the placement of the swing bridge on the pivot pier.

.4 All work required to complete the concrete sidewalk and restore access to the public washroom on the west side of the lock station blockhouse.

.6 All excavations shall be backfilled, and the landscaping reinstated as outlined elsewhere in the contract documents prior to the start of the construction shutdown on May 2nd, 2022 to secure the site and allow full operation of the canal without hazards or accommodations.

.7 Once the construction shutdown is over the execution of all remaining works shall not impede navigational traffic in the canal in any way for the remainder of the operating season. However, swinging the superstructure for commissioning/balancing purposes between boat traffic after September 6th, 2022 may be acceptable provided no interference occurs and there is a contingency plan to clear the canal should the bridge not function. and could be planned for accordingly.

.8 Swing Bridge operating, open to roadway traffic, and commissioning complete by December 2nd, 2022.

1.5 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing, and execution of Work as Bar Chart (GANTT).

.2 Departmental Representative will review and return revised schedules within 5 working days.

.3 Revise impractical or unrealistically ambitious schedule (as determined by Departmental Representative) and resubmit within 5 working days. Allocate additional resources to realize plan that meets the contract completion date.

.4 Accepted revised schedule will become Master Plan and be used as baseline for updates. Acceptance of the schedule assumes that adequate resources will be allocated to meet the schedule.

1.6 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule includes, at minimum, milestone and activity types as follows:

.1 Date of Award.

.2 Acquisition of permits.

.3 Mobilization and establishment of detour route.

.4 Removal of existing structure from site.

.5 Complete survey of the Pivot Pier and other bridge foundations.

.6 Removal of existing concrete features.

.7 Installation of micropiles at pivot pier, east abutment, west abutment and south west retaining wall.

.8 Casting of new concrete pivot pier cap, east abutment, west abutment and south west retaining wall.

.9 Installation of new swing bridge.

.10 Installation of new concrete counterweight, wood decking and wearing boards.

.11 Mechanical/Electrical refurbishment/installation.

.12 Commissioning, balancing, and contractor operation phase.

.13 Roadway work including installation of signage and painting.

.14 Site cleanup and restoration.

.15 Supplied material delivery dates.

.16 Submission and return dates for Shop Drawings, Samples etc.

1.7 PROJECT SCHEDULE REPORTING

.1 Update Project progress on Schedule every two weeks reflecting activity changes and completions, as well as activities in progress prior to the bi-weekly meeting.

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

1.8 PROJECT MEETINGS

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

.2 Weather related delays, with their remedial measures, will be discussed. The contractor must anticipate normal to severe winter conditions. Only extreme, one in 50-year weather events will be considered for adjustments to the schedule and only for short duration changes related to days that the site is completely inaccessible. Contractor to arrange snow removal to maintain schedule.

.3 No progress payments will be made until the construction progress schedule is approved and no subsequent payment will be made without an updated and approved schedule.

.4 Note that the schedule must include an allowance of two weeks before the Canal opens to navigation for commissioning of the bridge. This infers that the work on the bridge must be complete to the point that the bridge is ready for takeover by Parks Canada before this date.

.5 Distribute additional copies of approved schedule to:

.1 Job site office.

.2 Subcontractors.

.3 Other concerned parties, as directed.

.4 Bridge operator's office.

.6 Instruct recipients to report to Contractor within 5 days, any problems anticipated by timetable shown in schedule.

1.9 MEASUREMENT AND PAYMENT

.1 The work considered under this Section will not be considered separately for payment but will be considered as integral to the Work of the Contract and a condition for payment of all payment items. If the schedule is not produced, updated, maintained, and distributed a portion up to 10% (at the departmental representative's sole discretion) of all work will be considered incomplete. Disregard for providing scheduling information will be considered incomplete work in the calculation of the final payment. If one item of work is affected by an unknown all other items of work shall be scheduled based on an assumption regarding the unknown submitted to and reviewed by the Departmental Representative. It is unacceptable to not produce a schedule at anytime during the project.

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 SECTION INCLUDES

.1 Format and administrative requirements of submittal for all

.1 All submittals, schedules, procedures

.2 Shop drawings and product data.

.3 Samples.

.4 Certificates and transcripts.

.5 Proof of payment and obtaining all fees and permits.

1.2 ADMINISTRATIVE

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

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

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

.4 Where items or information is not produced in SI Metric units, converted values are acceptable but must be noted on the submission showing location in a coherent easy to read method.

.5 Review submittals and stamp with the contractor's submittal stamp or sign indicating conformance prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated, and identified as to specific project will be returned without being examined and shall not be considered. The shop review process is not a substitute for the contractors Quality Control procedures and if a submittal is reviewed by the Departmental Representative and found to be lacking it may be returned partially reviewed for the contractor to correct and resubmit.

.6 Notify Departmental Representative, in writing, at time of each submission on the transmittal and on the submission, identifying deviations from requirements of Contract Documents stating reasons for deviations. All deviations must be clearly listed and the review must specifically address with a note in writing that the deviation is accepted by the Departmental Representative before the deviation will be considered. Deviations on shop drawings not accompanied by the above transmittal and marking on the shop drawings or without a specific response accepting the exact change by the Departmental Representative will be considered not approved. If the contractor made a change and does not receive a specific approval for the change, the contractor must obtain the written specific approval in writing from the Departmental Representative before making any change.

.7 Verify field measurements and ensure affected adjacent Work is coordinated.

.8 Contractor's responsibility to fulfill the contract as well as for errors and omissions in submission is not relieved by Departmental Representative's review of submittals or review by their designates.

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

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

.11 Submit number of hard copies specified for each type and format of submittal and also submit in electronic format as PDF files. Forward PDF files either on stick, transfer site or through email as agreed by the Departmental Representative. It must be demonstrated that the method of transfer is reliable and trackable.

.12 Confirm receipt of submission and check on progress of review.

1.3 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Indicate materials, methods of construction, and attachment or anchorage, erection diagrams, connections, explanatory notes, and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.3 Where technical sections specify that shop drawings bear the stamp of a Registered Professional Engineer, registered in the Province of Ontario, submit name with contact information for the Contractor's Engineer. Produce all shop drawings with the contractor’s Engineer stamp indicating the Engineer’s approval of the content of the shop drawing.

.4 Allow ten (10) working days for Departmental Representative's review of each version of each submission and each subsequent resubmission.

.5 Allow an additional five (5) working days (15 total) for large or highly technical coordinated submittals that require additional review. The Departmental Representative will attempt to inform the contractor when such submittals occur.

.6 Allow an additional ten (10) working days (20 total) for each submittal and each subsequent resubmittal related to Archaeological, Cultural, or Environmental procedures which require acceptance by Client Departments and are coordinated through Departmental Representative.

.7 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 and obtain approval of additions costs if any prior to proceeding with work and explain the full reason as to why it is thought that the changes affect the price. In accordance with the CCN and Change Order process, no change in

price is valid unless agreed upon by the Departmental Representative and any work completed will be considered to have been included in the contract price.

.8 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of any revisions other than those requested on both the submission and the submission transmittal. Failure to do so will be assessed by the Departmental Representative who will have the right to choose between the preferred submitted solutions even if this means work has to be redone.

.9 Accompany submissions with transmittal letter, containing:

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

.10 Submissions shall include:

- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with 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 Erecting Sequence and Procedures.
  - .8 Operating weight.
  - .9 Wiring diagrams.
  - .10 Single line and schematic diagrams.
  - .11 Relationship to adjacent work.
  - .12 Equipment identification.

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

.12 The Engineer will attempt to return the shop drawings as expeditiously as possible. If, at a later date, an error or omission is noted, a revised, reviewed shop drawing will be

issued, and the Contractor shall distribute and enact the changes. Regardless of any error or omissions during review the contractor is responsible for complying with the contract intent and is responsible for the shop drawings conformance to the contract.

.13 Submit three (3) prints and one (1) electronic copy of shop drawings for each requirement requested in specification Sections and/or as Departmental Representative may reasonably request.

.14 Submit three (3) prints and one (1) electronic copy of product data sheets or brochures for requirements requested in specification Sections and/or as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.15 Submit three (3) prints and one (1) electronic copy of test reports for requirements requested in specification Sections and/or as requested by Departmental Representative.

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

.2 Testing must have been within six months of date of contract award for project or after contract award.

.16 Submit three (3) prints and one (1) electronic copy of certificates for requirements requested in specification Sections and/or 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.

.17 Submit three (3) prints and one (1) electronic copy of manufacturers instructions for requirements requested in specification Sections and/or 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.

.18 Submit three (3) prints and one (1) electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and/or as requested by Departmental Representative.

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

.19 Submit three (3) prints and one (1) electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and/or as requested by Departmental Representative.

.20 Delete information not applicable to project.

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

.22 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. Rejected shop drawing shall be no cause for claim of project delay.

.23 The review of shop drawings by Parks Canada, its representatives, inspectors and consultants is for the sole purpose of ascertaining general conformance with the general concept. This review shall not mean that Parks Canada approves detail design and field measurements inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors, or omissions, in shop drawings, or of responsibility for meeting all requirements of construction and Contract Documents including protection of the environment or safety. 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 all sub-trades.

.24 Submit three (3) prints and one (1) electronic copy of the completed Environmental Assessment check list after substantial completion and before final completion of the project.

1.4 SAMPLES

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

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

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

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

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing and obtain approval using the full CCN and CO process from the Departmental Representative prior to proceeding with Work.

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

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

1.5 MOCK-UPS

.1 Erect mock-ups in accordance with Section 01 45 00 – Quality Control.

1.6 PROGRESS PHOTOGRAPHS AND VIDEO

.1 Submit progress photographs in accordance with Section 01 32 00 – Construction Progress Documentation.

1.7 CONSTRUCTION PHOTOGRAPHS

.1 Submit electronic and hard copy of colour digital photography in JPG format, fine resolution.

.2 Identification: name and number of project and date of exposure indicated.

.3 Number of viewpoints: determined by Departmental Representative.

.4 Frequency: Maximum two-week intervals as directed by Departmental Representative.

1.8 FEES, PERMITS AND CERTIFICATES

.1 Provide authorities having jurisdiction with information requested.

.2 Pay fees and obtain certificates and permits required.

.3 Furnish certificates and permits.

1.9 CORRESPONDENCE

.1 All correspondence shall conform to a standard such that it is easily identifiable and referenced.

.2 Each submittal shall be numbered and shall include a title page describing the date and version of the submittal.

.3 Electronic submissions shall:

.1 All have a title format that identifies the specification section, project, the nature of the submittal, the number of the submittal and the contents of the submittal such that they are easy to electronically sort and identify and the contents can be known without opening the file. The titles will be similar in form to:

.1 "01 33 00 19M-01599-00 Lower Brewers Swing Bridge: Shop Drawings 7 - East End Gussets" or

.2 "01 33 00 19M-01599-00 Lower Brewers Swing Bridge: Mill Certificates 3 - 3x3x1/2 angles North West Bearing".

.2 Electronic submissions shall be PDF format.

.3 The electronic mail submissions shall be divided into sections such that the file size of each submission is less than 5 megabytes.

Part 2 Products

2.1 NOT USED

.1 Not Used

Part 3 Execution

3.1 NOT USED

.1 Not Used

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Province of Ontario:

.1 Occupational Health and Safety Act Revised Statutes of Ontario 1990, Chapter O.1 as amended, Regulations for Construction Projects, O. Reg. 213/91 as amended, and O. Reg. 629/94 as amended.

.2 Workplace Safety and Insurance Act, 1997.

.3 Municipal statutes and authorities.

.4 Canada Labour Code

.2 Fire Commissioner of Canada (FCC):

.1 FC-301 Standard for Construction Operations, June 1982.

.2 FC-302 Standard for Welding and Cutting, June 1982.

Labour Program
Fire Protection Engineering Services
4900 Yonge Street 8th Floor
Willowdale, Ontario M2N 6A8

Copies may be obtained from:
Human Resources and Social Development Canada
Labour Program
Fire Protection Engineering Services
Ottawa, Ontario K1A 0J2

1.2 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit site-specific General Health and Safety Policy and a Site-Specific Health and Safety Plan within the 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Results of site-specific safety hazard assessment identifying issues at the site that affect safety.

.2 Results of safety and health risk or hazard analysis for site tasks and operations.

.3 Contractor's and Sub-contractors' Safety Communication Plan.

.4 Contingency and Emergency Response Plan addressing standard operating procedures specific to the project site to be implemented during emergency situations, including evacuating injured personnel from the site and areas of limited or special access, such as height. Coordinate plan with existing Bridge Operators' Emergency Response requirements and procedures provided by Departmental Representative.

.3 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 10 days after receipt of plan. Revise

plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative.

.4 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. The contractor is the constructor and shall act accordingly with full control of safety of the site as per provincial legislation.

.5 Submit records of Contractor's Health and Safety meetings when requested.

.6 Submit copies of Contractor's authorized representative's worksite health and safety inspection reports to Departmental Representative monthly.

.7 Submit copies of orders, directions, or reports issued by health and safety inspectors of the authorities having jurisdiction.

.8 Submit copies of near miss, incident, and accident reports and/or confirmation monthly that no incidents have occurred.

.9 Submit Material Safety Data Sheets (MSDS) for all products and materials used in the completion of the work in accordance with Section 01 33 00 – Submittal Procedures.

.10 Submit Workplace Safety and Insurance Board (WSIB) Experience Rating Reports.

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

1.3 FILING OF NOTICE

.1 File Notice of Project with Provincial Authorities prior to commencement of Work.

1.4 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project and the tasks to be completed.

1.5 MEETINGS

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

1.6 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.

1.7 PROJECT/SITE CONDITIONS

.1 Work at the site will also involve control of the site and work near water and a canal with and without water.

.2 The Contractor shall coordinate and incorporate the Parks Canada / PSPC lock-out / tag-out procedures for the equipment at the site. The more stringent of the Provincial safety

regulations and the PSPC lock-out / tag-out procedures shall take precedence. The Parks Canada/PSPC procedure involves a multi-lock system.

.3 Known and obvious hazards include, but are not limited to, contact with:

.1 Silica in concrete.
.2 Lead-based paints in almost all painted areas.
.3 Mechanical systems.
.4 Moving equipment.
.5 Work on the roadway.
.6 Guano on structure.
.7 Rusted metals from structure.
.8 Work near water.
.9 Ice.
.10 Work near utilities including overhead utilities.
.11 Work at heights.
.12 Arsenic (CCA) and other chemicals in preserved wood.

1.8 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, improve, update, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Departmental Representative may respond in writing, where deficiencies or concerns are noted, and may request re-submission with correction of deficiencies or concerns either accepting or requesting improvements.

.3 Relief from, or substitution for, any portion, or provision, of minimum Health and Safety standards specified herein or reviewed site-specific Health and Safety Plan shall be submitted to Departmental Representative in writing.

1.9 COMPLIANCE REQUIREMENTS

.1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990 Chapter 0.1, as amended.

1.10 RESPONSIBILITY

.1 The Contractor is responsible for health and safety of persons on site and the public, the safety of property on site, the protection of persons adjacent to the site, and environment to the extent that they may be affected by conduct of Work and the adjacent areas affected by the work.

.2 Comply with, and enforce compliance by employees, public etc., with safety requirements of Contract Documents, applicable Federal, Provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

.3 Where applicable, the Contractor shall be designated "Constructor", as defined by Occupational Health and Safety Act for the Province of Ontario.

1.11 UNFORSEEN HAZARDS

.1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, immediately stop work address the issue and advise Departmental Representative verbally and in writing.

.2 Follow procedures in place for Employees Right to Refuse Work as specified in the Occupational Health and Safety Act for the Province of Ontario.

1.12 HEALTH AND SAFETY CO-ORDINATOR

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

.1 Have site-related working experience specific to activities associated with all types of work included in the Work.

.2 Have working knowledge of occupational safety and health regulations and have documented Health and Safety supervisor training.

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

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

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

1.13 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, and in consultation with Departmental Representative. Documents include, but are not limited to:

.1 Contractor's Safety Policy.

.2 Constructor's Name.

.3 Notice of Project.

.4 Name, trade, and employer of Health and Safety Representative or Joint Health and Safety Committee members.

.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 Safety Plan.

.11 Copy of valid certificate of first aid personnel on duty.

.12 WSIB "In Case of Injury at Work" poster.

.13 Location of toilet and cleanup facilities.

.14 Any special handling or procedures specific to the site.

1.14 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 a perceived non-compliance of health and safety regulations or a potential issue is perceived to have not been immediately corrected.

1.15 BLASTING

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

1.16 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.

1.17 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 Health and Safety Coordinator to stop or start Work when, at Health and Safety Coordinator's discretion, it is necessary, or advisable, for reasons of health or safety. Departmental Representative or their designates may also stop Work for health and safety considerations or perceived health and safety concerns. Address the concern and report the actions to be taken.

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 DEFINITIONS

.1 **Environmental Procedures:** Comprises and must consider all Archaeological, Cultural and Environmental Procedures and not just those associated with Natural Environmental factors.

.2 **Environmental Pollution and Damage**: presence of chemical, physical, biological elements or agents which adversely affect human, animal or plant health and welfare; unfavourably alter ecological balances of importance to human life; affect other species; or degrade environment or resources aesthetically, culturally and/or historically or in any way.

.3 **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 all other forms of pollutants or things that can affect the environment.

.4 **Deleterious Material**: any substance that, if added to a waterbody, 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 mortar, concrete and admixtures.

.5 · Alkali water resulting from fresh concrete or cementations grout.

.6 · Salt.

.7 · Solvents.

1.2 REFERENCES

.1 Environmental Protection Agency (EPA):

.1 EPA 832-R-92-005 – Storm Water Management for Construction Activities.

.2 Environmental Standards and Guidelines Document, Ontario Waterways, Parks Canada Agency, July 2017.

.3 Historic Canals Regulations apply and govern work under this Contract. Regulations may be obtained from Justice Canada's website at: http://lawslois.justice.gc.ca/eng/regulations SOR/93-220/ Department of Transport Act, May, 1993.

.4 Environmental Protection Act, Province of Ontario, R.S.O., 1990.

.5 Ontario Water Resources Act, Province of Ontario, R.S.O, 1990.

.6 Ontario Provincial Standard Specification, OPSS 805, November 2010, Construction Specification for Temporary Erosion and Sediment Control Measures.

.7 Environmental Impact Analysis (EIA) / Basic Impact Analysis (BIA).

.8 Fisheries Act (R.S.C., 1985, c. F-14, s.1); Sections 34 and 35.

.9 Species at Risk Act Section 73.

.10 Migratory Birds Convention Act (S.C. 1994 c.22), Section 5.

.11 Designated Substances - Ontario Regulation 490/09.

.12 General Waste Management - Ontario Regulation 347/90

.13 Ontario Regulation 387/04 – Water Taking and Transfer

.14 Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life: http://ceqgrcqe.ccme.ca/download/en/217.

.15 The Contractor shall not mobilize or begin any work until Parks Canada issues permit under Historic Canals Regulation (SOR/93-220 Sections, 11, 14 and 15).

.16 Impact Assessment Act (2019)

1.3 ENVIRONMENTAL ASSESSMENT

.1 Attached to this specification is the Basic Impact Analysis report including Mitigation Measures in Section 9 which must be considered the minimum mitigation to be supplemented by actions to be determined and included in the Contractor's Environmental Management Plan (EMP).

.2 The contractor will provide Environmental Assessment Mitigation Monitoring Reports which must be completed and updated throughout the project by the Contractor as part of the work. Environmental Monitoring Checklists shall be completed on a daily basis and submitted to PCA on a weekly basis (at minimum). The Environmental Monitoring Checklist Report Template shall be submitted as a component of the EMP.

.3 Significant information regarding Species at Risk and environmental requirements are listed in the Basic Analysis report however the contractor shall also assess their activities to determine if additional requirements are required.

1.4 CANAL REGULATIONS AND PERMITS

.1 "Historic Canal Regulations" apply to and govern work under this Contract.

Regulations may be obtained from Justice Canada's website at: https://laws-lois.justice.gc.ca/eng/regulations/SOR-93-220/FullText.html

.2 Contractor may not mobilize or begin any work until Parks Canada issues permit under Historic Canals Regulation (SOR93-220 Sections, 11, 14 and 15)

.3 Permit will not be issued before following submittals are submitted and accepted:

.1 Environmental Management Plan (EMP).

.2 Dewatering Plan.

.3 Health and Safety Plan.

.4 Site Layout Plan.

.5 Changes to project scope of work not assessed under site specific BIA will require review and acceptance by Departmental Representative and may require issuing revised permit.

1.5 REGULATORY REQUIREMENTS

.3 Comply with environmental requirements of Contract Documents, applicable federal, provincial, and local statutes, acts, regulations, and ordinances of Agencies having jurisdiction.

.4 Owner, Parks Canada Agency, is main Environmental Authority for Rideau Canal projects.

.5 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.

.6 Owner will not issue permit to authorize start of Work, under Historic Canal Regulations, before review and acceptance of Environmental Management Plan.

.7 Comply with and enforce compliance by employees of prescribed environmental mitigation measures outlined in 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.

.8 Changes to project scope of work not assessed under site-specific BIA will require review and acceptance by Departmental Representative.

.9 Preserve heritage elements of site by executing Work without damage to site features or character defining elements. This includes but is not limited to the canal features, cultural heritage landscape and block house adjacent to the bridge.

1.6 HERITAGE PROTECTION

.3 Preserve heritage elements of site, such as canal walls and block house, by executing Work without damage to site features or character defining elements.

.4 Detail protection schemes and plans in the EMP for the heritage elements that will allow the work without altering any element with heritage value during all phases of the work.

.5 Notify Departmental Representative and PCA Environmental Authority immediately if heritage items are damaged.

.6 Employ minimal intervention approach for all Work.

.7 Access roads, staging areas, and work pads require review and approval.

.8 Damage to heritage elements, such as canal walls, block house and others, will not be tolerated.

.9 Ensure appropriate supervision work, adequate training for workers, and other necessary precautions to protect existing structures.

.10 Notify Departmental Representative immediately where reasonable concern exists that damage may result from work Contractor may propose alternative work methodologies to be accepted by Departmental Representative and PCA Environmental Authority.

.11 Protect possible archaeological and cultural resources by excavating only to limits indicated. If a resource is uncovered stop and notify the Departmental Representative.

.12 Excavation beyond indicated limits requires acceptance by PCA Environmental Authority and the Departmental Representative.

1.7 RELICS AND ANTIQUITIES

.3 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 Departmental Representative immediately of discovery of such objects.

1.8 ARCHAEOLOGICAL AND CULTURAL REQUIREMENTS AND RESTRAINTS

.3 Site may contain possible cultural and archaeological resources.

.4 PCA Environmental 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.

.5 Cease Work immediately in affected Work area and notify Departmental Representative if cultural resources, suspected archaeological resources, or character-defining elements are uncovered or damaged during Work.

.6 Do not resume Work until directed by Departmental Representative.

.7 Proceed with other work and wait further direction for work in affected area from Departmental Representative on how to proceed.

.8 Allow Departmental Representative and PCA Environmental Authority Representative full access to affected Work area and cooperate to provide reasonable facilities for such access.

1.9 HISTORICAL, ARCHAEOLOGICAL CONTROL

.1 Provide protection for historical, archaeological, cultural, and biological/vegetation resources in accordance with approved EMP.

.2 Accommodate PCA Cultural Resource Management (CRM) representatives' needs for documentation of existing structures after discovery.

.3 Include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative to address situations where such resources not known to be on site are discovered during construction.

.4 Should any archaeological or cultural resource be discovered while excavation, stop work. Contact Departmental Representative for direction prior to continuing work.

1.10 SUBMITTALS

.3 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.

.4 Contractor is required to submit an Environmental Management Plan (EMP) to the Department Representative and Parks Canada which outlines all the measures to be implemented by the contractor on the project site to eliminate or reduce environmental effects and address mitigation measures outlined in the BIA.

.5 The EMP and its component plans, must be prepared in accordance with Parks Canada Agency's Environmental Standards and Guidelines Document (ESG) - Ontario Waterways, July 2017, and BIA and BMPs.

.6 In order to allow for the timely commencement of project activities, the EMP can be submitted as separate components as project details become available. This will only be entertained for limited well controlled activities and if it is perceived by the Departmental Representative that significant work is being attempted before the full base EMP plan is submitted all work will stop and the contractor will have to prevent any current threats to the environment while the plan is being completed.

.7 The EMP, or its components, will be submitted in writing prior to implementation of project activities and must be accepted by Parks Canada and the Departmental Representative.

.8 The complexity and level of detail of the EMP should be proportionate to the scope of work and level of complexity and risk involved.

.9 The site-specific EMP must be prepared by a Qualified Professional(s), signed and submitted to PCA's Environmental Authority and the Construction Manager for review and acceptance prior to mobilization to the site and the commencement of any work. Submit the names and credentials of the individuals that will prepare the bulk of the EMP and sign the EMP. An EMP accepted by PCA is required prior to the release of the Historic Canals Regulations Permit issued to the Contractor.

.10 It is critical that all changes to the initial EMP be documented such that on each submission the entire document does not have to be read. All changes in each subsequent version of a submitted EMP shall have a comment/change response table submitted with each submission in table format acceptable to the Departmental Representative. The comment/change response table shall detail the Parks Canada comment and the response to the comment, the proposed change to the EMP and the date. For each Parks Canada comment a line in the table and a response is required. In the case of a contractor initiated change the comment/change table shall list the portion being changed listed prior to the change, the reason for the change, the proposed change and the date. The comment/change table must provide a complete record of all changes. Changes made that do not appear and are clear in an approved comment change table and/or are just changed in the EMP document will be considered not approved. If the changes to the EMP do not match the comment/change table direction in the sole opinion of the Departmental Representative, then the Departmental Representative will decide which interpretation governs.

.11 The Environmental Management Plan should demonstrate the Contractor's understanding of the legislative context and PCA ESG document and BIA, and must provide a comprehensive overview of known or potential environmental issues to be addressed during construction tasks detailing all proposed methods, strategies, structures, facilities,

equipment and systems critical to environmental protection; all proposed environmental protection and mitigation measures, monitoring and follow-up activities; all relevant standards and guidelines and all performance criteria applicable to the project. The purpose of the EMP is the provide a detailed overview of what is being done where, and when, at a site-specific level. Components of the EMP (i.e. designated locations, placement of erosion and sediment control devices, water quality monitoring and sampling locations, etc.) must be written and detailed within the body of the EMP. Statements of 'refer to site plan' are not sufficient.

.12 The EMP is more than a list of items on site and must include diagrams and text indicating how the items are arranged to function to achieve all environment procedures required including all Archaeological, Cultural and Environmental Procedures and not just those associated with Natural Environmental factors.

.13 Environmental Management Plan to detail frequency of monitoring and high-risk construction activities requiring environmental professional on site for the duration of the high-risk activity.

.14 Environmental Management Plan to be prepared in accordance with requirements of Federal, Provincial, and Municipal laws and regulations.

.15 Notify Departmental Representative of proposed changes to project plans or schedules effecting Environment Management Plan.

.16 Contractor to ensure on-site personnel is aware of, and comply with prescribed mitigation measures in Environmental Management Plan

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

.18 The EMP document should be submitted to PCA as a clean and polished document which has been thoroughly proofread prior to submission. Provide confirmation with each submission that a qualified Senior Environmental specialist has thoroughly reviewed the EMP against PCA's comments of the previous versions, prior to distributing the revised EMP to PCA.

.19 Environmental Management Plan (EMP) includes, as applicable to this project:

- .1 Names of persons responsible for ensuring adherence to Environmental Management Plan (EMP).
- .2 Names of persons responsible for monitoring the adherence to the Environmental Management Plan (EMP).
- .3 Names and qualifications of persons responsible for managing hazardous waste to be removed from site.
- .4 Names and qualifications of persons responsible for training site personnel.
- .5 Descriptions of environmental protection personnel training program.
- .6 Erosion and Sediment Control Plan (ESC): identifies type and location of erosion and sediment controls to be provided including monitoring and reporting requirements, to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.1 Identify the key point and non-point sources of contaminants. Surface water drainage patterns. Sensitive erosion and sedimentation during each phase of the work.

.2 Describe mitigation requirements, maintenance and monitoring program

.3 The plan must cover all activities within the limits of the construction, laydown and traffic diversion areas.

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

.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 area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use of areas including methods for protection of features to be preserved within authorized work areas.

.10 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance as well as contents and location of spills kit.

.1 Describe the on-site roles and responsibilities for spills and emergency response.

.2 Include contents and location of spill kits.

.3 Up-to-date emergency response contact list including contact information for reporting spills.

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

.12 Air Pollution Control Plan: detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.

.13 Contaminant Prevention Plan: identifies 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. The plan shall include addressing the runoff of water from rain, snow, and weather.

.14 Waste Water Management Plan: identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

.1 Do not pump water directly into the waterway. Send all discharge to a settling pond or filtration area before being released into the waterway. Refer to ESG for waste water management.

.2 Water quality downstream of construction activities and/or released to watercourses not to exceed background turbidity readings of 8 nephelometric turbidity units (NTU), or a change of 25 mg/L for

suspended solids. Refer to CCME guidelines for the protection of aquatic life.

.3 Prior to dewatering, submit a Dewatering Plan for approval by the Departmental Representative.

.15 Historical, Archaeological, Cultural Resources Biological Resources, and Wetlands plans are not thought to be required for this project, unless the ground surface is to be disturbed. If it becomes necessary, the plans shall define procedures for identifying and protecting historical, archaeological, cultural, and biological resources, and wetlands.

.16 Fire protection plan including emergency response procedures, instructions, and reports to be used in event of fire.

.17 The area to be controlled. In addition to the construction site, it is necessary to identify adjacent areas that could be negatively impacted by construction activities.

.18 Drainage areas and patterns based on pre−construction topography and construction design.

.19 Design specification to address the specific soil and sediment types that are expected to be present.

.20 How sediment−laden run−off will be directed to detention or retention facilities on site. Large drainage areas can produce a significant amount of run−off, resulting in a need for large detention or retention structures.

.21 How clean storm run−on will be diverted around the site and away from exposed areas.

.22 Channels that are designed and constructed to the necessary design discharge.

.23 Temporary and permanent erosion control needs for all drainage channels.

.24 Consideration of project schedule in selecting, designing and laying out environmental controls.

.25 EMP document should also include:

.1 A Summery of the purpose and scope of the EMP;

.2 A project overview;

.3 A construction plan and schedules;

.4 The roles and responsibilities of the environmental management team;

.5 Environmental awareness, training and competency commitments;

.6 General communications and record keeping commitments;

.7 Environmental incident reporting procedures;

.8 Environmental monitoring and adaptive management summary; and EMP review and revision procedures.

.26 The EMP shall also address the following components likely to be affected: water quality, fish and fish habitat, vegetation, wildlife, species at risk, invasive species, noise and health and safety. Refer to ESG Document Part 2.

.27 The EMP Component Plans should describe the mitigation measures to be implemented during Pre-Construction, Construction and Post-Construction work activities in compliance with PCA ESG document - ESG-1-C to ESG-18-C (as applicable).

.28 Component Plans and Key Requirements should be included for each site-specific EMP. A key requirement of each Component Plan will be a table that summarizes applicable Environmental Impact Assessment (EIA) commitments, terms and conditions of approval and relevant environmental standards and guidelines.

.29 EMP shall also provide plans and mitigation for the installation and removal of any temporary structures (i.e. cofferdams, temporary bridges, etc.)

.30 EMP Plant and Tree Protection Plan (including plan to restore all vegetated areas disturbed by construction activities to original conditions or better) shall include

.1 Vegetation that is to be removed should be outlined (diagram) and kept to minimum.

.2 Trees that are required to be removed should be clearly identified and justification of removal should be made clear.

.3 Vegetation/trees that are removed shall be replaced or compensated for, and outlined within a revegetation plan.

.4 Invasive/Alien species control plan (i.e., preventative measures to avoid bringing invasive species to the site).

.31 EMP shall include controls during all activities related to Demolition:

.1 Provide schedule for demolition works. Describe the procedures.

.2 Describe mitigation requirements, maintenance and monitoring program

.32 EMP shall include and address Site Dewatering and Wastewater:

.1 Describe the methods equipment and materials to be used including control measures.

.2 Provide schedule. Specify water quality discharge criteria and point of discharge

.3 Describe mitigation requirements, maintenance and monitoring program

.4 Provide design, installation, operation and removal of dewatering structures and dewatering systems, to be updated as required.

.33 EMP shall include and address Aquatic Resources Management:

.1 List the methods, strategies to be used for aquatic resources management.

.2 Describe mitigation requirements, maintenance and monitoring program.

.3 - To include fish/aquatic species rescue and relocation plan (if applicable).

.4 - Throughout dewatering, ensure that the dewatered portion of the Work is cleared of all stranded fish. Use nets and/or traps to catch fish. Handle fish to prevent their injury and place in buckets with ample fresh water at lake temperature until released. Release alive as soon as possible to closest waterbody.

.34 EMP shall include and address Species at Risk Protection:

.1 Identify Species at Risk, critical habitat or areas to be protected.

.2 List the methods, strategies to be used for SAR and critical habitat management.

.3 Tabulate EIA commitments. Refer to ESG Document Part 2.

.4 Describe mitigation requirements, maintenance and monitoring program

.35 EMP shall include and address Hazardous Materials and Concrete Waste Management Plan:

.1 Identify and describe location of hazardous materials storage facilities on-site.

.2 Provide and inventory and MSDS for all hazardous materials to be used on site.

.3 Provide inventory and location of spill equipment to be stored on-site.

.4 Tabulate EIA commitments. Refer to ESG Document Part 2.

.5 Describe mitigation requirements, maintenance and monitoring program.

.36 EMP shall include and Fuel Management:

.1 Describe the fuel handling, transfer and storage procedures. Provide equipment refueling plans.

.2 Describe mitigation requirements, maintenance and monitoring program.

1.11 GENERAL CONSTRUCTION

.1 All mitigation measures shall be implemented to the satisfaction of PCA and PSPC.

.2 Ensure that all on−site personnel are aware of, and comply with, these mitigation measures.

.3 A copy of the EMP shall be kept on site for the duration of the project and all works, as applicable, shall be completed in compliance with the EMP.

.4 The Contractor shall adhere to all federal, provincial, and municipal legislation, by−laws, regulations, guidelines, safety standards, and codes governing construction activities. In cases of overlap, the most stringent will apply. If it is not clear as to which is more stringent seek clarification from the Departmental Representative.

.5 The Contractor shall obtain all permits, licenses, and approvals required to construct/rehabilitate and complete all other work as shown on the Contract Drawings.

.6 Only those cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, shall be used adjacent to water courses or ground water, with acceptance by PCA.

.7 Any new, or potentially questionable, cleaning products shall be approved by PCA.

1.12 FIRES

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

1.13 DRAINAGE

.3 As part of the EMP submission provide Erosion and Sediment Control Plan that identifies type and location of erosion and sediment controls to be provided. Plan to include

monitoring and reporting requirements to assure that control measures are in compliance with Erosion and Sediment Control Plan, and Federal, Provincial, and Municipal laws and regulations.

.4 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sedimentations control plan.

.5 Provide temporary drainage and pumping, as necessary, to keep excavations and site free from water including any temporary treatment systems or settling areas. A water management/ dewatering plan is to be outlined within the EMP.

.6 Do not pump water containing suspended materials into waterways, sewer, or drainage systems.

.7 Control disposal or runoff of water containing suspended materials, or other harmful substances, in accordance with Local, Provincial and Federal authority requirements. The following factors must be considered in determining the suitability of specific erosion control practices:

.1 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 preventing particle movement through the material.

.8 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements and provincial standards.

1.14 WORK ADJACENT TO WATERWAYS

.3 Do not operate construction equipment in waterways.

.4 Install sediment fences and erosion control structures, turbidity curtains and settling curtains prior to any work adjacent to waterways or on the pier.

.5 The Contractor shall employ appropriate sediment retention methods to ensure no sediment is discharged into the watercourse. Turbidity barriers and floating booms shall be located as shown on the Erosion Sediment Control Plan provided by the Contractor. The Contractor is responsible for the design of the turbidity barriers to meet the requirements of the Canadian Water Quality Guidelines for the Protection of Aquatic Life.

.1 CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life will form the baseline for water and streambed quality monitoring and assessment.

.2 Maintain water alkalinity and pH between 6.5 and 9.0. Water with pH > 9 or <6.5 cannot be released directly back into the watercourse. Aqueous substances with a pH ≥ 12.5 are corrosive and considered a hazardous waste under Ontario Regulation 347 of the Environmental Protection Act and wastewater in this condition must be either removed from site.

.3 Maximum increase of 8 NTU from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTU from background levels for a longer-term exposure (< 30-d). If elevated turbidity beyond 8 Nephelometric Turbidity Units (NTU) from background levels for a short-term

exposure is observed at the source of in-water work, the Departmental Representative will assess potential impact to the aquatic environment. Additional mitigation measures may be required.

.4 Maximum increase of suspended sediment concentrations by more than 25 mg/L over background levels during any short-term exposure period (e.g., 24-h). For longer term exposure (< 30-d), average suspended sediment concentrations shall not be increased by more than 5 mg/L over background levels. If elevated turbidity beyond 25 mg/L from background levels for a short-term exposure is observed at the source of in-water work, the Departmental Representative will assess potential impact to the aquatic environment. Additional mitigation measures may be required.

.6 Do not use waterway beds for borrow material.

.7 Do not dump excavated fill, waste material, or debris in waterways.

.8 Design and construct temporary crossings to minimize erosion to waterways. Temporary crossings shall not be composed of loose aggregate/granular material.

.9 Do not skid logs or construction materials across waterways.

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

.11 Clean storm run−on shall be diverted around the site and away from exposed areas as detailed in the EMP

.12 An adequate containment system (e.g., tarpaulins, plywood, or other type of protective shrouding) shall be placed between concrete surfaces requiring repair and a barge (or other vessel) to receive any debris produced by sawing, chipping, etc.

.13 Concrete debris from the barge (or other vessel) shall be properly contained in order to ensure that no concrete debris escapes or remains at the site.

.14 Temporary storage sites for debris generated from clearing/demo operations should be deposited away from watercourses, should be surrounded by a natural vegetative buffer, should be screened from the road and should be selected by the Departmental Representative.

.15 Do not use salt as a de-icer near canal. In areas where ice is a safety concern, the use of sand will be permitted, but it must not be allowed to enter the watercourse.

.16 Stockpile excavated or fill materials must be stored and stabilized away from water. Runoff from the excavated of fill material must be contained from entering the watercourse by sediment fencing installed 1 m out from the base and all around the stockpiled material. Stockpiled material should be covered with tarpaulin or other approved covering.

.17 Utilize turbidity curtains, flow checks, sediment fences, drainage swales or other methods necessary to prevent sediment from entering the watercourse.

1.15 WATER QUALITY AND AQUATIC LIFE PROTECTION

.3 All work must comply with the Fisheries Act, as regulated by the Department of Fisheries and Oceans (DFO). Water Quality and Aquatic Life Protection'

.4 All In-Water Work shall also be governed by these provisions.

.5 Activities shall be scheduled to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed. In−water works, including but not limited to installation and removal of turbidity curtains, shall be restricted to the approved fish timing window. In−water works shall be conducted between July 16 and March 14, no in−water work permitted from March 15 to July 15.

.6 In-water work shall be performed in a manner that minimizes the disturbance of the watercourse bottom and dispersion of sediment.

.7 The duration of in−water works should be minimized to the extent possible.

.8 With respect to turbidity curtain installation:

.1 Perform an initial sweep of the work area to drive fish out prior to completely closing off turbidity curtains surrounding the work area;

.2 Deployed turbidity curtains in a manner − e.g. moved in a direction from close to shore/structures outward − that prevent entrapment of fish inside the curtain; and

.3 Turbidity curtains shall not be deployed fully across the watercourse to serve as a barrier to fish migration.

.9 Turbidity curtains shall be weighted on the bottom edge and long enough to sit on the canal bed.

.10 Where necessary, fish salvages will be conducted by a qualified professional in areas isolated from flows prior to construction, under applicable permit(s).

.11 Where possible, schedule work to avoid wet, windy, and rainy periods that may increase erosion and sedimentation.

.12 Undertake all in−water works within an isolated work area using turbidity curtains, appropriate to the site conditions and permeability needs, as indicated in the design drawings while maintaining natural flow of water downstream.

.13 Refer to mitigation measures for Surface Water Quality for NTU and TSS requirements.

.14 Maintain fish passage at all times.

.15 Restore bed and banks of the waterbody to their original contour and gradient; if the original gradient cannot be restored due to instability, a stable gradient that does not obstruct fish passage should be restored.

.16 Should work conditions change such that it is possible that fish or fish habitat may potentially be impacted, all works shall cease until the problem/issue has been corrected or authorization has been obtained from the appropriate authorities.

.17 For additional guidance on in−water work the Contractor shall refer to the DFO "Measures to Avoid Causing Harm to Fish and Fish Habitat" which provides advice applying to all project types and replaces all "Operational Statements" previously produced by DFO for different project types in all regions (DFO 2013).

.18 In-water work shall be performed in a manner that minimizes the disturbance of the watercourse bottom and dispersion of sediment

.19 Place only clean, washed stone, free of fines in the waterbody.

.20 Treat any water containing a high level of silt or sediment by discharging to settling basins, vegetated areas or sediment traps prior to release to streams. Mechanical

filtration (ie. filterpress or chemical – flocculation) may be acceptable to the Departmental Representative. Confirm if this is an option and refer to ESG-14-C for the Treatment of Discharge Waters. Water quality downstream of construction activities and turbidity curtain should not exceed recommended CCME guidelines on water quality for the protection of aquatic life. Particularly no change from background turbidity readings of 8 nephelometric turbidity units (NTU), or a change of 25 mg/L for suspended solids, at any one time for a duration of 24 h in all waters during clear flows or in clear waters.

.21 Information on CCME guidelines can be obtained online at: http://ceqgrcqe.ccme.ca/download/en/217/. If NTU readings are found to be noncompliant, total suspended solids (TSS) may be sampled for laboratory analysis.

.22 In the event of significant sedimentation or debris caused by construction activities, contractor must take appropriate measures to confine work area.

.23 Develop a contingency plan (eg. Extra pumps/equipment) in the event of extreme precipitation events or spring flooding at the place of Work. Refer to ESG, Table 3 – EMP Component Plans and Key Requirements: Dewatering and Wastewater.

.24 Quickly address and seal any leaks discovered in cofferdams/berms. If leaks persist, create a clean water collection area, to be pumped back to the upstream or downstream receiving waters.

.25 Use of earth or granular material with sand and fines for any required cofferdam/water barrier structure construction is not acceptable. Washed gravel with 6 mm minimum aggregate size, contained within meter bags with waterproof liners, can be used as cofferdam/berm material. If using sandbags, sand must be washed and free of fines.

.26 In the event of significant sedimentation or escape of debris caused by construction activities, Contractor to stop work immediately, notify Departmental Representative, calls the MOE Spills Action Centre (1-800-268-6060) and take appropriate measures to confine work and modify Environmental Plan including installation of new environmental measures and/or additional turbidity curtains.

.27 Monitor water quality for suspended sediment levels exceeding identified requirements during in and near-water activities

.28 CCME has set criteria wherein the allowable increase in total suspended solids (TSS) beyond background levels is 25 mg/l for short-term exposure (24 hr period) and or maximum average increase of 5 mg/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 do not exceed and absolute TSS value, to be based on the background value at the site, and determined prior to construction.

.29 Turbidity Monitoring may be completed in conjunction with monitoring of TSS.

.1 Turbidity monitoring should be completed during dewatering discharge that is ultimately received by a surface water feature, at a minimum frequency of twice per day during active dewatering. Testing locations should be specified within the EMP and may be modified (with PCA acceptance) dependent of site activity and/or downstream effects (i.e. in the event of a plume release into the watercourse (turbidity, concrete fines, etc.) additional testing should be

conducted further downstream to track the movement and dissipation of the plume through the watercourse).

.2 Daily turbidity records shall be maintained by the contractor and shall be provided to the Departmental Representative on a weekly basis.

.30 If the Erosion and Sediment Control (ESC) strategies outlined on the EMP are not effective in preventing the release of a deleterious substance, including sediment, then alternative measures must be implemented to minimize potential. Changes to the EMP must be accepted by Departmental Representative and an updated EMP/Permit may be required.

.31 If utilized. ensure that sediment settling basins are of adequate size to allow for excess sediment run-off and erosion.

.32 Record pH measurements of water inside and outside containment area.

.33 Water with pH>9 or <6.5 cannot be released directly into the watercourse, such water must be treated prior to release.

.34 Water with pH>12.5 is treated as a hazardous waste in accordance with Ontario Regulation 347/90 of the Environmental Protection Act and impacted water must be removed from site.

.35 Stop work in immediate area in the event pH, sedimentation or turbidity exceed identified thresholds and implement mitigation measures accepted by Departmental representative.

.36 The intakes of pumping hoses will be equipped with an appropriate device to avoid entraining and impinging fish, as per DFO guidelines.

.37 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.

.38 Cessation of in-water work:

.1 In-water work will cease at the first indication of a significant oil sheen or distressed or dying fish in the vicinity of the work area.

.2 Departmental Representative may direct Contractor to other areas of work within the project limits while issues are investigated.

.3 Ensure original containment structures are containing the oil sheen or supplement them such that there is containment.

1.16 HAZARDOUS AND NON-HAZARDOUS WASTE

.3 Note: Lead paint is known to be present on site. See Section 01 35 44 - Environmental Protection, Lead Paint and Section 09 97 19 - Painting Exterior Metal Surfaces. Dispose of all rubbish and waste material in accordance with Section 01 74 21 Construction Demolition Waste Management and Disposal.

.4 Hazardous materials shall be appropriately disposed of at a licensed facility that accepts this class of waste; all applicable federal, provincial, and municipal laws, regulations, and guidelines shall be strictly adhered to.

.5 All lead−based paint shall be managed in accordance with Ontario Regulation 490/09.

.6 An adequate containment system shall be provided and inspected daily to effectively confine and capture any debris that could potentially become detached during the removal and replacement of the canal walls, or any of their component parts.

.7 All debris collected within the containment system shall be carefully emptied into an enclosed container daily, or more frequently if required, to ensure that no debris escape into the surrounding environment, or remain at the site. All debris shall be recovered, collected, and taken to a landfill site licensed to receive it for disposal in accordance with all applicable federal, provincial, and municipal laws, regulations, and guidelines.

.8 All chemicals and compounds used for this project shall be utilized according to the appropriate Product Technical Data Sheet, stating guidelines and methods for proper use, and provided by the manufacturer of the product.

.9 The Non−Hazardous Solid Waste Disposal Plan, included as a component of the EMP, shall be implemented for all construction phases such that discarded materials shall be separated, recycled, re−used, or disposed of, as appropriate, in a landfill licensed to accept the class of waste; all applicable federal, provincial, and municipal laws, regulations, and guidelines shall be strictly adhered to including the City of Kawartha Lakes Bylaws

.10 Do not dispose of preservative material into sewer system, into waterbodies, onto the ground, or in any other location where they will pose a health or environmental hazard.

.11 Any hazardous substances, if required, shall be stored (on impermeable pads a minimum of 30 m from the water), handled, and applied in accordance with local regulations and in a manner which prevents release into the environment. Berms surrounding material shall be established if necessary.

.12 Do not bury rubbish and waste materials on site.

.13 Do not dispose of waste or volatile materials, such as mineral spirits, oil, or paint thinner, into waterways, storm, or sanitary sewers.

.14 Waste subject to 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.

.15 Obtain and submit Waste Generator Numbers, permits, manifests, and other paperwork necessary to comply.

.16 Remove all garbage from site daily.

.17 Dispose of uncontaminated construction/demolition materials which cannot be recycled or reused, at an approved construction and debris disposal site.

.18 The management of fuels, lubricants and chemicals must meet with the requirements of the Ontario Dangerous Goods Transportation Act (RSO 1990, c. D.1) and all other appropriate provincial and federal regulations.

.19 The Departmental Representative must be immediately contacted after a spill of any volume of fuel or lubricant, and after any amount of other chemical products has escaped.

.20 Departmental Representative may suspend work following the improper handling of hazardous materials.

.21 Storage of hazardous material, including explosives, shall not be permitted (except for quantities which shall normally be expected to be utilized in a day of work, and which are not permitted to stockpile).

.22 Contractor to maintain on-site adequate supply of absorbent material and berming devices to contain spills.

.1 Provide training to site personnel in the use of the kit.

.2 Spill response materials to be compatible with the type and quantity of materials being handled.

.23 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.

.24 Dispose of hazardous materials and designated substances in accordance with Ontario Regulation 347/90.

1.17 PERMIT TO TRANSPORT

.3 All waste described as subject to Ontario Regulation 347, as amended by the Environmental Protection Act, must be transported with a valid "Certificate of Approval for a Waste Management System" to a site approved by the Ontario Ministry of the Environment to accept that waste.

.4 Lead paint is known to be present on site. See Section 01 35 44 - Environmental Protection, Lead Paint, and Section 09 97 19 - Painting Exterior Metal Surfaces. Obtain a Transportation of Dangerous Goods (TDGA) permit for all lead waste prior to transporting the waste.

1.18 NOISE CONTROL

.3 Many methods of rivet removal create a significant amount of noise. Limit the timing (avoid early morning, evening and night) of rivet removal, and noise from the removal, as much as possible. In all cases, comply with local by-laws, including the by-laws, related to noise and construction.

.4 Minimize the noise levels generated from construction activities by using proper muffling devices, in addition to appropriate timing and location of these activities, to reduce or minimize the effect of noise on nearby residents, recreationists, and wildlife.

.5 Work shall be conducted in accordance with the noise bylaws of the Town of Washburn, Ontario.

1.19 SPILL CONTAINMENT

.3 The contractor shall have a spill containment kit on site and available at all times. Spill kit must have the capacity to handle the volume of chemical liquids of the largest size tank at the site. Spill control kits to be available to Contractor employees at all areas where Work of the Contract is being performed and at all times during the course of the contract.

.4 During all operations, such as refueling and paint transfer, the operations shall be completed away from the waterway and within a secondary containment system capable

of preventing release of spills or leaks into the environment. Containment system must be of appropriate capacity to handle volumes expected from accidental release.

.5 An adequate supply of clean−up materials shall be maintained on site, on both sides of the canal, and employed immediately should a spill occur. In the case of a spill, including but not limited to concrete, grout, or water with pH > 9, PCA and the Ontario Spill Action Center (1− 800−268−6060) shall be notified immediately; all provincial and federal regulations shall be strictly adhered to the satisfaction of PCA. Documentation of remediation, testing and results will be provided to PCA.

.6 Construction crews shall be fully trained in the use of spill kits and spill response procedure to ensure timely and effective responses to spill incidents.

.7 Procedures, instructions, and reports to be used in the event of an unforeseen spill of a regulated substance are detailed in the Spill Control Plan, included as a component of the EMP, and shall be adhered to.

.8 Disposal of spilled materials and impacted/contaminated material to be off Parks Canada property and at approved locations for materials to be disposed of.

.9 Contractor to protect all wells, catch basins, drywells, drains and watercourses from contamination in event of a spill.

.10 Contractor to immediately remove as much or all of the contaminated soils as possible, from any spills created from Work of the Contractor.

.11 Contaminated soils/materials to be placed in sealed, isolating containers compatible to the contaminants.

.12 Any remaining clean-up of spills to be performed at no extra cost to Parks Canada. Clean-up to be to the Departmental Representative's satisfaction

.13 Documentation of remediation, testing, and results are to be submitted to Departmental Representative and PCA Environmental Authority.

1.20 POLLUTION CONTROL

.3 Maintain temporary erosion and pollution control features installed under this contract for the duration of the Work.

.4 Control emissions from equipment and plant to local authorities' emission requirements.

.5 Prevent blasting media, lead paint removed, and other extraneous materials from contaminating air, ground, and waterways beyond removal/application area by providing temporary enclosures. Air-tight full enclosures, in accordance with the guidelines for lead on construction projects, are required.

.6 Cover or wet down dry materials to prevent blowing dust and debris.

.7 Spills of deleterious substances:

.1 Remediation shall be conducted immediately. Contain, limit spread of, and clean up, in accordance with Provincial regulatory requirements, AND to the satisfaction of the departmental representative; provide documentation of remediation, testing, and results to the Departmental Representative.

.2 Report immediately to Ontario Spills Action Centre: 1-800-268-6060.

.3 Once the spill is reported to the Ontario Spills Action Centre, report to the Departmental Representative.

.4 Further information on dangerous goods emergency cleanup and precautions, including a list of companies performing this work, can be obtained from the Transport Canada 24-hour number (613) 996-6666.

.8 Releases of dust shall be suppressed using water mist or other appropriate methods of control during construction. Calcium chloride shall not be used as a dust suppressant due to the proximity of the work site to water.

.9 Use well−maintained heavy equipment and machinery, fitted with fully functional emission control systems/muffler/exhaust baffles, engine covers, etc.

.10 All on-site vehicles are expected to have a Drive Clean Emissions Report, in compliance with O.Reg. 361/98: Motor Vehicles Under the Environmental Protection Act, R.S.O. 1990, C.E.19.EA. Officers may stop a vehicle if they believe the vehicle is emitting excessive exhaust smoke or suspect that emission control equipment has been tampered with or removed.

.11 Machinery shall be left running only while in use, with the exception of during extreme temperatures which prohibit shutting machinery down.

.12 Waste and debris shall be transported from site in a fashion that limits the loss of soils and dust.

.13 Cleaning of heavy equipment, including concrete trucks, shall not be cleaned within the park boundaries.

.14 Prevent sandblasting, concrete dust and other extraneous materials from contaminating air and waterways beyond application area.

.1 Provide temporary enclosures where directed by the Departmental Representative.

.15 Be responsible for all costs of cleaning up any spills to the satisfaction of the Departmental Representative.

.16 Compressed fuel tanks shall be placed off to the side of the work area when not in use and shall be equipped with an impact-protection barrier.

.17 Use biodegradable hydraulic fluids for machinery that will be working in or around the river.

.18 Store all oils, lubricants, fuels and chemicals in secure areas on impermeable pads; provide berms and secondary containment systems as necessary.

.19 A secondary containment system is required of all on site ASTs as per provincial and federal storage tank requirements: https://www.canada.ca/en/environmentclimatechange/services/canadian-environmental-protection-actregistry/publications/codepractice-storage-tank-systems/part-3.html

1.21 NOTIFICATION

.3 Contractor shall monitor compliance with the Contractor's EMP, logging compliance and non-compliance issues. The log shall be completed daily and provided to PCA on a weekly basis (at minimum) for review and also at minimum be presented to the Departmental Representative for review at the weekly meetings and after any non-

compliance. The Departmental representative will designate the location or emails to which the weekly reports are to be delivered.

.4 While Contractor remains responsible for compliance review, the Departmental Representative may notify Contractor, in writing, of observed noncompliance with Federal, Provincial, or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Management Plan (EMP).

.5 Contractor, after receipt of such notice, shall inform the Departmental Representative of proposed corrective action and take such action to satisfy the Departmental Representative.

.6 Departmental Representative may issue a stop-work order until satisfactory corrective action has been taken.

.7 No time extensions will be granted, or equitable adjustments allowed, to Contractor for such suspensions.

.8 Contractor to co-operate with the authorities having jurisdiction and correct any noncompliance issues.

.9 Should any suspected species at risk as listed in the Basic Impact Analysis or identified during construction and/or eggs be encountered during construction, project staging, implementation, or demobilization, Departmental Representative and Parks Environmental Assessment (EA) Staff shall be notified. Contractor shall stop work within the vicinity of the specimen immediately and contact the Departmental Representative for guidelines on how to proceed. Additional measures to avoid impacts may be required before work can restart. Stand back and allow the animal to leave the site.

.10 In the event of an environmental incident or emergency such as:

.1 Chemical spill or petroleum spill;

.2 Poisonous or caustic gas emission;

.3 Biological or chemical explosion;

.4 Hazardous material spill;

.5 Sewage spill;

.6 Contaminated water into waterways; or

.7 Turbidity release into waterways.

Notify the Contractor’s job superintendent. Call the local emergency services and give type of emergency. Notify the MOE Spills Action Center (1-800-565-1633) and Rideau Canal Warden Office.

.11 Following an environmental incident or emergency, the Contractor is to submit to Departmental Representative an incident report, outlining details of the incident, actions taken to mitigate the incident, monitoring and results completed during, and after incident, remediation actions taken, lessons learned and actions taken/adjusted to prevent future incidents.

.12 Should conditions at the work site indicate that there are unforeseen negative impacts to fish or their habitat, cease all work until the problem has been corrected and/or appropriate guidance has been obtained from Parks Canada.

1.22 ENVIRONMENTAL MITIGATION MEASURES FOR TREMIE CONCRETE

.5 Ensure concrete forms are tight and no flow is occurring outside the forms.

.6 Isolate area with curtain or impermeable material specified for concrete particulates; Ensure fish exclusion is followed.

.7 Isolated area should be should be the minimum size required to complete the work.

.8 For tremie pours, a carbon dioxide (CO_2) system must be installed and operating along the entire length of the isolated area. The tank shall be used to release carbon dioxide gas into the affected area to neutralize pH levels. Ensure sufficiently sized tanks for the concrete volumes are used.

.9 Workers shall be trained in the use of the system.

.10 Use of neutralizing acids is not permitted.

.11 pH monitoring shall be conducted both inside and outside of the containment area.

.12 Use Anti−washout Admixture to decrease the percentage of concrete fines released to the water column.

.13 Use grout bags where possible to further contain the concrete.

.14 Stop placement of concrete if fish kill is observed and contact EA Officer.

.15 In event of a release of concrete, notify Departmental Representative, PCA Environmental Authority and Ontario Ministry of Environment and MOE Spills Action Centre (Tel: 1-800-268-6060).

.1 Clean up and execute remediation immediately in accordance with provincial and federal regulatory requirements and accepted by PCA Environmental Authority.

.2 Install additional turbidity curtain or sediment barriers as necessary.

.3 Document remediation, testing, results to be submitted to Departmental Representative and PCA Environmental Authority.

1.23 VEGETATION MANAGEMENT AND PROTECTION

.1 Protect trees and plants on site and adjacent properties as indicated in the tree/vegetation protection plan.

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

.3 Protect roots of designated trees 1 meter beyond the dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Restrict grubbing and clearing to locations identified in the Contract Drawings.

.5 Minimize stripping of topsoil and vegetation.

.6 Restrict tree removal to areas designated by PCA.

.7 Provide barriers around trees and gardens which may be affected by work, including staging areas.

.1 Locate barrier 1 meter beyond Drip line.

.2 Barrier to consist of protective wood framework covered with plastic construction fence material, extending from grade level to a height of 2 meters.

.3 Maintain barriers in good repair throughout duration of Work.

.4 Remove barriers upon completion of Work.

.8 Damage to trees due to Contractor's operations to be addressed as follows:

.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.

.9 Reduce soil displacement and compaction by using heavy machinery in designated areas with proper ground protection system or on existing vehicle paths.

.10 Should tree removal be required (alternative options for preservation not feasible), justification for removal should be provided within EMP.

.11 Where work restrictions impede placement of vegetation protective barriers, seek acceptance of Departmental Representative and PCA Environmental Authority for alternative solutions.

.12 Cut trees at ground level and do not leave pointed stumps.

.13 0.13 - No vegetation clearing to occur between April 1st and August 28th of any year to protect nesting birds.

.1 If vegetation clearing must take place during this period, an avian biologist must be present to screen and clear the area of nests no more than (2) days prior to clearing.

.14 Provide inventory of species removed, and a replanting plan using native species to be accepted by Departmental Representative and PCA Environmental Authority in cases of removing mature vegetation.

.15 Keep site stabilized if there is less than four weeks remaining in growing season.

.16 Visual site inspections to be conducted in spring and fall for first two growing seasons following planting. If any plantings are found dead or failing, mitigation measures to be implemented to reduce risk of future failure and plants to be replaced and monitored accordingly.

.17 Grubbing must not be conducted unless a suitable planting plan and Erosion and Sediment Controls are in place.

.18 Delineate areas to be avoided with flagging tape or temporary fences.

.19 Ensure appropriate handling procedures are followed for noxious weeds such as Giant Hogweed or Wild Parsnip.

.20 In the event that the installation of root-protective fencing is not possible and/or ideal, alternative measures, as approved must then be implemented. Such measures must

provide sufficient amount of soil compaction prevention with regards to the highest level of activity to occur within the immediate area of protection.

.1 For areas of light-to-medium levels of traffic activity, a geotextile cloth shall be placed over the area of protection and covered with 200 mm, minimum, thick layer of wood mulch material.

.2 Pins or staples must be used to secure the geotextile material to the ground.

.21 When practicable, prune or top the vegetation instead of grubbing/uprooting.

.22 Immediately stabilize shoreline or banks disturbed by any activity associated with the project to prevent erosion and/or sedimentation, preferably through re−vegetation with native species suitable for the site.

1.24 SITE ACCESS, STAGING AND STORAGE

.1 To the extent possible, existing access routes shall be used to minimize impacts to vegetation. Removal of habitat within the adjacent forest community shall not be undertaken to facilitate staging or storage.

.2 Areas for staging or storage shall be identified in the Contractor's EMP.

.3 Tree pruning, if necessary, shall be conducted by an experienced professional to ensure tree health and survival and approved by PCA prior to removal.

.4 All trees to be pruned shall be clearly marked.

.5 Land disturbance shall be minimized by clearly demarcating the construction envelope.

.6 Staging areas shall be set aside within a secondary containment system capable of preventing release of spills or leaks into the environment. These areas shall be used for refueling and for the storage of all deleterious substances, materials, and equipment, and shall be set−back at the maximum available on−site distance from the water's edge (recommended 30 m minimum) on impermeable pads/pans designed to allow full containment of spills. For additional requirements on the containment system, fueling, and storage protocols, refer to the Contractor's EMP.

.7 All hazardous materials (e.g., oils, lubricants, fuels, paints, solvents, paint thinners, etc.) shall be securely locked−up to avoid vandalism and accidental spills.

.8 Deliver, store, and handle materials in accordance with the manufacturer's written instructions.

.9 Materials should be stored in a dry location that is clean, dry, and well−ventilated.

.10 Replace defective or damaged materials with new.

.11 Stockpiles shall be stabilized and cover by tarpaulins when not in use and have a sediment fence barrier around their perimeter.

1.25 EROSION AND SEDIMENT CONTROL

.1 Erosion and sediment control measures shall be implemented prior to work and maintained during the work phase, to prevent entry of sediment into the water where site access or other activities cause exposed soil.

.2 Any stockpiled materials shall be stored and stabilized a safe distance away from any watercourse, drainage course or swales to prevent erosion and subsequent entry into the

water body OR removed from the site, in accordance with all federal, municipal, and provincial regulations. Material which is stockpiled on site shall have A sediment fence installed around it.

.3 All erosion and sediment control measures shall be inspected daily to ensure they are functioning properly and are maintained and/or upgraded as required to prevent entry of sediment into the water.

.4 If erosion and sediment control measures are not functioning properly, no further work shall occur until the sediment and/or erosion problem is addressed to the satisfaction of PCA.

.5 To the extent feasible, construction shall be undertaken during normal weather conditions, and the ESC Plan shall be designed to appropriate specifications to withstand variable weather conditions.

.6 Environmental protection measures shall be checked after each extreme weather event.

.7 Undertake earthworks using construction techniques designed to prevent sedimentation.

.8 Erosion and sediment control measures shall be left in place until all areas of the work site have been stabilized; once the site has stabilized and upon approval from departmental representative., remove all non−biodegradable ESC materials.

.9 All surplus excavated material must be disposed of at an approved location and in an approved manner.

.10 When vegetation must be removed, then the extent and duration of exposure should be kept to a minimum. Plan the phases of development so that only areas that are activity being developed are exposed.

.11 Where there is potential for severe erosion and/or downstream "sedimentation", cover exposed and excavated areas prior to major precipitation events.

.12 Prior to carrying out work, check long range weather forecast to ensure that there is adequate time before forecast of heavy rain storms to stabilize the work. Provide details of stabilization plan to Departmental Representative for review.

.13 Maintain a stockpile of appropriate erosion and environmental protection materials (e.g. sediment fences, wood chips, clean rock fill and aggregate base course) on site at all times.

.14 Provide a 1 meter high sediment fence barrier in all areas where, due to construction activities, sediment or debris may enter the waterway. Install sediment curtain a minimum of 3 m from shoreline.

.15 Disturbed areas of the work site shall be stabilized immediately and re-vegetated as soon as conditions allow. Exposed areas should be covered with fibre-based erosion control blankets or other measures to keep the soil in place and prevent erosion until re-vegetated.

.16 Sediment control measures and exclusion fencing must be removed in such a way which prevents the escape or resuspension of sediments.

1.26 OPERATION, MAINTENANCE AND STORAGE

.1 Comply with operating specifications for heavy equipment and machinery.

.2 All machinery and equipment are to arrive on site in a clean condition and be maintained free of fluid leaks, invasive species, and noxious weeds.

.3 Follow the Ontario Clean Equipment Protocol for Industry − Inspecting and cleaning equipment for the purposes of invasive species prevention.

.4 Operation and idling of gas−powered equipment, machinery, and vehicles shall be minimized to the extent possible.

.5 Movement of heavy equipment and machinery shall be avoided in areas with sensitive slopes, and vehicle traffic shall be minimized on exposed soils.

.6 All heavy equipment, machinery, and tools required for the work shall be regularly inspected and maintained to avoid leakage of fuels and liquids, and, where feasible, shall be operated, maintained, and stored a minimum of 30 m from the water in a manner that prevents any deleterious substance from entering the watercourse or soils.

.7 Heavy equipment, machinery, and tools shall be operated on land (from outside of the water) or on the water (i.e., from a barge or vessel) in a manner that minimizes disturbance to the banks or bed of the watercourse.

.8 When not in use, all materials, equipment, and tools should be securely locked up to avoid vandalism and accidental spills.

.9 Drip trays shall be placed under all fuel-run machinery on site and any equipment with potential to leak deleterious fluids (i.e hydraulic fluids). Drip trays shall be sized to encompass the perimeter of the machinery/equipment and shall provide ample spacing for refueling activities.

.10 In case of fuel heaters to be located with 30 m of a waterbody, use large drip pan to contain possible leakage from heater or refueling operations. Absorptive material to be placed at bottom of drip pan for added measure.

1.27 REFUELING ACTIVITIES

.1 Deleterious substances (including fuel) shall be handled, and utilized in a manner to avoid contamination of soils, groundwater, and surface waters.

.2 Refueling shall be conducted within the defined staging area as defined within the EMP and accepted by PCA.

.3 All deleterious substances (including fuel, cleaners, solvents, paint, etc.) shall be mixed and transferred within the defined staging area.

.4 Drip trays shall be placed under fuel−powered equipment when re−fueling.

.5 Refer to ESG-13-C – Refueling and Spill Management for PCA requirements.

.6 Refuelling activities shall not take within 30 m of the waterbody, unless additionally mitigations are employed and accepted by PCA.

.7 All spills of hydrocarbon based products such as gasoline, kerosene, naphtha, lubricating oils, engine oils, greases and de-icing fluids or antifreeze no matter how large or small to be reported to Departmental Representative and the Park’s Environmental Protection Officer (EPO).

.8 All refueling to be performed on level surfaces.

.9 Drip pans are to be utilized for all fuel-run machinery and equipment present on site, regardless of whether in use or not.

.10 Equipment with leaks or poor mechanical repair shall be immediately capped or patched and removed from site.

1.28 TREATED WOOD

.1 Treated wood shall meet provincial and federal guidelines, provided the wood is pre−treated, dry, and is not used where it has contact with water; creosote and/or pentachlorophenol treated wood must not be used.

.2 When working with treated wood, adherence to all respective regulations and good house− keeping shall be followed. This shall include prefabrication to the desired specifications, therefore eliminating the need for cutting and field application of treatment.

.3 Disposal of treated wood shall be done in a legal manner at a licensed facility.

.1 Disposal of treated wood wastes includes saw-dust.

.4 Utilizing PCA guidance and policy procedures, the treated wood material selected for the construction projects should be a material which have the least long and short-term adverse environmental impact upon water quality, fish health and fish habitat quality, without compromising the structural and cultural integrity of the wharf structures.

.5 In accordance with PCA's guidance and policy procedures regarding the treated wood, use of wood treated with CCA, ACZA, PAH or PCP preservatives is consequently not recommended within lands and waters administered by Parks Canada. However, in cases where there is no viable alternative (other material, non-Treated Wood, or wood treated with other preservatives) such as the Deck of this project:

.1 Treated wood is to be pre-weathered for 90 days (at minimum) prior to arrival on site, in order to prevent/minimize any initial leaching.

.2 Sampling must be conducted within three years of installation and again at the end of the products service life to ensure no contamination is present.

1.29 WILDLIFE MANAGEMENT AND PROTECTION

.1 In the event that an unexpected wildlife situation arises or a species at risk is found on site or encountered during construction activities, all work in the immediate vicinity of the animal will cease, and a Parks Canada representative will be contacted immediately to assist with mitigation measures.

.2 Detail procedures for preventing turtle entry and nesting within disturbed project area in EMP.

.3 Place temporary reptile exclusion fencing around stockpiled material and construction areas that may attract turtle nesting activities. 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-andenergy/species-atrisk/mnr_sar_tx_rptl_amp_fnc_en.pdf

.4 Environmental Management Plan to detail procedures for avoiding disturbance to wildlife and nesting birds, and Species at Risk.

.5 Do not use synthetic plastic erosion control mats or blankets to reduce potential for entrapment hazard for wildlife.

.6 Standard sediment fencing on site should not have mesh/netted backing.

.7 Removal of woody vegetation will not occur during the breeding bird season from May 1st to August 31st inclusive, unless a qualified biologist has searched the site for nests and concluded that no nests are present, no more than 7 days prior to clearing. If nests are found, a protective buffer around the nest location will be required until such time that the nest is abandoned.

.8 When possible, complete work during daylight. If nighttime lights are used, they are to be installed so as to illuminate the work area only to minimize impacts to nighttime activities of wildlife.

1.30 SPECIES AT RISK (SAR)

.1 The EMP must detail procedures (e.g. exclusion fencing) for preventing turtle entry/nesting within disturbed project gravels/soils during all stages of project activity.

.2 Daily ongoing observation for SAR and wildlife in general shall be undertaken for the duration of the project by all personnel on site.

.3 Should work−related activities have the potential to impact SAR, or those thought to be SAR, all work shall cease within the immediate vicinity of the specimen. PCA, shall be contacted immediately for guidelines on how to proceed.

.4 Park on roads or disturbed areas only.

.5 Provide training to all employees before beginning work on site on identifying species at risk and procedures to follow if species at risk are encountered.

.6 Stop work within the immediate vicinity of the specimen and contact the Departmental Representative and PCA Environmental Authority on how to proceed if species at risk does not or cannot leave site on its own accord.

.7 Minimize disturbed areas and clearly mark Work space.

.8 If species at risk are observed or encountered, the individual must not be harmed, harassed, or killed. Stand back and allow animal to leave site.

.9 Surround stockpiled materials by sediment control fencing to prevent turtle nesting.

.1 Fencing shall not have mesh backing, as this poses as a hazard to wildlife.

1.31 ENVIRONMENTAL MONITORING

.1 Environmental mitigation measures, shall be inspected daily and a daily checklist/log shall be maintained over the duration of the project.

.1 Daily logs are to include water quality monitoring, taken up and downstream of work area, twice daily (minimum), at locations designated within the EMP.

.2 Checklists/Logs are to be provided to Departmental representative on a weekly basis, at minimum.

.2 Any deficiencies should be addressed immediately.

.3 SAR and wildlife sightings, or lack thereof, should be reported on the daily inspection checklist.

.4 Environmental summary reports shall be completed monthly and provide details of monitoring work completed, the findings of all monitoring, and details of how and when issues were resolved.

.5 Following completion of the project, weekly ESC monitoring or ESC monitoring following precipitation and snowmelt events, shall be completed until vegetation has become establish on all disturbed areas and ESC measures are removed.

.6 Any damages should be repaired immediately and any build−up of sediment should be removed and disposed of as required by all applicable federal, provincial, and municipal laws, regulations, and guidelines.

.7 The Contractor shall provide a written checklist of for inspection for vehicle/machinery leaks and overall condition, and, for the purpose of invasive species prevention, a written record of measures taken to clean vehicles/machinery/equipment.

1.32 CLEANING OF CONCRETE EQUIPMENT

.1 Departmental Representative will designate cleaning area for equipment and tools to limit water use and control runoff.

.2 Cleaning area to be no closer than 30 m from waterway to prevent contamination.

.3 Where no safe cleaning area is available, Contractor to provide sealed containment basin for the area where equipment is to be cleaned.

.4 Alkali water, such as concrete wash water, is to be collected and disposed off-site in accordance with federal, provincial, and local authority requirements.

.1 Waste water which has cone into direct contact with concrete shall not to be treated and released on site.

.5 Use only trigger operated spray nozzles for water hoses.

.6 As concrete leachate is alkaline and highly toxic to fish and other aquatic life, ensure that all works involving the use of concrete, cement, mortars and other Portland cement of lime-containing materials (concrete) will not deposit, directly or indirectly, sediments, debris, concrete, concrete fines, wash or contact water into or about any watercourse. Concrete materials cast in place must remain inside formed structures. Concrete waste water must be removed from site. Refer to ESG-5-C – Concrete Pour Operations and Grouting and strictly follow the defined guidelines.

.7 Provide containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment and other tools and equipment.

.8 Dispose of all concrete wash water in a location where it will not enter subsurface drains, water bodies or storm drains.

.9 Prevent any water that contacts uncured or partly cured concrete during activities like exposed aggregate wash-off, wet curing, or equipment washing from directly or indirectly entering any watercourse.

.10 Maintain complete isolation of all cast-in-place concrete and grouting from fish-bearing waters for a minimum of 48 hours if ambient air temperature is above 0ºC and for a minimum of 72 hours if ambient temperature is below 0ºC.

.11 In accordance with the ESG, isolate and hold any water that contacts uncured or partly cured concrete, until the pH is between 6.5 and 9.0 pH units, and the turbidity levels are acceptable. Employ CO2 treatment as outlined in ESG-5-C – Concrete Pour Operations and Grouting.

.12 Filter material will consider the grain size characteristics of the concrete sediment and shall be designed around the principals of maintaining sufficient hydraulic flow and prevention of particle movement through the material.

1.33 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 the EMP and Clean Equipment Protocol for Industry: https://www.ontarioinvasiveplants.ca/wpcontent/uploads/2016/07/Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf

.2 Equipment and vehicles to be used in waterbody, to be cleaned before and after use. This includes any visible mud, vegetation, mussels.

- .1 Drain of standing water.
- .2 Clean with hot water (>50°C) 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.

.4 Conduct site assessment for invasive plant infestations prior carrying out field activities.

.5 Round gobies and other invasive species found during dewatering activities shall be euthanized and not returned to the water system. This shall be reported to PCA.

.6 Use weed-free material for erosion control and stabilization ensuring that seed does not potentially contain invasive plants.

.7 Commercially purchased seeds should have a label that states following:

- .1 Species.
- .2 Purity: no less than 90%.
- .3 Weed seed content: tag should state no invasive plants are present, only use certified weed-free seed.
- .4 Germination of desired seed: germination should not be less 50% for most species with exceptions for some shrubs and forbs.

.8 Move only contaminate-free materials to non-infested areas to prevent spread of invasive plants.

.9 Familiarize workers with invasive species potentially present within work site areas.

.10 Properly dispose of any found invasive species to ensure no further propagation.

.11 Preventative and Control Measures, as identified in the Ontario Waterways (2017) document to be incorporated into the EMP and implemented by the Contractor.

1.34 MEASUREMENT AND PAYMENT

.3 There shall be no measurement for this work.

.4 Payment shall be included as part of the Contract Lump Sum Amount and such payment shall be full compensation for all design, labour, equipment, and materials necessary to complete the work.

Part 2 Products

2.4 NOT USED

.3 Not Used

Part 3 Execution

3.4 CLEANING

.3 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.

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

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

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

.6 Waste Management: separate waste materials in accordance with Section 01 74 21 – Construction Demolition Waste and Disposal.

.7 Clean up work area continuously as Work progresses.

.8 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.

.9 Permit no amount of debris, trash or garbage to accumulate on site.

.10 Do not bury rubbish on site.

.11 Separate and recycle materials that can be recycled.

.12 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 storm or sanitary sewers, or in any location where material may enter the waterway.

.13 Excess concrete must be disposed of at an appropriate facility outside of the Parks Canada protected heritage place. If excess concrete must be dumped prior to transport outside of the protected heritage place, it must be deposited in a location approved by Parks Canada and removed following hardening for disposal at an approved facility. Stockpiled concrete waste must be stabilized and isolated with appropriate erosion and sediment controls.

.14 Ensure emptied containers are sealed and stored safely for disposal away from children and wildlife.

.15 Unless prior permission from the Departmental Representative is obtained, all contractor equipment, facilities and materials must be removed from the site at the finish of each work phase, or if work is suspended due to weather or other circumstances, upon the suspension of work activities.

.16 All work sites must be returned to a neat and tidy condition upon site abandonment.

.17 Remove all scaffolding, temporary protection, surplus materials, tools, plant, rubbish and debris and dispose of them in an approved manner off Crown property by the completion date of the Work.

.18 Clean areas under contract to a condition at least equal to that previously existing and to approval of Departmental Representative.

3.5 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.3 Temporary Erosion and Sedimentation Control Plan: in accordance with Section 01 52 00 – Construction Facilities.

.4 Provide Temporary erosion and sedimentation control measure 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-R92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.5 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.6 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION

Part 1 General

1.1 ENVIRONMENTAL PROTECTION

.1 The following applies when performing the removal, salvage, handling, or disposal of articles with lead paint, including abrasive blasting or any other removal method, or item of work, which removes or affects paint with lead content. Note that the paint of the structure has been tested and does contain lead (the results of the testing are listed at the end of this section). Prevent the release of lead paint, chips and dust etc. into the environment.

.2 Lead paint removal on site shall be kept to a minimum. Removal must include all parts to be salvaged. Other parts and materials to be disposed of shall be disposed of in appropriate facilities using appropriate methods as per regulations. The work shall be preferably completed off site in an appropriate facility. No blasting of lead paint shall occur on site without conforming to the specification Section 02 83 12 - Lead-Base Paint Abatement - Maximum Precautions.

.3 Comply with Ontario Ministry of Labour Guideline - Lead on Construction Projects.

.4 Remove lead containing dust from air using appropriate extraction system and effective dust collection system with an appropriate HEPA filtration system.

.5 In the case of conflict between any regulations, the regulations and this specification, or any sections of this specification, the most stringent requirement shall apply, and the environment shall be protected.

.6 No asbestos was identified in the analyzed samples taken from the Lower Brewers site however materials that become exposed during construction activities (i.e. insulation, electrical wiring, asphalt, cables and piping) that support the suspicion of asbestos, polychlorinated biphenyls (PCBs), or other Designated Substances should be sampled at that time to confirm the presence or absence in support of appropriate management options.

.7 The contractor should note that Silica is present in the concrete and mortar at the site. Standard dust control measures should be implemented where practical to ensure airborne dusts are controlled during construction activities as per the Guideline for Silica on Construction Projects (MOL, September 204, as amended).

1.2 REFERENCES

.1 Ontario Regulation 347 General Waste Disposal.

.2 Fisheries Act.

.3 CEPA - Canadian Environmental Protection Act.

1.3 MEASUREMENT PROCEDURES

.1 All costs associated with the temporary enclosures and collection, capture, and disposal of all paint, blasting medium, and other extraneous material will not be measured and will be included in the contract lump sum price.

.2 After the award of contract, as part of the breakdown of lump sum price, the cost of this work shall be assigned to a breakdown item "Environmental Protection - Lead Paint".

.3 Provision of respiratory equipment, clothing, and eye protection, as protection for workers for removal of paint and abrasive blasting material, will not be measured separately for payment but considered incidental to, and included in, the contract lump sum price and separated in the breakdown of the contract lump sum price into the task for "Environmental Protection - Lead Paint".

1.4 MITIGATION MEASURES

.1 Implement the mitigation measures listed in the Environmental Assessment and Environmental Assessment Checklist.

.2 Complete mitigation checklist indicating how each issue will be addressed prior to mobilizing on site and submit to the Departmental Representative.

1.5 DISPOSAL OF WASTE

.1 Be responsible for the collection and disposal of waste containing lead and all associated waste. Arrange and provide all containment equipment and materials, any temporary storage, transportation, and final disposal.

.2 Submit letter of proof of prior arrangement with appropriate disposal site three weeks prior to removal of waste.

.3 Obtain all waste disposal permits and certificates. All waste materials must be disposed of in a legal manner at a site approved by Provincial and Federal Authorities having jurisdiction as to the methods of disposal for the waste generated.

.4 Do not allow any material or deleterious substances to enter the waterway. The contractor will be liable for any violation of the Fisheries Act and will be prosecuted and responsible for clean-up and mitigation methods.

.5 Dispose of lead paint removal waste and abrasive blasting material in accordance with requirements of Provincial and Federal authority having jurisdiction.

.6 Co-operate with Ministry of Environment inspectors and immediately carry out instructions for remedial work at no extra cost.

.7 Ensure disposal site operator is fully aware of hazardous nature of material being handled and that testing results have been supplied to the operator and PSPC.

.8 Provide Departmental Representative with a copy of both the receipt or weigh bill for disposed lead removal of waste issued for the transportation to the disposal site and the receiving of the waste by the disposal site operator.

1.6 DRAINAGE

.1 Do not pump water containing suspended materials, or other harmful substances, into waterways, sewer, or drainage systems.

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

1.7 LEAD CONTENT REPORT

.1 The following presents the general results of the Lead Content Report.

.1 A paint sample was taken from the approach railing (black) was sent to a testing laboratory for chemical analysis. The sample contained .32% lead by weight.

.2 A paint sample was taken from the bridge (general use) was sent to a testing laboratory for chemical analysis. The sample contained .81% lead by weight. All site features that are painted should be considered to contain this or greater level of lead content and shall be handled and disposed of accordingly. Features are not limited to but include the following: timber superstructure and associated components, concrete abutments, wingwalls, foundations, steel railings, wooden bollards, gates, and mechanical equipment.

Standard demolition dust control measures should be implemented to ensure airborne dusts ae controlled as per the MOL's Guideline for Lead on Construction Projects.

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 SECTION INCLUDES

.1 Inspection and testing, administrative and enforcement requirements.

.2 Tests and mix designs.

.3 Mock-ups.

.4 Mill tests, grading certificates, material data and material control.

.5 Equipment and system adjustments, balance and documentation.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 78 00 - Closeout Submittals.

1.3 INSPECTION

.1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than the Place of Work, allow access to such Work whether it is in progress, or completed, for review.

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

.3 If Contractor covers, or permits to be covered, Work that requires inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed, and make good such Work as may have been disturbed.

.4 Departmental Representative may order any part of the Work in progress, or the completed Work, to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination, such work is found not in accordance with Contract Documents, correct such Work and pay cost of re-examination and correction.

1.4 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative. Such testing does not reduce or eliminate the contractor’s testing that should and must be performed to ensure quality control and compliance with the contract documents.

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

.3 Employment of Inspection/Testing Agencies does not relax responsibility for Contractor to have and conduct their own quality control program to verify that the work is completed in accordance with the Contract requirements and to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to the contract. Pay costs for retesting and reinspection and additional test on areas believed to be completed in a similar manner or using similar methods or materials.

1.5 ACCESS TO WORK

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

.2 Co-operate to provide reasonable facilities for such access including any scaffolding or access machines and equipment to properly inspect the work.

1.6 PROCEDURES

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

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence, giving time for review so as not to cause delay in Work.

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

1.7 REJECTED WORK

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

.2 Make good other Contractor's work damaged by such removals or replacements promptly. Have skilled subtrades complete repairs to work that was originally completed by these subtrades.

.3 If, in opinion of Departmental Representative, it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, the Departmental Representative may deduct from Contract Price the difference in value (not merely the cost) between Work performed and that called for by Contract Documents, the value of which shall be determined by Departmental Representative.

1.8 REPORTS

.1 Submit four (4) copies of inspection and test reports to Departmental Representative when the contractor is required to provide reports.

.2 Provide copies to Subcontractor, manufacturer, or fabricator of material being inspected or tested.

1.9 MOCK-UPS

.1 Prepare mock-ups for Work specifically requested in specifications.

.2 Construct in locations acceptable to Departmental Representative.

.3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in an orderly sequence allowing time for review, so as not to cause any delay in Work.

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 Remove mock-up at conclusion of Work, or, when acceptable to Departmental Representative.

1.10 MILL TESTS

.1 Submit mill test certificates for all steel. Mill certificate dates shall reasonably match the dates that steel is supplied and should illustrate that the steel meets the requirements of the specification.

1.11 CONCRETE TESTING

As part of the quality Control program for concrete submit a pour and testing schedule relating the number of trucks to be delivered to site and the number of concrete tests to be performed and for which full 7- and 28-day tests will be reported by the contractor’s certified tester. The Departmental Representative will be the sole judge if the amount of testing is adequate to represent a quality control program.

1.12 EQUIPMENT AND SYSTEM ADJUSTMENT AND BALANCE

Other sections include additional requirements for commissioning and operational performance. Overall, it is a requirement of the Contractor to have checks and quality procedures in place at all stages to deliver a working fully functional reliable swing bridge. The systems must be integrated and be adjusted and balanced to be durable and fully functional as intended.

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 SECTION INCLUDES

.1 Temporary utilities.

1.2 RELATED SECTIONS

.1 Section 01 52 00 - Construction Facilities.

.2 Section 01 55 50 - Access, Housing, Heating and Ventilation.

.3 Section 01 56 00 - Temporary Barriers and Enclosures.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Submit list of suppliers and type of temporary utilities and expected date when service will be accessible.

1.4 INSTALLATION AND REMOVAL

.1 Provide temporary utilities and controls in order to execute work expeditiously.

.2 Remove from site all such temporary utilities and controls after use.

1.5 WATER SUPPLY

.1 Departmental Representative will not provide a supply of water. Water is not available on site.

1.6 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, maintenance, and fuel.

.2 Construction heaters used inside enclosures must have all combustion products vented to outside. 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.
- .6 Satisfy the requirements included in the Section 01 55 50 – Access, Housing, and Ventilation.

.4 Maintain a minimum temperature of 10°C in areas where construction is in progress or materials are curing.

.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.

.7 Filter all ventilation to prevent release of any material into the air or surrounding area outside of the enclosure.

.6 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.7 TEMPORARY POWER AND LIGHT

.1 Contractor to arrange, connect and provide all temporary power required to complete the work from the utility company or by other acceptable means.

.2 Provide and maintain temporary lighting throughout project when work or inspection is to occur or as warranted for public safety. Areas to be inspected will require sufficient lighting to complete the inspection as determined by the sole judgement of the Departmental Representative.

.3 Good lighting is required to complete both the work and inspection of the cleaning and painting of the bridge. The surfaces of the structure being worked shall be completely lit, as well as adjacent surfaces, such that comparisons can be made between adjacent surfaces.

1.8 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work as required by insurance companies having jurisdiction and governing codes, regulations, and bylaws.

.2 Work exposed to fire will generally be rejected and require replacement at the sole discretion of the Departmental Representative. Post fire condition reports generally have a speculative element to the basis for the conclusions and as such will generally not be accepted as evidence that no damage to the durability or strength of the material has occurred. Prevent the work from being exposed to fire.

.3 Burning rubbish and construction waste materials is not permitted on site.

Part 2 Products

2.1 NOT USED

.1 Not Used

Part 3 Execution

3.1 NOT USED

.1 Not Used

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Construction aids.

.2 Office and sheds.

.3 Parking.

.4 Project identification.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 1.189-2000, Exterior Alkyd Primer for Wood.

.2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.2 Canadian Standards Association (CSA International)

.1 CSA-A23.1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA-0121-17, Douglas Fir Plywood.

.3 CAN/CSA-S269.2-16, Access Scaffolding for Construction Purposes.

.4 CAN/CSA-Z321-96(R2006), Signs and Symbols for the Occupational Environment.

.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.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

1.4 INSTALLATION AND REMOVAL

.1 Prepare and submit 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 be used, and fenced area with details of fence installation.

.2 Identify areas which have to be gravelled to prevent tracking of mud. The grounds of the site are part of a Heritage Site and are to be disturbed as little as possible. Limit areas where the surface of the earth is disturbed. If any artifact is uncovered, stop work in the area of the artifact and contact Departmental Representative

.3 Indicate use of supplemental or other staging area.

.4 Secure the site when ever workers are not present on the site. Visit the site or arrange for the site to be checked at a minimum of one-week intervals or more frequently as appropriate based on conditions at the site.

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

.6 Remove from site all such work after use.

1.5 SCAFFOLDING

.1 Scaffolding in accordance with CAN/CSA-S269.2-16.

.2 Provide and maintain scaffolding ramps, ladders, swing staging platforms, and temporary stairs. See Section 01 55 50 – Access, Housing, Heating, and Ventilation.

1.6 HOISTING

.1 Provide, operate and maintain hoists/cranes required for moving of workers, materials, and equipment.

.2 Hoists/cranes shall be operated by qualified operator.

1.7 SITE STORAGE/LOADING

.1 Confine work and operations of employees on site to areas defined by Contract Documents. Do not unreasonably encumber premises with products.

.2 Do not load, or permit to load, any part of Work or approaching roadways with a weight or force that will endanger the Work or Workers or cause damage to the work or roadways.

1.8 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of Work and access required by Parks Canada. All Work and parking must be within the Parks Canada land. If this parking is insufficient then the contractor must arrange parking off site.

.2 Provide and maintain adequate access to project site. Reserve parking spaces for Parks Canada, Parks Canada employees, Designated Representatives, and Inspectors when on site.

1.9 CANAL NAVIGATION

.1 Assume that channel navigation is possible and that such activities as snowmobiling will occur in the vicinity of the site. Mark all obstructions such as bridges or restrictions to the channels if it is possible that a boat could pass. Formwork and all changes to the channels shall be marked for both daylight and nighttime visibility. Submit plans of all access showing maker type and locations.

.2 No obstructions will be allowed in the channels/canal after the canal opens for the season during normal operation hours. All work will have to occur outside operation hours and any watercraft or boat crossing the site shall be guided and directed to ensure safety.

1.10 OFFICES

.1 Provide office for the full duration of site work heated to 22°C, lighted 750 lx, ventilated, of sufficient size to accommodate site meetings, and furnished with drawing laydown table.

.2 Provide a clearly marked and fully stocked first-aid case in a readily available location.

.3 Provide, for the sole use of the inspector, a lockable office with a layout table desk and file cabinet, meeting the lighting and heating requirements outlined above. This room can be used for meetings, provided it is not used for any other purpose and is of sufficient size.

.4 Subcontractors may provide their own offices, as necessary. Offices to be located within the designated work and storage area.

1.11 EQUIPMENT, TOOL, AND MATERIALS STORAGE

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

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

1.12 SANITARY FACILITIES

.1 Provide sanitary facilities for workforce and inspectors, Departmental Representative and designated individuals in accordance with governing regulations and ordinances.

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

1.13 CONSTRUCTION SIGNAGE

.1 Provide and erect, one week before access to site, two project signs in locations designated by the Departmental Representative.

.2 No other signs or advertisements, other than warning signs and traffic control signage, are permitted on site, except with the express written consent of the Departmental Representative.

.3 While generally unacceptable if desired direct requests for approval to erect a Consultant/Contractor signboard to Departmental Representative. The request likely will not be accepted. For consideration, general appearance of Consultant/Contractor signboard must conform to project identification site sign. Wording shall be in both official languages.

.4 Signs and notices for safety and instruction shall be in both official languages. Graphic symbols shall conform to CAN/CSA-Z321. Traffic signs shall conform to the Manual of Uniform Traffic Control Devices and specific references in the Specifications and on the drawings.

.5 Maintain approved temporary signs and notices in good condition for duration of project, and dispose of, offsite, on completion of project, or earlier, if directed by Departmental Representative.

1.14 CLEAN-UP

.1 Remove construction debris, waste materials, and 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.

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 covers the work of supplying, maintaining, and removing temporary access, housing, and supplementary heating and ventilating for the workspaces and the work described by the drawings and the Specification.

.2 The work involves both work on and off site. The work must be completed in environmental conditions that allow maximum quality of work and protection for the natural environment.

.3 Additional requirements for the sealing and containment of the areas during paint removal are provided in Section 02 83 12 - Lead-Base Paint Abatement - Maximum Protection.

.4 Note that the existing lock station blockhouse building is not available for use as storage or staging, by this Contractor, at anytime during this Contract.

.5 The access, housing, heating, and ventilating must be sufficient to:

.1 Ensure a safe working environment.

.2 Facilitate progress of Work in an efficient manner.

.3 Eliminate any chance of debris falling to the waterway below.

.4 If paint removal is completed on site, then the Air Tight Full Enclosure shall be constructed to carry and shed snow and water away from the work area in such a manner as to not concentrate water or result in significant snow accumulation.

.5 To protect areas or features adjacent to the Work during procedures which may damage or affect those areas or features.

.6 To protect Work and products against dampness and cold.

.7 To prevent moisture condensation on surfaces.

.8 To ensure that exposed surfaces/excavations that are intended to support structures (temporary or permanent) must be protected against freezing.

.9 To provide ambient temperatures and humidity levels for storage, application, installation, and curing of materials.

.10 To allow inspection of the Work.

.11 To allow verification of commissioning.

.6 The requirements of this Section apply to all other Sections of the specification in order to complete the work, and anywhere dust and/or cold weather protection are implemented to provide an appropriate environment to complete the Work, as required, to achieve the best quality of the finished product. This section is especially important to all demolition, erection and painting operations.

1.2 RELATED SECTIONS

.1 Section 01 35 29.06 - Health and Safety Requirements

.2 Section 02 83 12 - Lead-Base Paint Abatement - Maximum Protection

.3 Section 05 12 33 - Structural Steel for Bridges

.4 Section 09 97 19 - Painting Exterior Metal Surfaces

1.3 DEFINITIONS

.1 **Scaffolding**: any method used for access to carry out the Work such as rigid framed scaffolding, mobile access buckets, cranes, ladders, etc. Scaffolding includes swing staging.

.2 **Housing**: enclosure placed around Work to provide protection for the Work taking place, and to the waterway, and, to provide an air-tight micro-climate more suitable to the Work than ambient atmospheric conditions.

1.4 REFERENCES

.1 SSPC Guide 6 - Steel Structures Painting Council Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations, May 2015.

.2 SSPC Guide 16 - Steel Structures Painting Council Guide for Specifying and Selecting Dust Collectors, August 2003.

1.5 DESIGN

.1 If Work is going to occur on site in inclement weather a full enclosure shall be erected around the sections of bridge where the Work is located, and may be in part, or whole, supported off the ground and bridge foundations. Engage a Professional Engineer who is licensed in the Province of Ontario and who is experienced in this work to design, draw, and inspect the enclosure housing before and during use. Ensure all drawings are sealed and signed by the engaged Professional Engineer. All costs associated with the Engineer shall be included in the contract price.

.2 General design concepts and detailing, relative to the containment of debris and the provision of dust collection equipment, will be in accordance with this specification and SSPC Guide 6 and SSPC Guide 16, if any paint removal occurs on site.

.3 The Contractor must design the access and containments system to transition between site conditions and provide protection and containment of all debris throughout each condition and transition.

.4 If work such as blast cleaning is completed on site, it will generate significant dust while adding significant volumes of air to the enclosure. The enclosure must be designed with venting that is fully effective in trapping air born dust and debris while allowing the venting of excess air such that the dust is not forced out of the enclosure. The filters must be cleaned on regular intervals to maintain their effectiveness.

.5 The contractor shall take into account that the timber for the structure will be treated with an oil borne (flammable) preservative and shall select an appropriate method for heating.

1.6 SUBMITTALS

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

.1 Drawings for all housing and temporary lighting.

.2 Heating and humidity control methods.

.2 Information to include, but is not limited to, the following:

.1 Enclosure/housing design, including all anchorage or connection to the structure.

.2 Heater number, types, locations, fire prevention measures, and capacities.

.3 Number and location of fire extinguishers associated with heating equipment.

.4 Number of compressors, assumed volume of air, location and size of vents, and type of filtering material and equipment.

.5 Number, lumens, wattage, and location of temporary lights.

1.7 SITE BARRIERS

.1 Site barriers must be sufficient to protect public and exclude them from the work area.

1.8 SCAFFOLDING

.1 Provide all scaffolding, ladders, access, lifting equipment, etc., to carry out the work. Field measure to ensure proper fit. Transition area from the ladder(s) or structure to the scaffolding shall be clear of obstructions and cross bracing so people and materials can easily enter.

.2 Carry out all work in accordance with the Occupational Health and Safety Act and the Site-Specific Safety Plan. Make all changes required by Ministry of Labour officials and address all concerns of the Departmental Representative.

.3 Make periodic inspections of scaffolding as the work progresses.

.4 Remove all anchors installed in the concrete as part of the scaffolding and housing work. Ensure all holes are filled to the satisfaction of the Departmental Representative as scaffolding is dismantled.

1.9 HOUSING

.1 Provide strong and durable housing for portions of the work which must be protected, heated, and/or ventilated during the Work. Design housing to be strong enough to withstand rain, wind, and snow.

.2 Install and maintain plywood coverings in order to protect existing features, such as gearing, from damage in the course of the Work. Remove these to complete work local to the protected feature and then at the end of Work. Make good all damage to the satisfaction of the Departmental Representative.

.3 For coating application:

.1 Additional temperature and relative humidity requirements as per Section 09 97 19 - Painting Exterior Metal Surfaces.

.2 Ensure no water can drip onto surfaces at any time between surface preparation and the time each coat has fully cured and dried.

1.10 AIR QUALITY

.1 Monitor and sample air quality inside the enclosure and the integrity of housing. Rectify deficiencies in monitoring, control, and containment as per Departmental Representative or MOE inspector’s direction.

.2 Provide separate air supply for workers

.3 Implement and maintain dust control measures in accordance with Province of Ontario regulations.

.4 Monitor temperature, humidity, and minimum air exchange rates within enclosures.

1.11 LIGHTING

.1 In all areas of Work, ensure sufficient and good lighting is provided to complete and inspect the work.

.2 Especially during night time work, or in dark areas of the shop, provide additional lighting in work areas and to Public ways to compensate for the lack of natural lighting.

.3 Provide for the use of the Departmental Representative additional work lights for inspection.

1.12 TEMPORARY HEATING

.1 Provide temporary heating required during construction period, including Watch keeping attendance, maintenance, and fuel.

.2 Be responsible for damage to Work and structure due to failure in providing adequate (or too much) heat or adequate protection during construction.

.3 For coating application:

.1 Additional temperature and relative humidity requirements as per Section 09 97 19 - Painting Exterior Metal Surfaces.

.2 Ensure no water can drip onto surfaces at any time between surface preparation and the time each coat has fully cured and dried.

.4 Temperature requirements for other works shall be as noted in relevant Sections, or, if not specified in a particular section, in accordance with manufacturer's requirement and/or good practice.

1.13 TEMPORARY VENTILATING

.1 Ventilate storage spaces containing hazardous or volatile materials but do so in a manner as to not reduce the containment of lead containing dust.

1.14 MEASUREMENT FOR PAYMENT

.1 The work of this section will not be measured for payment. It will be paid for under the Contract lump sum price.

.2 After the award of tender, as part of the breakdown of the lump sum price, the following items will be assigned pricing.

.1 "Access and Housing"

.2 "Heating and Humidification"

.3 For purposes of facilitating progress payments during construction, the "Access and Housing" lump sum breakdown item shall be paid for as follows:

.1 50% of the lump sum items will be paid for upon satisfactory completion of set-up (pro-rated for the percentage of set-up completed). If portions are removed

prior to the work being completed and will be remobilized any over payment will be calculated in the progress payments.

.2 15% of the lump sum items will be paid for upon satisfactory completion of dismantling and removing the scaffolding and housing from the site (pro-rated to the percentage of work area where all work is completed).

.3 The remaining 35% shall be pro-rated over the duration of the Contract based on the progress relative to the accepted schedule submitted by the Contractor.

.4 For purposes of facilitating progress payments during construction, the "Heating and Humidification" lump sum breakdown item shall be pro-rated over the period of time that heating is indicated as being required or where it should be anticipated according to the submitted and approved Project Schedule.

.5 All other work necessary to the completion of the work of this section, will not be measured separately for payment but will be considered incidental to the work of this section.

Part 2 PRODUCTS

2.1 MATERIALS

.1 The following alternatives are acceptable:

.1 New materials; or,

.2 Used, salvaged, or recycled materials, in good condition, subject to the approval of the Departmental representative; or,

.3 Prefabricated, portable components in a good, safe condition, approved by the Departmental Representative as to type, materials, and detail.

Part 3 EXECUTION

3.1 HEATING EQUIPMENT

.1 Use only heating equipment types acceptable to Departmental Representative.

.2 Heating fuels:

.1 Use electricity, gas, diesel oil, or other fuels approved by the Departmental Representative.

.2 Fuel Storage: to the requirements of the Fire Commissioner of Canada.

.3 Provide and maintain temporary fire protection equipment during performance of Work commensurate with fuel source selected.

.4 Locate fuel storage facilities away from lock station blockhouse and waterway.

.3 Ensure that the heating requirements are met by providing, at optimum efficiency of the equipment, a capacity of 125% of the heat requirement and a sufficient number of standby heaters ready for use at the site.

.4 Vent the exhausts of heating equipment to the outside of the housing and well clear of combustible materials. Maintain air quality within the enclosure and do not pollute the

environment. If the products of combustion enter the enclosure provide regular (minimum twice per week) air sampling for products of combustion.

3.2 REMOVAL OF HEATING AND VENTILATING EQUIPMENT

.1 Upon receipt of the Departmental Representative's approval:

.1 Discontinue heating operations;

.2 Remove housing and heating equipment from the site in accordance with the additional provisions of Section 02 83 12 - Lead-Base Paint Abatement-Maximum Protection.

3.3 FIELD QUALITY CONTROL

.1 Provide maximum-minimum thermometers inside the housing.

.2 Measure and monitor humidity levels to ensure they are compatible with such operations as blasting, painting, and curing of products and concrete.

.3 Ensure continuity of protection by providing a Watchkeeper to make periodic checks with a minimum of one check every hour when temperature critical work is in progress, at all times of the day and night when work is and is not in progress. This includes overnight and weekend checks.

.1 The Watchkeeper's qualifications, under this Section of the Specification, are to be sufficient to perform, such duties as:

.1 Maintain strict supervision of operation of temporary heating and ventilating equipment.

.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 preventative maintenance and re-fueling of heating equipment normally performed on any shift.

.6 Complete emergency repairs, of minor complexity, to heating equipment.

.7 Place standby items in service.

.8 Record maximum and minimum temperature at each thermometer on a daily basis.

.1 Make the temperature records available to the Departmental Representative on a daily basis.

.2 Provide certified written records to the Departmental Representative on a weekly basis.

3.4 REVIEW OF WORK

.1 In the event that heating, or humidity levels are not maintained, all suspect Work shall be replaced at no cost to the Contract, and with no delay to the schedule, as defined by the longer of:

.1 150% of the manufacturer’s written curing time, or

.2 150% of any modified curing time provided as a written direction by the Departmental Representative.

.2 Suspect Work shall be considered all Work that is not fully cured. Where the additional 50% of the curing times is longer than 36 hours, then the limit for suspect Work shall be the shorter of:

.1 The full curing times plus 36 hours, or

.2 150% of the curing time defined above.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 55 50 – Access, Housing, Heating, and Ventilation.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-O121-17, Douglas Fir Plywood.

1.3 INSTALLATION AND REMOVAL

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

.2 Remove from site all such Work after use.

1.4 MODULAR FENCING

.1 Provide surface mounted modular fencing around the Work area to limit public access and delineate the site. Do not drive posts on site for temporary fencing.

1.5 GUARD RAILS AND BARRICADES

.1 Provide appropriate barrels and signage transitioning into railings, and around excavations, open edges of the structure, and areas of potential falls, or in areas where the public should be excluded.

1.6 ACCESS TO SITE

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

1.7 PUBLIC TRAFFIC FLOW

.1 Provide and maintain competent signal flag operators, traffic signs, barricades, and flares, lights, or lanterns as required to complete the Work while protecting the workers and the public.

.2 When the road is to be fully closed and again when it is to be fully opened keep all emergency services, stakeholders and school boards affected aware of the state of passage. It is critical when they respond that they know whether the route is opened or closed.

1.8 FIRE ROUTES

.1 Maintain access to property and adjacent properties, including overhead clearances, for use by emergency response vehicles.

1.9 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

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

.2 Be responsible for damage incurred as a result of construction operations or influenced by construction operations.

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 SECTIONS

.1 Section 01 11 00 Summary of Work

.2 Section 05 12 33 - Structural Steel for Bridges

.3 Section 09 97 19 - Painting Exterior Metal Surfaces

1.2 MEASUREMENT PROCEDURES

.1 The requirement for traffic control will not be measured separately for payment and shall be included in the Contract lump sum price.

.2 After the award of tender, as part of the breakdown of the lump sum price, the cost of traffic control will be assigned a separate breakdown item.

.3 In addition to the requirements for temporary signage and control devices to allow construction, all permanent signs shall be supplied installed, complete with posts, as part of the contract lump sum. All signs within the project limit shall be replaced with new signs at the end of the project except those designated for salvage and reinstatement on the Contract Drawings. All old signs shall be returned to the Departmental Representative who will determine which signs can be disposed of and which ones will be delivered to the Parks Canada yard. All additional temporary signs are to be supplied by and remain the property of the Contractor.

1.3 REFERENCES

.1 Ontario Traffic Manual (OTM), Book 7, January 2014 - Temporary Conditions (OTM Book 7)

.2 Transportation-Association of Canada - Manual of Uniform Traffic Control Devices, 2014.

1.4 MAINTENANCE OF TRAFFIC

.1 There are signs currently on site. Record existing conditions on site and augment / adjust / bag to obscure existing conditions on site and beyond to fully conform to OTM, Book 7 requirements and direct traffic.

1.5 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 present minimum interference and hazard to travelling public and, where appropriate, to protect workers.

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

.3 When approved by Departmental Representative, and before re-routing traffic, erect suitable signs and devices in accordance with instructions contained in the OTM, Book 7.

1.6 INFORMATIONAL AND WARNING DEVICES

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

.2 Supply and erect signs, delineators, barricades, and miscellaneous warning devices as specified in OTM Book 7, and/or as called for on the Contract Drawings.

.3 Advance construction warning signs are required in accordance with the requirements of the Ontario Traffic Manual books. The drawing layout is intended as a start toward the full signage required. Evaluate the conditions on site and the use of the detour and roadways with the signs in place and adjust based on traffic behavior and requirements of OTM Book 7.

.4 Place signs and other devices in locations recommended in OTM Book 7, and as shown on the Contract Drawings.

.5 Meet with Departmental Representative prior to commencement of work to submit a list of signs and other devices including the placement required for the project. If situation on site changes, revise list to the approval of Departmental Representative.

.6 Continually maintain traffic control devices in use by:

.1 Checking signs daily for legibility, damage, suitability, lost or missing signs and location. Clean, repair, or replace to ensure clarity and reflectance and a full set of signs and maintain a signing diary.

.2 Remove or cover signs which do not apply to current existing conditions and as short duration activities demand. Reinstate signs as soon as they do apply and provide temporary flag persons during any transitional periods.

1.7 CONTROL PUBLIC TRAFFIC

.1 Provide flag persons, trained in accordance with, and properly equipped as specified in, OTM Book 7 in the following situations:

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

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

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

.4 For emergency protection when other traffic control devices are not readily available or fully functional.

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

1.8 PERMANENT SIGNS

.1 The final position of the permanent signs will be confirmed with the Departmental Representative.

.2 All signs will be replaced, and permanent signs will be new, installed securely, and fully compliant with the Manual of Uniform Traffic Control Devices for Ontario. The hardware, post, etc., will be consistent with those generally used in the Province of Ontario.

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 SECTION INCLUDES

.1 Product quality, availability, storage, handling, protection, and transportation.

.2 Manufacturer's instructions.

.3 Quality of Work, coordination, and fastenings.

.4 Existing facilities.

1.2 RELATED SECTIONS

.1 Section 01 45 00 - Quality Controls.

1.3 REFERENCES

.1 Within text of Specifications, reference may be made to reference standards.

.2 Conform to these standards, in whole, unless conformance in part is specifically requested in Specifications or specifically in writing approved by the Departmental Representative.

.3 If there is question or dispute as to whether any product specified or system incorporated in the work is in conformance with applicable standards, Departmental Representative reserves the right to have such products or systems tested to prove or disprove conformance.

.4 Test results proving or certifying conformance of alternatives suggested by the contractor shall be submitted when the alternatives are submitted, and any associated testing will be at the contractor cost and paid for by the contractor.

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

1.4 QUALITY

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

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

.3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents or judgement.

.4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout bridge.

.5 Permanent labels, trademarks, and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.5 AVAILABILITY

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

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

1.6 STORAGE, HANDLING AND PROTECTION

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

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

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

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

.6 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

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

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

1.7 TRANSPORTATION

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

1.8 MANUFACTURER'S INSTRUCTIONS

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

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

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

1.9 QUALITY OF WORK

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

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

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

1.10 COORDINATION

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves, and accessories.

1.11 REMEDIAL WORK

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

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

1.12 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour, and finish as adjacent materials, unless indicated otherwise in Contract Documents, or by Departmental Representative.

.2 Prevent galvanic or electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive, hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum, space evenly, and install neatly.

.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.13 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished, unless otherwise specified. Use No.316 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain-type washers on equipment, sheet metal, and soft, gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.14 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of any part of structure. Do not cut, drill, or sleeve any load bearing structural member, unless specifically indicated by written approval of Departmental Representative.

Part 2 Products

2.1 NOT USED

.1 Not Used

Part 3 Execution

3.1 NOT USED

.1 Not Used

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Progressive cleaning.

.2 Final cleaning.

1.2 RELATED SECTIONS

.1 Section 01 35 43 - Environmental Procedures

1.3 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris.

.2 Remove waste materials from site at regularly scheduled times. Do not burn waste materials on site.

.3 Keep the work site clear of snow and ice.

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

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

.6 Provide and use clearly marked separate bins for recycling.

.7 Remove waste material and debris from site and deposit in waste container at end of each working day.

.8 Dispose of waste materials and debris off site.

.9 Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.

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

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

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

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

.14 Prior to opening the roadway clean all debris, sand, and salt.

.15 Clean roadway areas to broom clean removing all signs of construction and ensuring that the line painting etc. is visible. Rinse staining such that when traffic is restored dust will not be generated.

1.4 FINAL CLEANING

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

.2 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 stains, spots, marks, and dirt.

.5 Broom clean and wash exterior walks, steps, and surfaces; rake-clean other surfaces of grounds and roadway. Pay special attention to grassed areas, be especially vigilant with regard to removing all items that could become projectiles during grass cutting operations.

.6 Remove dirt and other disfiguration from exterior surfaces.

.7 Sweep, and wash clean, paved areas.

.8 Remove snow and ice.

1.5 MEASUREMENT FOR PAYMENT

.1 No measurement for payment will be made for the work of this Section. All costs for labour, materials, and equipment necessary to complete the work shall be included in the Contract lump sum price.

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 SECTION INCLUDES

.1 The text, schedules, and procedures for systematic Waste Management Program for construction, deconstruction, demolition, and renovation projects, including:

- .1 Diversion of Materials.
- .2 Waste Audit (WA) - Schedule A.
- .3 Waste Reduction Workplan (WRW) - Schedule B.
- .4 Demolition Waste Audit (DWA) - Schedule C.
- .5 Cost/Revenue Analysis Workplan (CRAW) - Schedule D.
- .6 Materials Source Separation Program (MSSP).
- .7 Canadian Governmental Responsibility for the Environment Resources - Schedule E.

1.2 RELATED SECTIONS

.1 Section 01-35-43 - Environmental Procedures

1.3 DEFINITIONS

.1 **Cost/Revenue Analysis Workplan (CRAW)**: Based on information from WRW, and intended as financial tracking tool for determining economic status of waste management practices.

.2 **Demolition Waste Audit (DWA)**: Relates to actual waste generated from project, O. Reg. 102/94. See Waste Audit.

.3 Materials Source Separation Program (MSSP): Consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

.4 **Recyclable**: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.

.5 **Recycle**: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.6 **Recycling**: Process of sorting, cleansing, treating, and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.7 **Reuse**: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:

- .1 Salvaging designated parts and assemblies for reuse in the bridge.
- .2 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project, or for storage for use on future projects.
- .3 Returning reusable items including pallets or unused products to the vendor.

.8 **Salvage**: Removal of structural and non-structural materials and mechanical/ electrical components from deconstruction/disassembly projects for purpose of reuse or recycling. Note some parts of the bridge must be carefully salvaged as they are to be reused in the newly constructed bridge or returned to Parks Canada. Inventory and submit in accordance with the submission requirements of section 01 33 00 Submissions Procedures a list of parts to be salvaged and their final reuse or drop off location prior to disassembling or removing anything from site. In general parts to be reused shall be stored and protected by the contractor while parts to be returned to the owner shall be taken to the Parks Canada Yard at the Kirkfield Lock.

.9 **Separate Condition**: Refers to waste sorted into individual types.

.10 **Source Separation**: Acts of keeping different types of waste materials separate beginning from first time they became waste.

.11 **Waste Audit (WA)**: Detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill. Refer to Schedule A. Target for this project is 30% diversion from landfill.

.12 **Waste Management Coordinator (WMC)**: Contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal, and reporting requirements.

.13 **Waste Reduction Workplan (WRW)**: Written report which addresses opportunities for reduction, reuse, or recycling of materials. Refer to Schedule B. WRW is based on information acquired from WA (Schedule A).

1.4 MEASUREMENT PROCEDURES

.1 No measurement for payment will be made for the work of this section. All costs associated with this portion of the work shall be included in the Contract Lump Sum Price. Provide a breakdown item specifically for complying with the waste management requirements entitled “Cost of Waste Management Requirements”. This item should not include the actual cost of disposal.

1.5 DOCUMENTS

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

- .1 Waste Audit.
- .2 Waste Reduction Workplan (WRW).
- .3 Material Source Separation Plan.
- .4 Schedules A, and B, completed for project.

1.6 SUBMITTALS

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

.2 Prepare and submit following prior to project start-up:

- .1 Submit 2 copies of completed Waste Audit (WA) - Schedule A.
- .2 Submit 2 copies of completed Waste Reduction Workplan (WRW) - Schedule B.

.3 Submit 2 copies of completed Demolition Waste Audit (DWA) - Schedule C.

.4 Submit 2 copies of Cost/Revenue Analysis Workplan (CRAW) - Schedule D.

.5 Submit 2 copies of Materials Source Separation Program (MSSP) description.

.3 Submit before final payment summary of waste materials salvaged for reuse, recycling, or disposal by project using deconstruction/disassembly material audit form.

.1 Failure to submit could result in hold back of final payment.

.2 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled, co-mingled, and separated off-site or disposed of.

.3 For each material reused, sold, or recycled from project, include amount quantities by number, type, and size of items and the destination.

.4 For each material land-filled or incinerated from project, include amount of material and identity of landfill, incinerator, or transfer station.

1.7 QUALITY ASSURANCE - SITE VISIT

.1 Pre-bid site visit:

.1 Walk-through of project site prior to completion of bid submittal is optional.

1.8 WASTE AUDIT (WA)

.1 Conduct WA prior to project start-up.

.2 Prepare WA: Schedule A.

.3 Record, on WA - Schedule A, extent to which materials or products used consist of recycled or reused materials or products.

1.9 WASTE REDUCTION WORKPLAN (WRW)

.1 Prepare WRW prior to project start-up.

.2 WRW should include but not be limited to:

.1 Destination of materials and listing of material.

.2 Deconstruction/disassembly techniques and sequencing.

.3 Schedule for deconstruction/disassembly.

.4 Location.

.5 Security.

.6 Protection.

.7 Clear labelling of storage areas.

.8 Details on materials handling and removal procedures.

.9 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.

.3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.

.4 Describe management of waste.

.5 Identify opportunities for reduction, reuse, and recycling of materials based on information acquired from WA.

.6 Post WRW, or summary, where workers at site are able to review its content.

.7 Set realistic goals for waste reduction, recognize existing barriers, and develop strategies to overcome these barriers.

.8 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

1.10 DEMOLITION WASTE AUDIT (DWA)

.1 Prepare DWA prior to project start-up.

.2 Complete DWA: Schedule C.

.3 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

1.11 COST/REVENUE ANALYSIS WORKPLAN (CRAW)

.1 Prepare CRAW: Schedule D.

1.12 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

.1 Prepare MSSP and have ready for use prior to project start-up.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.

.3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide containers to deposit reusable and recyclable materials.

.5 Approximately locate containers, to facilitate deposit of materials without hindering daily operations.

.6 Locate separated materials in areas which minimize material damage.

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.

.1 Transport to approved and authorized recycling facility or to users of material for recycling.

.8 Collect, handle, store on-site, and transport off-site, salvaged materials in combined condition.

.1 Ship materials to site operating under Certificate of Approval.

.2 Materials must be immediately separated into required categories for reuse or recycling.

1.13 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled, and salvaged in locations as directed by Departmental Representative.

.2 Unless specified otherwise, materials for removal become Contractor's property.

.3 Protect structural components not removed for demolition from movement or damage.

.4 Support affected structures. If safety of structure is endangered, cease operations and immediately notify Departmental Representative.

.5 Protect surface drainage, and mechanical and electrical systems and components from damage and blockage.

.6 Separate and store materials produced during dismantling of structures in designated areas.

.7 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

.1 On-site source separation is recommended.

.2 Remove co-mingled materials to off-site processing facility for separation.

.3 Provide waybills for separated materials.

1.14 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, mineral spirits, oil, or paint thinner into waterways, storm sewers, or sanitary sewers.

.3 Keep and provide to Departmental Representative records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Total tonnage generated.

.4 Tonnage reused or recycled.

.5 Reused or recycled waste destination.

.4 Remove materials from deconstruction as deconstruction/disassembly work progresses.

.5 Prepare project summary to verify destination and quantities on a material-by-material basis, as identified in pre-demolition material audit.

1.15 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises.

1.16 SCHEDULING

.1 Coordinate Work with other activities at site to ensure timely and orderly progress of Work.

Part 2 Products

2.1 NOT USED

.1 Not Used

Part 3 Execution

3.1 APPLICATION

.1 Do Work in compliance with WRW.

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

3.2 CLEANING

.1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.

.2 Clean-up work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

3.3 DIVERSION OF MATERIALS

.1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Departmental Representative, and consistent with applicable fire regulations.

.1 Mark containers or stockpile areas.

.2 Provide instruction on disposal practices.

.2 On-site sale of materials is not permitted.

.3 Demolition Waste

Material Type	Recommended Diversion %	Actual Diversion %
Metals	100%	
Rubble	100%	
Wood (uncontaminated)	100%	
Other	100%	

.4 Construction Waste

Material Type	Recommended Diversion %	Actual Diversion %
Metals	100%	
Plastic Packaging	100%	
Rubble	100%	
Steel	100%	
Wood (uncontaminated)	100%	
Other	100%	

3.4 WASTE AUDIT (WA)

.1 The following pertains to Schedule A - Waste Audit (WA).

.1 Column-1 refers to the category of waste, and a physical description of the material (eg. off-cuts, clean drywall, etc.).

.2 Column-2 refers to the total quantity of materials received by the Contractor. Measurement units must be specified.

.3 Column-3 refers to the estimated percentage of material that is waste.

.4 Column-4 refers to the total quantity of waste (column-2 x column-3).

.5 Column-5 refers to the area(s) in which the waste was generated.

.6 Column-6 refers to the total percentage of recycled material from the specified total quantity of waste (column-4).

.7 Column-7 refers to the total percentage of reused material from the specified total quantity of waste (column-4).

.2 Schedule A - Waste Audit (WA)

(1) Material Category Unit	(2) Material Quantity	(3) Estimated Waste of Waste (unit)	(4) Total Quantity	(5) Generation Point	(6) Recycled	(7) Reused
Wood and Plastics						
Material Descrip						
Off-cuts						
Warped						
Pallet						
Forms						
Plastic Packaging						
Cardboard Packaging						
Other						

3.5 WASTE REDUCTION WORKPLAN (WRW)

.1 The following pertains to Schedule B - Waste Reduction Workplan (WRW).

.1 Column-1 refers to the category and type of waste materials.

.2 Column-2 refers to the persons responsible for completing the WRW.

.3 Column-3 refers to Column-4 of Schedule A.

.4 Column-4 refers to the amount of reused waste predicted and realized.

.5 Column-5 refers to the amount of recycled waste predicted and realized.

.6 Column-6 refers to the approved recycling

.2 Schedule B

(1) Material Category Unit	(2) Person Responsible Projected	(3) Total Qty (units)	(4) Actual Reused Amount	(5) Recycled Amount Projected	(6) Material Destination (unit)
Wood and Plastics					
Material Descrip					
Off-cuts					
Warped					
Pallet					
Forms					
Plastic Packaging					
Cardboard Packaging					
Other					

3.6 CONSTRUCTION & DEMOLITION WASTE

.1 Carefully deconstruct and source separate materials/equipment and divert from D&C waste destined for landfill to maximum extent possible. Reuse, recycle or sell material off-site for reuse, except where indicated otherwise. On-site sales are not permitted.

.2 For construction and demolition projects, source separate waste and maintain waste audits in accordance with the Environmental Protection Act, Ontario Regulation 102/94 (March 3, 1994) and Ontario Regulation 103/94 (October 31, 2011).

.1 Provide facilities for collection, handling, and storage of source separated wastes.

.2 Source separate the following waste:

.1 Brick and Portland cement concrete.

.2 Corrugated cardboard.

.3 Wood (not including painted, treated or laminated wood).

.4 Steel.

.3 Submit a Waste Reduction Workplan (WRW) indicating the materials and quantities of material that will be recycled and diverted from landfill.

.1 Indicate how material being removed from the site will be reused or recycled.

.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.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Administrative procedures preceding preliminary and final inspections of Work.

1.2 RELATED SECTIONS

.1 Section 01 78 00 - Closeout Submittals.

1.3 INSPECTION AND DECLARATION

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

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

.2 Request Departmental Representative's Inspection.

.2 Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.

.3 Submit completed and documented maintenance manual prior to seeking inspection and declaration.

.4 Completion: submit written certificate that the following have been performed:

.1 Work has been completed and inspected for compliance with Contract Documents.

.2 Bridge functions have been tested and that they have proven to be reliable.

.3 All commissioning requirements have been performed, completed, passed and documented.

.4 Defects have been corrected and deficiencies have been completed.

.5 Equipment has been tested and are fully operational, and the performance of the equipment has been verified and documented.

.6 Required certificates have been submitted.

.7 Work is complete and ready for Final Inspection.

.5 Final Inspection: When items noted above are completed, request final inspection of Work by Departmental Representative, and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request reinspection.

.6 Declaration of Substantial Performance: When Departmental Representative considers deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for Certificate of Substantial Performance.

.7 Commencement of Lien and Warranty Periods: Date of Owner's acceptance of submitted declaration of Substantial Performance shall be date for commencement for warranty

period and commencement of lien period unless required otherwise by lien statute of Place of Work.

.8 Final Payment: When Departmental Representative considers final deficiencies and defects have been corrected, and it appears requirements of Contract have been totally performed, make application for final payment. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request reinspection.

.9 Payment of Holdback: After issuance of Certificate of Substantial Performance of Work, and the required period for preserving or perfecting a lien has passed, submit an application for payment.

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 SECTION INCLUDES

.1 As-builts, samples, and specifications.

.2 Equipment and systems.

.3 Product data, materials and finishes, and related information.

.4 Operation and maintenance data.

.5 Spare parts, special tools, and maintenance materials.

.6 Warranties and bonds.

.7 Final site survey.

1.2 SUBMISSION

.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.2 Submit the manuals in an organized format in accordance with the requirements.

.3 Draft Copy will be returned after final inspection, with Departmental Representative's comments.

.4 Revise content of documents, as required, prior to final submittal.

.5 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative four copies with all final required contents of maintenance manuals and commissioning documentation in English. Submissions that are incomplete and poorly organized will not be accepted and may not be reviewed.

.6 Ensure touch-up materials, spare parts, maintenance materials, and special tools provided are new, undamaged, defect-free, and of same quality and manufacture as products provided in Work.

.7 If requested, furnish evidence as to type, source, and quality of products provided.

.8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.9 Pay costs of transportation.

1.3 FORMAT

.1 Provide three (3) hard copies and one (1) electronic copy in PDF format.

.2 Organize data in the form of an instructional manual.

.3 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm, with spine and face pockets.

.4 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

.5 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project, project number etc. and identify subject matter of contents. Only the Parks Canada Logo shall appear on the outside of the binder.

.6 Arrange content under Section numbers and sequence of Table of Contents.

.7 Provide tabbed fly leaf for each separate product section with typed description of product and major component parts of equipment.

.8 Text: Manufacturer's printed data, or typewritten data.

.9 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.10 Provide 1:1 scaled CAD files in DXF format on USB; provide 2 copies of CD.

.11 Provide electronic version of binder contents in PDF format.

1.4 CONTENTS - EACH VOLUME

.1 Table of Contents:

.1 Title of project;

.2 Date of submission;

.3 Names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties;

.4 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 clearly identify specific products and component parts and data applicable to installation; delete inapplicable information. Where multiple products are shown on the sheet “X” out products not used.

.4 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 – Quality Control.

1.5 BINDER CONTENT

.1 In addition to requirements in General Conditions, include in the binders one record copy of:

.1 Contract Drawings with all As-built changes clearly electronically marked.

.2 Specifications.

.3 Amendments.

.4 Change Orders and other modifications to the Contract.

.5 Copies of Warranties and Bonds

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

.7 Field test records.

.8 Inspection certificates and reports.

.9 Manufacturer's certificates.

.10 Operators manuals for all equipment

.11 Operating instructions and sequence of operation and trouble shooting information to address common issues, system restart and shutdown, emergency stop and reset and the function, normal setting and range and implication of range of all adjustable settings.

.2 Store record documents and samples in field office apart from documents used for construction. 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. Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry, and legible condition. Do not use record documents for construction purposes.

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

.6 Turn one set, paper copy and electronic copy, of AS-BUILT drawings and specifications over to Departmental Representative on completion of work.

.7 If project is completed without significant deviations from Contract drawings and specifications, submit to Departmental Representative one set of drawings and specifications marked "AS-BUILT".

1.6 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of black line opaque drawings, and in copy of Project Manual.

.2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

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

.1 Field changes of dimension and detail.

.2 Changes made by change orders.

.3 Details not on original Contract Drawings.

.4 References to related shop drawings and modifications.

.5 Depth of various foundation elements.

.6 Location of internal utilities and appurtenances referenced to visible and accessible features.

.7 Horizontal and vertical location of underground and underwater utilities referenced to visible surface features.

.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 Amendments and change orders.

.6 Other Documents: maintain manufacturer's certifications, inspection certifications, and field test records required by individual specifications sections.

1.7 MATERIALS AND FINISHES

.1 Building Products, Applied Materials, and Finishes: include product data with catalogue number, size, composition, colour, and texture designations.

1.8 STORAGE, HANDLING AND PROTECTION

.1 Store spare parts and maintenance materials in a 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 to satisfaction of Departmental Representative.

1.9 WARRANTIES AND BONDS

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer with name, address, and telephone number of responsible party.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.

.4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of 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.

1.10 MEASUREMENT FOR PAYMENT

.1 The work considered under this section will not be considered separately for payment but will be considered as integral to the work of the Contract and a condition for payment.

Part 2 Products

2.1 NOT USED

.1 Not Used

Part 3 Execution

3.1 NOT USED

.1 Not Used

END OF SECTION

Part 1 General

1.1 GENERAL

.1 The Decommissioning and Commissioning of a swing bridge requires precision in all aspects of the process. Clear documentation is required as well as persistence, repeating operation cycles and checking repeated and good performance to ensure that problems are addressed, and all of the above are contract requirements.

.2 The assembly, fabrication and lifting or placing of the bridge is one of the steps of the overall job and part of commissioning and some aspects and requirements are described below.

.3 Measuring the existing dimensions, gaps, shims beneath wheels, bearings, and elevations prior to demolition provides a record point from of previous bridge operation and given the changes in the bridge will only provide guidance for the past operation of the bridge. The contractor is responsible for confirming the dimensions of the bridge in sufficient detail to ensure that the dimensions can be used as reference of past performance in case it helps in troubleshooting the operation of bridge when the balancing and running of the new bridge is completed by the Contractor.

.4 For purposes of Section 4.4 - Commissioning Acceptance - Balance described below, it is assumed that the new bridge structure has been successfully positioned on the pintle, that the balance wheel assemblies have been connected to the bridge sub-structure, and that the bridge is completely set up according to the dimensions and elevations on the Contract Drawings and dimensions of the existing bridge. It is also assumed that the bridge has been balanced and is completely operational. If this is not the case the contractor shall rectify any discrepancies and set the bridge in that condition as part of the contract.

.5 After substantial completion and preliminary acceptance, the bridge shall be allowed to run for a period of sixty days, open for normal navigation traffic. This period will be termed the “maintenance period” and the Contractor will be responsible for maintenance and adjustment of the bridge to ensure it operates reliably and as intended. The period will be extended based on unreliable performance as described below.

1.2 RELATED SECTIONS

.1 Section 01-35-43 - Environmental Procedures

Part 2 Products

2.1 NOT USED

.1 Not Used

Part 3 Execution

3.1 GENERAL DECOMMISSIONING

.1 Contractor will submit dimensioned drawings showing, at minimum, the dimensions and records described in this section prior to any construction at the site and will decommission the bridge and mechanical systems as described below.

3.2 ELEVATION

.1 At minimum, the following elevations shall be measured and recorded:

.1 Elevations of the pivot pier at six points directly under where the wheels are to be located (same as existing).

.2 Elevation of at least six points on the pivot rail in the area of swing confirming whether the track is currently level or on a pitch to an accuracy of +/- 1 mm.

.3 Elevations of the bearing points on the abutments.

.4 At a minimum of five locations across the roadway the elevation of the top of each of the abutments at the roadway bridge interface. Five measurements will be taken on the bridge side and five more corresponding elevations on the abutment side at each end.

.5 The Contractor shall establish two solid and secure benchmarks to ensure that they will have vertical control for bridge installation and when the concrete work is completed. Note: the elevation of the roadway will be adjusted to meet the new elevation of the bridge.

3.3 DIMENSIONS

.1 At minimum, the following dimensions shall be confirmed:

.1 The overall length of the bridge and the horizontal dimension between the centerlines of adjacent floor beams. The temperature at the time of measuring must be recorded.

.2 With the bridge in the open (hanging) position, record the elevation of the bridge deck surface along the centreline at both ends of the bridge and directly overtop of the pivot. After the removal of the bridge superstructure, the distance from the pintle to the abutment face shall be confirmed, recording the radii to each abutment and bearing point.

3.4 ERECTION, FABRCATION AND INSTALLATION

.1 The contractor is responsible for procedures and methods for the erection, assembly and installation of the bridge. An installation sequence shall be submitted in accordance with Section 01 33 00 Submissions Procedures. The review of the plan will be complex and must detail the loading points, connections and steps in the installation. Allow a minimum of four weeks for each review. The quality completeness and consistency of the submission will determine the amount of time and iterations required to review the submission. This scheme should be submitted early in the project as delays in obtaining approval will not be considered reason for project delay.

.2 It appears challenging or impossible to build the bridge in the open position over the rest pier given all constraints related to not interfering with canal operation and navigation.

Canal operations are critical, and the contractor can not interfere in any way with these operations.

.3 The drawings illustrate a potential assembly area and crane location. The contractor is responsible for assessing if these areas are sufficient and can be used.

.4 The Contractor is responsible for all lifting methods, rigging, spreader beams, connections and methods to lift control and stabilize the assembled sections and pieces being lifted. The bridge without counterweight will be unbalanced. The lifting method must not reverse loads in the connections of the superstructure and the lifting method must replicate the same directional loading as when the bridge is supported in the closed position. The Contractor's Engineer shall design, review and stamp the lifting and installation scheme. Submit the lifting scheme sufficiently in advance of the operation to allow review as above. The Contractor's Engineer shall be an Engineer licenced in the province of Ontario with experience in the design of hoisting, rigging, and design of connections.

.5 Contractor's Engineer to be present at the site at the time of lifting and final placement to supervise and assess the conformance with the lifting scheme and the installation certifying compliance with the intent of the scheme. The contractors engineer shall also visit the site at each time the temporary support/false work has been changed to ensure the falsework is meeting the intent of the contract documents and shall provide written confirmation to that effect.

3.5 BRIDGE BALANCE

.1 The process of balancing the bridge requires time and must be done over a sufficient period to allow the bridge to be turned and settle into the new adjustments before it can be fully assessed.

.2 While the bridge must be stabilized throughout the erection, the wheel elevations can only be evaluated after the bridge is fully assembled and the deck, running boards, railings, etc., have been installed.

.3 The alignment of the centre bearing casting and bearing angles, relative to the main girder, determines whether the bridge must be placed level, or, if it must be hung on an angle to compensate for the inclination of the pin and casting. Confirm alignment during assembly to ensure that the main girder will hang as level as possible.

.4 In the setting of the pier bearing casting and the wheel ramps, the contractors shall include the time and costs for supporting the items on stainless steel nuts and shims to set their relative elevations and then grouting around the pads when all elevations are confirmed. The relative elevations of the support points depend on the precision with which the bridge was built and requires adjustment. Direction from the Departmental Representative will be provided as to whether the final stainless-steel shims placed under the bearing points will be grouted or if some will be left exposed to allow for future adjustment.

.5 At all stages of construction, the position, relative to level, should be monitored in orthogonal directions parallel and perpendicular to the bridge. This should be completed, at minimum, at the following stages:

.1 Before demolition of old bridge in both the open and closed position.

.2 Finish of superstructure construction less the west end counterweight and deck boards (before lifting bridge into place on pivot).

.3 After new superstructure is lifted into place and the counterweight, west end deck boards and longitudinal running boards have been installed (with ends still supported).

.4 After tension rods have been installed and end supports have been removed.

All stages should be recorded and submitted to the Departmental Representative before proceeding to the next stage.

.6 The level and consistency of installation of the rail used as the balance rail is important in the success of commissioning.

.1 Take elevations of old rail prior to demolition.

.2 When finishing concrete of pier, pay attention to elevations around track location such that shimming is less onerous.

.3 Tolerances for rail elevation are extremely tight (1 mm). Take care when accepting rolled sections of rail and during shimming and installation to produce a truly flat and level track.

3.6 BRIDGE SET UP AND INITIAL TESTING

.1 When setting wheel heights at pier, it should be possible to have the bridge balanced on only the center pier bearing. All wheels can be set to have the specified gap but must be checked and adjusted after time and a number of rotations. Mechanical specifications must be consulted as to mechanical setup.

.2 Prior to swinging the bridge for the first time, the Contractor shall verify that all systems and equipment have been installed and are adjusted. Demonstrate to the Departmental Representative the presence of all equipment and perform all functional tests that can be performed including testing to confirm that the bridge can be operated.

.3 If any failure occurs during any phase of testing, commissioning, or Contractor operation, a written report will be prepared by the Contractor. The Contractor shall identify the cause of all issues, document the repair and adjustment actions taken and, document the tests of the system involved as well as adjacent and dependent systems. The Contractor shall transmit the information with 24 hours and keep a copy of the report in the commissioning logbook. Submit the commissioning logbook at the end of the project in accordance with 01 33 00 Submission Procedures. The Departmental Representative will determine if an on-site meeting is required. At the meeting, the Contractor shall demonstrate the actions taken and that the system functions as intended.

.4 The height of concrete at the top of the abutment, and the elevations across the nose armouring, can only accurately be set after the bridge is balanced and operating is operating well and the bridge elevation has been determined and. The pouring of the abutment cap shall occur after the new bridge is balanced and operating to allow for a precise matching of bridge deck and top of abutment elevations. The tolerance for relative heights across the joints is normally +/-2 mm of height elevation difference from the bridge to the abutment maximum.

Part 4 Acceptance Criteria

4.1 GENERAL COMMISSIONING ACCEPTANCE

.1 The Contractor is responsible for the commissioning of the bridge system, as outlined elsewhere in this document. The following procedure outlines the steps that will be taken by the Departmental Representative in the acceptance of the bridge system, once it has been commissioned by the Contactor.

.2 If, during commissioning, problems are encountered with the Contractor's work that should have been detected during the Contractor's pre-commissioning work, or develop or are identified during the commissioning, commissioning will be temporarily suspended until the problems are rectified. These periods of time will not be counted as commissioning time and the Contractor will therefore not be entitled to additional reimbursement for this time. If the extent of required repairs warrants it, commissioning may, at the Departmental Representative's sole discretion, be temporarily terminated until another date, after required repairs and additional pre-commissioning has been carried out by the Contractor.

4.2 DOCUMENTATION OF AS-BUILT DATA

.1 The Contractor will survey the new bridge structure and submit dimensioned drawings showing each of the dimensions and elevations noted above in Sections 3.2 - Elevations, 3.3 - Dimensions and the specification of balance weights that were applied during the balancing process (as described in 3.4 - Miscellaneous .2) two (2) weeks prior to commissioning acceptance.

.2 The Departmental Representative will review the decommissioning and commissioning data and provide observations and recommendations.

.3 The Contractor will make corrections and adjustments as part of the original Work.

4.3 COMMISSIONING ACCEPTANCE - BALANCING

.1 On the day of commissioning acceptance, the Departmental Representative will check the following parameters at the bridge site, and will provide an acceptance sign-off, conditional on completion of any noted deficiencies.

.1 Check that both ends of the bridge are approximately level to the bridge approaches and that the ballast walls when poured will allow a smooth transition. Do not pour the ballast wall cap until the bridge has been shown to be operating well.

.2 Check that the pivot pier caster wheels are shimmed to correct gaps (typically 0.010" - 0.030").

.3 Check that the caster wheels located on the east end of the bridge are in soft contact with the rest pads or are adjusted to hover with a very small gap, before jacking.

.4 Lower the west end mechanical jacks and check that the east side caster wheels are in full contact with the rest pads when in the closed position.

.5 Jack the west end of the bridge using an instrumented manual jack and check the out-of-balance load condition.

.6 Rotate the bridge (with west wheels retracted) until the fixed caster wheel clears the abutment wheel rest pads on the opposite side of the bridge.

.7 With the west wheels retracted, document both the east and west caster wheel clearance to the rest pads and the concrete.

.8 Progressively rotate the bridge to the fully open position, checking pivot pier caster clearances.

.9 Check the elevation of the pivot rail at 6 locations and ensure that it is relatively level (+/-1mm differential). Do not grout under the rail until this check has been performed.

.10 Repeat and record the above procedures/measurements opening the bridge a minimum of five times. Ensure the results are consistent before proceeding.

.11 Return to the site when the ambient air temperature is 35°C and ensure that the parameters as described above are being met.

.12 Any other tests warranted to confirm proper operation of the bridge.

.13 This may be an iterative process requiring several cycles of weight/clearance adjustment to complete.

4.4 COMMISSIONING ACCEPTANCE - MECHANICAL SWING

.1 On the day of commissioning acceptance, the Departmental Representative will check the following parameters at the bridge site, and will provide an acceptance signoff conditional on completion of any noted deficiencies:

.1 Confirm lubrication is possible at all appropriate locations.

.2 Confirm the appropriate level of effort is required to open the bridge manually.

.3 Confirm proper range of motion, clearances, and general operation of the latching/locking mechanism and all of its associated components.

.4 Ensure that the refurbished crab and winch mechanism is operating within acceptable parameters.

4.5 OPERATIONAL TEST PERIOD

.1 After all systems are verified and tested individually as per the commissioning acceptance criteria, all deficiencies are addressed and corrected, and the systems have been proven to work together in the operation of the bridge the contractor shall apply in writing for permission to start the Operational Test Period. The permission will not be granted if the bridge has not been under simulated highway loading for a period of 1 week and Departmental Representative has not witnessed 10 successful bridge openings with no adjustments and the previous adjustments have been minor. The decision to proceed to the operational test period is the sole judgement of the Departmental Representative.

.2 The contractor is to demonstrate the replacement swing bridge is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements.

.3 Activities includes transfer of critical knowledge to Parks Canada operational personnel.

.4 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

.5 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment and personnel.

.6 Departmental Representative and Contractor’s Agent to witness activities and verify results.

.7 Review and repeat commissioning of systems if inconsistencies found during operation and when recommissioned start operation testing from the beginning.

.8 Performance pressures must be monitored and recorded in the hydraulic system as an indication of performance as well as to check maximum pressure. Pressure during lifting and during lowering shall be recoded.

.9 Upon a failure of any kind the test period will be terminated by the Departmental Representative or by the Contractor, and the Contractor shall commence an assessment period. The Contractor shall identity all failures, determine causes of all failures, repair all failures, and deliver a written report to the Departmental Representative. The report shall explain in detail the nature of each failure, corrective action taken, results of tests performed, and shall recommend the point at which testing should be resumed. After delivering the written report, the Contractor shall convene a test review meeting at the job site to present the results and recommendations to the Departmental Representative. As a part of this test review meeting, the Contractor shall demonstrate that all failures have been corrected by performing appropriate portions of the conditional acceptance functional checkout test and openings. Based on the Contractor's report and the test review meeting, the Departmental Representative shall be the sole judge of whether the Commissioning shall be repeated and whether the Operational test period restarts with zero successful days or continues with some successful days credited. The default and normal procedure would be to restart with zero days credited.

.10 During the test period the bridge simulated, or public traffic must be allowed to cross the bridge. Simulated contractor traffic is preferred but the timing of the testing will affect the nature of the traffic.

.11 In order to pass the operational test period a minimum of 10 openings per day must be completed for 14 consecutive days without adjustment, issues, problems or failures. All alignments and operation must be as intended and witnessed by Parks Canada. If the test period is before the season at Parks Canada direction the test periods may be interrupted on the weekends and extended so that 14 weekdays of operation are included in the test period. A pass of the test is a condition to receive substantial completion as the bridge is not fully constructed and completed until it is operational and therefore the entire bridge will be considered incomplete when assessing the value of work remaining.

.12 If the Test Operation test is passed the contractor will receive confirmation in writing that the test has been evaluated and passed. This is a requirement to move on to the Maintenance period.

.13 An “opening” for the test period will be defined as starting in the open to vehicle traffic position with the gates open and the system turned off. The system will be turned on and all activities including gates, locks, lift mechanisms and turning mechanism and all other

components shall be run through their intended operation ending with gates being opened and the system being turned fully off. The opening will simulate all functions required during the canal season and shall fully open the bridge clearing the navigation channel, pause a minimum of 30 seconds in the open position and then close the bridge and open it to vehicle traffic. The entire cycle of bridge operation counts as one opening.

.14 Each day the bridge shall be operated a minimum of three (3) of the opening times shall be performed with the intent to operate at or near the temperature extremes for that day (possibly at 06:00 and 14:00 but to be confirmed).

.15 The Contractor shall make no repairs or adjustments during this phase (14 days) of operational testing or the test will be considered a failure and the opening count for the next round of testing will be restarted. The operational test will continue until the required number of consecutive days of operation are achieved.

4.6 MAINTENANCE PERIOD

.1 It is a condition of substantial completion that the commissioning be completed. The value of the work to be completed will be considered greater than all statutory limits as major components are involved and work associated with those components is not complete unless it can be proven that they function as intended.

.2 The Contractor will be responsible for all maintenance, adjustment, and repairs at the bridge for a period of 60 days after Substantial Completion, or until final acceptance, whichever is longer.

.3 During the maintenance period, the Contractor will make all adjustments, and service the bridge such that operations can be maintained.

.4 The performance of the bridge will be evaluated for reliability and consistency.

.5 For any issue where the bridge is not sufficiently operational to allow navigation, or to allow vehicular traffic, the Contractor will be required to be on site, and to not abandon the site, until the problem is resolved. Relief from this duty will not be granted except through consent of the Departmental Representative.

.6 The Contractor must have personnel on site within three (3) hours of the incident being reported to the Contractor's office.

.7 Parks Staff will be allowed to make adjustments during the three-hour period in an attempt to get the bridge to function, but this does not relieve the contractor of his responsibility to respond or solve issues.

.8 A portion of the Holdback equal to $30,000 will be held until the end of the maintenance period. Should the contractor not be able to respond within the three-hour window, $5,000 per occurrence will be deducted from the contract. In addition, the associated time/wages of any Parks Canada canal staff and the Project Staff and the Consultants after the three-hour period shall be deducted from the contract amount.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 Due to the changes that will be made in the operating system and controls, the Contractor must illustrate the operation of the bridge to the Parks Canada Staff in a training session not to exceed six (6) hours, and one follow-up visit not to exceed four (4) hours.

.2 The contractor must also submit video of training sessions edited for content or prepare a video illustrating all information that should be in the training session.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

1.3 MEASUREMENT AND PAYMENT

.1 No measurement and payment will be made for the work of this task. The cost of all Work associated with the preparation and submittals, the verification of the dimensions, and the training of Parks Canada Staff will be included in the Contract Lump Sum.

1.4 TRAINEES

.1 **Trainees**: personnel selected for operating of the bridge including managers, operators, and maintenance staff.

.2 Trainees will be available for training after the Contractor has tuned the bridge and it is balanced and operating well.

1.5 INSTRUCTORS

.1 Contractor will provide:

- .1 Descriptions of systems.
- .2 Instruction operation.
- .3 Instruction regarding normal maintenance and adjustment.

.2 Contractor to provide instruction on the following:

- .1 Start-up, operation, and shut-down of equipment, components, and systems.
- .2 Emergency stop and return to operation.
- .3 Operation with the Crab and Winch (manual).
- .4 The control features and results of the control features, the implications on associated systems of each control feature, and the adjustment of set points of control and safety devices.
- .5 Instructions on servicing, maintenance, and adjustment of systems, equipment, and components.

1.6 TRAINING OBJECTIVES

.1 Training to be detailed and of sufficient duration to ensure:

.1 Safe, reliable operation of systems in normal and emergency modes, under all conditions.

.2 Proper preventive maintenance, diagnosis, and troubleshooting.

.3 Ability to update documentation.

.4 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.7 TRAINING MATERIALS

.1 Instructors to be responsible for content and quality.

.2 Training materials to include:

.1 "As-Built" Contract Documents.

.2 Operating Manual.

.3 Maintenance Manual.

.4 Management Manual.

.3 Submit manuals three weeks prior to training. Project Manager, Commissioning Manager, and Facility Property Manager will review training manuals.

.4 Training materials to be in a format that permits future training procedures to same degree of detail.

1.8 SCHEDULING

.1 Include in Commissioning Schedule time for training.

.2 Deliver training during regular working hours; training sessions to be maximum six (6) hours in length.

.3 Training to be completed prior to acceptance of facility.

1.9 RESPONSIBILITIES

.1 Be responsible for:

.1 Implementation of training activities.

.2 Coordination among Instructors.

.3 Quality of training and training materials.

.2 Departmental Representative will evaluate training and materials.

.3 Upon completion of training, provide written report signed by Instructors, witnessed by Departmental Representative.

1.10 TRAINING CONTENT

.1 Training to include demonstrations by Instructors using the installed equipment and systems.

.2 Content includes:

.1 Review of system layout, equipment, components, and controls.

.2 Equipment and system start-up, operation, monitoring, servicing, maintenance, and shut-down procedures.

.3 System operating sequences, including step-by-step directions for starting up, shut-down, switches, adjustment of control settings, and emergency procedures.

.4 Maintenance and servicing.

.5 Emergency shutdown and starting up after shutdown.

.6 Trouble-shooting diagnosis.

.7 Interaction among systems during integrated operation.

.8 Review of Operation and Maintenance documentation.

1.11 VIDEO-BASED TRAINING

.1 Training videos to be used as training tool with Departmental Representative's review and written approval one (1) month after commencement of scheduled training.

.2 On-site training videos:

.1 Training sessions to be video recorded for use during future training.

.2 To be performed after systems are fully commissioned.

.3 Organize into several short modules to permit incorporation of changes.

.3 Production methods to be of a professional nature and high quality.

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 OF WORK

.1 This Section covers the requirements for the:

- .1 Removal of the existing timber superstructure.
- .2 Removal of concrete and reinforcement at abutments, wingwalls and pivot pier.
- .3 Partial depth removal of the existing canal wall in the north east quadrant of the structure.
- .4 Excavation for foundations, backfill, and frost tapers.
- .5 Structure Backfill.
- .6 Any "Miscellaneous Removals" of items not covered by the above that are necessary for the completion of the Work, such as removal of sensors and wires.

.2 All removed materials that are not specifically incorporated back into the Work or designated to be returned to Parks Canada are to be disposed of in accordance with the appropriate regulations, at an appropriate facility, and in accordance with the Waste Management Plan. Note there are portions of the bridge hardware, components, counterweights, gearing and track hardware on the pier, regulators that must be salvaged and reused or provided to Parks Canada in the case of the wheels and regulators. Carefully prepare a salvage list and submit in accordance with 01 33 00 Submittals prior to removing any items from site and obtain approval from the Departmental Representative.

1.2 RELATED SECTIONS

.1 Section 01-35-43 - Environmental Procedures

.2 Section 01 74 21 – Construction Demolition Waste Management and Disposal.

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

.4 Section 31 23 10 – Excavating, Trenching and Backfilling.

.5 Section 32 11 19 – Granular Sub-Base.

1.3 REFERENCES

.1 Canadian Federal Legislation

- .1 Canadian Environmental Protection Act (CEPA), 1999.
- .2 Canadian Environmental Assessment Act (CEAA), 2012.
- .3 Transportation of Dangerous Goods Act (TDGA), 1992.
- .4 Motor Vehicle Safety Act (MVSA), 1993.
- .5 CSA S269.1-16, Falsework for Construction Purposes.

1.4 MEASUREMENT AND PAYMENT

.1 No measurement for payment will be made for the following work tasks (payment shall be included in the Contract lump sum price).

.1 "Removal of Timber Superstructure"

.2 “Removal of Existing Concrete Sidewalk”

.3 " Excavation for foundations, backfill, and frost tapers.”

.4 “Structure Backfill.”

.5 “Salvage of Selected Bridge Components”

.2 All costs for labour, materials, and equipment necessary to do the Work of the above items, in accordance with the drawings and these specifications, shall be included in the tendered Contract lump sum price.

.3 After tender, when the Contract lump sum breakdown is submitted, pricing for the listed tasks will be provided.

.4 Measurement procedures for the following unit price item shall be paid for under payment items in the unit price table:

Item No. 21 - Full Depth Concrete Removal – The work shall include the removal of footings; foundations; abutments, wingwalls, pivot pier, concrete appurtenances; associated railings; and similar concrete structures specified in the Contract Documents. All other work shall be included in the Contract lump sum price.

Item No. 22 - Partial Depth Concrete Removal – The work shall include the removal of the north east canal wall to allow for installation of the new wing wall; and similar concrete structures specified in the Contract Documents. All other work shall be included in the Contract lump sum price.

1.5 STORAGE AND PROTECTION

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

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

.3 In all circumstances ensure that demolition work does not adversely affect adjacent locks, block house and mechanical/electrical systems not specified for removal, or contribute to excess air and noise pollution.

.4 Do not dispose of waste or volatile materials such as mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, or storm or sanitary sewers. Ensure proper disposal procedures are maintained throughout the project.

.5 Do not pump or allow water containing suspended materials to enter watercourses, storm or sanitary sewers, or onto adjacent properties.

.6 Control disposal or runoff of water containing suspended materials, or other harmful substances, in accordance with local authorities.

1.6 EXISTING CONDITIONS

.1 Prior to the start of any demolition work remove contaminated or hazardous materials, as defined by authorities having jurisdiction, from site and dispose of at designated disposal

facilities in safe manner in accordance with TDGA and all other applicable regulatory requirements.

1.7 REGULATORY REQUIREMENTS

.1 Ensure all Work is performed in compliance with CEPA, CEAA, TDGA, MVSA, and all applicable Federal and Provincial regulations.

.2 Follow mitigation requirements of CEAA.

1.8 SUBMITTALS

.1 Prior to commencement of Work on site, submit detailed Waste Reduction Workplan (WSW) indicating anticipated percentages of reuse, recycling, and landfill, schedule of selective demolition, material description and quantities of materials to be salvaged, number and location of dumpsters, anticipated frequency of tippage, and name and address of all waste receiving organizations.

.2 Supply certified bills of lading from authorized disposal sites and reuse and recycling facilities for all material removed from site. Written authorization from the Departmental Representative is required to deviate from the receiving organizations listed in WRW.

.3 Submit a removals plan and working drawings. The removals plan shall contain the following:

.1 Proposed method of removing the timber superstructure.

.2 Layout and description of concrete removal sequences and temporary supports

.3 Clearances at existing and proposed structures

.4 If necessary, the size, type, and location of any temporary supports to facilitate removals.

.5 The contractor shall submit identification of equipment and the manufacturers published specifications for all concrete removal equipment.

Saw cutting details.

.6 Submit as part of the removals plan, a method to protect the historic blockhouse adjacent to the west abutment during concrete removal.

Part 2 PRODUCTS

2.1 EQUIPMENT

.1 Equipment and heavy machinery to meet or exceed all applicable emission requirements.

.2 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

.3 Sawing equipment shall be used to the neat lines and elevations as shown on the contract drawings to limit vibration to the remaining concrete, bedrock, and to the historic blockhouse.

.4 Rig mounted breakers shall not be used for any concrete removal at the west abutment, west abutment foundation, and adjacent to the easterly canal wall. The historic building

adjacent to the west abutment must be protected from vibration and/or other types of damage from removal work.

.5 Air compressor for abrasive blast cleaning shall supply a minimum pressure of 620 kPa within 3 m of the hose.

.6 Chipping hammers shall have a maximum weight of 9 kg prior to any handle modification and a maximum piston stroke of 102mm. The use of chipping hammers shall be permitted in all areas of concrete removal.

.7 Jack hammers shall have a maximum weight of 14 kg. The use of jack hammers shall not be permitted for the removal of concrete at the following locations:

.1 Where partial depth removals are specified.

.2 Within 100 mm from concrete, masonry, or other types of structures that are to remain in place.

.3 Within 25mm of any reinforcing steel to remain in place.

Part 3 EXECUTION

3.1 PREPARATION

.1 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, and items to remain.

.2 Take pre-construction photos and review the condition of the historic building adjacent to the west abutment prior to completing any removals.

.3 Locate and protect utilities. Preserve active utilities traversing site in operating condition. There are overhead wires immediately to the east and west of the bridge.

.4 Excavation for footings, working slabs, and granular pads shall be to the neat lines specified in the contract documents in accordance with section 31 23 10 – Excavating, Trenching and Backfilling. The bottom of the excavation on which the footing, working slab, or granular pad is to rest shall commence immediately after the final removal of material to the foundation level has been completed. Over excavated areas outside of the neat lines specified in the contract documents shall be restored to their original conditions with suitable subgrade and subject to the approval of the Departmental Representative.

.5 Sawcut the existing foundations at the elevations shown on the drawings to allow for the placement of the new bridge substructure.

3.2 BRACING AND SHORING

.1 Provide all temporary bracings and shoring to the structure so that stability is maintained throughout the project. Bracing and shoring shall be in accordance with CSA S269.1-16.

.2 Provide bracing to prevent overloading of members and to maintain alignment of components. Do not allow forces in connection to increase such that any loosening of the connections could occur.

.3 All demolition procedure drawings, including any required bracing and shoring design and drawings, are to be completed by a Professional Engineer licensed in the Province of

Ontario engaged by the Contractor and shall be stamped, sealed, and dated. The installation and final configuration of the bracing and shoring shall be reviewed by the Contractor's Engineer.

3.3 RESTORATION

.1 Restore areas and existing works outside areas of demolition to conditions that existed prior to commencement of work.

.2 Use only procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses, or ground water.

.3 Structure backfill will be placed to the neat lines shown in the contract documents to the underside of road subgrade, in accordance with sections 31 23 10 – Excavating, Trenching, and Backfilling and 32 11 19 – Granular Sub-Base. Other than the backfill placed to the tops of the footings, no fill shall be placed against an abutment, wingwall, retaining wall, or concrete culvert until the concrete has reached 70% of its design strength.

3.4 CLEANUP

.1 Upon completion of Work, remove debris, trim surfaces, and leave work site clean.

.2 Use only cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses, or ground water.

3.5 REPORTING

.1 Record off-site removal of debris and materials and provide the following information regarding removed materials to Departmental Representative within 48 hours:

.1 Time and date of removal.

.2 Type of material.

.3 Weight and quantity of materials.

.4 Final destination of materials.

.2 The Contractor is responsible for ensuring all reporting requirements are fulfilled to the requirements of legislation and to the satisfaction of Departmental Representative.

3.6 REMOVAL PLAN

.1 Prior to completing removals, submit removal plan to Departmental Representative for review. Plan shall indicate sequence of removals, equipment to be used, permissible loadings for removal equipment, and temporary bracings to structure to ensure structure remains stable at all times during the course of the Contract Works.

3.7 MISCELLANEOUS REMOVALS

.1 During the course of the Work, should removals of items be required to complete the Work, or are shown on the plans, complete those removals as "Miscellaneous Removals" under this contract.

.2 All "Miscellaneous Removals" shall be completed to the satisfaction of the Departmental Representative and shall in no way cause any damage to structures to remain.

3.8 CONCRETE REMOVAL

.1 The general intent is to remove the existing east, west concrete abutments and wingwalls, and to remove the concrete pivot pier to the limits specified on the Contract Drawings.

.2 The concrete of the various structures is variable in strength, condition, and consistency. The Contract drawings show approximate removal locations and volumes. The actual extent of the existing foundations is not known, and it is to be expected that the removal requirements will vary from those shown on the Contract Drawings. During removals, direction will be given by the Departmental Representative as to the required removal limits.

3.9 SALVAGED MATERIALS OTHER THAN BRIDGE COMPONENTS TO BE REUSED

.1 Parks Canada wishes to have certain items of salvage to be retained and these items should be turned over to the Departmental Representative. These items include:

.1 Existing Wheels that will be replaced

.2 The two regulating mechanisms at the top of the tower frame

.3 The two L steel brackets on the interior of the king posts

.4 The pivot bearing at the pivot pier.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 The majority of this section is intended for the lead-based paint removal from salvaged components and refurbished mechanical components which may be completed off-site. For direction on the remainder of the lead-based paint removal, refer to the WSP Designated Substances Survey Lower Brewers Bridge and Brass Point Bridge Report Dated August, 2021 and follow the Ministy of Labour's guideline for "Lead on Construction Projects" Issued September 2004 (Updated April 2011). Removals of lead-based paint or working/removing features that have been identified as being coated with lead-based paint shall be done in accordance with the appropriate health and safety standards and regulations. All effluent and debris shall be collected and disposed of in accordance with Sections 01 35 43 – Environmental Procedures and 01 35 44 – Environmental Protection – Lead Paint.

.2 Lead-based paint removal will be required for all salvaged components, which represent a small portion of the total bridge.

.3 Comply with sections of this Specification related to proper disposal of waste for all on and off-site removal of lead-based paint.

.4 Remove lead-containing dust from the air using an appropriate extraction system including an effective dust collection system equipped with HEPA filter.

.5 Comply with Ontario Guideline: Lead on Construction Projects, September 2004 (updated April 2011).

.6 This Section is to be used in conjunction with all other Sections. In case of conflict, the most stringent requirement must be met.

1.2 REFERENCES

.1 Ontario Regulation 347 General Waste Management

.2 The Federal Fisheries Act

.3 Canadian Environmental Protection Act, 1999 CEPA.

.4 Canadian Standards Association (CSA International)

.1 CAN/CSA-Z180.13-00(R2018), Compressed Breathing Air and Systems.

.5 Department of Justice Canada

.1 Canadian Environmental Protection Act, 1999 (CEPA).

.6 Health Canada

.1 Workplace Hazardous Materials Information System (WHMIS), Material Safety Data Sheets (MSDS).

.7 Human Resources and Social Development Canada (HRSDC)

.1 Canada Labour Code Part II, - SOR 86-304 - Occupational Health and Safety Regulations.

.8 Ministry of Labour, Occupational Health and Safety Branch, Guideline: Lead on Construction Projects, September 2004.

.9 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.10 U.S. Environmental Protection Agency (EPA)

.1 EPA 747-R-95-007-1995, Sampling House Dust for Lead.

.11 U.S. Department of Health and Human Services/Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health (NIOSH)

.1 NIOSH 94-113 - NIOSH Manual of Analytical Methods (NMAM), 4th Edition (1994).

.12 U.S. Department of Labour - Occupational Safety and Health Administration (OSHA) - Toxic and Hazardous Substances

.1 Lead in Construction Regulation - 29 CFR 1926.62-1993.

.13 Underwriters' Laboratories of Canada (ULC)

.14 WSP - Designated Substances Survey - Lower Brewers Bridge and Brass Point Bridge, Kingston, Ontario, August 6, 2021.

1.3 DEFINITIONS

.1 **HEPA Vacuum**: High Efficiency Particulate Air filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.

.2 **Authorized Visitors**: Departmental Representative, designated Inspectors, or designated representatives of regulatory agencies.

.3 **Occupied Area**: area of bridge or work site outside Work Area where construction staff, Parks Canada staff, designated representatives, or the public could access.

.4 **Dioctyl Phthalate (DOP) Test**: testing method used to evaluate particle penetration and air flow resistance properties of filtration materials - HEPA filter leak test.

.5 **Sprayer**: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray; appropriate capacity for scope of work.

.6 **Airlock**: ingress or egress system without permitting air movement between contaminated area and uncontaminated area consisting of two curtained doorways at least 2 m apart.

.7 **Curtained doorway**: arrangement of closures to allow ingress and egress from one room to another while permitting minimal air movement between rooms, typically constructed as follows:

.1 Place two overlapping sheets of polyethylene over existing or temporarily framed doorway, secure each along top of doorway, secure vertical edge of one sheet along one vertical side of doorway, and secure vertical edge of other sheet along opposite vertical side of doorway.

.2 Reinforce free edges of polyethylene with duct tape and add weight to bottom edge to ensure proper closing.

.3 Overlap each polyethylene sheet at openings 1.5 m on each side.

.8 **Action Level**: employee exposure, without regard to usage of respirators, to an airborne concentration of lead of 50 micrograms per cubic metre of air calculated as an 8-hour time-weighted average (TWA). Maximum precautions for lead abatement are based on airborne lead concentrations greater than 1.25 milligrams per cubic meter of air within Work Area.

.9 **Competent Person**: individuals or Departmental Representative capable of identifying existing lead hazards in workplace and taking corrective measures to eliminate them.

.10 **Lead in Dust**: wipe sampling on the vertical and/or horizontal surfaces, dust and debris is considered to be lead contaminated if it contains more than 40 micrograms of lead in dust per square foot.

.11 **Negative Air Pressure Machine**: extracts air directly from Work Area and filters extracted air through a HEPA filter, discharge air to exterior of building.

.1 Maintain pressure differential of 5 to 7 Pa relative to adjacent areas outside of Work Areas. Machine to be equipped with alarm to warn of system breakdown and equipped with instrument to continuously monitor and automatically record pressure differences.

1.4 SUBMITTALS

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

.2 Provide proof. satisfactory to Departmental Representative. that suitable arrangements have been made to dispose of lead-based paint waste in accordance with requirements of authority having jurisdiction.

.3 Provide Provincial and local requirements for Notice of Project Form.

.4 Provide proof of Contractor's General and Environmental Liability Insurance.

.5 Submit proposed layout of decontamination systems, enclosures, and barrier systems.

.6 Submit Medical Surveillance Program requirement as identified in “Guideline: Lead on Construction Projects” to the Departmental Representative.

.7 Quality Control:

.1 Provide to Departmental Representative necessary permits for transportation and disposal of lead-based paint waste and proof it has been received and properly disposed of.

.2 Provide proof, satisfactory to Departmental Representative, that employees have instruction on hazards of lead exposure, respirator use, dress, entry and exit from Work Area, and aspects of work procedures and protective measures.

.3 Provide proof that supervisory personnel have attended lead abatement course, of not less than two days duration, approved by the Ministry of Labour and provide documentation to the Departmental Representative. Minimum of one supervisor who will be on site for all work for every ten workers shall have attended.

.8 Product data:

.1 Provide documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for all chemicals and materials used in this project.

1.5 MITIGATION MEASURES

.1 Implement the mitigation measures listed in the Environmental Assessment and Environmental Assessment Check List.

.2 Complete mitigation checklist, indicating how each issue will be addressed prior to mobilizing on site and submit to the Departmental Representative.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial/Territorial, and local requirements pertaining to lead, including SSPC guidelines specified in Sections of these Specifications. In case of conflict among those requirements or with these Specifications, the more stringent requirement applies. Comply with regulations in effect at time work is performed.

.2 Comply with requirements identified in MOL “Guideline: Lead on Construction Projects” for Type 3 operations for abrasive blasting projects.

.3 Health and Safety:

.1 Require construction Work to be in compliance with Section 01 35 29.06 – Health and Safety Requirements.

.2 Safety Requirements: worker and visitor protection.

.1 Protective equipment and clothing to be worn by workers while in Lead Work Area includes at minimum:

.1 Abrasive blasting of lead paint: NIOSH approved, equipped with filter cartridges with assigned protection factor of 1000, acceptable to Authority having jurisdiction. Suitable for type of lead and level of lead dust exposure in Lead Work Area. Respirator to be equivalent Type CE abrasive blast supplied air Respirator operated in a pressure demand or positive pressure mode with a tight-fitting full-face-piece. Compressed air used to supply supplied-air respirators to meet breathing air purity requirements of CAN/CSA-Z180.1. Where an oil-lubricated compressor is used to supply breathing air, a continuous carbon monoxide monitor/alarm to be provided.

.2 Disposable protective clothing that does not readily retain or permit skin contamination, consisting of full body covering including head covering with snug fitting cuffs at wrists, ankles, and neck.

.2 Requirements for workers:

.1 Remove street clothes in clean change room and put on respirator with new filters or reusable filters, clean coveralls and head covers before entering Equipment and Access Rooms or Work Area. Store street clothes, uncontaminated footwear,

towels, and similar uncontaminated articles in clean change room.

.2 Remove gross contamination from clothing before leaving Work Area. Place contaminated work suits in receptacles for disposal with other lead-contaminated materials. Leave reusable items, except respirator, in Equipment and Access Room. When not in use in Work Area, store work footwear in Equipment and Access Room. Upon completion of lead abatement, dispose of footwear as contaminated waste or clean thoroughly, inside and out, using soap and water before removing from Work Area or from Equipment and Access Room.

.3 Enter Unloading Room from outside, dressed in clean coveralls, to remove waste containers and equipment from Holding Room of Container and Equipment Decontamination Enclosure system. Workers shall not use this system as means to leave or enter Work Area.

.3 Eating, drinking, chewing, and smoking are not permitted in Work Area.

.4 Ensure workers are fully protected with respirators and protective clothing during preparation of system of enclosures prior to commencing actual lead abatement.

.5 Ensure workers wash hands and face when leaving Lead Work Area. Facilities for washing are to be provided by contractor in a designated area.

.6 Provide and post in Clean Change Room and in Equipment and Access Room the procedures described in this Section, in both official languages.

.7 Ensure no person required to enter Work Area has facial hair that affects seal between respirator and face.

.8 Visitor Protection:

.1 Provide protective clothing and approved respirators to Authorized Visitors to Work Areas.

.2 Instruct Authorized Visitors in use of protective clothing, respirators, and procedures.

.3 Instruct Authorized Visitors in proper procedures to be followed in entering into, and exiting from, Work Area.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Disposal of waste materials in accordance with Section 01 74 21 – Construction Demolition Waste Management and Disposal.

.2 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, and Regional and Municipal regulations.

.3 Disposal of lead waste generated by removal activities must comply with Federal, Provincial, and Municipal regulations. Dispose of lead waste in sealed, double-thickness 0.15 mm thick bags, or leak proof drums. Label containers with appropriate warning labels.

.4 Provide manifests describing and listing waste created. Transport containers by approved means to licensed disposal site appropriate to the waste.

1.8 EXISTING CONDITIONS

.1 Reports and information pertaining to lead-based paint to be handled, removed, or otherwise disturbed and disposed of during this Project are listed in this Specification (WSP - Designated Substances Survey - Lower Brewers Bridge and Brass Point Bridge, Kingston, Ontario, August 6, 2021).

.2 Notify Departmental Representative of lead-based paint discovered during Work that is not apparent from drawings, Specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative. Note all paint is assumed to have lead content.

1.9 SCHEDULING

.1 Upon award of contract, not later than ten (10) days before beginning Work on this Project, notify the following in writing, where appropriate:

.1 Appropriate Regional or Zone Director of Medical Services Branch, Health Canada.

.2 Provincial Ministry of Labour.

.3 Disposal Authority.

.2 Inform sub-trades of presence of lead-containing materials identified in Existing Conditions.

.3 Provide Departmental Representative copy of notifications prior to start of Work.

.4 Submit mitigation plans for reducing the need for disturbing lead painted objects or for handling that will reduce exposure to the environment.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Polyethylene 0.15 mm thickness unless otherwise specified; in largest practical sheet size to minimize joints in Lead Work Area enclosure.

.2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric, bonded both sides with polyethylene.

.3 Tape: fibreglass-reinforced duct tape suitable for sealing polyethylene under dry conditions, and wet conditions using amended water.

.4 Slow-drying sealer: non-staining, clear, water-dispersible-type that remains tacky on surface for at least 8 hours, and designed for trapping residual lead-based paint residue.

.5 Lead waste containers: metal or fibre type acceptable to dump operator with tightly fitting covers, and 0.15 mm, sealable polyethylene liners.

.1 When ready for removal to disposal site, label containers with clearly visible, pre-printed, bilingual cautionary “Warning Lead”.

Part 3 EXECUTION

3.1 SUPERVISION

.1 Approved Supervisor must remain within Work Area during disturbance, removal, or handling of lead-based paints.

3.2 PREPARATION

.1 Work Area:

.1 Prevent lead dust and particulate dispersal into the environment, or outside of the work areas. Conduct smoke tests to ensure enclosure systems is airtight at regular intervals, or as directed by the Departmental Representative.

.2 Install negative pressure machine system and operate continuously from installation of airtight enclosure systems until completion of final cleanup. Provide automatic instrumentation capable of continuous monitoring and recording of pressure difference.

.3 Build airlocks at entrances and exits from Work Areas to ensure Work Areas are always closed off by one curtained doorway when workers enter or exit.

.4 At point of access to Work Areas, install warning signs, in both official languages, in upper case "Helvetica Medium" letters reading as follows (where number in parentheses indicates font size to be used):

.1 CAUTION LEAD HAZARD AREA (25 mm).

.2 NO UNAUTHORIZED ENTRY (19 mm)

.3 WEAR ASSIGNED PROTECTIVE EQUIPMENT AND RESPIRATOR (19 mm).

.4 BREATHING LEAD CONTAMINATED DUST CAUSES SERIOUS BODILY HARM (7 mm).

.5 Maintain emergency and fire exits from Work Areas, or establish alternative exits satisfactory to Authority having jurisdiction.

.6 Provide electrical power and shut-off for operation of powered tools and equipment. Provide 24-volt safety lighting and ground fault interrupter circuits on power source for electrical tools, in accordance with applicable CSA Standard. Ensure safe installation of electrical lines and equipment.

.2 Worker Decontamination Enclosure System:

.1 Worker Decontamination Enclosure System includes Equipment and Access Room and Clean Room, as follows:

.1 Equipment and Access Room: construct between exit and Work Areas, with two curtained doorways: one to the rest of the suite, and one to Work Area. Install waste receptacle and storage facilities for workers' shoes and protective clothing to be re-worn in Work Areas. Build large enough to accommodate specified facilities, required equipment, and at least one worker (allowing sufficient space to change comfortably).

.2 Clean Room: construct with curtained doorway to outside of enclosures. Provide lockers, or hangers and hooks, for workers' street clothes and personal belongings. Provide storage for clean protective clothing, and

respiratory equipment. Install mirror to permit workers to fit respiratory equipment properly.

.3 Construction of Decontamination Enclosures:

.1 Construct framing for enclosures or use existing rooms. Line enclosure with polyethylene sheeting and seal with tape. Apply two layers of FR polyethylene on floor.

.2 Construct curtained doorways between enclosures so when people move through, or waste containers and equipment are moved through doorway, one of two closure comprising doorways always remains closed.

.3 Shower room in decontamination facility to be provided with the following:

.1 Hot and cold water, or water, of constant temperature not less than 40 degrees Celsius or more than 50 degrees Celsius.

.2 Individual controls inside to regulate, water flow and temperature, (as applicable).

.4 Prior to each shift in which a decontamination facility is being used, a competent person should inspect the facility to ensure that there are no defects that would allow lead-containing dust to escape. Defects should be repaired before the facility is used. The decontamination facility should be maintained in a clean and sanitary condition.

.4 Create airtight barrier as separation of Work Areas from Occupied Areas for Bridge Staff and the general public.

.5 Maintenance of Enclosures:

.1 Maintain enclosures in tidy condition.

.2 Ensure barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately.

.3 Visually inspect enclosures at beginning, middle, and end of each working day.

.4 Use smoke test method to test effectiveness of barriers, as directed by Departmental Representative.

3.3 LEAD-BASED PAINT ABATEMENT

.1 Removal of lead-based paint to be performed using abrasive blasting and an effective dust-collecting system with HEPA filters to minimize lead-containing dust in air.

.2 Remove lead-based paint waste debris in sections of appropriate size to be removed in labelled, sealable, and transportable containers.

.3 Use appropriate methods to reduce dust generation.

.4 Seal filled containers. Clean external surfaces thoroughly before moving containers, or equipment, out of enclosure systems or decontamination systems. Ensure containers are removed from Holding Room by workers who have entered from uncontaminated areas dressed in clean coveralls.

.5 After completion of abrasive blasting, remove all visible lead-based paint waste and debris from the enclosure. Clean entire Work Area including Equipment and Access Room. Compressed air or dry sweeping not be used to clean up lead-containing dust or waste. Departmental Representative will conduct inspection, and approve for clean up, of

the Work Area. Prior to dismantling enclosure with approval by Departmental Representative, apply continuous coat of slow-drying sealer to surfaces. Do not disturb Work Area for 12 hours. No entry, activity, or ventilation (other than operation negative air machine) is permitted in the Work Area during this period.

.6 After enclosing Work Area surfaces, wet clean Work Area and Equipment and Access Room. During settling period, no entry, activity, or ventilation will be permitted.

3.4 INSPECTION

.1 Perform inspection to confirm compliance with Specification and governing Authority requirements. Deviations from requirements that have not been approved, in writing, by Departmental Representative will result in Work shutdown, at no cost to Owner.

.2 Departmental Representative will inspect Work for:

.1 Adherence to specific procedures and materials.

.2 Final cleanliness and completion.

.3 No additional costs will be allowed for additional labour or materials required to provide specified performance level.

.4 If lead-containing dust leakage from Work Area occurs, Departmental Representative will order Work shutdown.

.1 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

.2 Contractor will be in violation of the Fisheries Act and would be responsible for any convictions issued by Authorities having jurisdiction.

3.5 LEAD SURFACE SAMPLING - WORK AREAS

.1 Surface sampling will be conducted prior to removal of enclosure to ensure that no residual lead-dust is released to the environment during the dismantling of the enclosure systems.

.2 Final lead surface sampling conducted as follows:

.1 After Work Area has passed a visual inspection for cleanliness approved by Departmental Representative, acceptable coat of lock-down agent has been applied to surfaces within enclosure, and appropriate settling period of 8 hours has passed, Departmental Representative will perform lead wipe sampling in Work Area.

.1 Final lead wipe sampling results from horizontal and vertical surfaces must show lead levels of less than 40 micrograms of lead in dust per square foot. Samples collected and analyzed in accordance with EPA 747-R-95-007.

.2 If wipe sampling results show levels of lead dust in excess of 40 micrograms per square foot, re-clean Work Area at contractor's expense and apply another acceptable coat of lock-down agent to surfaces.

.3 Repeat, as necessary, until lead-containing dust levels are less than 40 micrograms per square foot.

3.6 FINAL CLEANUP

.1 Following specified cleaning procedures, and, when lead wipe sampling is below acceptable concentrations, proceed with final cleanup.

.2 Remove polyethylene sheet by rolling it away from walls to center of Work Area. Vacuum visible lead containing particles observed during cleanup, immediately, using HEPA vacuum.

.3 Place polyethylene sheets, tape, cleaning material, clothing, and contaminated waste in plastic bags and sealed labelled waste containers for transport.

.4 Clean-up Work Areas, Equipment and Access Room, and other contaminated enclosures.

.5 Remove sealed waste containers and equipment used in Work and remove from Work Areas at appropriate time in cleaning sequence.

.6 Conduct final check to ensure no dust or debris remain on surfaces as result of dismantling operations.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01-35-43 - Environmental Procedures

.2 Section 03 20 00 - Concrete Reinforcing.

.3 Section 03 30 00 - Cast-in-Place Concrete and Patch Repairs.

1.2 MEASUREMENT PROCEDURES

.1 No measurement will be made under this Section. Include costs of this work in associated unit cost items for concrete.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-A23.1-14, Concrete Materials and Methods of Concrete Construction.

.2 CAN/CSA-O86, Engineering Design in Wood.

.3 CSA O121-17, Douglas Fir Plywood.

.4 CSA O151-17, Canadian Softwood Plywood.

.5 CSA S269.1-16, Falsework for Construction Purposes.

.6 CAN/CSA-S269.3-M92 (R2013), Concrete Formwork.

.2 Council of Forest Industries of British Columbia (COFI)

.1 COFI Exterior Plywood for Concrete Formwork.

1.4 SHOP DRAWINGS

.1 Submit shop drawings for formwork and falsework in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate method and schedule of construction, shoring, stripping, arrangement of joints, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings. Comply with CAN/CSA-S269.3 for formwork drawings.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Formwork materials:

.1 Use wood and wood product formwork materials to CSA-O121 and CAN/CSA-O86.

.2 Form ties:

.1 Use of form ties will only be permitted for concrete features below grade. Use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm in diameter in concrete surface. All holes shall

be patched with appropriate materials approved by the Departmental Representative and arranged in a symmetrical and aligned pattern to minimize the visual impact of the patched tie holes.

.3 Form liner:

.1 Plywood: high density overlay Douglas Fir to CSA O121.

.4 Form release agent: non-toxic, biodegradable, low VOC.

.5 Form stripping agent: colorless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 15 to 24 mm 2/s at 40°C, flashpoint minimum 150°C, open cup.

.6 Falsework materials: to CSA-S269.1.

Part 3 EXECUTION

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels, and centers before proceeding with formwork/falsework and ensure dimensions agree with drawings and field measurements, especially in curved area where the bridge must swing. Verify the radius of the concrete is larger than the radius of the bridge as the concrete is further away from the pivot such that the gap is maintained throughout the swing.

.2 Fabricate and erect falsework in accordance with CSA S269.1 and COFI Exterior Plywood for Concrete Formwork

.3 Formwork and falsework shall not be supported by, braced to, or come in contact with another structure unless written permission is received from the departmental representative or it is shown on the contract drawings to be in contact.

.4 The formwork shall be constructed by tradespersons and lead formwork foreman with 10 years demonstrated experience with the majority of their work completing concrete forms for architectural finish concrete. Submit resumes of proposed individuals listing past projects which can be visited to confirm past results.

.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 CAN/CSA-A23.1.

.8 Align form joints and make watertight. Keep form joints to minimum.

.9 Use 20 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, and joints, unless specified otherwise.

.10 Form chases, slots, openings, drips, recesses, and expansion and control joints as indicated.

.11 Built-in anchors, sleeves, and other inserts required to accommodate Work are specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.12 Clean formwork in accordance with CAN/CSA-A23.1 before placing concrete.

3.2 REMOVAL AND RESHORING

.1 Leave formwork in place for a minimum of ten (10) days after placing concrete. Separate based on curing rate but leave in place.

.2 Remove formwork no earlier than when concrete has reached 75% of its design strength, or minimum period noted above, whichever comes later.

.3 Re-use of formwork and falsework shall be subject to requirements of CAN/CSA-A23.1.

3.3 QUALITY OF FINISH

.1 The finished surface of all concrete surfaces, at minimum, shall conform to the provisions of CSA 23.1, 7.10.2.6-Smooth-Form Finish with the exception of areas below grade and not visible in the finished bridge. The level of finish for the visible portion of the concrete shall be that of architectural concrete and shall receive a smooth-form finish with no discernable form lines form ties etc. The posts on the wingwalls and the abutment faces sealing, lining and filling form joints to produce a truly consistent and unblemished finish will be required. It is not acceptable to simply patch, grind or parge mistakes, errors, honeycombing or incomplete filling of the forms.

.2 Grinding of the surfaces to achieve proper alignment and tolerance will generally not be accepted and the work must conform to the lines and be smooth when the forms are removed.

.3 The structure is a heritage structure and an above-average finish of concrete, uniform in colour, straight in appearance (or with uniform curves where curves are required) is a condition of acceptance. Acceptance shall be at the sole discretion of the Departmental Representative.

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

.1 This Section covers the requirements for concrete reinforcing, above water.

.2 This Section does not cover underwater concrete reinforcing.

1.2 RELATED SECTIONS

.1 Section 01-35-43 - Environmental Procedures

.2 Section 03 30 00 - Cast-in-Place Concrete and Patch Repairs.

1.3 MEASUREMENT PROCEDURES

.1 No measurement for payment will be made for the work to "Concrete Reinforcing." All costs shall be included in the Contract lump sum price. All costs for labour, materials and equipment necessary to the work of this item in accordance with the drawings and these specifications shall be included in the Contract lump sum price.

.2 All other work of this Section that is not identified as a unit price item, shall be included in the Contract Lump Sum Price.

1.4 REFERENCES

.1 American Standards Testing of Materials (ASTM)

.1 ASTM F593-17 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

.2 American Concrete Institute (ACI)

.1 ACI 315R-18, Guide to Presenting Reinforcing Steel Design Details.

.3 American National Standards Institute/American Concrete Institute (ANSI/ACI)

.1 ANSI/ACI 315-17, Details and Detailing of Concrete Reinforcement.

.4 Canadian Standards Association (CSA)

.1 CAN/CSA-A23.1-14, Concrete Materials and Methods of Concrete Construction.

.2 CAN3-A23.3-14, Design of Concrete Structures.

.3 CSA G30.18:21 Carbon Steel Bars for Concrete Reinforcement.

.4 CSA G30.14-M1983(R1998), Deformed Steel Wire for Concrete Reinforcement.

.5 CAN/CSA-G30.18-M92, Billet-Steel Bars for Concrete Reinforcement (R2007).

.6 CAN/CSA-G40.21-13 (R2018), Structural Quality Steel.

.7 CAN/CSA-G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles.

.8 CSA W186-M1990 (R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.5 SHOP DRAWINGS AND SUBMISSIONS

.1 Submit shop drawings, including placing of reinforcement, in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate on shop drawings bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement, and need for mechanical splices (if approved by Engineer), with identifying code marks to permit correct placement without reference to Structural Drawings. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice by Reinforcing Steel Institute of Canada.

.3 Detail lap-lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.

.4 Contractor to field verify site dimensions and prepare all Shop Drawings based on site dimensions.

.5 Two copies of the mill certificates for each lot shall be submitted to the Departmental Representative prior to shipment of reinforcing steel bars, stainless steel reinforcing bars, welded wire reinforcement, splice bars, and stainless steel splice bars. The certificates shall show that the material is as specified in the Contract Documents.

Part 2 PRODUCTS

2.1 MATERIALS

.1 All reinforcing bars shall be 400W reinforcing steel and have a minimum yield strength of 400MPa.

.2 Threaded rod used for dowels shall be alloy group 2 (316L) with a yield strength of 480 MPa, manufactured in accordance with ASTM F593-17.

.3 Substitute different size bars only if permitted in writing by Departmental Representative.

.4 Deformed steel wire for concrete reinforcement: to CSA G30.14.

.5 Chairs, bolsters, bar supports, and spacers: to CAN/CSA-A23.1.

.6 Mechanical splices: subject to approval of Departmental Representative.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, ANSI/ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.2 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.

.3 No welding of reinforcing steel should be required.

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists. For stainless steel bars, method of bundling and transportation shall be in accordance with ASTM A955/A955M- 19 with the special provision that all handling shall avoid contact with metals that will de-pacify the stainless steel such as all carbon steels.

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 four (4) weeks prior to commencing reinforcing work.

.2 Inform Departmental Representative of proposed source of material to be supplied.

Part 3 EXECUTION

3.1 FIELD BENDING

.1 Do not field-bend or field-weld reinforcement, except where indicated or authorized by Departmental Representative.

.2 When field-bending is authorized, bend without heat, and applying a slow and steady pressure using proper bending tools.

.3 Replace bars which develop cracks or splits.

3.2 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CAN/CSA-A23.1.

.2 Dowels may be installed using chemical anchors in accordance with the epoxy manufacturers recommendations. Every effort shall be made to ensure the surrounding concrete is not damaged while drilling for dowels in new concrete. The contractor is responsible for ensuring dowels do not conflict with reinforcing if utilizing epoxy dowels. Alternatively, dowels may be placed prior to casting concrete to ensure no interference with reinforcing.

.3 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.

.4 Ensure cover to reinforcement is maintained during concrete pour.

.5 Protect reinforcing steel bars with covering during transportation and handling. During placing, use vibrators with protective sheaths.

.6 Repair all areas where the surface has been de-pacified of the reinforcing steel, regardless of the cause, including all scrapes embedment and issues.

3.3 COLD WEATHER WORK

.1 The Contractor is advised that the Work requires installation of epoxy anchors during the winter navigational shut-down period. The Contractor shall provide heating and hoarding as required to bring concrete and ambient temperatures above the minimum temperatures recommended by then manufacturer of the epoxy adhesive. The contractor shall also maintain these temperatures for the durations recommended by the manufacturer of the epoxy adhesive. If the manufacturer of the epoxy adhesive does not specific recommendations for the cold weather installation, then the Contractor shall follow the requirements in Section 03 30 00 – Cast-in-Place Concrete and Patch Repairs, for the housing and heating.

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

.1 The Work of this Section covers the requirements for the supply and placement of concrete for the construction of the concrete abutments, wingwalls, pivot pier and south west retaining wall. Abrasive blast cleaning of the concrete surfaces and existing reinforcing steel, to which the concrete or patching material is to be placed, as well as all necessary formwork, is also part of this Work.

.2 Comply with restrictions stipulated in this and other Sections of these Specifications. Submit certification that mix design will produce durable concrete with the specified properties.

.3 Note that the finished elevation of all surfaces that support the bridge are critical and require coordination with the bridge balancing process. The actual finished elevations of bearing points on the abutments must be reviewed by the contractor and submitted to the Departmental Representative to ensure sufficient allowance for adjustment. This adjustment may be made with shims and grout.

.4 Asphalt impregnated fibreboard (non-absorbing, self-sealing) in accordance with ASTM D994/D994M-11 (2016) shall be installed at locations and of dimensions as shown on the contract drawings.

.5 The work in this section shall also cover the requirements for the installation of nosing angles that are to be embedded in the concrete of the ballast walls. For information regarding the angles see Section 05 12 33 – Structural Steel for Bridges.

1.2 RELATED SECTIONS

.1 Section 01-35-43 - Environmental Procedures

.2 Section 02 41 23 - Selective Site Demolition.

.3 Section 05 12 33 – Structural Steel for Bridges

1.3 MEASUREMENT FOR PAYMENT PROCEDURES

.1 No measurement for payment will be made for the work to " Cast-in-Place Concrete and Patch Repairs.” All costs shall be included in the Contract lump sum price. All costs for labour, materials and equipment necessary to the work of this item in accordance with the drawings and these specifications shall be included in the Contract lump sum price.

.2 Heating or cooling of water and aggregates and providing hot and cold weather protection will not be measured, but are considered incidental to the Work. The work must proceed and as the contract timing is in the non-navigation season the contractor must be prepared to proceed during the winter months to meet the completion date.

.3 All other Work, necessary to the completion of the Work of this Section, including abrasive blast cleaning of concrete and existing reinforcing steel, will not be measured separately for payment, but will be considered incidental to the Work.

1.4 REFERENCES

.1 Canadian Standards Association (CSA).

.1 CAN/CSA-A3000-18, Cementitious Materials Compendium.

.2 CSA-A23.1-14, Concrete Materials and Methods of Concrete Construction.

.3 CSA-A23.2-14, Methods of Test for Concrete.

.4 CSA S269.3-M92 (R2013), Concrete Formwork as supplemented by the Contract Specifications.

.5 CSA S269.1-16, Falsework and Formwork.

.2 SSPC.

.1 SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning.

.3 ASTM International.

.1 ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.

.2 ASTM C494/C494M-17, Standard Specification for Chemical Admixtures for Concrete.

.3 ASTM D4285-83(2018), Standard Test Method for Indicating Oil or Water in Compressed Air.

.4 ASTM D994/D994M-11 Preformed Expansion Joint Filler for Concrete (Bituminous Type).

.5 ASTM C1059/C1059M-13 Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.

.4 American Concrete Institute (ACI).

.1 ACI 546.2R-14, Guide to Underwater Repair of Concrete.

1.5 SAMPLES

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

.2 At least two (2) weeks prior to commencing Work, inform Departmental Representative of proposed source of aggregates and provide proof of compliance as a source of aggregate for concrete such as a Ministry of Transportation Ontario approval and access to the pit if so desired by the Departmental Representative for sampling.

1.6 CERTIFICATES AND SUBMISSIONS

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

.2 A minimum of two (2) weeks prior to starting concrete Work, submit to Departmental Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that the following materials will meet specified requirements for:

.1 Portland cement.

.2 Blended hydraulic cement.

.3 Supplementary cementing materials.

.4 Grout.

.5 Admixtures.

.6 Aggregates.

.7 Water.

.8 Joint filler.

.3 Provide certification that mix proportions selected will produce concrete of quality, yield, and strength as specified in concrete mixes, and will comply with CSA-A23.1.

.4 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1.

.5 In the case of pre-blended proprietary concrete and cement-based products, provide manufacturer's data sheets and ensure that all products are delivered in original manufacturer's labelled packaging. If any doubt exists regarding the source or quality of the material, provide shipping records or other suitable certification that the product was delivered to the site and that it is the product stated. Such certification must be provided from the manufacturer.

.6 Submit material data sheets from the proposed supplier of the bituminous joint filler.

1.7 QUALITY ASSURANCE

.1 A minimum of two (2) weeks prior to starting concrete Work, submit proposed quality control procedures for Departmental Representative's approval for following items:

.1 Falsework erection.

.2 Hot weather concrete procedures.

.3 Cold weather concrete procedures.

.4 Curing.

.5 Finishing.

.6 Formwork removal.

.7 Joints.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 To Section 01 35 43 - Environmental Procedures, with the following additional requirements:

.1 Carefully coordinate the specified concrete Work with weather conditions.

.2 Choose least harmful, appropriate cleaning method which will perform adequately.

Part 2 PRODUCTS

2.1 SUBSTITUTION

.1 Substitution of specified products may be considered by the Departmental Representative, providing the Contractor requests the use of alternative products in writing, and such request includes a certificate of compliance from an independent CSA certified testing laboratory certifying that the proposed product meets or exceeds the

specified product's performance criteria, tested in accordance with standards designated in the specified product manufacturer's technical data sheet.

.2 Substitute product(s) shall be composed of constituent material similar to those comprising the specified product(s) and shall have similar performance characteristics. They must be fully compatible with other repair products specified or substituted.

.3 Submittals to Section 01 33 00 - Submittal Procedures.

2.2 MATERIALS

.1 Portland cement: to CAN/CSA-A5.

.2 Supplementary cementing materials: to CAN/CSA-A23.5.

.3 Cementitious hydraulic slag: to CAN/CSA-A363.

.4 Water: to CAN/CSA-A23.1.

.5 Aggregates: to CSA-A23.1. Coarse aggregates to be normal density.

.6 Abrasives for blast cleaning shall be angular or sub-angular in shape and not more than 1% shall pass the 300 sieve. Adjustments to the type and angularity of the aggregate shall be made as necessary to produce the desired results.

.7 Air entraining admixture: to ASTM C260.

.8 Chemical admixtures: to ASTM C 494. Engineer to approve accelerating or set retarding admixtures during cold and hot weather placing.

.9 Patching material: A polymer-modified cementitious patching material suitable for the depth of patch required, and providing suitable colour match to existing concrete sub-strate. Proposed patching material shall be approved by the Departmental Representative. Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

.10 Asphalt impregnated fibreboard (non-absorbing, self-sealing): in accordance with ASTM D994/D994M-11 (2016).

2.3 MIXES

.1 Proportion normal density concrete in accordance with CSA-A23.1, Table 13, Alternative 1, to give following quality:

.1 Cement: Type 10 Portland cement.

.2 Minimum compressive strength at 28 days: 35 MPa.

.3 Minimum cement content: 335 kg/m³ of concrete.

.4 Class of exposure: C-1.

.5 Nominal size of coarse aggregate: 20 mm, except for sections of thin concrete where a maximum size of 9.5 mm may be used subject to the approval of the Departmental Representative.

.6 The water/cement ratio shall be no greater than 0.40.

.7 Air content: 6% to 8%, except for concrete with 9.5 mm aggregate which shall have air content 7% to 9%.

.8 Chemical admixtures: in accordance with ASTM C494. Do not use calcium chloride or compounds or admixtures containing calcium chloride.

.9 Shrinkage Reducing Admixture shall be used - Equivalent to "Eclipse" by Grace Construction Products, 2% of cement by weight, or, as recommended by admixture manufacturer.

.10 Plasticizing admixtures are to be used to increase the workability of the concrete and ensure that the concrete can be placed.

.2 Ensure that aggregate sources conform to the requirements of Clause 5.5, "Deleterious Reactions", of CSA-A23.1, and that performance certification includes certification that the aggregate is non-reactive.

2.4 EQUIPMENT

.1 Air Compressors:

.1 The air compressor for air blasting shall have a minimum capacity of 3.5 m^3/min. The compressed air shall be free from oil when tested in conformance with ASTM D4285.

.2 The air compressor for abrasive blast cleaning shall supply a minimum pressure, in the hose, of 620 kPa within 3 m of the nozzle. The air shall be free from oil when tested in conformance with ASTM D4285.

.2 Straight Edge:

.1 The straight edges for checking alignment shall be 1.5 m and 3 m long and commercially made of metal with little or no deviation from a straight line.

.3 Vibrators

.1 Vibrators shall be used during the placing of concrete to ensure that voids are eliminated, and the cavity is completely filled. The use of the vibrator shall be coordinated with the number of admixtures to ensure that the concrete does not segregate. Ensure wands of vibrators are fully encased to protect stainless steel and avoid contact that will affect the stainless steel.

Part 3 EXECUTION

3.1 HOUSING AND HEATING

.1 Protection - General

.1 The Contractor shall protect the concrete and patching during cold weather in accordance with Section 01 55 50 - Access, Housing Heating and Ventilation, and as augmented below.

.2 The protection system shall be designed for the worst conditions that can be reasonably anticipated from local weather records, forecasts, site conditions, and past experience for the time period during which the protection is required.

.3 Schedule Work to avoid unusual conditions and allow flexibility in schedule to avoid poor weather.

.4 The Contractor shall monitor the conditions and modify the protection system as required.

.2 Epoxy Injection

.1 Because of the relatively short nosing angles, and with adequate vibration the use of the injection hoses is not anticipated at this time. After the concrete has achieved 75% of its capacity, the nosing angles will be sounded and if there appears to be voids behind the angles, epoxy injection via the already installed hose system will be utilized.

.2 Epoxy shall be injected into the injection hose system once concrete in the ballast wall has reached a minimum compressive strength of 25 MPa and curing of concrete has been completed.

.3 Only the supplier of the nosing angles or an agent approved by the supplier shall inject the epoxy used in the injection hose system. The epoxy shall be mixed and pressure injected according to the manufacturer's specifications.

.4 Injection shall start at the injection fitting at one end of a section of hose to initially fill the hose and continue until the epoxy discharges from the other injection fitting of the same section. Injection shall then alternate at both fittings of the same section until the epoxy emanates from the voids in the concrete or at the interface between the steel angles and concrete or both. The injection fittings shall then be plugged.

.5 The above procedure shall be repeated in each section of hose until the full length of the nosing angle has been filled with epoxy. The top surface of the ballast wall shall be thoroughly cleaned to remove any excess epoxy prior to hardening. After the epoxy has set, all adapters and injection fittings shall be removed, and the ends of each hose shall be filled with epoxy.

.6 The nosing angles shall be checked for voids remaining under the angles. Holes shall be drilled in angles where voids are detected and voids and boltholes shall be filled with epoxy.

.3 Protection - Minimum Requirements

.1 The formwork and existing concrete/substrate shall be heated to a temperature of 10° C for a period of 36 hours prior to pouring concrete.

.1 During the seven days following placing, the concrete or patching temperature shall not fall below 10°C or exceed 70°C.

.2 For cold weather conditions, protection of concrete and patching shall at least conform to Table 1 of this Section. However, the temperature of the concrete and patching shall be checked to ensure that at least the minimum temperature specified above is maintained.

Table 1 - Minimum Cold Weather Protective Measures All Concrete and Patching

ANTICIPATED MINIMUM AIR TEMPERATURE	**THICKNESS**			
(°C)	>1.0m	1.0-0.5m	<0.5-0.25m	<0.25m
+5 to 0	PM1	PM1	PM1	PM2
-1 to 10	PM2	PM2	PM3	PM4
-11 to -20	PM3	PM3	PM4	PM5
Less than -20	PM4	PM5	PM5	PM5

MAXIMUM ALLOWABLE DROP IN CONCRETE OR PATCHING TEMPERATURE / 24H
>2.0 m - 10°C
1.0-1.99 m - 15°C
<1.0 m - 20°C

PROTECTIVE MEASURE
PM1 – Cover concrete with a moisture vapour barrier as specified for curing with moisture vapour barrier
PM2 – Cover concrete as for PM1, then cover the moisture vapour barrier with insulation having and R-Value of 0.67**
PM3 – Cover concrete as for PM1, then cover the moisture vapour barrier with insulation having and R-Value of 1.33**
PM4 – Cover concrete as for PM1, then cover the moisture vapour barrier with insulation having and R-Value of 2.00**
PM5 – House and heat as specified for housing and heating.

****NOTE:** All R-Values are metric. The conversion factor from metric to imperial is Metric "R" value x 5.678 = Imperial "R" value.

.4 Housing and Heating

.1 The design of the protective housing shall take into account the effects of construction activities such as placing concrete, grouting, and patching. Heating equipment of sufficient capacity to establish and maintain the specified curing conditions shall be used throughout the curing period and for such time thereafter as is necessary for the completion of the Work. Heating equipment used within the housing shall be vented outside the housing. Heating equipment having an open flame will not be permitted.

.2 The ambient air temperature adjacent to the concrete or formwork within the housing shall not be permitted to vary, from location to location, by more than 8°C.

.5 Withdrawal of Protection

.1 The cold weather protection shall be gradually removed or reduced in such a manner that the maximum allowable drop of concrete or patching temperature for each 24-hour period as specified in Table 1 is not exceeded.

.2 The protection shall not be completely removed; nor shall the concrete or patching be fully exposed to the air, until the average concrete temperature is within 10°C of the ambient air temperature.

3.2 PREPARATION

.1 Obtain Departmental Representative's written approval before placing concrete patching. Provide 72 hours notice prior to placing of concrete or patching.

.2 Pumping of concrete is permitted only after approval of equipment and mix. The mix supplier and mix designer must certify that the mix can be pumped using the proposed equipment and not affect the concrete properties.

.3 Ensure reinforcement and inserts are not disturbed during concrete placement.

.4 Before placing concrete, obtain Departmental Representative's written approval of proposed method for protection of concrete during placing and curing.

.5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature, and test samples taken.

.6 Do not place load upon new concrete or patching until authorized in writing by Departmental Representative.

3.3 CONSTRUCTION

.1 Complete cast-in-place concrete Work in accordance with CSA-A23.1.

.2 Complete patching Work in strict conformance to patching manufacturer's recommendations.

.3 Finishing.

.1 Finish concrete in accordance with CSA-A23.1. Patching to match finish on adjacent concrete surfaces.

.2 Use procedures acceptable to Departmental Representative or those noted in CSA-A23.1, to remove excess bleed water. Ensure surface is not damaged.

.3 Provide screed float finish unless otherwise indicated.

.4 Chamfer and rub exposed sharp edges of concrete or patching with carborundum to produce 3 mm radius edges, unless otherwise indicated.

3.4 TYPE 1 ABRASIVE BLASTING

.1 Applicable to all existing concrete surfaces against which new concrete or patching is to be placed.

.2 Must take place not more 48 hours before the placement of any concrete or patching. Special direction will be given when placement of reinforcing steel will require more time.

.3 Preparation and Abrasive Blasting.

.1 Remove all oil or grease on the surface, to which concrete or patching is to be placed, prior to blasting. If oil or grease has penetrated, expose and clean the course aggregate of the existing concrete by blasting with abrasive medium. Remove all dirt, laitenance, loose material, paint, hardened concrete slurry, or

any other contaminant(s) which would inhibit the bonding of the new concrete or patching to the existing concrete. Adjust the blast medium and pressures to obtain the required level of cleanliness, without damaging adjacent surfaces.

.2 Immediately after abrasive blasting, blast with compressed air all surfaces against which the repair product is to be placed. Compressed air must remove all remaining abrasive, sand, dust, and debris. The surface will be checked by the Departmental Representative for fractured concrete, or loose aggregate. Remove this material using hand tools.

.4 Protection and Disposal of Debris.

.1 Install tarps, enclosures, etc. as required to satisfactorily limit the amount of air-borne dust.

.2 Provide worker protection measures to Site Specific Health and Safety Plan. See Section 01 35 29.6 - Health and Safety Requirements.

.3 Dispose of all blast media and debris resulting from the abrasive blast cleaning operation off site in accordance with applicable legislation.

3.5 PLACEMENT AND CURING

.1 Before placing concrete, thoroughly dampen the concrete surfaces to promote bond, concrete shall be saturated satisfactorily. Immediately before placing concrete, place bonding agent to ASTM C1059 or cement slurry bonding agent. In the case of patching, prepare surface in strict conformance to patching manufacturer's recommendations.

.2 Install wet burlap and white plastic sheeting over the newly placed concrete after it has initially set, and in a manner that the placement of the burlap and plastic will not damage the surface. Install cold weather protection. Maintain moist curing on the concrete for a minimum of 4 days. Use this same procedure for patch repairs unless otherwise stipulated by the patch material manufacturer.

3.6 SITE TOLERANCE

.1 Unless otherwise noted, concrete and patching application tolerance shall be in accordance with CSA-A23.1, the straight edge method detailed in CSA-A23.1.

3.7 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Departmental Representative in accordance with CSA-A23.1.

.2 The contractor’s quality control program must include concrete testing for properties of the harden concrete at 7 and 28 days as well as air entrainment. Parks Canada may run parallel test with their own testing company. Provide all concrete necessary for samples to the Parks Canada testing designate. If retesting is required due to non-conformance, the Contractor shall pay all costs associated with retesting and replacement of the concrete that is in question.

.3 Contractor shall take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent. Again, the Departmental Representative may run parallel test. Accommodate all items necessary to run the parallel tests.

3.8 WATER LEVEL AND CONCRETE PLACEMENT

.1 The water levels at the site will vary during the construction and it is likely that water may be encountered at the base of the concrete pours. Pumping and water control shall be used to reduce the water level and this will necessitate environmental controls to address the pumped water. The pouring of concrete, as much as possible, shall be completed to avoid high water levels. Where water can not be avoided, the concrete Work shall be completed in accordance with the guidelines of the American Concrete Institute publication ACI 546.2R-10 Guide to Underwater Repair of Concrete. Specifically, the provisions of Chapter 5 to 7 related to the preparation, concrete removal, reinforcement placement, formwork, concrete mix design, and concrete placement.

.2 Ice inside and outside the forms shall not be allowed to affect the concrete. Ice shall be removed from all formwork. Movement of water away from the forms shall deter and prevent the formation of ice and allow concrete placement. Insulation will be required to maintain the temperature of the concrete to allow normal curing to occur.

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

.1 This Section covers the requirements for the supply and installation of all steel required during the replacement and construction of the new Lower Brewers Swing Bridge. The existing timber pivot beam, west end beam, east end beam and balance beams are to be replaced with new steel fabricated members.

.2 The existing timber pivot beam, west end beam, east end beam and balance beams of the Bridge shall be replaced with steel members as shown on the Contract Drawings using new steel conforming to CSA G40.20-13 / G40.21 - 13 (R2018) General Requirements for Rolled or Welded Structural Quality Steel.

.3 Due to the clearances between bolts, sequenced installation of bolts, particularly at floor beam connections, will be required.

.4 Counter balancing of the bridge is to be achieved utilizing a combination of “variable” and “fixed” counterweight. The estimated amount of counterweight required to balance the bridge is estimated to be 13.5 tonnes. The contractor shall supply 13.040 t of "fixed counterweight and 1.215 t of adjustable counterweight. The "fixed" galvanized steel counterweights shall not exceed 815 kg per piece and shop drawings shall be provided showing the proposed dimensions. The "adjustable" counterweight shall be in the form of galvanized steel billets not exceeding 22 kg per piece.

.5 The work in this section shall also cover the requirements for the supply and installation of nosing angles that are to be embedded in the concrete of the ballast walls. For information regarding the concrete in ballast wall see Section 03 30 00 – Cast-in-Place Concrete and Patch Repairs.

.6 The Stay Rods shall be 41mm diameter, UNC-2B ASTM A193 B8M Class 2, 316 Stainless Steel rod, threaded to match turnbuckles.

.7 The turnbuckles connecting the stay rods shall be UNC-2B ASTM A182 Grade F316 Stainless Steel Turnbuckles.

1.2 RELATED SECTIONS

.1 Section 02 41 23 - Selective Site Demolition.

.2 Section 02 83 12 – Lead-Based Paint Abatement.

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

.4 Section 09 97 19 - Painting Exterior Metal Surfaces.

1.3 MEASUREMENT AND PAYMENT

.1 The Work of this Section will not be measured for payment. It will be paid for under the Contract Lump Sum Price.

.1 After the award of tender as part of the breakdown of the Lump Sum Price, the following will be assigned pricing "Structural Steel Fabrication", and "Structural Steel Erection".

1.4 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM F3125/F3125M-19, Standard Specification for High Strength Structural Bolts, and Alloy Steel, Steel, Heat Treated 120 ksi (830 MPa) and 150 ksi (1040 MPa), Minimum Tensile Strength, Inch and Metric Dimensions.

.2 ASTM A 123/A123M-17 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.3 ASTM A182/A182M-21 Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.

.4 ASTM A193/A193M-20 Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.

.2 Canadian Standards Association (CSA)

.1 CSA G40.20-13/G40.21-13 (R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CSA G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CSA-S6-19 Canadian Highway Bridge Design Code.

.4 CSA-S16.-19, Design of Steel Structures.

.5 CSA S269.1-16, Falsework and Formwork.

.6 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.

.7 CSA W59-18, Welded Steel Construction.

.8 CSA W47.1 -19 Certification of Companies for Fusion Welding of Steel.

.3 American Society of Civil Engineers (ASCE).

1.5 SHOP DRAWINGS AND SUBMISSIONS

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

.2 Indicate shop and erection details including shop splices, cuts, copes, connections, holes, bearing plates, threaded fasteners, bolts, and welds. Indicate welds by CSA W59 welding symbols.

.3 Submit Mill Certificates.

.4 Minimum thickness of galvanized zinc coating for the pieces making up the counterweight shall be per CSA G164-18 for Structural Steel > 6.35 mm and plates, non-centrifuged (100 µm). Thickness for all other steel elements that are designated for galvanizing shall be per Table 1 in CSA G164-18 unless noted otherwise.

.5 Submitted bracing and falsework drawings shall bear the signature and stamp of the Contractor's engineer who shall be a qualified Professional Engineer licensed in the Province of Ontario.

.6 Shop details shall provide:

.1 Full detail dimensions and sizes of the three new steel beams;

.2 All necessary specifications for the materials to be used;

.3 Identification of areas requiring special surface treatment;

.4 Identification of fracture-critical and primary tension members and component parts;

.5 Bolt installation requirements; and

.6 Details of all welds.

.7 Prior to commencement of fabrication of the nosing angles, working drawings shall be submitted to the Departmental Representative. An Engineer shall affix their seal and signature on the working drawings verifying that the drawings are consistent with the Contract Documents and product drawings. The working drawings shall clearly indicate the following:

.1 Material properties.

.2 Dimensions, including total length.

.3 Connection attachments.

.4 Injection hose system components and name of approved injection company.

.5 Installation details and manufacturers installation procedure.

.6 Placement and size of setting devices used to stabilize the nosing angles during the pour.

1.6 DELIVERY, STORAGE, AND HANDLING

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

.2 Provide protective blocking for lifting, transportation, and storing. Exercise care during fabrication, transportation, and erection so as not to damage plates and Sections. Do not notch edges of members. Do not cause excessive stresses.

.3 Protect threads of bolts and nuts during use, storage and after installation.

.4 Ensure that no portion of delivered material comes into direct contact with the ground. Support all material on wood blocking and keep all bolts, nuts, and washers in containers protected from moisture.

.5 Provide Departmental Representative with delivery schedules minimum 7 days prior to shipping. Submit site delivery and storage plan as part of the erection plan. Show truck and crane locations including swings and obstructions such as hydro poles and lines.

1.7 RECORD DRAWING

.1 The Contractor shall modify the shop drawings to complete As-Built Drawings for the structure based on all changes that occur. It is anticipated that the Shop Drawings will form the basis for the As-Built Drawings for the steel work, marked with changes that occurred during fabrication and the field.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Structural steel:

.1 Structural steel shall conform to CAN/CSA G40.20-13/G40.21-13 (R2018). Structural steel members and connections shall be Grade 350WT unless noted otherwise.

.2 For Grade 350WT members, record shall be kept identifying the heat number of the material and its corresponding mill test certificate.

.3 The strength of the Steel Stay rod assembly (Jaws, Rods, Turnbuckles, Pins etc..) shall have a minimum working force capacity of 37 000lbs (163.8kN).

.4 The Charpy impact energy requirements for "WT" steel shall be 27 joules and the test temperature shall be -20°C for "Fracture Critical" members and 0°C for "Primary Tension" members. Members considered fracture critical shall be the pivot beam, west end beam and east end beam. It is recognized that supply of the various shapes with the corresponding testing requirements will be difficult.

.5 The Charpy V-notch requirements specified herein shall apply only to standard, full-size specimens. For plates from 8 mm to 11 mm thick, sub-size specimens with adjusted energy levels mat be used, as permitted by CSA G40.21.

.2 Bolts:

.1 Bolts on coated steel shall be A325M Type 1.

.2 High strength bolts, nuts, and hardened washers: to ASTM F 3125.

.3 Welding electrodes: to CSA W59 and made with E480xx electrodes and shall be performed by a welder qualified under CSA W47.1-03. Surfaces to be welded shall be thoroughly cleaned of all foreign material.

.4 Hot dip galvanizing: to CSA G164-18, minimum zinc coating of 600 g/m².

2.2 SOURCE AND QUALITY CONTROL

.1 Submit all source documents in accordance with 01 33 00 Submittal Procedures. All certifications are to clearly define the source, manufacturer and all companies in the chain of supply.

.2 Provide Departmental Representative, prior to fabrication, with two copies of steel producer certificates, in accordance with CSA G40.20/G40.21.

.3 The Fabricator of all steel shall be certified to the requirements of CSA W47.1 Division 1 or 2.

.4 All welding shall be completed to CSA W59 and made with E480xx electrodes and shall be performed by a welder qualified under CSA W47.1-03. Surfaces to be welded shall be thoroughly cleaned of all foreign material

.5 Provide certification that tension control bolts, bolts, nuts, and washers comply with applicable standards.

.6 Provide Departmental Representative with two copies of certified test reports for Charpy V-notch tests for plates and Sections.

.7 The Contractor shall have a quality control program that will demonstrate to the Inspector the consistency of the fabrication and the bolt tightening.

.8 The preparation for painting of A325 bolts has the potential to affect proper torque.

.1 If the contractor intends to prepare and prime bolts prior to installation, the bolts shall be cleaned and primed with the nut and washer in place at the approximate location where the bolt will finally be tightened.

.2 All oils and residues will be removed immediately prior to priming regardless if the bolts are installed before or after priming.

.3 Contractor to Test methods of preparing bolts relative to the ability to consistently duplicate and produce comparable results relative to the turn of the nut method as described below prior to preparing bolts to ensure that a large number of bolts will not be rejected. The bolts must achieve the correct Turn-of-Nut twist after snug tight without over tightening (resulting in too much relative rotation). Confirm methods with Departmental Representative.

.9 Regardless of the method or timing of preparation and painting, if tension control bolts are used the bolts shall be installed with the Tension Control guns. Spot-checks of bolts are required, particularly at the start of installation, to prove that the proper turn is being achieved comparing to the Turn-of-Nut method on bolts installed using the torque control method. Throughout installation, spot-checks must be completed at intervals as directed by the Departmental Representative. The interval will be determined based on the consistency of the results. If in consistent results are being achieved in addition to the spot checking regular A325 Bolts will be test installed and removed to provide a comparison of the normal application of turn of the nut relative to the results of the Tension Control Bolts.

.10 The Contractor shall provide a suitable, calibrated torque-wrench for checking the torque created by the Turn-of-Nut method and the torque-control bolt spine method, such that additional spot checking of bolt torque can be completed by that method also at the Departmental Representatives discretion.

.11 Provide suitable facilities and cooperate with inspection organization and Departmental Representative in carrying out inspection and tests required.

Part 3 EXECUTION

3.1 ERECTION

.1 If staining or defacing occurs, clean steel surfaces to Departmental Representative's approval.

.2 Restrict drifting during assembly to the minimum required to bring parts into position without enlarging or distorting holes, and without distorting, kinking, or sharply bending metal of any member or unit. Enlarging holes, if necessary, by reaming, may be conducted only after written approval is obtained from Departmental Representative. Reamed holes not to exceed size of bolt used by more than 2 mm.

3.2 INSTALLATION

.1 Do falsework in accordance with CSA S269.1, except where specified otherwise.

.2 Do fabrication and erection of structural steel in accordance with CSA-S6-19.

.3 High strength bolting where torque control bolts are in accordance with CSA-S6. Use 'Turn-of-Nut' tightening method.

.4 Finish member true to line, free from twists, bends, open joints, sharp corners, and sharp edges. Grind sharp edges and square corners to ensure a suitable surface and no sharp edges prior to painting. Rounding/ chamfer need only be 0.5 mm or to eliminate sharp edge that disrupts film of paint.

.5 The bridge shall be erected to the proper alignment on plan and in elevation, with members plumb and in-plane, taking into account the specified dead load camber, and under full dead loading.

.6 Allowable tolerance for bolt holes:

.1 Matching holes for bolts to align so that a dowel, 1 mm less in diameter than the hole diameter, 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-center distance between any two holes of group to vary by not more than 1 mm from existing dimensions, or, in the case of new bolt locations, dimensioned distance between such holes.

.4 Centre-to-center distance between any two groups of holes to vary not more than 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 mis-punched or mis-drilled members only as directed by Departmental Representative.

.7 Field splices: to approval of Departmental Representative.

.8 Mark members in accordance with CSA G40.20/G40.21. Do not use die stamping.

.9 All match marking shall be executed in the fabricator’s shop.

.10 The provision of shims or the supply and placement of new shims is considered part of the Work. Where total shimmed thickness is greater than 40 mm, the number of shims to be used to make up the total thickness will be reviewed with the Departmental Representative otherwise in general one shim should be used except at locations such as wheel assemblies where adjustment with shims is required throughout the life of the bridge.

.11 Where pieces to be salvaged must be removed to install, or replace or modify another piece, that piece must be reinstalled as part of the Work of installation, replacement, or modification of the intended Work. New bolts will be required.

.12 Regardless of weather, or additional Work, the steel work of the bridge and access for painting that would interfere with the operations of the bridge must be completed prior to the navigation season. Repairs to all steel work must be completed in conjunction with the operations of the Bridge and shall allow time for commissioning specified elsewhere in this Specification.

.13 Unless otherwise noted the minimum fillet, weld shall size for joints shall be as follows.

Material Thickness Thicker Part Joined (mm)	Minimum Size of Fillet Weld (mm)
To 12 Inclusive	6
12 to 20	6
20 to 40	8
40 to 60	10
60 to 120	12

3.3 PROTECTION

.1 During storage, the nosing angles shall be protected from dirt and deleterious materials and stored so that distortion cannot occur. The angles shall be supported on wood blocking spaced a maximum of 2m apart.

3.4 BOLTS

.1 Tension Control Bolts (if used) are single use bolts and must be replaced if they are loosened.

.2 High strength bolts shall be tightened no more than two (2) times. Any bolts tightened two (2) times which require loosening or damaged in anyway during the first tightening or loosening shall be replaced.

3.5 ALIGNMENT OF BEARING

.1 The alignment of the center bearing casting, and bearing angles, relative to the new, steel pivot beam, determines whether the bridge must be placed level or if it must be hung on an angle to compensate for the inclination of the pin and casting. Confirm alignment during assembly to ensure that the main girder will hang as level as possible.

3.6 PARTS TO BE SALVAGED

.1 All wheels, wheel brackets, the main bearing, regulating mechanisms on the tower posts, shall be salvaged.

.2 The pivot bearing shall be salvaged and refurbished (see Mechanical Section 13 10 00)

.3 The wheels and regulators that are salvaged shall be returned to the owner at the Parks Canada yard in Elgin.

.4 Follow the direction of the mechanical section regarding the main bearing.

END OF SECTION

Part 1 General

1.1 TREATMENT AVAILABILITY

.1 Pentacholorophenol Solvent A (PCP-A) and Chromated Copper Arsenate (CCA) preservative treatment are becoming more difficult to source. The Contractor must account for long lead times to ensure supply of the preservative treated wood will not delay other construction activities. Consultation with potential suppliers shall be completed prior to submitting the tender and the project schedule. One possible supplier of the timber is:

Goodfellow Incorporated
Montreal/Delson, Québec
(450) 635-6511

One possible preservative treatment supplier is:

Stella Jones Incorporated
Truro, Nova Scotia
(902) 893-9456

A list of preservative treatment suppliers is provided in the Canadian Wood Preservation Certification Authority Certified Plants list available on Wood Preservation Canada's website (https://woodpreservation.ca/wp-content/uploads/2020/12/CWPCA-Certified-Treaters-December-2020.pdf). All wood shall meet the provisions of this Specification.

1.2 RELATED SECTIONS

.1 Section 01 35 43 - Environmental Procedures

.2 Section 06 10 11 - Rough Carpentry

1.3 REFERENCES

.1 American Wood-Preservers' Association (AWPA)

.1 AWPA M2-07, Standard for Inspection of Wood Products Treated with Preservatives.

.2 AWPA M4-06, Standard for the Care of Preservative-Treated Wood Products.

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA O80 Series-15 (R2020), Wood Preservation.

.3 Western Wood Preservatives Institute (WWPI)

.1 Best Management Practices for the use of Treated Wood in Aquatic and Other Sensitive Environments.

.4 Where two technical standards overlap in their scope, the more stringent criteria shall apply.

1.4 SUBMITTALS

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

.2 Quality assurance submittals:

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

.2 For products treated with preservative by pressure impregnation, submit the following information certified by authorized signing officer of treatment plant:

.1 Information listed in AWPA M2 and revisions specified in CSA O80-15 Series, Supplementary Requirement to AWPA M2 applicable to specified treatment.

.2 Moisture content after drying, prior to treatment with water-borne preservative.

.3 After providing third-party inspection, provide original, signed copies of the inspection reports.

.4 The Contractor shall provide the following information, in writing, to the Departmental Representative, three (3) weeks in advance of fabrication and preservative treatment, as applicable:

.1 Name of the fabricator/treater.

.2 Location of the plants(s).

.3 Expected date of fabrication of treatment.

.4 Name and credentials of third-party Inspector.

.3 Early in the project, submit samples and documentation illustrating the quality of the wood and that the correct preservative will be delivered.

1.5 QUALITY ASSURANCE

.1 Plant inspection of products treated with preservative by pressure impregnation will be carried out by designated Testing Laboratory to AWPA M2, and revisions specified in CSA O80 Series, Supplementary Requirements to AWPA M2.

.2 The contractor will submit the name of the company they plan to use for Inspection and testing of the preservative treated wood. Inspection and testing will be carried out by a third-party Testing Laboratory reviewed by the Departmental Representative.

.3 The cost of testing will be included in the contract lump sum price. .

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

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

.2 Storage and Handling:

.1 Adequate protection and proper handling of the timbers shall be provided for the timbers during transit to the site.

.2 Timber stored on site shall be kept off of the ground, kept dry and out of the weather, and the area where it is stored shall be secured and monitored regularly.

.3 No other materials or equipment shall be stacked or placed even temporarily on the stored timbers.

.4 At the contractor's discretion, it is advised that extra transverse deck boards and running boards shall be supplied to ensure that there are no delays should a member be damaged while on site or during transit.

1.7 MEASUREMENT AND PAYMENT

.1 No measurement for payment will be made for the work to "Wood Treatment." All costs shall be included in the Contract lump sum price. All costs for labour, materials and equipment necessary to the work of this item in accordance with the drawings and these specifications shall be included in the Contract lump sum price.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Suppliers of CCA treated wood are becoming less common. Confirm source during tendering. All treated wood products are to be processed in a wood preservation plant certified under the CWPCA program. All wood suppliers shall follow the Western Wood Preservatives Institute's (WWPI) Best Management Practices for of Treated wood in Aquatic and Other Sensitive Environments. All wood used for the Pedestrian Railing (SPF), and Longitudinal Running Boards (Hemlock) shall be treated with the water borne preservative Chromated Copper Arsenate Type C (CCA) conforming to CSA 080. The CCA treated wood shall meet the approved requirements of the CSA Use Category UC4.1.

.2 All wood to be used for the Transverse Deck Boards (Douglas Fir), Deck Stringers (Douglas Fir), Floor Beams (Douglas Fir), King Posts (Douglas Fir) including Frames (Douglas Fir) and Braces (Douglas Fir) shall be treated with the oil borne preservative Pentachlorophenol (Penta) solvent A, (PCP-A) conforming to CSA 080. Pentachlorophenol shall be a mixture of not less than 5% pentachlorophenol and petroleum solvent. The PCP-A treated wood shall meet the requirements of the CSA Use Category UC4.2.

.3 Repair of field cuts, abrasions, and holes in material treated with water-borne preservative shall be in accordance with CAN/CSA O80.

.4 Waterproofing shall be self-sealing waterproof membrane similar to Grace Ice & Water Shield and meet the standards of CSA A123.22/ASTM D1970 (Standard Specification for) Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection. Waterproofing must be compatible with the preservative treatment.

Part 3 EXECUTION

3.1 SHOP FABRICATION

.1 Cutting, framing, drilling, and grooving of wood shall be performed prior to Preservative treatment. Field-cutting and drilling of treated dimensional lumber shall only be permitted where absolutely necessary. If field-modification of treated wood is required, written notification shall be submitted to the Departmental Representative identifying the

location, detail, and a field treatment plan. Preservative Treated Wood shall be marked with an end tag to certify that it has been treated to the applicable CSA treatment standard. The end tag should show the preservative used, the use category, the product group and a plant identification number.

3.2 APPLICATION: PRESERVATIVE

.1 Treat all wood to CSA O80 Series.

.2 Wood treated using oil borne preservatives shall be subjected to a vacuum expansion bath at a treatment plant according to CSA O80 Series to produce a material that is free of excessive surface oil.

.3 Wood treatment using water-borne preservatives shall have an average moisture content not exceeding 25% at 25 mm depth below the surface prior to preservative treatment. The water-borne preservative treated wood shall be treated utilizing the modified full cell process (MFC) which uses a final vacuum to ensure that preservative retention and penetration are reached and at the same time the product is not overtreated. Apply appropriate post treatment procedures to maximize preservative fixation as listed in the WWPI's Best Management Practices for the Use of Treated Wood in Aquatic and Other Sensitive Environments. Confirm fixation using the Chromotropic Acid Test (AWPA Standard A74-18, Method for Determination of the Presence of Hexavalent Chromium (VI) in Wood Treated with Chromium Containing Preservatives, 2018). If testing shows that fixation has not been achieved according to the Chromotropic Acid Test, the material should not be shipped until fixation according to the Chromotropic Acid Test is confirmed.

3.3 APPLICATION: FIELD TREATMENT

.1 Comply with AWPA M4 and revisions specified in CSA O80 Series, Supplementary Requirements to AWPA M2.

.2 Remove chemical deposits on treated wood to receive applied finish.

.3 All end cuts, defects, drilled holes and field-damage in wood must be field-treated with three-thorough soakings, each separated by an adequate interval of drying time. The field preservative must be compatible with the preservative used in the original preservative treatment. The only approved field preservative treatment is copper naphthenate. Submit related field-treatment product documentation to the Departmental Representative for approval.

.4 Prevent treatment chemicals and wood materials from contaminating the ground or waterway. When the product is applied it shall be done so over an impermeable surface. Contractor shall create a designated temporary Work area for undertaking the site-modification and field treatment of wood (only where necessary). This Work area should be sufficiently removed from the waterway so that sawdust from field-modification activities will not blow into the waterway. Contractor shall cover or immediately clean sawdust and waste wood materials in an appropriate manner as to prevent tracking material through the site, or blowing of material into the waterway. The ground in this Work area shall be covered as to prevent the accumulation of treated wood sawdust and debris on the ground. Cleaning of this area shall be conducted immediately at the end of each treatment or modification session to prevent accidental contamination of the site or waterway. Submit an Environmental Management Plan (EMP) and Site Sketch, describing how the Contractor will meet the above requirements, to the Departmental

Representative for approval at least two (2) weeks prior to the commencement of deck construction.

.5 Ensure that field applicators (using commercial or restricted class pesticides meet the requirements of the "standard for Pesticide Education, Training and Certification in Canada" established by Health Canada – Pest Management Regulatory Agency (PMRA).

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 The work of this section deals with the supply and installation of:

.1 All lumber/timber in the bridge superstructure.

1.2 RELATED SECTIONS

.1 Section 02 41 23 - Demolition and Removal.

.2 Section 05 12 33 - Structural Steel for Bridge.

.3 Section 06 05 73- Wood Treatment.

1.3 REFERENCES

.1 American Wood Preservers Association (AWPA)

.1 AWPA M2-16, Standard Inspection of Preservative Treated Products for Industrial Use.

.2 AWPA M4-15, Standard for the Care of Preventive-Treated Wood Products.

.2 Canadian Standards Association (CGSB)

.1 CAN/CSA O80 Series-15 (R2020), Wood Preservation.

.2 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.

.3 CSA G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles.

.4 CAN/CSA O141-05 (R2019), Softwood Lumber.

.5 CSA O86-14 (R2019) Engineering Design in Wood.

.6 CAN/CSA G40.20-13/G40.21-13 (R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.7 CSA A123.22-08 (R2013), Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

.3 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2017.

.4 Canadian Wood Preserves Bureau (CWPB).

.5 ASTM International

.1 ASTM A653/A653M-18, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM A153/A153M-16a, Standard Specification for Zinc Coting (Hot-Dip) on Iron and Steel Hardware.

.3 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

.4 ASTM A449-14(2020) Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.

.5 ASTM D1970/D1970M-21, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

.6 ASTM F1554-20 Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

.7 ASTM F1667-21, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.8 ASTM F2329/F2329M-15 Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Stel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

.6 American Society of Mechanical Engineers (ASME)

.1 ASME B18.2.1-2012, Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series).

.7 Where two technical standards overlap in their scope, the more stringent criteria shall apply.

1.4 QUALITY ASSURANCE

.1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board (CLSAB).

1.5 SHOP DRAWINGS

.1 The Contractor shall be responsible for visiting the site and taking all measurements necessary to ensure that all wood features of the superstructure are accurately replicated with the modifications indicated in the Contract Drawings.

.2 The Contractor shall submit shop drawings showing all members that make up the superstructure (including the wood façades for the steel beams), their location, size of holes to be drilled, and the lengths of the members.

.3 The Contractor shall coordinate with suppliers and sub-contractors to minimize all holes and cuts in timber members made post preservative treatment.

.4 The Contractor shall indicate on shop drawings all holes and cuts that cannot be made prior to preservative treatment which shall be subject to review by the Departmental Representative.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

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

.3 Separate metal, plastic, wood, and corrugated cardboard-packing and place in designated areas for recycling.

.4 Dispose of treated wood, end pieces, wood scraps, and sawdust at approved sanitary landfill site.

.5 Fold metal banding, flatten, and place in designated area for recycling.

1.7 MEASUREMENT AND PAYMENT

.1 No measurement for payment will be made for the work to "Supply and Install Wood/Timber for Superstructure". All costs shall be included in the Contract Lump Sum Price. All costs for labour, materials, and equipment necessary to the Work of these Items in accordance with the Contract Drawings and these Specifications shall be included in the Contract Lump Sum Price.

.2 No additional payment will be made for work required to trim, cut or notch wood members around connections and details as indicated on the drawings. It is known that intricate wood detailing will be required to achieve certain details shown on the drawings and this is to be anticipated and accounted for by the Contractor.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Wood: All wood shall be new and conform to the grade, species, size, and surface-finish specified. Unless noted otherwise, wood shall be Douglas Fir Grade SS, preservative treated with PCP-A, and graded in accordance with the NLGA Standard Grading Rules for Canadian Lumber. All sizes of sawn wood are dressed sizes.

.2 Wood for the transverse deck boards shall be Douglas Fir Grade SS, preservative treated with PCP-A, and graded in accordance with NGLA Standard Grading Rules for Canadian Lumber.

.3 Wood for the pedestrian railing shall be Douglas Fir Grade SS, preservative treated with CCA, and graded in accordance with NGLA Standard Grading Rules for Canadian Lumber.

.4 Wood for the running boards shall be full dressed Western Hemlock, Grade No. 1, preservative treated with CCA as indicated on the Contract Drawings.

.5 Care shall be exercised to ensure that, for deck boards that have defects close to the limits of the criteria for knots, splits, shakes, and wanes of the grading rules, that the defects are not placed within three (3) adjacent deck boards of another similarly less than ideal piece of dimensional lumber.

.6 All sizes of sawn wood are dressed finished sizes not nominal sizes.

.7 All wood shall be marked using a grading stamp of an association or independent grading agency conforming to CSA O141. If the stamp is obscured or non-existent, a certificate of compliance shall be submitted to the Departmental Representative before the wood can be used on the project.

The following tolerances shall apply:

.1 The following tolerances shall apply:
  .1 Cross-sectional dressed dimensions: +/- 2 mm
  .2 Length: +/- 10 mm

.2 Splitting and checking in all treated wood shall not exceed the following:
  .1 The width of splits and checks at the surface shall not exceed:
    .1 3 mm, or;

.2 The applicable limitations of the grading rules if the grading rule allowable dimension is smaller.

.2 Splits shall not exceed a length equal to the lesser of:

.1 Twice the member thickness,

.2 One and a half times the member width, or;

.3 The applicable limitations of the grading rules.

.8 Preservatives: all preservatives shall conform to the requirements described in Section 06 05 73 – Wood Treatment.

2.2 ACCESSORIES

.1 All fasteners connecting steel to wood and wood to wood shall be hot dip galvanized in accordance with astmf2329/F2329M-15 Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Stel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners, unless noted otherwise.

.2 All lag screws shall be type I lag screws manufactured in accordance with ASTM A449-14(2020).

.3 All Bolts shall be grade A325, Type I, Manufactured in Accordance with ASTM F3125.

.4 All Threaded rod shall be grade 55, class 1A, manufactured in accordance with ASTM F1554-20 and shall be galvanized.

.5 Nails, spikes, and staples: to CSA B111/ASTM F1667, where applicable.

.6 Proprietary fasteners: toggle bolts, expansion shields, lag bolts, screws, and lead or inorganic fibre plugs, recommended for purpose by manufacturer.

Part 3 EXECUTION

3.1 HANDLING, STORAGE AND CARE OF WOOD

.1 Handling and storage of wood shall conform to CAN/CSA O80. Wood shall be free of dirt and stored in a location which will not create an excessive increase in temperature resulting in rapid drying of the material. Wood shall be stored in a manner which will prevent ponding or trapping of excess moisture between surfaces where it cannot dry readily.

.2 Repair of cuts, abrasions, and holes in material treated with water-borne preservatives shall conform to CAN/CSA O80.

.3 Cutting, framing, drilling and grooving of wood shall be performed prior to preservative treatment. If there is a particular cut or connection after preservative treatment, written notification shall be submitted to the Departmental Representative identifying the location/detail and a field treatment plan provided.

.4 The threaded portion of the lag screw shall be inserted into its lead hole by turning with a wrench, not by driving.

.5 Lag screws and connections utilizing lag screws shall only be installed once. If lag screws are installed incorrectly in one connection, the Contractor will be responsible for any delays and cost involved with replacing the entire member.

.6 Soap or other lubricant, not petroleum based, may be used on the screws or in the lead hole to facilitate insertion and prevent damage to the screw.

3.2 TRANSVERSE DECK

.1 Complete repairs to treated members that will be partially or fully inaccessible after the wood deck is installed before any wood is installed.

.2 All defects in any piece of wood has to be placed such that no similar or other defect is present in the next adjacent two (2) boards in either direction.

.3 Running boards and decking shall be fabricated to allow a 10 mm gap around the king frame posts, king frame braces, railing posts and tension rod connections. This gap shall be detailed on the shop drawings.

.4 Deck boards shall be installed as per the lag screw pattern specified in the Contract Drawings.

3.3 RUNNING BOARDS

.1 Running boards shall be installed so as to provide a level, continuous surface. The pouring of the concrete ballast wall shall not occur until the height of the bridge is set.

.2 Lag screws securing the running boards to the deck shall be countersunk so that they do not protrude from the surface.

.3 Running boards shall be installed such that the adjacent boards are at the same level and the thickness of all boards is uniform.

.4 The edges of the board shall be placed tight together.

.5 The outer-most running board on each side of the bridge shall be an unmodified, full-width board. If the 203 mm wide running board width does not result in a total running board surface width that matches the deck width below, the first interior board on one edge of the deck shall be permitted to be ripped to the appropriate width in order to achieve a flush vertical edge between the deck and running boards.

.6 Running boards and decking shall be fabricated to allow a 10 mm gap around the king frame posts, king frame braces, railing posts and tension rod connections. This gap shall be detailed on the shop drawings.

.7 Running boards shall be installed as per the lag pattern specified in the Contract Drawings.

.8 Running board plank lengths must be a minimum of 12 ft in length wherever possible. Shorter plank lengths must not be placed at the ends of the decks.

.9 Submit a running board arrangement and nailing drawing as part of the bridge deck Shop Drawing Package.

.10 Care shall be taken that the lag screws securing the running boards to the deck below pass through the running boards into the centre of deck planks below.

3.4 WOOD FAÇADES FOR STEEL BEAMS

.1 The intent of the wood end façades is to cover the new steel beams to make them look like the existing wood members. The Contractor is responsible for observing and recording the existing wood members to facilitate the fabrication of the wood façades.

.2 The façade panels shall be Douglas Fir Grade SS, preservative treated with PCP-A, and graded in accordance with the NLGA Standard Grading Rules for Canadian Lumber.

.3 All panels for a single façade shall be cut from the same piece of wood to ensure that the grain is continuous so that the panels accurately mimic the existing conditions.

.4 The existing west end member is composed of two transverse 406 x 457 wood beams stacked on top of each other. The façade panels should be fabricated in a way that visually mimics the original transverse beams. The transverse seam between the top and bottom panels shall be visually obvious in a way that represents two separate members. The vertical seams separating individual panels shall be discrete to allow for the overall visual effect of the panels to represent only two members. The vertical seams are required to keep the panels to a size that is manageable for removal and reinstallation.

.5 The existing east end member is composed of one transverse 356 x 406 wood beam. The façade panels should be fabricated in a way that visually mimics the original transverse beam. The vertical seams separating individual panels shall be discrete to allow for the overall visual effect of the panels to represent only one member. The vertical seams are required to keep the panels to a size that is manageable for removal and reinstallation.

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

.1 The following section covers the requirements for painting treated wood. Specifically, the portions of the bridge that are to be painted colours similar to the current painted areas. All portions of the bridge that are currently painted both grey and white shall be painted. Colours to be confirmed based on samples.

.2 The colour and paint samples shall be approved by the Departmental Representative as there are many shades and tones. In addition, the sheen of the paint will also be approved by the departmental representative.

.3 Part of the work is having a compatible coating system. As it is not usual to paint all treated wood testing was completed to ensure the compatibility of at least one system. Alternate products are acceptable if they can perform under the same testing process procedures and results. The testing is described below.

1.2 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 43 Environmental Procedures

.3 Section 06 05 73 Wood Treatment.

1.3 REFERENCE STANDARDS

.1 Environmental Protection Agency (EPA)

.1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, EPA Method 24 - Surface Coatings.

.2 SW-846, Test Method for Evaluating Solid Waste, Physical/Chemical Methods.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

.3 Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual - [current edition].

.2

.4 National Research Council Canada (NRC)

.1 National Fire Code of Canada 2015 (NFC).

.5 Society for Protective Coatings (SSPC)

.1 Systems and Specifications, SSPC Painting Manual 2011.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling

.1 Provide work schedule for various stages of painting to Departmental Representative for approval. Provide schedule minimum of 3 weeks in advance

of proposed operations. The operations must be coordinated with the wood treatment in order to ensure wood treatment is in a condition to accept paint.

.2 Obtain written authorization from Departmental Representative for changes in work schedule.

.3 Coordinate painting operations with other trades.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Product submittals must demonstrate compatibility with the wood preservative. Submit tests showing compatibility in conformance with the tests provided for the example product to prove compatibility and inform the departmental representative of the timing of the tests such that they can be observed at each stage.

.2 Provide manufacturer's instructions, printed product literature and data sheets for the solvent cleaner, paint and products being used in producing the finish. Include product characteristics, performance criteria, physical size, finish and limitations.

.3 Submit WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements & 01 35 43 - Environmental Procedures.

.4 Upon completion, provide records of products used. List products in relation to finish system and include the following:

.1 Product name, type and use.

.2 Manufacturer's product number.

.3 Colour number[s].

.4 Manufacturer's Safety Data Sheets (SDS).

.3 Samples:

.1 Provide duplicate 200 x 300 mm sample panels of each paint with specified paint or coating in colours, gloss/sheen and textures submitted on following substrate materials:

.1 13 mm plywood for finishes over wood surfaces.

.2 When approved, samples shall become acceptable standard of quality for appropriate on-site surface.

.3 Provide full range of available colours where colour availability is restricted.

1.6 CLOSEOUT SUBMITTALS

.1 Provide in accordance with Section [01 78 00 - Closeout Submittals].

.2 Operation and Maintenance Data: Provide operation and maintenance data for [painting materials] for incorporation into manual.

.3 Include:

.1 Product name, type and use.

.2 Manufacturer's product number.

.3 Colour number[s].

.4 MPI Environmentally Friendly classification system rating.

1.7 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Stock Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Submit one litre can of each type and colour of primer and finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

1.8 QUALITY ASSURANCE

.1 Qualifications:

.1 Contractor: to have a minimum of 5 years proven satisfactory experience and specialize in coating and painting on construction sites. When requested, provide list of last 3 comparable jobs including, job name and location, specifying authority, and project manager.

.2 Qualified journeypersons as defined by local jurisdiction to be engaged in painting work

.3 Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.

.4 Conform to latest MPI requirements for exterior painting work including preparation and priming.

.5 Materials: from a single manufacturer for each system used.

.6 Retain purchase orders, invoices and documents to prove supply and age of products and submit to the Departmental Representative.

.7 Standard of Acceptance:

.1 No defects visible from a distance of 1000 mm from surface.

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

.2 Mock-Ups:

.1 When requested by Departmental Representative or Paint Inspection Agency, prepare and paint designated surface area, to requirements specified herein, with specified paint or coating showing selected colours, number of coats, gloss/sheen, textures and quality of work to MPI Painting Specification Manual standards for review and approval.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

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

.1 Labels: to indicate:

.1 Type of paint or coating.

.2 Compliance with applicable standard and manufacturer's designations.

.3 Colour number in accordance with established colour schedule.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in a dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area. Do not use any portion of the Block House or store materials near the Block House.

.2 Observe manufacturer's recommendations for storage and handling.

.3 Store materials and supplies away from heat generating devices.

.4 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.

.5 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Departmental Representative. After completion of operations, return areas to clean condition to approval of Departmental Representative.

.6 Remove paint materials from storage only in quantities required for same day use.

.7 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

.8 Fire Safety Requirements:

.1 Provide one 9 kg 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 on a daily basis.

.3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada (NFC).

.9 Replace defective or damaged materials with new.

1.10 SITE CONDITIONS

.1 Ambient Conditions:

.1 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless specifically pre-approved by Departmental Representative and, applied product manufacturer, perform no painting work when:

.1 Ambient air and substrate temperatures are below 5 degrees C. This is far above some of the paint product literature limits and manufacturer's minimum specified temperatures but is required to allow for the moisture content of the wood. This limit will govern over limits that are lower in manufacturer's recommendations.

.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 paint manufacturer's prescribed limits or temperatures above.

.4 Relative humidity is above 85% or when dew point is less than 3 degrees C variance between air/surface temperature.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

.2 Perform no painting work when maximum moisture content of substrate exceeds:

.1 15% for hard wood.

.2 17% for soft wood.

.3 Conduct moisture tests using a properly calibrated electronic Moisture Meter.

.2 Application Requirements:

.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.

.3 Apply paint when previous coat of paint is dry or adequately cured.

.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 5 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 painting 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.

.9 Paint occupied facilities in accordance with approved schedule only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

Part 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

.1 Constraints:

.1 It is unusual to paint over the wood preservative treatment that is being used on this project and as such testing was conducted to ensure the adhesion of coating systems and aid in the selection.

.2 Any Substitution must go through the same testing applied to wood of the same species and treated in the same way and for the same duration of testing. Testing to be conducted at the contractor's expense and be fully witnessed by the Departmental Representative and/or their designate. If such testing is pursued sufficient notice and access must be provided.

2.2 MATERIALS

.1 Paint materials for paint systems: to be products of single manufacturer.

.2 The primer paint coating must adhere when tested in the following way – (Note Carboguard 635 by Carboline Coatings was tested with a 4 to 8 mils Dry Film Thickness (DFT) and passed and would not require further tests (tested and approved alternatives may be acceptable). The test procedure requirements are as follows and must be witnessed by the Departmental Representative such that they may have to be conducted on site:

.1 Solvent clean the surface with a rapid evaporating solvent that cleans without fully removing the wood treatment and does not react with the wood treatment. (Note Carboline Thinner #2 was tested but tested and approved alternatives are acceptable)

.2 Paint suppliers must complete adhesion testing using ASTM D4541-17 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers using a pneumatic testing device. The test results to pass must require both wood fibers to be removed with the dolly during the test as well as meeting a 300 PSI minimum average adhesion requirement. White - Carboguard 635 by Carboline Coatings was tested and passed and would not require further tests, but approved and tested alternatives are acceptable.

.3 A minimum of 2 Months after application there must be no visible signs of bleed through discolouration or change in the finish of the paint that appears uneven.

.4 The topcoat must be applied to the primer and must not affect the primer for a period of 2 Months. In order to have parallel testing it is acceptable to leave a portion of the primer exposed and overcoat a portion of the primer. Each section shall be a minimum of 0.5 m^2 in area.

.5 Samples must be applied to Douglas Fir and have the full wood preservative process as per 06 05 72 Wood Treatment.

.6 Paint must be applied with a brush to work into the incised areas and cracks.

.7 Topcoat to be compatible with primer as per manufacturer's recommendation and be from one supplier. Topcoat shall not yellow or chalk or deteriorate in anyway over a period of 2 years.

.3 Topcoat once a tested or acceptable material is established for the primer coat a suitable topcoat compatible with the primer from the same manufacturer similar in quality to the topcoat that matches the tested primer. For the tested primer the top coat shall be Carbothane 133LH applied with a 3 to 5 mils DFT.

2.3 COLOURS

.1 Departmental Representative will provide Colour Schedule after Contract award it is intended that no more than two colours will be used and possible that only one colour of white shall be used. Submit proposed Colour Schedule to Departmental Representative for approval.

.2 Colour schedule will be based upon selection of 3 base colours. No more than 3 colours will be selected for the wood coating.

.3 Selection of colours will be from manufacturers' full range of colours if possible but will be a white or off white in general. Custom colours may be required based on the compatibility and coordination with the contractor’s samples of adjacent elastomeric coating and coatings for metal.

.4 Where specific products are available in restricted range of colours, selection will be based on limited range if possible but custom colours may be required.

.5 Base coats of the system to be tinted slightly lighter colour than topcoat to show visible difference between coats.

2.4 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Departmental Representative's written permission.

.2 Add thinner to no more than paint manufacturer's recommendations. Do not use kerosene or organic solvents to thin water-based paints.

.3 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.

2.5 GLOSS/SHEEN RATINGS

.1 Paint gloss: defined as sheen rating of applied paint, in accordance with following values:

Gloss Level Category	Units @ 60 Degrees	Units @ 85 Degrees
G1 - matte finish	0 to 5	max. 10
G2 - velvet finish	0 to 10	10 to 35
G3 - eggshell finish	10 to 25	10 to 35
G4 - satin finish	20 to 35	min. 35
G5 - semi-gloss finish	35 to 70	
G6 - gloss finish	70 to 85	
G7 - high gloss finish	> 85	

.2 Gloss level ratings of painted surfaces as per Departmental Representatives approval of samples.

2.6 SOURCE QUALITY CONTROL

.1 Perform following tests on each batch of consolidated post-consumer material before surface coating is reformulated and canned. Testing by laboratory or facility which has been accredited by Standards Council of Canada.

.1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.

.2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.

.3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

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 except where more stringent requirements are contained in the specification. Any perceived conflicts or items not in accordance with the manufacturer’s recommendations must be brought to the Departmental Representatives attention in writing and the Departmental Representative will confirm how to proceed. Any conflict that does not receive prior written approval to proceed may result in the work being removed and repaired by the contractor at the contractor’s expense.

3.2 GENERAL

.1 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable to be painted 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.

3.4 PREPARATION

.1 Apply paint materials in accordance with paint manufacturer's written application instructions.

.2 Clean and prepare surfaces to be painted to specific requirements and as follows:

.1 Remove dust, dirt, and surface debris.

.2 Clean surfaces by removing rust, dirt, oil, grease and foreign substances in accordance. Remove such contaminates from surfaces, pockets and corners to be painted by brushing with clean brushes, blowing with clean dry compressed air, or brushing/vacuum cleaning as required and supplemented as required and reviewed by the Departmental Representative by the nature of the contaminate.

.3 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats. Touch-up, spot prime, and apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.4 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

.5 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

3.5 EXISTING CONDITIONS

.1 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter and report findings to Departmental Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.2 Maximum moisture content as follows:

.1 Hard Wood: [15]%.

.2 Soft Wood: [17]%

3.6 PROTECTION

.1 Protect existing building 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 only after direction from and as directed by Departmental Representative. Damage to Heritage Structures is unacceptable and cleaning methods may make the conditions worse. Prearrange with the Departmental Representative such tasks that must be completed in a timely matter as wiping drips with a cloth on surfaces such they have been reviewed prior to execution.

.2 Protect factory finished products and equipment.

.3 Cover portions of the canal wall and Block House as necessary to prevent any alterations to the surface as cleaning will cause damage or change the surface.

3.7 APPLICATION

.1 Method of application to be as approved by Departmental Representative. Apply paint by brush. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush Application:

.1 Apply paint in a uniform layer using brush suitable for application.

.2 Work paint into cracks, crevices and corners.

.3 Paint surfaces and corners not accessible to brush using daubers and/or sheepskins.

.4 Brush out runs and sags, and over-lap marks.

.5 Remove runs, sags and brush marks from finished work and repaint.

.6 Paint lag screw and bolt heads in the wood areas where the wood is painted with the topcoat of the system. All of these heads should be galvanized and should be prepared to accept the paint system used including priming if required.

.7 Stripe paint around and on bolt and/or lag screw heads to limit the thickness to the desired DFT.

.3 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by Departmental Representative.

.4 Apply coats of paint as continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.5 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for at least or more than the minimum time period as recommended by manufacturer.

.6 Sand and remove dust between coats to remove minor visible defects except those defect to be corrected as above by repainting or more significant defects that require removal and repainting.

3.8 FIELD QUALITY CONTROL

.1 Exterior surfaces requiring painting to be inspected by Departmental Representative and/or their designate and will inform the General Contractor in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.

.2 Standard of Acceptance:

.1 No defects visible from a distance of 1000 mm from surface.

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

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

.4 Cooperate with inspection firm and provide access to areas of work.

.5 Retain purchase orders, invoices and other documents to prove conformance when requested by Departmental Representative.

3.9 RESTORATION

.1 Clean and re-install items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashing’s on exposed surfaces that were not painted. Review procedures and products with Departmental Representative prior to work and 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. Avoid scuffing newly applied paint.

.5 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 OF THE WORK

.1 This section specifies the requirements for coating all surfaces of the concrete exposed above grade on both abutments and wingwalls with an elastomeric coating after the appropriate curing interval.

1.2 REFERENCED STANDARDS

.1 ASTM International

.1 ASTM D 412-06ae2, Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers - Tension.

.2 ASTM D 1044-08e1, Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.

.3 ASTM D 2369-10e1, Standard Test Method for Volatile Content of Coatings.

.4 ASTM D 2832-92(2011), Standard Guide for Determining Volatile and Non-volatile Content of Paint and Related Coatings.

.5 ASTM E 84-12, Standard Test Method for Surface Burning Characteristics of Building Materials.

.6 ASTM E 96/E 96M-10, Standard Test Methods for Water Vapor Transmission of Materials.

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 elastomeric coating application and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit copies of WHMIS SDS

.3 Samples:

.1 Submit duplicate 200 x 200 mm samples of each colour and texture of wall coating applied to cement board. Submit samples in accordance with 01 33 00 Submittal Procedures on suitable substrate. Allow 4 weeks for review of colour samples after delivery to the Departmental Representatives office.

.2 It is anticipated that the elastomeric coating will be a bright white similar to existing but coordinated with but not necessarily matching the coating on the wood and metal. It may require a custom colour if suitable colours are not available from the manufacturer.

.3 Prior to commencing application, prepare wall and apply sample of wall coating to a 2000 mm wide full height wall panels, for Departmental Representative's approval.

1.4 DELEIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect elastomeric coating materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.5 SITE CONDITIONS

.1 Environmental Requirements:

.1 Temperature: minimum temperature of substrate 10 degrees C. Minimum temperature of air during and for 48 hours before and after coating is applied 15 degrees C.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Coating: primer and then two coats of elastomeric, water based acrylic crack bridging anti-carbonation protective and decorative coating which is water vapour permeable but provides resistance to the penetration of water and is mildew resistant. Colour to be selected by Departmental Representative but to be generally described as off white/ grey. For 16 mils DFT the following parameters shall be met.

.1 Moisture resistance: water vapour transmission to ASTM E 96 14.5 ng/(Pa.s.m²).

.2 Static Crack Bridging at -20 Deg C 0.75 mm

.3 Elongation to ASTM D 412 Modified: 500% at 23 Deg C.

.4 Tensile strength after aging to ASTM D 412 Modified: 1.3 MPa.

.2 Identify each coating material container with listed markings stating fire hazard classification.

.3 Provide factory-mixed coatings. Do not thin, reduce, dilute, or add materials to coatings unless described in manufacturer's product literature and approved by the Departmental

Representative. It is unlikely that the Departmental Representative will approve products that require thinning.

.4 Where products call for a primer or for a surface preparation such as filling bug holes and irregularities or water blasting or abrasive blasting the surface complete all surface preparation and priming as per the manufacturer's recommendations.

Part 3 EXECUTION

3.1 PREPARATION OF CONCRETE

.1 Allow a minimum of 56 days curing time before applying any of the elastomeric coating

.2 Moisture content of concrete to be less than 5%

.3 Do not apply after rain or if surface is damp or wet

.4 Do not apply if rain is forecast or if humidity is above 90%.

.5 Ensure negative alkalinity of substrate before application of coating.

3.2 APPLICATION

.1 Prime surfaces according to manufacturer's directions. Allow to dry.

.2 Apply coating employing trained applicators, using equipment specifically designed for this purpose.

.3 Apply coating to a small test area and allow to set. Notify Departmental Representative to inspect mock-up.

.4 Apply coating in two individual, uniform applications, permitting first to cure at least four hours or as per manufacturers recommendation before applying second coat.

.5 Minimum dry film thickness: 16 mils. Verify film thickness of completed coating system in field using Tooke Mark II coating inspection gauge.

.6 Apply additional coats as required to achieve specified dry film thickness and complete coverage and uniform colour.

.7 Finished work: to match approved samples, be uniform in thickness, sheen, colour and texture and be free from marks, dirt particles, runs, crawls, drips, sags, brush marks, curling, holes, air pockets and other defects.

Part 4 MEASUREMENT AND PAYMENT

4.1 MEASUREMENT FOR PAYMENT

.1 No measurement for Payment will be made for the application of Elastomeric Coating in for all concrete of the abutments and wingwalls. All costs for the application shall be included in the contract lump sum.

.2 The lump sum price for the item shall include all labour, material and equipment to complete the work through the area including surface preparation, filling of bug holes etc. priming and two full application coats of the product to achieve the required dry film thickness of each coat to a total dry film thickness of 16 mils.

.3 When the breakdown of the contract lump sum price is provided include a line item for the cost of the “Elastomeric Coating".

***** END OF SECTION *****

Part 1 General

1.1 DESCRIPTION OF WORK

.1 This section covers the requirements for the painting of all existing and new steelwork on the bridge, the pier and abutments. Note that the requirements for disposal and abatement of lead-containing paint is covered in Section 01 35 43 Environmental Procedures, Section 01 35 44 - Environmental Protection-Lead Paint and Section 02 83 12 - Lead-Based Paint Abatement.

.2 All metal on site will be painted in accordance with this Specification. This includes all new, salvaged, and remaining steel, cast iron and any other metals of any kind except the galvanized Vehicle W-Beam off the bridge on the approaches. Such items as the chains and pipe rails, stay rods, regulator and components unless otherwise specifically indicated will be coated with this costing system as well as all steel fabrications such as the end beams and center beam. The counterweights and all salvaged parts are to be painted and the preparation will be as described or as agreed to with the Departmental Representative.

.3 This Section also includes a description of the Contractor's requirement for quality control and verification procedures

.4 **NOTE**: In addition to existing metals, all new steel as well as all salvaged parts must be abrasive blast cleaned to meet the preparation requirements of this Section.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 43 - Environmental Procedures.

.3 Section 01 35 44 - Environmental Protection-Lead Paint.

.4 Section 01 55 50 - Access, Housing, Heating and Ventilation

.5 Section 05 12 33 - Structural Steel for Bridges.

1.3 REFERENCES

.1 Ontario Provincial Standard (OPSS),

.1 OPSS 1704 Material Specification for Paint Coating Systems for Structural Steel April 2010.

.2 Ministry of Transportation Designated Sources List DSM # 9.20.39.

.3 American Society for Testing and Materials (ASTM).

.1 ASTM D610-08 (2019), Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces.

.2 ASTM D2369-10 (2019), Standard Test Method for Volatile Content of Coatings.

.3 ASTM D2832-92(2016), Standard Guide for Determining Volatile and Non-volatile Content of Paint and Related Coatings.

.4 Canadian General Standards Board (CGSB).

.1 CAN/CGSB 1.171-98, Inorganic Zinc Coating (withdrawn).

.2 CAN/CGSB 1.207-98, Low-Temperature Curing Epoxy Coating (withdrawn).

.3 CAN/CGSB 1.212-2004, Heavy-Metal Free Marine Primer for Steel and Light Alloy Services.

.4 CAN/CGSB 1.18-99, Ready-Mixed Organic Zinc-Rich Coating.

.5 Environment Canada's Environmental Choice Program (ECP).

.1 CCO-048 (March 2006), Surface Coatings: Recycled Water-borne.

.2 CCO-047 (December 2005), Architectural Surface Coatings.

.6 Federal Standard (FS)

.1 FS-595B-98, Paint Colours.

.7 Society for Protective Coatings (Formerly known as the Steel Structures Painting Council abbreviated SSPC)

.1 SSPC-SP-1-(2015, rev 2016), Solvent Cleaning.

.2 SSPC-SP-6/NACE No 3 (2007), Commercial Blast Cleaning.

.3 SSPC-SP-7/NACE No 4 (2007), Brush-off Blast Cleaning.

.4 SSPC-SP-10/NACE No 2 (2007), Near-White Metal Blast Cleaning

.5 SSPC-VIS-1, (2002), Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning.

.8 Manufacturer's current product data sheets must be used in conjunction with, and form part of, this Specification. Where contradictions occur, the most stringent requirement that will produce the best quality and durability of the coating system, as judged by the Departmental Representative, thus protecting the structure, shall be used. Do not proceed if there is a contradiction without direction from the Departmental Representative.

.9 Canadian Association for Laboratory Accreditation (CALA).

.10 Environmental Protection Act (EPA).

.1 R.R.O 1990, Reg. 347, General – Waste Management.

.11 Municipal Elections Act.

.1 O. Reg. 326/16, General.

1.4 DEFINITIONS

.1 CALA: Canadian Association for Laboratory Accreditation.

.2 TCLP: Toxicity Characteristic Leaching Procedure.

.3 The terms "paint", "painting," and "coating" are used interchangeably with and without the term system throughout the documents and drawings. The terms shall refer to the full coating system with all primer, sealer, mid-coat, and top-coats applied on a fully prepared and abrasive blast cleaned surface to SSPC SP 10. This treatment is to be applied to all surfaces of the Bridge and all metal on site.

1.5 SUBMITTALS

.1 Submit Painting Plan to Section 01 33 00 – Submittal Procedures. Content of Plan to designate locations and order of painting as well as location of laps in coating system layers. Laps to be illustrated on a drawing.

.2 Submit Lot and Batch number for each product and shipping requests and deliveries.

.3 Submit copies of Inspection sheets for the quality control program showing confirmation of cleaning, preparation, and all aspects of the painting system, including thickness and function of each coat. Sheets to be submitted in accordance with Section 01 33 00 – Submittal Procedures.

.4 Samples:

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Paints must be approved by Departmental Representative before use on project. Submit one (1) sample to Departmental Representative at least four (4) weeks prior to commencement of painting for acceptance. Mark samples with name of project, its location, paint manufacturer's name and address, name of paint, CGSB standard number, and manufacturers paint code number.
- .3 If requested, enable Departmental Representative to take any number of samples totaling 2 L of each component of paint delivered to site, which may include samples from manufacturer's containers and samples from painter’s pot. If test fails, provide additional samples to allow further testing to determine whether rejection of the paint is necessary.

.5 Submit test reports from accredited laboratories as specified below.

.6 Submit the following in accordance with Section 01 33 00 - Submittal Procedures:

- .1 All purchase orders, invoices, and other documents that prove the materials to be used meet the requirements of this Specification.
- .2 Paint colour chips.
- .3 Copies of manufacturer's instructions for chemical paint strippers, if they are to be used.
- .4 Copies of manufacturer's instructions for mixing, straining, thinning, and applying coatings.
- .5 Manufacturer's recommendations for tip size, air pressure, paint guns, and air supply.
- .6 Include worker protection measures for cleaning and painting in the Site-Specific Safety Plan. See Section 01 35 29.6 - Health and Safety Requirements.
- .7 Copies of all leachate test reports from CALA-Accredited laboratory.
- .8 Copies of all manifests from waste carriers and all other documentation regarding disposal of wastes at landfill sites.

.7 Where materials are specified by trade name, the product sets a standard to which any substitutes will be compared. All requests for approval of alternative products must be submitted in writing and be accompanied by full literature and recommendations from manufacturers concerned as well as authoritative documentation from independent labs and various Ministries/Departments of Transportations accepting the product as suitable

for use on Bridges and equivalent to the systems specified based on designated sources criteria. Written opinions of the Ministry of Transportation Ontario designated sources list recommendations will be considered. No requests for approval of alternatives will be considered during the tender period.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Engage and pay for a CALA-accredited laboratory to conduct individual TCLP leachate tests to Ontario Regulation 347, as amended to Ontario Regulation 326/16 for representative samples of residue from the following surfaces being cleaned:

- .1 Test Samples 1-3: Representative samples from the areas of paint removal. Provide Owner with additional samples of residue.
- .2 Contractor to arrange and pay for the cost of this testing.

.2 Use these results to develop a plan for worker protection and safety and disposing of cleaning residues and old paint materials. Be responsible for all co-ordination and paperwork required to comply with proper waste disposal to Ontario Regulation 347 made under the Environmental Protection Act.

- .1 For bidding purposes, assume the paint and cleaning residues fall into the following categories:
  - .1 Wastes suitable for regular landfill:
    - .1 None.
  - .2 Wastes suitable for regular landfill with special documentation:
    - .1 None.
  - .3 Wastes requiring special hazardous disposal procedures:
    - .1 Residues from Paint of Bridge and removal materials.

.3 It is assumed that all paint on the bridge has the potential to include lead.

1.7 MEASUREMENT AND PAYMENT

.1 No measurement for payment will be made for the painting of the Bridge. All costs for the Work of this Section shall be included in the Contract Lump Sum Price for the Project. All areas shall be painted. Where areas are believed to be inaccessible, the areas shall be reviewed with the Departmental Representative and direction will be given as to alternate methods for applying the coating system or the standards of acceptance will be set by the Departmental Representative. Note some areas will require painting prior to assembly. Faying surfaces are to be primed prior to assembly. To ensure the continuity and quality of the coating system, all areas will be painted.

.2 All other Work necessary to the completion of the Work to achieve a system consistent with the intent of this Specification and the provision of this Section will not be measured separately for payment but will be considered incidental to the Work of this Section.

Part 2 Products

2.1 PAINT MATERIALS

.1 Coat 1: Organic Primer:

.1 Organic Zinc - Rich Epoxy with a minimum of 85% minimum zinc content in the dry film and to all other requirements of CGSB-1.181. Coating Primer to be surface tolerant but all surfaces are to be well prepared. Acceptable Products:

Carbozinc 859 by Carboline, or Amercoat 68HS by Amercoat Canada or alternate as approved by Departmental Representative

.2 Coat 2: Intermediate Coat:

.1 High Solids Urethane Modified Epoxy Acceptable Products:

Carbomastic 15 by Caroboline

Amerlock 400 Aluminum Epoxy by Amercoat Canada

Or for Cold Weather Applications: Carbomastic 242 or Amerlock 2 Aluminum Epoxy by Amercoat Canada or equivalent as approved by Departmental Representative

.2 Cold weather products shall not be used in conditions where curing is too rapid or where any signs of issues with the intermediate coat develop and temperatures could be considered as not being cold by the Departmental Representative.

.3 Coat 3 Topcoat:

.1 Aliphatic Polyurethane to CAN/CGSB-1.177-M91. Acceptable Products:
Carbothane 133 HB by Carboline
Amercoat 450H by Amercoat Canada
or equivalent as approved by Departmental Representative.

.4 Coat after Primer at Joints and Connections: Penetrating Sealer

.1 Penetrating sealer such as Amercoat Amerlock Sealer or Carboline Rust Bond Sealer or equivalent Sealer matching the manufacturers product and fully compatible with the coating system shall be used. Submit system to the Departmental Representative.

.2 Penetrating Sealer is to be applied to all joints and connections through the bridge.

.3 This includes contact points of metal to metal as well as all gussets etc.

.4 Sealer must be suitable and compatible with the paint system and applied after primer.

.5 Colour: Submit Samples to be approved by the Departmental Representative all metal shall be painted submit samples.

.1 Multiple colours of topcoat will be required. Three colours to match the colours of the wood coating and a black coating for specific metal pieces.

.2 The colour scheme will be generally as per the current scheme. However, all metal will require the full coating system and some unpainted wood members that have been replaced with steel will require a coating of one of the three colours.

.3 Submit samples in accordance with 01 33 00 Submittal Procedures on suitable substrate 100mm x 100mm. Allow 4 weeks for review of colour samples after delivery to the Departmental Representatives office.

.6 Sealant: Paintable Silicone Sealant, UV resistant, compatible with paint system, and recommended for having been successfully used for, this application. If Urethane or hybrid urethane sealers are more compatible and would provide a longer life they can be submitted and will be considered by the Departmental Representative.

.7 Chloride reducing washes from or recommended by the paint manufacturer capable of reducing PH and chloride level of the steel. All salvaged pieces shall be tested and cleaned and if the new pieces are transported and exposed to any salt from road spray etc. they shall be tested and cleaned. If the chloride content measured by Chlor-Test is higher than 5 µg/cm2 decontaminate the area by steam cleaning or by using Chlor-Rid DTS, according to the manufacturer's instructions

.8 All components of the paint system must be from a single manufacturer, be compatible, and be recommended for use together to form one paint system by the manufacturer.

.9 The Primer should have a minimum of 85% zinc content in the dry film and conform to all other requirements of CAN/CGSB-1.181-99. Product to be approved by Departmental Representative.

.10 Note: all materials must be applied in a climate-controlled environment which is in accordance with manufacturer's recommendations and this Specification. The heating to achieve working temperatures requirements of this Specification are generally more stringent than some manufacturers require and shall be adhered to unless it would cause an adverse affect in the product.

.11 All primer must have an unlimited recoat time to allow areas to be painted in stages and must satisfy the requirements for slip resistance of a Class B coating as defined in CSA S6-14. All faying surfaces are to be primed for all bolted connections with no intermediate or top coat on the faying surface.

2.2 PAINT STRIPPER

.1 Abrasive blast cleaning surface preparation is the anticipated and the required method of paint removal on new and salvaged steel. Paint strippers are not considered a substitute for blast cleaning, as both the degree of cleaning and the surface profile is difficult or impossible to achieve and full containment of the strippers is difficult.

.2 Do not use a methylene chloride based system.

.3 If any paint stripper is to be used, confirm selection of paint stripper with coating manufacturer. Obtain written approval from coating manufacturer that the selected paint stripper is compatible with the intended paint system. Provide a copy of this written approval to the Departmental Representative before proceeding.

.4 Note: all materials must be applied in a climate controlled environment in accordance with manufacturer's recommendations and this Specification.

.5 All residue and stripper from the stripping process must be removed from the steel and collected in the containment for the project. All residue must be disposed of in accordance with applicable legislation.

.6 Abrasive blast cleaning will be required to create the necessary surface profile for paint application. All remnants of the stripping process and all chemicals must be removed prior to blasting.

2.3 ALTERNATIVES

.1 Primer, intermediate coat, and topcoat paint materials for each coated area must be the products of a single manufacturer and be approved by that manufacturer for use together as one painting system in the environment considered (immersion, splash zone, or atmospheric exposure) and for that particular substrate. Alternatives for paint system require the submission for evaluation of the information requested in OPSS 1704 Material Specification for Paint Coating Systems for Structural Steel, April 2003. The Departmental Representative can reject any coating system for either a lack of information or information in a different form that is hard to compare or if the test results do not exceed or meet the products listed as possible suppliers in everyway. In addition, a 10 year history of successful applications in a similar bridge environment where salt is applied to the roads may be required to be judged solely by the Departmental Representative.

.2 Alternatives will not be considered during the tender period.

Part 3 Execution

3.1 SITE EXAMINATION

.1 Precaution should be taken when removing loose and rusted existing paint from metal surfaces.

.2 Tests have been carried out to determine existence of lead-based paint. Lead-based paint is present. See testing requirements.

.3 Dispose of lead-based paint, after removal, in an environmentally safe manner in accordance with all applicable legislation.

.4 Examine and confirm areas to be cleaned with Departmental Representative.

3.2 PAINTING AFTER CLEANING

.1 It is recognized that rusting of the cleaned members occurs quickly and that priming must follow the cleaning operation shortly after cleaning is complete. Coordinate with the Inspectors to allow verification of the prepared surfaces cleanliness and profile.

3.3 PROTECTION OF SURROUNDING WORK

.1 Protect surrounding surfaces during the cleaning and painting process.

.2 Avoid paint splashing on exposed surfaces not to be painted. Remove smears and spatter immediately, using compatible solvent.

.3 Repair other damages in the course of Work, as directed by Departmental Representative.

.4 All cleaning and rectification of damaged surfaces must be at Contractor's expense.

.5 At all times, if on site work is required, prevent overspray from reaching the travelling public, vehicles, and surrounding property and concrete.

3.4 SURFACE PREPARATION

.1 This surface preparation is applicable to all metal surfaces.

.2 SSPC SP 1-(2014), Solvent Cleaning. Solvent clean to SSPC SP1.

.3 SSPC SP 10/NACE No 2-94, Near-White Blast Cleaning. Blast Cleaning to SSPC SP10.

.4 All surfaces are to be cleaned by abrasive blast cleaning. Degree of paint removal to be equivalent to SSPC SP10 Near-White Blast Cleaning when compared with SSPC Vis-1 Visual Standard.

.5 Solvent cleaning shall be used to remove grease and oil prior to blasting.

.6 In areas close to items that can not be blasted. Strippers may be required. After removing paint, follow manufacturer's instructions for rinsing to remove stripper residues. Check final pH of surface with test strips and submit these to the Departmental Representative. Control rinsing-solution runoff and contain all contaminants.

.7 Very lightly hand-sand the surface to roughen in preparation for the new coatings where surface preparation by abrasive blast cleaning did not achieve the profile. The sanding process must not damage the steel. Therefore, in the presence of the Departmental Representative, prepare a separate mock-up area of sanding for each of the different substrate surfaces. Upon Departmental Representative's approval of mock-up, proceed with light sanding of the rest of the surfaces.

.8 The preparation of the surfaces using only strippers and sanding without abrasive blast cleaning is not possible given that both cleanliness and surface profile must match SSPC-SP10.

.9 All surfaces are to be abrasive blast cleaned to SSPC SP10 to create the required surface profile and to reach an acceptable level of cleaning for paint adhesion.

3.5 PROTECTION OF CLEANED SURFACES

.1 Apply primer as soon as possible after surface has been cleaned and inspected by Departmental Representative and before deterioration of surface occurs.

.2 If flash rust or rusting occurs after completion of surface preparation, fully clean surfaces again to conform to preparation standards.

.3 Prevent contamination of cleaned surfaces before primer-coat is applied and between applications of remaining coats of paint.

3.6 COATING SYSTEMS

.1 Each surface shall receive an appropriate thickness of coating as per manufacturer’s recommendations. It is generally anticipated that the dry film thickness will be as follows; but will depend on the product submitted. The approval of the Departmental Representative is required to vary from the thickness below:

.1 Coat 1 Primer: one coat, 3 to 5 mils dry film thickness.

.2 Coat 2 Intermediate: one coat, 3 to 5 mils dry film thickness.

.3 Coat 3 Topcoat: one coat, 3 to 5 mils dry film thickness.
For the paint system submitted, the optimum dry film thickness and the manufacturer’s acceptable range for each layer shall be submitted for review as part of the review process.
The Departmental Representative reserves the right to reduce the range and require stricter control if it is deemed that the range is too large when compared

to the range of other manufacturer's products and to require the Contractor to achieve a dry film thickness closer to the optimum thickness.

3.7 PREPARING COATINGS FOR APPLICATION

.1 Follow manufacturer's instructions for mixing, straining, and thinning paint. In addition to the manufacturer's instructions:

- .1 Do not dilute or thin the paint for brush application: use as received from manufacturer accept with written permission from Departmental Representative.
- .2 Do not mix, or keep paint in suspension, by means of air bubbling through paint.
- .3 Record and submit any instructions provided by the manufacturer related to thinning.
- .4 Submit Lot and Batch number for all products.

3.8 QUALITY CONTROL

.1 The Contractor's personnel will confirm cleanliness of surfaces and inform the Departmental Representative that the surfaces are ready to check the degree of cleanliness of surfaces. Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

.2 For each surface, if chemical paint stripping is used as part of the process of rinsing, confirm the pH of cleaned surfaces is within acceptable range for the coating application. Submit pH test strips to Departmental Representative. Indicate which strip is for which surface on the strips.

.3 The Contractor shall be responsible for confirming and recording the dry film thickness of each layer of paint on each member or on a reduced number of members if it can be shown that consistent dry film thicknesses are being produced that are within the specified thickness to the satisfaction of the Departmental Representative and that spot-checked results by the Contractor and the Departmental Representative agree with, and continue to agree with, previous thickness measurements.

.4 The Contractor shall record the thicknesses of coating of each layer for each member and provide a written record of all measurements taken.

.5 Each coat of paint serves a function. Before applying the next coat, the layer before must be successfully applied. This is particularly important for such functions as the mid-coat's function of sealing and building over gaps and joints in the steel and paint below.

- .1 Review with the Departmental Representative that the mid-coat has sealed and created a continuous, thicker film over connections where plates touch, filling the gaps and raw edges between plates before applying any topcoat.
- .2 Review for all coats that the edges of the plates and sections particularly at cut ends have not thinned or broken the film and that the coat is continuous.

.6 Work with the manufacturer's representative to obtain the results intended from the products specified. Report all adjustments and additives to the paint or thinning of the paint. Never thin the paint more than the specified amount, and record the amount of thinner used. Record and provide records of any direction given by the manufacturer's representative. If the direction contradicts the written instructions on the product sheets in

any way, or approaches the product limits, specifically notify the Departmental Representative of the issues, in writing, before applying any coating.

.7 The Contractor will note areas requiring correction due to thickness, and areas which have other defects such as runs, drips, and errors and propose remediation. The contractor should purpose and receive acceptance of a method of addressing these issues from the Departmental Representative prior to completing repairs. The Departmental Representatives inspector will verify the accuracy of the reviews and possibly provide their own reviews and list of items for action. If the contractor is not completing quality control and correcting their own defects at the sole judgement of the Departmental Representative then the entire paint coat may be rejected or the cost of inspections will be back charged to the contractor as reinspection will be required.

.8 Proper and sufficient lighting is required to prepare, paint, and inspect the Bridge. Provide proper and sufficient lighting to the requirements of the Departmental Representative. Lighting shall be area lighting and not merely spot-lighting.

.9 The Departmental Representative will be provided access and an opportunity to spot-check dry film thickness of each layer and application of paint after it is applied and before the next coat is applied, as they see fit.

.10 At the time of inspection, the Departmental Representative will also check for gross defects, such as (but not limited to) mud cracking and holidays.

.1 The Contractor shall pay the cost of rectifying defects. This may include, when so directed by Departmental Representative, the removal of all defective areas as well as adjacent areas, as well as all under coats, re-cleaning of surfaces, and re-painting in accordance with these Specifications.

.2 For each coat, do not apply subsequent coats until the dry painted surface has been accepted by Departmental Representative.

3.9 HOUSING HEATING AND / OR SHOP CONDITIONS

.1 See also Section 01 55 50 - Access, Housing, Heating, and Ventilation.

.2 Ensure no water, including condensation water, can drip onto surfaces during the cleaning and painting operations.

.3 Protect, shelter, or heat surface and surrounding air to comply with the following temperature and relative humidity conditions:

.1 Ensure ambient air temperature is above 10°C at time of painting and at all times afterwards, until paint has fully cured and dried.

.2 Ensure metal surface temperature is between 10°C and 45°C at time of coating application.

.3 Ensure relative humidity is below 85% at time of coating application and at all times afterwards until paint has fully cured and dried. Note that this may require heating above the minimum temperature requirement if this is necessary to ensure relative humidity requirement is met. Adjustments in humidity to allow better curing can be submitted in writing for review by the Departmental Representative.

3.10 PROTECTION OF PAINTED SURFACES

.1 Do not handle painted metal until paint has fully cured and dried.

.2 Remove and touch up paint which is damaged during the Work in accordance with the Section regarding repairs to coated surfaces.

.3 Avoid scuffing or damaging newly applied paint.

.4 Protection of surfaces.

.1 Protect surfaces not to be painted, and, if damaged, clean and restore such surfaces as directed by Departmental Representative.

.2 Apply primer, paint, or pre-treatment as soon as possible after surface has been cleaned and before deterioration of surface occurs.

.3 Clean surfaces again if rusting occurs after completion of surface preparation.

.4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats of paint. Remove contaminants from surface and apply paint immediately after surface is ready to receive paint.

.5 Protect cleaned and freshly painted surfaces from dust to approval of Departmental Representative.

3.11 APPLICATION

.1 Apply paint by spraying, brushing, or combination of both. Use sheepskins or daubers only when no other method is practical in places of difficult access.

.2 If airless equipment is used, provide and maintain airless spray equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges. Provide written confirmation from the paint manufacturer that the particular equipment to be used is suitable.

.3 Provide traps or separators to remove oil and water from compressed air and drain periodically during operations.

.4 Keep paint ingredients properly mixed in spray pots or containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary to keep solids suspended and mixed.

.5 Use dipping or roller-coating method of application only when specifically authorized by Departmental Representative in writing.

.6 Caulk seams at contact surfaces of built up members with material approved by Departmental Representative, before finish coat is applied. Discuss with, and seek direction from, Departmental Representative before caulking.

.7 Do not apply paint when:

.1 Air temperature is below 10°C or when temperature is expected to drop to 0°C before paint has dried.

.2 Temperature of surface is over 45°C, unless paint is specifically formulated for application at high temperatures.

.3 Fog or mist occur at site; it is raining or snowing; there is danger of rain or snow; relative humidity is above 85%.

.4 Surface to be painted is wet, damp, or frosted.

.5 Previous coat is not dry.

Note: that these provisions set the minimum standards for extreme temperature and humidity regardless of when manufacturer's documentation allows application under more extreme conditions. Where the provisions of SSPC SP 10 Near-White Blast Cleaning or the Contract Documents are more stringent then in all cases, the more stringent requirement shall apply as reviewed by the Departmental Representative.

.8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow, or condensation during curing. Prepare surface again and repaint.

.9 Provide cover at all times and especially when paint must be applied in damp or cold weather. Protect, shelter, or heat surface and surrounding air to comply with temperature and humidity conditions specified. Protect until paint is cured in accordance with the curing requirements of this Specification, or until weather conditions are suitable.

.10 Apply each coat of paint as continuous film of uniform thickness. Repaint thin spots or bare areas if products allow recoating before next coat of paint is applied. If products do not allow recoating, fully remove paint and prepare the surface in accordance with the abrasive blast cleaning and preparation requirements of this Specification and then re-apply the full coating system.

.11 If any layer of coating is too thick, it will be reviewed by the Departmental Representative and, if rejected, the area of concern will be fully removed and the surface prepared in accordance with the abrasive blast cleaning and preparation requirements of this Specification and then re-apply the full coating system.

.12 Brush application:

.1 Work paint into cracks, crevices, and corners and paint surfaces not accessible to brushes by spray, daubers, or sheepskins.

.2 Brush out runs and sags.

.3 Remove runs, sags, and brush marks from finished work and repaint in accordance with direction from Departmental Representative.

.13 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 Provide traps or separators to remove oil and water from compressed air and drain periodically during operations.

.3 Keep paint ingredients properly mixed in spray pots or containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.

.4 Apply paint in uniform layer, with overlapping at edges of spray pattern.

.5 Brush out immediately all runs and sags.

.6 Use brushes to work paint into cracks, crevices, and places which are not adequately painted by spray. In areas not accessible to spray gun, use brushes, daubers, or sheepskins.

.7 Remove runs, sags, and brush marks from finished work and repaint.

.14 Shop painting:

.1 The vast majority of all painting is to be completed in the shop. Complete all painting possible in the shop.

.2 On new pieces, do shop preparation and primer painting using the products specified for the Bridge after fabrication and before any damage to surface occurs from weather or other exposure. Mid coat and top-coat can only be applied after final assembly of each sub assembly or just before access is lost in the case of inaccessible parts.

.3 Spray paint contact surfaces of bolted, joints with specified primer coat prior to assembly. Do not brush primer after spraying. After the contact surfaces are primed, assemble the connections and then reclean the exposed portion of the connection, as the adhesion of primer to cured primer is not as good as to well prepared steel.

.4 Apply Primer across full subassembly.

.5 Apply sealer to all connections as per manufacturer's instructions.

.6 Apply mid-coat and top coat in shop to joints that will not be flexed during transport. repair any damage to paint caused by flexing.

.7 At field-connected joints, prime the full joint and protect for transportation. After field assembly apply sealer. During shop painting of adjacent mid-coat and top coat, allow proper lap lengths and account for overcoat timing such that each layer can be completed. In some cases, a better result may be achieved by switching products within the manufacturer's product line for field painting, however, this will require a demonstrated advantage to the Owner and shall be completed at no cost to the Contract.

.8 Paint metal surfaces to be in contact with wood with full paint system specified.

.9 Do not paint metal within 50 mm of edge to be field welded until after weld is completed. Give unprotected steel one coat of boiled linseed oil or other approved protective coating after shop fabrication is completed. Clean steel surfaces before painting to the full requirements of the surface preparation section.

.10 Remove weld spatter before painting. Remove weld slag and flux. These are to be repainted.

.11 Protect machine-finished or similar surfaces that are not to be painted but that do require protection with coating of rust inhibitive petroleum, molybdenum disulphide, or other coating approved by Departmental Representative.

.12 Copy previous erection marks and weight marks on areas that have been shop painted.

.15 Field painting:

.1 Paint steel structures as soon as practical after erection.

.2 Field-paint surfaces which are accessible before erection but which are not to be accessible after erection.

.3 Where painting does not meet with requirements of Specifications, and when so directed by Departmental Representative, remove all defective paint, thoroughly clean affected surfaces, and repaint in accordance with these Specifications.

.16 Handling painted metal:

.1 Do not handle painted metal until paint has dried, except for necessary handling for painting.

.17 All rivets, bolts, nuts, washers, and pitted areas shall be given a prime-coat, mid-coat and finish coat by brush (commonly referred to as striping) in addition to the spray application in order to control the paint thickness and get full coverage. Generally the same paint will be used but when inorganic zinc primer is specified, the brush application shall be carried out with an organic epoxy-zinc primer from the same manufacturer, after the spray-application of the prime-coat. Each of the subsequent coats shall have a similar procedure with brush and spray application to best produce coverage and control thickness.

3.12 JOINTS IN PAINTING SYSTEM

.1 At joints where the system must be left incomplete, an exposed section of primer and each coat must be left to allow each coat to be lapped on respective coats without lapping other coats.

.2 The band of primer left exposed must be wide enough to allow cleaning of adjacent steel and a transition to mid-coat and finish coat and still allow primer to be applied to cleaned metal and the surface, or exposed primer, before the transition to mid-coat.

.3 When cleaning near transitions, protect finished areas from blasting and select transition locations such that the transitions can be made.

3.13 INACCESSIBLE AREAS

.1 All areas and surfaces of the Bridge are to be prepared and painted, including all metal, except where specifically directed not to be painted.

.2 There are areas where spraying access is tight. Review all areas and work with the Departmental Representative to devise ways of applying a continuous coating system to these areas.

3.14 LIMITS OF PAINTING

.1 Painting shall include all new and old metal surfaces with few exceptions. The only exception shall be:

.1 Galvanized W and Thrie-Beam Railing Panels.

.2 Machined sliding surfaces designated on the cylinders.

.2 All steel-to-steel connections shall have the faying surface covered with primer prior to connection. At all steel to wood connections the steel shall be painted on all sides with the full coating system including the surface to be connected to the wood prior to making the connection.

.3 All connections in the steel and points of attachment will be cleaned, and the faying surfaces primed, prior to reconnecting or attaching of joints the area shall be then recleaned such that the primer coat is applied continuously across the layers of the connection while it is assembled. Apply sealer to all steel-to-steel connections.

.4 All interior and exterior surfaces of all the members will be painted.

3.15 REPAIRS TO PAINT SYSTEM

.1 Touch-up any painted surface that has been damaged, marred, or does not meet the intent and details of this Specification using the procedures listed below. Apply paint to the specified thickness of each coating layer of the painting system.

.2 Any area left for field connections, where the Contractor has been allowed to apply the full painting system before installation, shall have touch-up painting as follows. In general, the full system will not be applied on the shop field connections, as this will not provide the mid-coat seal. This is to include cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint.

.3 Repair or field painting procedure for coating system

.1 Remove loose rust and/or paint by hand scraping.

.2 Test the area for chloride contamination by using Chlor-Test.

.3 If the chloride content measured by Chlor-Test is equal or less than 5 µg/cm2, proceed to next step. If the chloride content measured by Chlor-Test is higher than 5 µg/cm2 decontaminate the area by steam cleaning or by using Chlor-Rid DTS, according to the manufacturer's instructions.

.4 Abrade the exposed area (including a band of a minimum width of approximately 1 cm into the intact coating system) by using an MBX Bristle Blaster or approved equal. Obtain an SSPC SP-10 degree of surface cleanliness and a profile of between 1 and 3 mils.

.5 Feather edges of the existing coating systems to provide a smooth transition between the repair area and the existing coating system.

.6 Mask the repair area to avoid overspray onto the existing coating system.

.7 Spray-apply one coat of Organic Zinc primer compatible with original system to a 3 to 5 mils dried film thickness. The Departmental Representative will have the option of changing the primer for the repair to an additional coat of mid-coat based on the depth of damage or continuity of the original primer remaining.

.8 Spray-apply one coat of mid-coat to a 5 to 7 mils dried film thickness.

.9 Spray-apply one coat of top-coat to a 3 to 5 mils dried film thickness. Match top-coat colour to selected top coat colour.

.10 All dry film thickness measurements to be adjusted as per manufacturer’s recommendations and Departmental Representative’s approval.

3.16 PAINTING OF BOLTS

.1 Special handling of bolts will be required to achieve proper coating if individual pieces are fabricated, primed, and then assembled. This would also apply to field bolting or primed field splices.

.2 All oils must be removed.

.3 Nuts shall be threaded to location on threads where the bolts will be tightened in the final structure such that the nut protects the threads that will actually be used in the tightening process from abrasive blast cleaning.

.4 Abrasive blast clean individual bolt and nut assemblies and prime prior to installation.

.5 Perform abrasive blast cleaning test and torque verifications on a significant sample of bolts to be used and repeat throughout the abrasive blast cleaning process to confirm quality control and torque on bolts. Do not abrasive blast clean large quantities of bolts if any sign of variability in the torque test (turn-of-nut) is seen. Perform checks regularly and in each batch.

3.17 CHLORIDE ON METALS

.1 Clean all salvaged parts to decontaminate them from chloride using Chlor-Rid DTS in accordance with manufacturer's instructions. The chloride content measured by Chlor-test must be less than 3 µg/cm2.

.2 Additional cleaning in a similar manner, is required for any part where chloride content is greater than 5 µg/cm2.

3.18 COATING OF CASTINGS

.1 The exact coating for castings will be reviewed. If the surface condition of the casting warrants, the Departmental Representative may direct that castings shall be primed with mastic, at no additional cost to the Contract.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM A 276-91a, Specification for Stainless and Heat-Resisting Steel Bars and Shapes.

.2 ASTM B 209M-92a, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.3 ASTM B 210M-92a, Specification for Aluminum-Alloy Drawn Seamless Tubes.

.4 ASTM B 211M-92a, Specification for Aluminum and Aluminum-Alloy Bar, Rods and Wire.

.5 CAN/CSA-G40.21-M92, Structural Quality Steels.

.6 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.

.7 CAN/CSA-O80 Series-M89, Wood Preservation.

.8 CSA O121-M1978, Douglas Fir Plywood.

.9 CSA W47.2-M1987, Certification of Companies for Fusion Welding of Aluminum.

.10 CGSB 1-GP-12c-65, Standard Paint Colours:

.11 CAN/CGSB-1.28-M89, Alkyd, Exterior House Paint.

.12 CAN/CGSB-1.59-M89, Alkyd, Exterior Gloss Enamel.

.13 CAN/CGSB-1.94-M89, Xylene Thinner (Xylol).

.14 CAN/CGSB-1.99-92, Exterior and Marine Phenolic Resin Varnish.

.15 CAN/CGSB-1.104-M91, Semi-gloss Alkyd Air Drying and Baking Enamel.

.16 CAN/CGSB-1.132-M90, Zinc Chromate Primer, Low Moisture Sensitivity.

.17 CGSB 1-GP-189M-78, Primer, Alkyd, Wood, Exterior.

.18 CGSB 31-GP-3M-88, Corrosion Preventive Compound, Cold Application, Soft Film.

.19 CGSB 62-GP-9M-80, Prefabricated Markings, Positionable, Exterior, for Aircraft Ground Equipment and Facilities.

.20 CGSB 62-GP-11M-78, Marking Material, Retroreflective, Enclosed Lens, Adhesive Backing.

1.2 DESIGN

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

1.3 MEASUREMENT PROCEDURES

.1 No measurement for payment will be made for the Work of this Section. All costs associated with this Work shall be included in the Contract Lump Sum Price. All signs within the contract area shall be replaced at the end of the project with new signs and the

old signs are to be salvaged as well as all lighting materials to Parks Canada yard in 1822 Davis Lock Rd, Elgin, ON K0G 1E0.

1.4 SHOP DRAWINGS

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

Part 2 PRODUCTS

2.1 CONFORMANCE

.1 All signs to conform to the Manual of Uniform Traffic Control Devices.

2.2 MATERIALS

.1 Sign supports.

.1 Steel posts: to CSA G40.21, 4 m long, flanged, "U" shaped in cross Section, measuring 65 mm wide by 30 mm deep. Metal thickness: 4.5 mm. Hot dipped galvanized to CSA G164, minimum zinc coating g/m ý.

.2 Standard tubular supports for small signs: to ASTM B210M.

.3 Vertical tubular supports and connecting diagonal members: to ASTM B210M.

.4 Truss members: to ASTM B210M.

.5 Aluminum tubular members: belt-ground satin finish.

.6 Base plates for ground mounted signs: to ASTM B209M. Base plates for overhead supports: to ASTM B209M.

.7 Tubular support caps for ground mounted signs: to ASTM B210M (or fabricated from aluminum plate as specified in ASTM B 209M). Castings for overhead signs: to ASTM B211M.

.8 Aluminum flanges: to ASTM B211M.

.9 Corrosion preventive compound: to CGSB 31-GP-3M.

.10 Anchor and connecting bolts, “U” clamps, and miscellaneous hardware for overhead sign installations: fabricate from 304 stainless steel as specified in ASTM A276.

.11 Fasteners: bolts, nuts, washers, and other hardware for roadside signs to be cast aluminum alloy, or galvanized steel.

.2 Signboards:

.1 Aluminum sheet: to ASTM B209M, precut to required dimensions. Thickness to be 1.6 mm for signboards up to 750 mm wide. Thickness to be 2.1 mm for signboards 750-1200 mm wide.

.2 Aluminum extrusions: to ASTM B211M, 150 mm or 300 mm panels suitable for bolting together.

.3 T-shape stiffeners for signboards: to ASTM B210M.

.4 Connecting straps and brackets: to ASTM B209M.

.5 Aluminum materials: to ASTM B209M.

.6 Xylene thinner: to CAN/CGSB1.94-1789.

.7 Primer for plywood: to CAN/CGSB 1.189-2000.

.8 Chemical conversion coating for aluminum: to CGSB 31-GP-101MA.

.9 Primer for aluminum: to CAN/CGSB-1.132-M90.

.10 Finish paint: to CAN/CGSB-1.59.

.11 Silk screen ink:

.1 Transparent or opaque colours: to CGSB 1-GP-12c, and as indicated.

.12 Reflective sheeting and tape: to CGSB 62-GP-11M AMEND. Adhesive, class of reflectivity and colour as indicated.

.13 Transparent tape: flexible, smooth-surfaced, moisture resistant tape with pressure sensitive adhesive.

.14 Clear varnish protective coat: to CAN/CGSB-1.99.

2.3 FABRICATION

.1 Supports.

.1 Connect aluminum support members by welding in accordance with CSA W47.2. Work to be performed by Canadian Welding Bureau qualified members only. Flame cutting of members not permitted.

.2 Welds to be of same strength as adjacent member or casting.

.3 Reinforce in area of electrical hand holes to equal strength of full Section member.

.4 Remove sharp edges and burrs.

.2 Signboards.

.1 Aluminum blanks:

.1 Degrease, etch, and bonderize with chemical conversion coating.

.2 Clean surfaces with xylene thinner. Dry.

.3 For non-reflective signs, spray face with one-coat vinyl pre-treatment coating and two (2) finish coats of required colour.

.4 For aluminum signboards that are to be painted before installation, spray and bake face of signboards with two (2) coats of enamel in accordance with CAN/CGSB-1.104.

.2 Reflective background sheeting and lettering:

.1 Cut and apply in accordance with manufacturer's instructions.

.2 Apply adhesive coated material with heat lamp vacuum applicator or by squeeze roll application method. Apply pressure sensitive material with roller or squeegee.

.3 Edge-wrap sheeting on each extrusion prior to bolting extrusions. Match pieces of sheeting from different rolls for each signboard to ensure uniform appearance and brilliance by day and night.

.4 Reflective signboard faces may be prepared using silk screen transparent ink.

.3 Non-reflective lettering and symbols: cut from vinyl film as specified in CGSB 62-GP-9M, or paint using required colour of finish paint or silk screen transparent ink.

.4 Clean signboards completely and apply transparent tape over top edge and extending 25 mm minimum down back and front of signboard.

.5 Protect finished signboard faces with one (1) coat of clear varnish.

.3 Sign identification:

.1 Apply sign number and date of installation with 25 mm high stencil painted black letters on lower left back face of each signboard.

Part 3 EXECUTION

3.1 INSTALLATION

.1 Sign support.

.1 Erect supports as indicated. Permissible tolerance: 50 mm maximum departure from vertical for direct buried supports. Where separate concrete footings have been placed, erect posts with base plates resting on levelling nuts and restrained with nuts and washers. Permissible tolerance: 12 mm maximum departure from vertical.

.2 Coat underside of base plate with corrosion protective paint before installation. Connect shoe base to shaft with inside and outside fillet welds.

.3 Close open aluminum tubes and posts with aluminum cap. Cut oblong holes in shoe bases to drain condensation. Install aluminum bolt cover on each base plate restraining nut.

.4 Erect posts plumb and square to details as indicated.

.5 Single channel steel posts:

.1 Drive to required depth without damage to posts.

.2 If rock or concrete is encountered, drill hole to required depth and set post in sand.

.3 In finished concrete surfaces, backfill with concrete or grout. Protect from adverse conditions until cured.

.2 Signboards

.1 Fasten signboards to supporting posts and brackets as per standard details and good practice.

.2 Fasten lane markers to signboard.

.3 Use strapping with crimped or bolted connections where signs fastened to utility poles.

.4 Use “T”-shape aluminum stiffeners to join portions of sign panel on site. Cover face of “T”-stiffener with material identical to face of sign panel.

3.2 PROTECTION

.1 Place temporary covering on signboards when erected and not in service. Covering to be capable of withstanding rain, snow, and wind and be non-injurious to signboard. Replace deteriorated covering and remove covers as directed by Departmental Representative.

3.3 CORRECTING DEFECTS

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

3.4 REMOVAL AND SALVAGE

.1 Carefully dismantle and salvage aluminum and steel materials.

.2 Dismantle electrical equipment. Terminate power feed as indicated. Salvage luminaires and pack in weatherproof containers with glassware adequately protected. Salvage brackets, hardware, lamps, wiring, conduit, and accessories.

.3 Remove and Reinstate Existing Wooden Posts that are used as delineators.

.4 Deliver salvaged materials to Parks Canada yard in Parks Canada yard in 1822 Davis Lock Rd, Elgin, ON K0G 1E0.

END OF SECTION

1 GENERAL

1.01 SUMMARY

.1 The following mechanical equipment on the Lower Brewers Swing Bridge shall be either refurbished, salvaged or replaced as follows:

- .1 Modify and Reinstall – Pivot bearing.
- .2 Refurbish and Reinstall – Swing Chain and Crab Arrangement.
- .3 Remove and Salvage – Temporary electrical swing drive system including controls and motor.
- .4 Replace – Balance wheels, shafts and stools (6).
- .5 Replace - Balance wheel rail.
- .6 Replace – West end castor wheels (2) and ramps (2) with new end lift assemblies (2) and ramps (2).
- .7 Replace – East end castor wheels, axles and brackets (2) and abutment mounted ramps (2).
- .8 Remove – South span closed locking pin mechanism.
- .9 Replace – North span closed lock and end stop assembly.
- .10 Replace – Span Open end stop assembly.
- .11 Refurbish or Replace – Stay rod regulators (2).

1.02 RELATED REQUIREMENTS

.1 Section 01 33 00, Submittal Procedures

.2 Section 01 35 29, Health and Safety Requirements

1.03 REFERENCE STANDARDS

.1 ASTM

- .1 ASTM A240/A240M [20a], Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- .2 ASTM A325/A325M [14], Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi (830 MPa) Minimum Tensile Strength
- .3 ASTM F436/F436M [19], Standard Specification for Hardened Steel Washers Inch and Metric Dimensions
- .4 ASTM A563/A563M [15/07(2013)], Standard Specification for Carbon and Alloy Steel Nuts
- .5 ASTM A153/A153M [16a], Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

.2 CSA Group

- .1 CSA W59 [18], Welded Steel Construction
- .2 CSA W47.1 [19], Certification of Companies for Fusion Welding of Steel

1.04 DEFINITIONS

.1 Abandon: Leave in place without removal. Loose objects or ends shall be removed.

.2 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.

.3 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.

.4 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.

.5 Modify and Reinstall: Detach items from existing construction, modify according to drawings provided and reinstall them where indicated.

.6 Refurbish and Reinstall: Remove items, replace all wear items as indicated on drawings and reinstall them where indicated.

.7 Remove: Planned deconstruction and disassembly of items from existing construction 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.

.8 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.9 Remove and Salvage: Detach items from existing construction and deliver them to Departmental Representative ready for reuse.

.10 Replace: Remove items and install new items in their place, adjusting mounting brackets and locations as required.

.11 Reuse: Existing to Remain and confirmed in proper working order.

.12 Sympathetic Replica: Newly designed item that has a very similar appearance to existing item so as to maintain the historical nature of the replica span.

1.05 DRAWINGS

.1 It is the Contractor’s responsibility to prepare all detail, assembly and installation shop drawings. The drawings shall identify and describe all purchased components, all fabricated components, as well as all assemblies and installation of all components. The following drawings are supplied for reference only and are not to be considered as shop drawings:

- .1 Mechanical Layout – Drawing No. M01.
- .2 Pivot Bearing Arrangement & Details – Drawing No. M02 and M03.
- .3 Swing Chain and Crab Arrangement & Details – Drawing No. M04.
- .4 Balance Wheel and Rail Arrangement & Details - Drawing No. M05 and M06.
- .5 End Lift Arrangement & Details – Drawing No. M07 thru M10.
- .6 Hydraulic and Pneumatic Schematic – Drawing No. M11.
- .7 East End Bearing Wheel and Ramp Arrangement & Details – Drawing No. M12.
- .8 Span Lock and End Stop Bumper Arrangement & Details – Drawing No. M13.
- .9 Stay Rod Regulator Arrangement & Details – Drawing No. M14.

.2 All shop drawings shall be submitted to the Departmental Representative in electronic format, in accordance with Section 01 33 00, for approval before procurement, manufacturing and installation.

.3 Preliminary shop drawings shall be provided in PDF format for review. Final shop drawings shall be original and editable drawings in CAD format (DWG, DXF or similar format approved by the Departmental Representative). No insertion of copied drawings into CAD files shall be permitted. Design concept drawings shall only be provided to the Contractor in PDF format.

.4 All final shop drawings shall bear the stamp of approval from a Licensed Professional Engineer in the Province of Ontario who will take full design responsibility for the mechanical design.

.5 All drawings shall be dual dimensioned with SI units first and Imperial dimensions in brackets.

.6 Shop drawings shall show all details for new mechanical components and assemblies complete with Bills of Materials.

.7 Installation drawings shall show dimensions for location, in plan and elevation, of critical items, i.e. centre pivot, balance wheel rail, etc.

.8 Dimensional and geometric tolerances shall conform to the applicable tolerances indicated on the drawing including general tolerances.

.9 It is the contractor’s responsibility to verify all dimensions, details and elevations of the existing structure that are relevant to the work shown on the drawings prior to commencement of the work. Any discrepancies shall be reported to the Departmental Representative and the proposed adjustment of the work required to match the existing structure shall be submitted for approval.

.10 The contractor shall assist the Departmental Representative with confirming installation details and/or measurements of the existing system during disassembly. The Departmental Representative shall assist the Contractor with updating drawings based on this detail which may include, but is not limited to, details of fabricated components, mounting locations or integration components.

.11 The Contractor shall submit a list and specification details of all proposed purchased components, as well as the modifications required to fabricated components and installation assemblies to use these components, to the Departmental Representative for approval prior to purchase of any component.

.12 All fabricated weldments shall be stress relieved prior to final machining.

1.06 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 It is the Contractor's responsibility to remove and dispose of in a proper manner all replaced components and scrap material and maintain a tidy and safe work site.

.3 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in Work; immediately notify Departmental Representative if materials suspected of containing hazardous substances are encountered and perform following activities:

.1 Hazardous substances will be as defined in Hazardous Products Act.

.2 Stop work in area of 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 Departmental Representative under a separate contract or as a change to Work.

.5 Proceed only after written instructions have been received from the Departmental Representative.

1.07 SALVAGE AND DEBRIS MATERIAL

.1 Demolished and removed items become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain Departmental Representative's property.

.2 Carefully remove materials and items designated for salvage or to be reused and store in a manner to prevent damage or devaluation of materials.

2 PRODUCTS

2.01 MATERIALS

.1 All stainless steel shall be ASTM A240/A240M Type 316 Stainless Steel unless otherwise specified.

.2 All cap screws, nuts, washers and threaded rod shall be ASTM A240/A240M Type 316 Stainless Steel unless otherwise specified.

.3 All shims shall be ASTM A240/A240M Type 316 Stainless Steel.

.4 Concrete elevations underneath applicable mechanical components must permit a minimum 25 mm allowance for grout. Entire void including any shear pockets or annular space around anchor bolts to be filled with a non-shrinking grout approved for the intended application to ensure full contact between component and concrete. Grout edges surrounding any component to be sloped as required to avoid pooling of water.

.5 Anchor bolts connecting mechanical components to concrete must meet the requirements of AISI Type 316 ASTM F593 CW2 unless otherwise specified.

.6 Anchors shall be set in place using the HILTI HIT-HY 200R Safe Set System or an equivalent approved by the Departmental Representative.

.7 All grout to be non-shrinking pourable epoxy type suitable for 20-year life in the outdoor Ontario road-side environment.

.8 Hex bolts connecting any mechanical component to structural steel must meet the requirements of ASTM A449 Type 1 and galvanized per ASTM A153/153M.

.9 Flat washers used in structural applications must meet the requirements of ASTM F426 Type 1 and galvanized per ASTM A153/A153M.

.10 Nuts used in structural applications must meet the requirements of ASTM A563 and galvanized per ASTM A153/A153M.

3 DEMOLITION, REMOVAL AND COORDINATION

3.01 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 Prevent debris from blocking drainage inlets.

.3 Protect mechanical systems that will remain in operation.

.2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the Departmental Representative and users is minimized and as follows:

.1 Prevent debris from endangering safe access to and egress from occupied buildings.

.2 Notify the 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.

3.02 EXECUTION

.1 Refer to Drawing No. M01 for location and details reference for the items that are included in the Work.

.2 Pivot Bearing

.1 Refer to Section 4.02 for details reference for the pivot bearing modification and installation. Existing pivot bearing shall be removed and provided to the machine shop for modification.

.2 Existing anchor bolts and shims shall be removed.

.3 Swing Chain and Crab Mechanism

.1 Refer to Section 4.03 for details reference for the swing chain and crab mechanism refurbishment. Existing swing crab shall be removed and refurbished.

.2 Existing swing chain and span connection bracket shall be removed.

.3 Existing swing chain pulleys (3) shall be removed for modification and reinstallation.

.4 Existing electric swing drive motor, motor mounting bracket, pinion and electrical controls shall be removed and salvaged.

.4 Balance Wheel and Rail

.1 Refer to Section 4.04 for details reference for the balance wheel and rail replacement. Existing balance wheels, stools, shims and rail shall be removed and salvaged.

.2 Existing rail anchor bolts shall be removed.

.5 End Castor Wheels and Ramps

.1 Refer to Sections 4.05 and 4.06 for details reference for the East and West End Wheel and Ramp replacement. Existing wheels and ramps shall be removed and salvaged.

.2 Existing ramp anchor bolts shall be removed.

.6 Span Lock and End Stop Bumpers

.1 Refer to Section 4.07 for details reference for the span lock and end stop bumper replacement. Existing span lock and span closed bumper mechanism on the North-West side of the span as well as the span lock mechanism on the South-West side of the span shall be removed and salvaged. The span open bumper shall be removed.

.7 Stay Rod Regulators

.1 Refer to Section 4.08 for details reference for the stay rod regulators. Existing stay rod regulators shall be removed and salvaged.

4 INSTALLATION DETAILS

4.01 GENERAL ARRANGEMENT

.1 Refer to Drawing No. M01 for location and installation details reference for the items included in the Work.

4.02 PIVOT BEARING

.1 Refer to Drawing No. M02 for installation and assembly details reference of the pivot bearing arrangement and Drawing No. M03 for details reference of the manufactured and/or modified items. Existing pivot bearing components shall be modified and reused where indicated. New items shall be manufactured where indicated on Drawing No. M03.

.2 The Top half of the existing bearing shall be refurbished and modified as shown on Drawing No. M03. Reference dimensions indicate existing features and should be verified to confirm design. The interface shall be machined to accept an ASTM A693 Type 630 Condition A disc that is keyed to rotate with the top half.

.3 The Bottom half of the existing bearing shall be refurbished and modified as shown on Drawing No. M03. Reference dimensions indicate existing features and should be verified to confirm design. An indicator gauge shall be added to show the current oil level, with minimum level line set to approx 10mm above top of spherical interface and maximum level line set to approx 10mm below the base of the seal interface plate. The Bottom face of pocket in shall be inspected to confirm suitability for dowel reuse. If required, bottom face shall be machined flat and dowel holes relocated.

.4 ASTM A240/A240M Type 316 Stainless steel interface plates shall be manufactured and fastened to the upper side of the bottom pintle where the oil seal will interface. This seal plate shall be of split-style construction to permit replacement without lifting of the span.

.5 An ASTM A240/A240M Type 316 Stainless steel split-style debris shield shall be manufactured to be mounted on top of the oil seal to prevent course debris from contaminating the seal interface. The split-style shield shall be field removable and installable with the span in place to permit service and seal inspection. The shield shall be held in place with stainless steel hardware and when mounted in place, shall turn with the span and not contact the bottom pintle half throughout the entire pivot operation.

.6 A face seal excluder ring manufactured from NBR rubber shall be used to contain the pivot bearing oil and exclude contaminants. The seal shall be split to permit replacement without lifting of the span.

.7 Contractor shall clean spherical surfaces of bearing and coat with oil immediately prior to lowering two halves of bearing together.

.8 Bearing shall be shop assembled and tested prior to installation on site.

.9 ASTM A240/A240M Type 316 shims shall be manufactured as required to field adjust the nominal shim values shown the drawing to meet bridge elevation and end lift load requirements.

.10 Contractor shall size anchor bolt length to suit application requirements.

.11 Copper oil fill tube shall be routed inconspicuously along pivot beam to common location at intersection of pivot girder and longitudinal girder. Suitable means to add oil and seal tube when not in use shall be proposed to the Departmental Representative for approval.

4.03 SWING CHAIN AND CRAB MECHANISM

.1 Refer to Drawing No. M04 for details reference. Existing swing chain crab shall be refurbished. This refurbishment shall reuse as many of the existing components as practicable and include the following as a minimum:

- .1 Disassemble and sandblast all components.
- .2 Manufacture replica handles duplicating handles on lock crabs or sourcing original handles from the Departmental Representative.
- .3 Propose to the Departmental Representative wear components such as bushings that require replacement and/or adjustment.
- .4 Re-assemble crab, lubricating any rotating or sliding components with suitable lubricant approved by the Departmental Representative.
- .5 Paint entire assembly as per contract specifications, ensuring when paint dries that crab continues to rotate and function as required for operation.

.2 The swing chain crab shall be anchored in place with suitable concrete anchors sized to handle the maximum chain loads.

.3 A new span chain connection bracket shall be manufactured as shown on Drawing No. M04 from ASTM A240/A240M Type 316 Stainless Steel and attached to the span using suitable stainless steel hardware.

.4 The swing pulleys (3) shall be modified as shown on Drawing No. M04. It is the contractor's responsibility to verify all dimensions, details and elevations of the existing components that are relevant to the work shown on the drawings prior to commencement of the work. Any discrepancies shall be reported to the Departmental Representative and the proposed adjustment of the work required to match the existing structure shall be submitted for approval.

.1 Existing pulleys shall be replaced with sympathetic replica pulleys manufactured from ASTM A564/A564M Type 630 Condition H1150 stainless steel including ASTM B22 Bronze bushings.

.2 Existing pulley housing casting shall have chain retainer modification replaced and be refurbished with sand blasting and painting as per contract specifications.

.3 Swing pulley anchors and foundations shall be inspected once pulleys are removed. The contractor shall provide recommendations to the Departmental Representative regarding reuse or refurbishment of the anchors and foundations.

.4 Refurbished pulleys and housings shall be reinstalled on the existing or refurbished foundations and anchors.

.5 Contractor shall ensure the pulleys do not interfere with the swing operation under all operating conditions of the span.

.6 Chain shall be replaced with an ASTM A240/A240M Type 316 Metric trade size M10 chain with minimum 15.5kN working load. The chain shall be arranged with the crab and pulleys and connected to the span connection bracket with ASTM A240/A240M Type 316 screw pin shackles so that it can be disconnected from the span for normal operation and quickly attached to the span when required.

.7 The chain shall be wrapped around the crab drum a minimum of 3 complete wraps and be arranged so that rotation of the crab for a full swing operation does not cause the chain to bind nor slip.

4.04 BALANCE WHEELS AND RAIL

.1 Refer to Drawing No. M05 for installation and assembly details reference of the balance wheels and rail arrangement and Drawing No. M06 for details reference of the manufactured items. Existing balance wheels, stools and rail shall be replaced with sympathetic replica manufactured components.

.2 The balance wheels shall be sympathetic replicas of the existing wheels with the following changes:

.1 Diameter increased as shown on Drawing No. M06.

.2 Cast or machined from ASTM A564/A564M Type 630 Condition H1150.

.3 Fitted with a tapered roller bearing arrangement suitable for the maximum loading conditions.

.4 Shaft seals on both ends to contain grease and exclude contaminants.

.3 The balance wheels shall be mounted to the span via CSA G40.21 44W/300W sympathetic replica clevises with the following changes:

.1 Height increased as shown on Drawing No. M06.

.2 Welded or cast construction.

.3 Additional mounting holes as shown on Drawing No. M06.

.4 The wheels shall be removable from the stools without disconnecting the stool from the span.

.5 The stools and shafts shall have passages for grease to the centre of each set of two wheel bearings that are connected to a common grease point through a concealed copper tube fitted on the inside of the stool.

.6 ASTM A240/A240M Type 316 shims shall be manufactured as required to field adjust the nominal shim values shown the drawing to permit the clearance shown between each wheel and the rail as shown on Drawing No. M06 Section D.

.7 The East and West balance wheels shall be mounted to the span with 19mm lag screws to the Corbel frame. The remaining four balance wheels shall be mounted to the span with 19mm Structural bolts.

.8 The installation shall include the ability to shim the balance wheels individually by +/- 13 mm with ASTM A240/A240M Type 316 shims to field adjust the clearance shown between each wheel and the rail as shown on Drawing No. M06 Section D.

.9 All six balance wheels shall be positioned to track the centre of the rail to within +/- 10 mm for all span swing positions.

.10 The balance rail shall be replaced with a sympathetic replica rail as shown on Drawing No. M06. The rail may be cast or of welded construction.

.11 The rail shall have a diameter of 3400 mm on centreline and made of six segments that fit together to form a complete circle. The maximum runout from a perfect circle permitted is +/- 5mm.

.12 Each rail segment shall have a minimum of six Ø13 mm anchor bolts holding the rail in place. Maximum distance between anchor bolts is 650 mm.

.13 The rail shall be held in place with fastening plates under each set of anchor bolts. At each end of the rail segments, the fastening plates will connect the anchor bolts of one rail segment to the next rail segment anchor bolts, allowing for a 1-2mm gap between each segment.

.14 The rail shall be shimmed level within +/- 1mm and grouted in place following span commissioning with a minimum 50 mm grout allowance under the rail (25mm under the rail fastening plates.

.15 The grout shall have passages of minimum 50 mm height and 100 mm width in eight locations around the diameter of the rail to permit drainage of water that may collect inside of the rail. The maximum spacing between the passages is 1500 mm.

.16 The drainage passages and rail splices shall be located so they are as far as practicable away from the balance wheel locations when the span is in the closed position.

.17 The contractor shall size the anchor bolt lengths as required to suit the application requirements.

4.05 WEST END LIFTS, RAMP AND MECHANISM

.1 Refer to Drawing No. M07 for installation and details reference. The existing west end castor wheels and ramps shall be replaced with end lift and ramp assemblies

.2 The end lift assemblies shall have the following features:

- .1 A heavy-duty hydraulic cylinder shall rotate a wheeled lever to lift the span.
- .2 The wheel shall engage an abutment mounted bearing plate.
- .3 The hydraulic cylinder shall be retracted when the end lift is in the raised position.
- .4 When the cylinder is fully retracted, the lever shall rotate over-centre by a minimum of 5 mm so that the vertical force of the live-loaded span is transferred to the assembly base plate through the over-centre stop and the pivot pin, and any live loading does not cause the mechanism to lower.

.3 The heavy duty lift assembly cylinders shall be 51 mm (2.00") diameter bore with 35 mm (1.38") diameter rods and include the following features:

.1 Stainless Steel cylinder mounted counterbalance valve assembly mounted directly to the head cylinder port.

.2 Stainless steel counterbalance valves to prevent uncontrolled rotation of the lift assembly when raising or lowering the span

.3 Nominal Maximum Working Pressure – 20.7 MPa (3000 psi).

.4 17-4PH Stainless Steel Rod.

.5 Nickel Plated Rod equivalent to or better than Parker Hannifin Corporation Global Shield™ coating. Minimum spec: ASTM B117 Salt Spray performance – 1,200h; Thickness – 0.004"; Hardness – HRC 54.

.6 2-part epoxy primer and painted body

.7 102 mm stroke.

.8 Mill-Duty with bolted heads.

.4 A hydraulic flow divider/combiner shall be used so both end lift cylinders retract and extend at the same rate regardless of load. The cylinders shall be synchronized at the end of their travel stroke.

.5 A hydraulic regenerative circuit shall be used to minimize the flow required for cylinder extension.

.6 A relief valve shall be used to limit pump pressure.

.7 The hydraulic cylinders shall be activated by a manual hydraulic pump with the following features:

.1 Able to generate hydraulic pressure in two ports for use with a double-acting cylinder.

.2 Two speed operation. Minimum oil displacement of 39 cubic centimeters when the load pressure is below 2750 kpa and 2.5 cubic centimeters at higher load pressure.

.3 Glass-filled nylon reservoir and nylon encapsulated aluminum base for maximum corrosion resistance.

.4 Lever operated flow direction reversal.

.5 Rotational handle extended from North-West side of span to allow operator ability to activate pump. Handle shall be removable and shaft lockable to prevent rotation when an operator is not present.

.6 Crank style linkage to convert rotational motion to linear pump motion, connected to shaft via stainless steel roller bearing.

.7 Lever arm extending from North-West side of span to control flow direction.

.8 The hydraulic pump shall be located inside of the span and not visible from the exterior, other than handles to control flow and direction.

.9 The hose connections shall be arranged so that, under all positions of the cylinders, the hoses do not make contact with any part of the end lift assemblies, bridge structure or abutment.

.10 A stainless steel pneumatic or hydraulic cylinder shall be activated when the end lifts are in the full lift position. Visual indicators shall be provided to indicate to the operator the status of the end lifts.

.11 The wheels, shafts and abutment mounted ramps shall be manufactured from ASTM A564/A564M Type 630 Condition H1150 stainless steel.

.12 The wheels shall be fitted with journal bearings with machined grease grooves manufactured from ASTM B22 C95800 or equivalent.

.13 The shafts shall be fitted with grease fittings to deliver grease to the wheel bearings. The grease fittings shall be accessible when the span is in the closed position.

.14 The wheel brackets shall be machined or cast from ASTM A240/A240M Type 316 stainless steel.

.15 The wheels shall be removeable from the span without removing the wheel brackets.

.16 The North-West ramp shall have an elevation approximately 20mm higher in elevation than the South-West ramp to permit clearance for the North-West wheel during swing operations.

.17 The abutment mounted ramps shall have the ability to shim individually by +/- 13 mm.

.18 The abutment mounted ramps shall have a stop to assist with centering the span while the end lifts engage. These stops shall have enough clearance to allow for span lateral expansion.

.19 The ramps shall be anchored to the abutment with a minimum of four Ø13 mm anchors sized for the application.

.20 The ramps shall have a removable contact plate that can be field replaced with an equivalent ramp without the end stop.

.21 The minimum clearance between the disengaged lever, i.e. cylinder extended, and the abutment mounted bearing plate and stop shall be 50 mm.

.22 Once the ramps have been positioned and the span commissioned, the ramps shall be grouted in place.

4.06 EAST END BEARING WHEELS AND RAMPS

.1 Refer to Drawing No. M12 for installation and details reference. Existing east end bearing wheels and abutment mounted ramps shall be replaced with sympathetic replica manufactured wheels and ramps.

.2 The wheels, shafts and abutment mounted ramps shall be manufactured from ASTM A564/A564M Type 630 Condition H1150 stainless steel.

.3 The wheels shall be fitted with journal bearings with machined grease grooves manufactured from ASTM B22 C95800 or equivalent.

.4 The shafts shall be fitted with grease fittings to deliver grease to the wheel bearings. The grease fittings shall be accessible when the span is in the closed position.

.5 The wheel brackets shall be machined or cast from ASTM A240/A240M Type 316 stainless steel.

.6 The wheels shall be removeable from the span without removing the wheel brackets.

.7 Both wheels shall have the ability to be shimmed vertically by +/- 13mm with ASTM A240/A240M Type 316 stainless steel shims.

.8 The ramps shall have the ability to be shimmed vertically by +/- 13 mm (1/2”) with ASTM A240/A240M Type 316 stainless steel shims.

.9 The South-East ramp shall have an elevation approximately 20 mm higher than the North-East ramp to permit clearance for the South-East wheel during swing operations.

.10 Once span swing function has been commissioned the ramps shall be grouted in place.

4.07 SPAN LOCK AND END STOP BUMPERS

.1 Refer to Drawing No. M13 for installation and details reference. The North-West span lock and span closed end stop bumper assembly as well as the span open end stop bumper assembly shall be replaced.

.2 The span locking mechanism shall prevent the span from opening when the lock is in place. The latch shall be slam-style so that when the latch is in the locked position and the span is closed, the latch will be forced open and lock when the span is in the closed position.

.3 A keyed padlock shall be used to hold the latch in the closed position and prevent the span from opening when an operator is not present.

.4 The end stop bumper assemblies shall be designed to absorb the impact from an opening or closing span at a rotational velocity of 0.072 radians/sec.

.5 The span shall have an ASTM A240/A240M Type 316 stainless steel striker plate positioned to prevent contact between the span and the bumper.

.6 The span closed bumper shall have the ability to be shimmed +/- 13 mm to adjust the span closed position and align the roadway.

.7 The span lock and span closed bumper assembly shall be anchored to the concrete with 19 mm anchor bolts sized for the maximum impact force during span closing and grouted in place.

.8 The span lock and span closed bumper assembly shall be placed in a position to avoid contact with the swing chain.

.9 The span open bumper shall be mounted to a wooden rock cribbing placed in the existing location in the canal.

.10 When the span is aligned with the roadway in the closed position, the latch shall hold the span in contact with the span closed bumper.

4.08 STAY ROD REGULATORS

.1 Refer to Drawing No. M14 for installation and details reference. Existing stay rod regulators shall be refurbished or replaced.

.2 The contractor shall inspect and take dimensional and material hardness measurements of the existing regulators to determine their suitability for reuse.

.3 Following measurements, the Departmental Representative shall advise the contractor if the existing stay rod regulators can be reused.

.4 If the existing regulators can be reused, the contractor shall update the shop drawings to reflect the existing design and refurbish the components.

.5 If the existing regulators cannot be reused, the contractor shall salvage the regulators and replace with a sympathetic replica design suitable to the application.

.6 Sympathetic replica regulators shall have the following features:

- .1 ASTM A240/A240M Type 316 stainless steel pins.
- .2 Cast or machined steel body and regulator.
- .3 Ability to rotate about a horizontal axis to balance horizontal forces between short and long arm of span stay rods.
- .4 Aligned to centre of King posts.

5 GENERAL REQUIREMENTS

5.01 EXAMINATION

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

5.02 EXECUTION

.1 The work specified in the "INSTALLATION DETAILS" section must be performed by a licensed Millwright or by a person who is under the direct supervision of a licensed Millwright. The Contractor is expected to perform the necessary risk assessments on site and take measures to complete the work safely. Contractor to have workplace safety procedures in place as per OH&SA, other relevant regulations and in accordance with Section 01 35 29, Health and Safety Requirements.

.2 It is critical that all drawings be checked by the contractor before manufacture to confirm that all components and assemblies meet the relevant specifications and the interface of all components, and interface with Existing structure, is correct.

.3 All mechanical equipment, other than Stainless Steel and electrical components, shall be painted as per the contract.

.4 Before grouting of any pier or abutment mounted equipment, the span must be moved through the open to closed position to confirm the following:

.1 No interferences exist.

.2 All components are located correctly.

.3 All load carrying components are functioning correctly.

.5 Mill specification sheets are to be provided for all steel used in the manufacture of mechanical components.

.6 Welding shall be made in accordance with CSA W59 and shall be performed by a welder qualified under CSA W47.1.

.7 All anchor and mounting bolts shall be torqued to manufacturer’s recommended torque.

.8 Unless otherwise noted, all work must conform to the requirements of CAN/CSA S6-14, Canadian Highway Bridge Design Code and any other applicable federal, provincial, local or industrial regulations.

5.03 OPERATION AND MAINTENANCE MANUAL

.1 The contractor shall assemble and Operation and Maintenance manual, in electronic format, for the bridge mechanical systems. The manual shall include the following sections as a minimum:

.1 Title Page

.2 Index

.3 Introduction – Brief summary of what is include in the manual.

.4 Assembly Drawings – List only

.5 Consumables – specifications for consumable items, i.e. filter elements, hydraulic oil, greases, etc.

.6 Maintenance, Inspection and Lubrication - procedures and frequency

.7 Pre-operational Verifications

.8 Start-up Procedures

.9 Appendix A – As-Built Detail and Assembly Drawings including Bills of Material.

.10 Appendix B – Recommended Spare Parts

.11 Appendix C - Manufacturer’s Data (to include data for all purchased parts including consumables)

.2 The Final Certificate of Acceptance will not be issued until the information submitted is approved by the Departmental Representative.

5.04 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.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 35 43 - Environmental Procedures

.2 Section 31 23 10 - Excavating, Trenching and Backfilling

.3 Section 32 11 19 - Granular Sub-Base

.4 Section 32 11 23 - Aggregate Base Courses

1.2 REFERENCES

.1 Ontario Provincial Standard Specification (OPSS).

.1 OPSS 314 (November 2013), Construction Specification for Untreated Granular Sub-Base, Base Surface, Shoulder and Stockpiling.

1.3 SAMPLES

.1 Submit test results for granular gradation in accordance with Section 01 33 00 - Submittal Procedures.

1.4 MEASUREMENT FOR PAYMENT

.1 Measurement Procedures: In accordance with Section 01 11 22 - Measurement and Payment.

Part 2 Products

2.1 MATERIALS

.1 Aggregate quality: sound, hard, and durable material free from soft, thin, elongated, or laminated particles, organic material, clay lumps, minerals, or other substances that would act in a deleterious manner for the intended use.

.2 Use of recycled materials on this Project is not permitted.

2.2 SOURCE APPROVAL

.1 Inform Departmental Representative of proposed source of aggregates and provide test results for sampling at least four (4) weeks prior to commencing production.

.2 If, in the opinion of Departmental Representative, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

.3 Should a change of material source be proposed during Work, advise Departmental Representative two (2) weeks in advance of proposed change and provide documentation for testing.

.4 Acceptance of material at source does not preclude future rejection if material fails to conform to specified requirements, lacks uniformity, or if its field performance is found to be unsatisfactory.

Part 3 Execution

3.1 PROCESSING

.1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.

.2 Blend aggregates, if required, to achieve gradation requirements, percentage of crushed particles, or particle shapes, as specified.

.3 If required Wash aggregates, to meet Specifications. Use only equipment approved by Departmental Representative.

3.2 HANDLING

.1 Handle and transport aggregates in a manner to avoid segregation, contamination, and degradation.

3.3 STOCKPILING

.1 If stockpiling is required by Contractor:

- .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.
- .2 Stockpile aggregates in sufficient quantities to meet Project schedules.
- .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
- .4 Separate different aggregates by strong, full-depth bulkheads, or stockpile far enough apart to prevent intermixing.
- .5 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48h of rejection.
- .6 Stockpile materials in uniform layers of thickness as follows:
  - .1 Max 1.5m for coarse aggregate and base course materials.
  - .2 Max 1.5m for fine aggregate and sub-base materials.
  - .3 Max 1.5m for other materials.
- .7 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .8 Do not cone piles or spill material over edges of piles.
- .9 Do not use conveying stackers.
- .10 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.
- .11 Provide silt fence barrier around perimeter of stockpile (considered incidental to Work).

3.4 AGGREGATE STOCKPILE CLEAN UP

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

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

.2 Final Cleaning: Upon completion, remove sand base and restore stockpile site at completion of the work in accordance with Section 01 74 11.

.3 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

.4 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.

.5 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21.

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

.6 Restrict public access to temporary stockpiles by means acceptable to Departmental Representative.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 Clearing consists of cutting off brush vegetative growth to not more than a specified height above ground and disposing of felled trees, stumps, and surface debris.

.2 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of all fallen timber and surface debris.

.3 Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of specified size to not less than a specified depth below existing ground surface.

.4 Trimming consists of cleanly cutting branch overhangs on trees.

1.2 RELATED SECTIONS

.1 Section 01 35 43 - Environmental Procedures

1.3 STORAGE AND PROTECTION

.1 Prevent damage to fencing, trees, existing buildings, existing pavement, utility lines, site, appurtenances, water courses, root systems of trees which are to remain.

.1 Repair any damaged items to approval of Departmental Representative.

.2 Replace any trees designated to remain, if damaged, as directed by Departmental Representative.

1.4 MEASUREMENT FOR PAYMENT

.1 Measurement Procedures: In accordance with Section 01 11 22 – Measurement and Payment.

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 remain.

.2 Obtain Official Locates and identify all Utility lines as well as all Parks Canada lines and protect all utility lines and Parks Canada lines. Preserve in operating condition active and non- active utilities traversing site. Identify non-active utilities that interfere with work

submitting a drawing and obtain approval to remove utilities from the Departmental Representative as part of the work.

.3 Notify utility authorities before starting clearing and grubbing.

3.2 CLEARING

.1 Clear, as indicated, by cutting at a 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 500 mm above ground surface.

.2 Cut down tree overhangs as indicated on Contract Drawings and as directed by Departmental Representative.

3.3 GRUBBING

.1 Grub out all stumps and roots below ground surface as indicated on Contract Drawings and as directed by the Departmental Representative.

3.4 REMOVAL AND DISPOSAL

.1 Dispose of material in accordance with OPSS 180 General Specification for the Management and Disposal of Excess Material.

.2 Disposal of cleared and grubbed materials by burning will not be permitted.

.3 Chip or mulch material shall be disposed off-site.

3.5 FINISHED SURFACE

.1 Leave ground surface in condition suitable for immediate grading operations to approval of Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 23 10 – Excavating, Trenching and Backfilling

.2 Section 32 11 23 - Aggregate Base Course

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM D698-07e1, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m3).

.2 Canada Green Building Council (CaGBC)

.1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations (including Addendum 2007).

.2 LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.

.3 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Commercial Interiors.

.4 LEED Canada-EB: O M-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Existing Buildings: Operations and Maintenance 2009.

.3 Underwriters Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 EXISTING CONDITIONS

.1 Examine subsurface investigation report which is available upon request.

.2 Known underground and surface utility lines and buried objects are as indicated on site plan.

.3 Refer to dewatering in Section 31 23 10.

Part 2 Products

2.1 MATERIALS

.1 Fill material: Granular B ‘Type II’ in accordance with Section 31 23 10.

.2 Suitability of excavated material for reuse as fill for grading work to be approved by Departmental Representative.

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 rough grading 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 STRIPPING OF TOPSOIL

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Departmental Representative.

.2 Commence topsoil stripping of areas as indicated after area has been cleared of grasses, weeds, brush and removed from site.

.3 Strip topsoil to depths as indicated. Rototill weeds and retain as topsoil on site. Avoid mixing topsoil with subsoil.

.4 Stockpile height not to exceed 3 m.

.5 Dispose of unused topsoil off site as directed by Departmental Representative.

3.3 GRADING

.1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.

.2 Rough grade to following depths below finish grades:

- .1 250 mm for concrete walks
- .2 690 mm for lanes

.3 Slope rough grade away from building as indicated.

.4 Grade ditches to depth as indicated.

.5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm minimum before placing fill over existing ground. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

.6 Compact filled and disturbed areas to corrected maximum dry density to ASTM D698, as per Geotechnical Requirements.

.7 Do not disturb soil within branch spread of trees or shrubs to remain.

3.4 TESTING

.1 Inspection and testing of soil compaction will be carried out by testing laboratory designated by ULC. Costs of tests will be paid under a Cash Allowance by Departmental Representative in accordance with Sections 01 29 83 - Payment Procedures for Testing Laboratory Services and 01 45 00 - Quality Control.

.2 Submit testing procedure, frequency of tests, testing laboratory as designated by Departmental Representative or certified testing personnel to Departmental Representative for approval.

3.5 CLEANING

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

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

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21.

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

3.6 PROTECTION

.1 Protect existing trees, fencing, buildings, pavement, surface or underground utility lines which are to remain as directed by Departmental Representative. If damaged, restore to original or better condition unless directed otherwise.

.2 Maintain access roads to prevent accumulation of construction related debris on roads.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 Earth excavation includes the excavation of all materials, of whatever nature, including asphalt, topsoil, granular, dense tills, and frozen materials that can be ripped and excavated with heavy construction equipment.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 35 43 - Environmental Procedures

.3 Section 31 05 17 - Aggregate Materials

.4 Section 32 11 19 - Granular Sub-Base

.5 Section 32 11 23 - Aggregate Base Course

1.3 REFERENCES

.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/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 D6913-17, Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.

.4 ASTM D1557-12 e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbs/ft) (2,700 kN-m/m³).

.5 ASTM D4318-17 e1, Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian Standard Association (CSA).

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.2 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete.

.3 Ontario Provincial Standards (OPSS).

.1 OPSS 1003 Aggregates - Hot Mixed, Hot Laid, Asphaltic Concrete.

.2 OPSS 1010 Aggregates - Granular A, B, M and select sub-grading materials.

1.4 DEFINITIONS

.1 Unclassified excavation: excavation of deposits, of whatever character, encountered in Work.

.2 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping, and seeding.

.3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

.4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.

.5 Unsuitable materials:

.1 Weak and compressible materials under excavated areas.

.2 Frost susceptible materials under excavated areas.

.3 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422, and ASTM C136-96a: Sieve sizes to CAN/CGSB-8.1-88.

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

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

.3 Unshrinkable fill: very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.5 PROTECTION OF EXISTING FEATURES

.1 Existing buried utilities and structures:

.1 Size, depth, and location of existing utilities and structures if indicated are for guidance only. Completeness and accuracy are not guaranteed.

.2 Prior to commencing excavation Work, arrange with the designated utility locator to stake existing Municipal, Parks Canada, and private utility locations.

.3 Confirm locations of buried utilities by careful test excavations.

.4 Maintain and protect from damage, water, sewer, gas, electric, telephone, and other utilities and structures encountered.

.5 Where unidentified utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing.

.6 Record location of maintained, re-routed, and abandoned underground lines.

.2 Existing features:

.1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by work.

.2 Protect existing features from damage while Work is in progress. In event of damage, immediately make repair to approval of Departmental Representative.

.3 Where required for excavation, cut roots or branches as approved by Departmental Representative.

1.6 SHORING, BRACING AND UNDERPINNING

.1 Protect existing features in accordance with applicable local regulations.

.2 Engage services of qualified Professional Engineer who is registered or licensed in the province of Ontario, Canada in which work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for work.

.3 Submit design and supporting data at least 2 weeks prior to commencing work.

.4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in the province of Ontario, Canada.

1.7 EXCAVATION AND BACKFILLING REQUIRED BY OTHER SECTIONS

.1 Excavation and backfilling for site services is included in this Section and shall be carried out in accordance with provisions specified herein and as indicated on drawings. This work to be laid out and supervised by trade concerned.

1.8 MEASUREMENT FOR PAYMENT

.1 Measurement Procedures: In accordance with Section 01 11 22 – Measurement and Payment.

Part 2 Products

2.1 Materials

.1 Granular A to Ontario Provincial Standard Specification OPSS 1010, Maximum size 19 mm.

.2 Granular B ‘Type II’ to Ontario Provincial Standard Specification OPSS 1010, Maximum size 65 mm.

.3 Select sub-grade backfill: selected material from excavation or other sources, approved by Engineer for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials per OPSS 1010.

.4 Sand: clean, washed, minimum 100% passing 4.75 mm sieve, maximum 5% passing 0.075 mm sieve to OPSS 1010.

.5 Geotextiles: per Section 31 32 21.

Part 3 Execution

3.1 GEOTECHNICAL REPORT

.1 Refer to Geotechnical Report for site specific information.

3.2 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 and Environmental Protection specification.

.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 SITE PREPARATION

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

.2 Cut pavement neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.4 PREPARATION / PROTECTION

.1 Protect existing features as required.

.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 Department Representative's approval.

.4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.5 Protect buried services that are required to remain undisturbed.

3.5 STRIPPING OF TOPSOIL

.1 Begin topsoil stripping of areas as indicated after area has been cleared of brush and weeds and removed off site.

.2 Strip topsoil to depths as indicated or as directed by Departmental Representative. 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 as directed by Departmental Representative.

3.6 STOCKPILING

.1 Topsoil to be removed from site shall be disposed of off-site in locations arranged by the Contractor.

.2 Protect fill materials from contamination.

.3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries into water bodies.

3.7 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while work is in progress.

.2 Provide for Departmental Representative's approval details of proposed dewatering or heave prevention methods, including well points (if applicable).

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur. Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.

.4 Protect open excavations against flooding and damage due to surface run-off.

.5 Dispose of water in accordance with Section 01 56 00 and in manner not detrimental to public and private property, or any portion of work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits as required.

3.8 EXCAVATION

.1 Excavate to lines, grades, elevations, and dimensions as indicated in accordance with OPSS.PROV 410 and the contract drawings.

.2 If soils with visual and/or olfactory evidence of contamination not previously identified within this document are observed during construction, the Contractor shall contact the Departmental Representative immediately. Determining the soil management procedures for these soils shall be handled as required on an incident basis, with close involvement of the Contractor and the Departmental Representative.

.3 Dispose of waste material (i.e. asphalt, excess or unsuitable excavated material) off-site.

.4 Do not obstruct flow of surface drainage or natural watercourses.

.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.

.8 Earth bottoms of excavations to be undisturbed soil, level, and free from loose, soft, or organic matter.

.9 Notify Departmental Representative when bottom of excavation is reached.

.10 Obtain Departmental Representative approval of completed excavation.

.11 Remove unsuitable material from trench bottom to extent and depth as directed by Departmental Representative.

.12 Correct unauthorized over-excavation as follows:

.1 Fill with Granular A to depths indicated on Contract Drawings, compacted to not less than 95% of corrected maximum dry density.

.13 Trim, make firm, and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

.14 Excavated topsoil and subgrade not to reused for reinstatement, to be disposed off site. Coordinate with Department Representative.

.15 Install geotextiles in accordance with Section 31 32 21.

.16 All open excavations shall be protected from freezing.

3.9 Fill Types and Compaction

.1 Use fill types as indicated on the drawings. Compaction shall be as per Departmental Representative.

3.10 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular A material for bedding and surround of underground services. Cover material to extend above pipe obvert, as indicated.

.2 Place bedding and surround material in unfrozen condition.

3.11 BACKFILLING

.1 Do not proceed with backfilling operations until Departmental Representative has inspected and approved installations.

.2 Areas to be backfilled to be free from debris, snow, ice, water, and frozen ground.

.3 Do not use backfill material which is frozen, or contains ice, snow, or debris.

.4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

3.12 COMPACTION OF ROADWAY

.1 Compaction in accordance with OPSS 314.

.2 Contractor shall proof-roll excavated area prior to the placement of any granular material.

3.13 Restoration

.1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21. Trim slopes, and correct defects as directed by Departmental Representative.

.2 Replace all disturbed topsoil as indicated and to the satisfaction of the Departmental Representative.

.3 Clean and reinstate areas affected by work as directed by Departmental Representative.

END OF SECTION

Part 1 General

1.1 DELIVERY AND STORAGE

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

1.2 MEASUREMENT FOR PAYMENT

.1 Measurement Procedures: In accordance with Section 01 11 22 – Measurement and Payment.

Part 2 Products

2.1 MATERIAL

.1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls.

.2 Seams: sewn or lapped in accordance with manufacturer's recommendations.

.3 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

.4 Physical properties:

- .1 Thickness: to CAN/CGSB-148.1-M85, number 3 minimum 3.5 mm.
- .2 Mass per unit area: to CAN/CGSB-148.1-M85, number 2, minimum 375 g/m.
- .3 Tensile strength and elongation (in any principal direction): to CAN/CGSB-4.2-90, method 9.2.
  - .1 Tensile strength: minimum 690 N, wet condition.
  - .2 Seam strength: equal to or greater than tensile strength of fabric.
  - .3 Mullen burst strength: to CAN/CGSB-4.2-M88, method 11.1, minimum 2.2 kPa, wet condition.

.5 Geotextile sock for perforated subdrain as per OPSS 1860.

Part 3 Execution

3.1 INSTALLATION

.1 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

.2 Overlap each successive strip of geotextile 500 mm over previously laid strip.

.3 Join successive strips of geotextile by sewing.

.4 Protect geotextile material from displacement and damage during placement of filter stone material.

.5 Replace damaged or deteriorated geotextile.

END OF SECTION

GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 35 43 – Environmental Procedures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Section 03 30 00 – Cast-In-Place Concrete; Section 03 20 00 – Concrete Reinforcing.

.4 Section 03 20 00 – Concrete Reinforcing.

1.2 DESCRIPTION

.1 This work shall consist of constructing micropiles as shown on the contract plans and approved working drawings and as specified herein. The micropile specialty Contractor is responsible for furnishing of all design, materials, products, accessories, tools, equipment, services, transportation, labor and supervision, and manufacturing techniques required for design, installation and testing of micropiles and pile top attachments for this project.

.2 The selected micropile Contractor shall select the micropile type, size, pile top attachment, installation means and methods, estimate the ground-grout bond value and determine the required grout bond length and final micropile diameter. The micropile Contractor shall design and install micropiles that will develop the load capacities indicated on the contract plans. The micropile load capacities shall be verified by verification and proof load testing as required and must meet the test acceptance criteria specified herein.

.3 Where the imperative mood is used within this specification, “The Contractor shall” is implied.

1.3 MICROPILE CONTRACTOR’S EXPERIENCE REQUIREMENTS AND SUBMITTALS

.1 The micropile Contractor shall be experienced in the construction and load testing of micropiles and have successfully constructed at least five (5) projects in the last five (5) years involving construction totaling at least 100 micropiles of similar capacity to those required in these plans and specifications.

.2 The Contractor shall have previous micropile drilling and grouting experience in soil/rock similar to project conditions. The Contractor shall submit construction details, structural details and load test results for at least three previous successful micropile load tests from different projects of similar scope to this project.

.3 The Contractor shall assign an Engineer to supervise the work with experience on at least three (3) projects of similar scope to this project completed over the past five (5) years. The Contractor shall not use consultants or manufacturers’ representatives to satisfy the supervising Engineer requirements of this section. The on-site foremen and drill rig operators shall also have experience on at least three (3) projects over the past five (5) years installing micropiles of equal or greater capacity than required in these plans and specifications.

.4 The micropiles shall be designed by a Registered Professional Engineer with experience in the design of at least three (3) successfully completed micropile projects over the past five (5) years, with micropiles of similar capacity to those required in these plans and specifications. The micropile designer may be either an employee of the Contractor or a separate Consultant designer meeting the stated experience requirements.

.5 At least 45 calendar days before the planned start of micropile construction, the Contractor shall submit the completed project reference list and a personnel list. The project reference list shall include a brief project description with the owner's name and current phone number and load test reports. The personnel list shall identify the micropile system designer (if applicable), supervising project Engineer, drill rig operators, and onsite foremen to be assigned to the project. The personnel list shall contain a summary of each individual's experience and be complete enough for the Engineer to determine whether each individual satisfies the required qualifications. The Engineer will approve or reject the Contractor's qualifications within 15 calendar days after receipt of a complete submission. Additional time required due to incomplete or unacceptable submittals will not be cause for time extension or impact or delay claims. All costs associated with incomplete or unacceptable submittals shall be borne by the Contractor.

.6 Work shall not be started, nor materials ordered, until the Engineer's written approval of the Contractor's experience qualifications is given. The Engineer may suspend the Work if the Contractor uses non-approved personnel. If work is suspended, the Contractor shall be fully liable for all resulting costs and no adjustment in contract time will result from the suspension.

1.4 DEFINITIONS

.1 **Admixture**: Substance added to the grout to control bleed and/or shrinkage, improve flowability, reduce water content, or retard setting time.

.2 **Alignment Load (AL)**: An initial load applied to micropile during testing to keep the testing equipment correctly positioned (Typically 5% maximum test load).

.3 **Bonded Length**: The length of the micropile that is bonded to the ground and conceptually used to transfer the applied axial loads to the surrounding soil or rock. Also known as the load transfer length.

.4 **Bond-breaker**: A sleeve placed over the steel reinforcement to prevent load transfer.

.5 **Casing**: Steel tube introduced during the drilling process in overburden soil to temporarily stabilize the drill hole. This is usually withdrawn as the pile is grouted, although in certain types of micropiles, some casing is permanently left in place to provide added pile reinforcement.

.6 **Centralizer**: A device to support and position the reinforcing steel in the drill hole and/or casing so that a minimum grout cover is provided.

.7 **Contractor**: The person/firm responsible for performing the micropile work.

.8 **Coupler**: The means by which load capacity can be transmitted from one partial length of reinforcement to another.

.9 **Creep Movement**: The movement that occurs during the creep test of a micropile under a constant load.

.10 **Design Load (DL)**: The maximum ULS factored load expected to be applied to the micropile during its service life.

.11 **Encapsulation**: A corrugated or deformed tube protecting the reinforcing steel against corrosion.

.12 **Engineer**: The Owner or Owner's authorized agent.

.13 **Free (Unbonded) Length**: The designed length of the micropile that is not bonded to the surrounding ground or grout.

.14 **Geotechnical Bond Design Strength**: For Ultimate Limits States (ULS) or Load Factor Design (LFD), computed as the nominal grout-to-ground bond strength multiplied by a geotechnical resistance factor φ_g. Use:

.1 $\varphi_g = 0.6$ for compression loading

.2 $\varphi_g = 0.4$ for compression loading

.15 **Micropile**: A small-diameter, bored, cast-in-place composite pile, in which the applied load is resisted by steel reinforcement, cement grout and frictional grout/ground bond.

.16 **Maximum Test Load**: The maximum load to which the micropile is subjected during testing

.17 **Nominal Grout-to-Ground Bond Strength**: The estimated ultimate geotechnical unit grout-to-ground bond strength selected for use in design.

.18 **Overburden**: Material, natural or placed, that may require cased drilling methods to provide an open borehole to underlying strata.

.19 **Post-grouting**: The injection of additional grout into the load transfer length of a micropile after the primary grout has set. Also known as regrouting or secondary grouting.

.20 **Primary Grout**: Portland-cement-based grout injected into the micropile hole prior to or after the installation of the reinforcement to direct the load transfer to the surrounding ground along the micropile.

.21 **Proof Load Test**: Incremental loading of a production micropile, recording the total movement at each increment.

.22 **Reinforcement**: The steel component of the micropile that accepts and/or resists applied loadings.

.23 **Sheathing**: Smooth or corrugated piping or tubing that protects the reinforcing steel against corrosion.

.24 **Spacer**: A device to separate elements of a multiple-element reinforcement.

.25 **Ultimate Load (UL)**: Micropile load corresponding to the nominal grout-to-ground bond strength for the pile configuration and dimensions.

.26 **Verification Load Test**: Pile load test performed to verify the design of the pile system and the construction methods proposed, prior to installation of production piles. Test piles are typically constructed to full scale or may be scaled for practical testing purposes.

1.5 REFERENCED CODES AND STANDARDS

.1 The following publications form a part of this specification to the extent indicated by the references. The latest publication as of the issue date of this specification shall govern, unless indicated otherwise:

.2 American Society for Testing and Materials (ASTM) & American Association of State Highway and Transportation Officials (AASHTO)

.1 ASTM A36, A572, AASHTO M183, M223 - Structural Steel

.2 ASTM A1064, AASHTO M55 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

.3 ASTM A252 - Welded and Seamless Steel Pipe Piles

.4 ASTM A615, AASHTO M31 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement

.5 ASTM A722 - Uncoated High-Strength Steel Bar for Prestressing Concrete

.6 ASTM A775 - Epoxy -Coated Reinforcing Steel Bars

.7 ASTM A934 - Epoxy-Coated Prefabricated Steel Reinforcing Bars

.8 ASTM C33, AASHTO M80 - Concrete Aggregates

.9 ASTM C109 - Compressive Strength of Hydraulic Cement Mortar

.10 ASTM C188, AASHTO T133 - Density of Hydraulic Cement

.11 ASTM C144 - Aggregate for Masonry Mortar

.12 ASTM C150. AASHTO M85 - Portland Cement

.13 ASTM C494, AASHTO M194 - Chemical Admixtures for Concrete

.14 ASTM D1143 - Method of Testing Piles Under Static Axial Compressive Load

.15 ASTM D1784 - Polyvinyl Chloride (PVC) Pipe (Class 13464-B)

.16 ASTM D3350, AASHTO M252 - Polyethylene Corrugated Tubing

.17 ASTM D3689 - Method of Testing Individual Piles Under Static Axial Tensile Load

.18 ASTM D3966 Standard Test Method for Piles Under Lateral Load

.19 AASHTO T26 Quality of Water to be Used in Concrete

.3 Canadian Codes

.1 CSA W59-13 - Welded Steel Construction (Metal Arc Welding)

.2 CSA W186-M1990 (R2012) - Welding of Reinforcing Bars in Reinforced Concrete Construction

.3 CSA G40.20-13/G40.21-13 - General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel.

.4 CSA S16-14 - Design of Steel Structures.

.5 CSA W48-14 - Filler Metals and Allied Materials for Metal Arc Welding.

.6 CSA 47.1-09 (R2014) - Certification of Companies for Fusion Welding of Steel.

.4 American Society of Civil Engineers (ASCE):

.1 ASCE 20-96 - Standard Guidelines for the Design and Installation of Pile Foundations.

.5 Deep Foundations Institute (DFI)

.1 Guide to Drafting a Specification for High Capacity Drilled and Grouted Micropiles for Structural Support, 1st Edition, Copyright 2001 by the Deep Foundation Institute (DFI).

.6 U.S. Department of Transportation, Federal Highway Administration (FHWA)

.1 FHWA-SA-97-070 - Micropile Design and Construction Guidelines Manual

.2 NHI-05-039 - Micropile Design & Construction

1.6 AVAILABLE INFORMATION

.1 Available information developed by the Owner, or by the Owner's duly authorized representative include the following items:

.1 Plans prepared by WSP, dated 2021-10-29.

.2 Geotechnical Report titled Lower Brewers Swing Bridge Replacement Geotechnical Investigation, dated October 2021.

1.7 CONSTRUCTION SITE SURVEY

.1 Before bidding the Work, the Contractor shall review the available subsurface information and visit the site to assess the site geometry, equipment access conditions, and location of existing structures and above ground facilities.

.2 The Contractor is responsible for field locating and verifying the location of all utilities shown on the plans prior to starting the Work. Maintain uninterrupted service for those utilities designated to remain in service throughout the Work. Notify the Engineer of any utility locations different from shown on the plans that may require micropile relocations or structure design modification. Subject to the Engineer's approval, additional cost to the Contractor due to micropile relocations and/or structure design modification resulting from utility locations different from shown on the plans, will be paid as Extra Work.

.3 Prior to start of any micropile construction activity, the Contractor and Engineer shall jointly inspect the site to observe and document the pre-construction condition of the site, existing structures and facilities.

1.8 MICROPILE DESIGN REQUIREMENTS

.1 The micropiles shall be designed to meet the specified loading conditions, as shown on the contract plans and approved working drawings. Design the micropiles and pile top to footing connections using the Service Load Design (SLD) procedures contained in the FHWA "Micropile Design and Construction Guidelines Manual", Report No. FHWA-SA-97-070.

.2 The required geotechnical resistance factors (for ULS or LFD Design) shall be in accordance with the FHWA manual, unless specified otherwise. Estimated soil/rock design shear strength

parameters, unit weights, applied foundation loadings, slope and external surcharge loads, corrosion protection requirements, known utility locations, easements, right-of-ways and other applicable design criteria will be as shown on the plans or specified herein.

.3 Steel pipe used for micropile permanent casing shall incorporate an additional 1.6 mm thickness of sacrificial steel for corrosion protection, unless specified otherwise.

.4 Where required as shown on the contract plans, corrosion protection of the internal steel reinforcing bars, consisting of either encapsulation, epoxy coating, or grout, shall be provided. Where permanent casing is used for a portion of the micropile, encapsulation shall extend at least 1.5 m into the casing.

1.9 MICROPILE DESIGN SUBMITTALS.

.1 At least 21 calendar days before the planned start of micropile structure construction, submit complete design calculations and working drawings to the Engineer for review and approval. Include all details, dimensions, quantities, ground profiles, and cross-sections necessary to construct the micropile structure. Verify the limits of the micropile structure and ground survey data before preparing the detailed working drawings.

.2 The drawings and calculations shall be signed and sealed by the contractor's Professional Engineer or by the Consultant designer's Professional Engineer (if applicable), previously approved by the owner's Engineer. If the micropile contractor uses a consultant design engineer to prepare the design, the micropile contractor shall still have overall contract responsibility for both the design and the construction.

1.10 DESIGN CALCULATIONS

.1 Design calculations shall include, but not be limited to, the following items:

.1 A written summary report which describes the overall micropile design.

.2 Applicable code requirements and design references.

.3 Design calculation sheets (both static and seismic) with the project number, micropile structure location, designation, date of preparation, initials of designer and checker, and page number at the top of each page.

.4 Micropile structure critical design cross-section(s) geometry including soil/rock strata and water levels and location, magnitude and direction of design applied loadings, including slope or external surcharge loads.

.5 Design criteria including, soil/rock shear strengths (friction angle and cohesion), unit weights, and ground-grout bond values and micropile drill-hole diameter assumptions for each soil/rock strata.

.6 Load and resistance factors used in the design on the ground-grout bond values, surcharges, soil/rock and material unit weights, steel, grout, and concrete materials.

.7 Seismic design earthquake acceleration coefficient.

.8 Design notes including an explanation of any symbols and computer programs used in the design.

.9 Pile to footing connection calculations within the pile cap configuration shown on the contract drawings.

1.11 WORKING DRAWINGS

.1 The working drawings shall include all information required for the construction and quality control of the piling. Working drawings shall include, but not be limited to, the following items unless provided in the contract plans:

.1 A plan view of the micropile structure(s) identifying:

.1 A reference baseline and elevation datum.

.2 The offset from the construction centerline or baseline to the face of the micropile structure at all changes in horizontal alignment.

.3 Beginning and end of micropile structure stations.

.4 Right-of-way and permanent or temporary construction easement limits, location of all known active and abandoned existing utilities, adjacent structures or other potential interferences. The centerline of any drainage structure or drainage pipe behind, passing through, or passing under the micropile structure.

.5 Subsurface exploration locations shown on a plan view of the proposed micropile structure alignment with appropriate reference base lines to fix the locations of the explorations relative to the micropile structure.

.2 An elevation view of the micropile structure(s) identifying:

.1 Elevation view showing micropile locations and elevations; vertical and horizontal spacing; batter and alignment and the location of drainage elements (if applicable).

.2 Existing and finish grade profiles both behind and in front of the micropile structure.

.3 Design parameters and applicable codes.

.4 General notes for constructing the micropile structure including construction sequencing or other special construction requirements.

.5 Horizontal and vertical curve data affecting the micropile structure and micropile structure control points. Match lines or other details to relate micropile structure stationing to centerline stationing.

.6 A listing of the summary of quantities on the elevation drawing of each micropile structure showing pay item estimated quantities (if applicable).

.7 Micropile typical sections including micropile spacing and inclination; minimum drillhole diameter; pipe casing and reinforcing bar sizes and details; splice types and locations; centralizers and spacers; grout bond zone and casing plunge lengths (if used);

corrosion protection details; and connection details to the substructure footing, anchorage, plates, etc.

.8 A typical detail of verification and production proof test micropiles defining the micropile length, minimum drillhole diameter, inclination, and load test bonded and unbonded test lengths (if applicable).

.9 Details, dimensions, and schedules for all micropiles, casing and reinforcing steel, including reinforcing bar bending details.

.10 Revise the drawings when plan dimensions are changed due to field conditions or for other reasons. Within 30 days after completion of the work, submit as-built drawings to the Engineer. Provide revised design calculations signed by the approved Registered Professional Engineer for all design changes made during the construction of the micropile structure.

1.12 CONSTRUCTION SUBMITTALS

.1 Work other than test pile installation shall not begin until the construction submittals have been received, reviewed, and accepted in writing by the Engineer. Provide work plan, schedule, welding procedure, headroom requirements and surface water control plan at least 21 calendar days prior to initiating micropile construction.

.2 Provide mill reports as the work progresses for each delivery.

.3 Provide grout plan and load test plan at least seven days prior to start of micropile load testing or incorporation of the respective materials into the work.

.4 The Contractor shall allow the Engineer seven (7) calendar days to review the construction submittals after a complete set has been received. Additional time required due to incomplete or unacceptable submittals shall not be cause for delay or impact claims. All costs associated with incomplete or unacceptable Contractor submittals shall be the responsibility of the Contractor.

.5 Work Plan: Detailed step-by-step description of the proposed micropile construction procedure, including personnel, testing and equipment to assure quality control. This step-by-step procedure shall be shown on the working drawings in sufficient detail to allow the Engineer to monitor the construction and quality of the micropiles.

.6 Schedule: Proposed start date and time schedule and micropile installation schedule providing the following:

.1 Micropile number

.2 Micropile design load

.3 Type and size of reinforcing steel

.4 Minimum total bond length

.5 Total micropile length

.6 Micropile top footing attachment

.7 Welding procedure: If welding of casing is proposed, submit the proposed welding procedure, certified by a qualified welding specialist.

.8 Information on headroom and space requirements for installation equipment that verify the proposed equipment can perform at the site.

.9 Surface Water Control Plan describing how surface water, drill flush, and excess waste grout will be controlled and disposed.

.10 Certified mill test reports for the reinforcing steel or coupon test results for permanent casing without mill certification. The ultimate strength, yield strength, elongation, and material properties composition shall be included. For API N-80 pipe casing, coupon test results may be submitted in lieu of mill certification.

.11 Proposed Grouting Plan. The grouting plan shall include complete descriptions, details, and supporting calculations for the following:

.1 Grout mix design and type of materials to be used in the grout including certified test data and trial batch reports.

.2 Methods and equipment for accurately monitoring and recording the grout depth, grout volume and grout pressure as the grout is being placed.

.3 Grouting rate calculations, when requested by the Engineer. The calculations shall be based on the initial pump pressures or static head on the grout and losses throughout the placing system, including anticipated head of drilling fluid (if applicable) to be displaced.

.4 Estimated curing time for grout to achieve specified strength. Previous test results for the proposed grout mix completed within one year of the start of grouting may be submitted for initial verification and acceptance and start of production work. During production, grout shall be tested in accord with PART 3.

.5 Procedure and equipment for Contractor monitoring of grout quality.

.12 Load Testing Plan: Detailed plans for the proposed micropile load testing method. This shall include all drawings, details, and structural design calculations necessary to clearly describe the proposed test method, reaction load system capacity and equipment setup, types and accuracy of apparatus to be used for applying and measuring the test loads and pile top movements in accordance with Section 3.12, Pile Load Tests.

.13 Calibration reports and data for each test jack, pressure gauge and master pressure gauge and electronic load cell to be used. The calibration tests shall have been performed by an independent testing laboratory, and tests shall have been performed within 90 calendar days of the date submitted. Testing shall not commence until the Engineer has reviewed and accepted the jack, pressure gauge, master pressure gauge and electronic load cell calibration data.

1.13 PRE-CONSTRUCTION MEETING

.1 A pre-construction meeting will be scheduled by the Contractor and held prior to the start of micropile construction. The Engineer, prime Contractor, micropile specialty Contractor, micropile designer, excavation Contractor and geotechnical instrumentation specialist (if applicable) shall attend the meeting. Attendance is mandatory. The pre-construction meeting will be conducted to clarify the construction requirements for the work, to coordinate the construction

schedule and activities, and to identify contractual relationships and delineation of responsibilities amongst the prime Contractor and the various Subcontractors – specifically those pertaining to excavation for micropile structures, anticipated subsurface conditions, micropile installation and testing, micropile structure survey control and site drainage control.

1.14 PAYMENT

.1 Measurement procedures for the following unit price item shall be paid for under payment items in the unit price table:

.1 Item No. 23 - Micropiles – The work shall include the full compensation of all labour, equipment and materials necessary to complete the work as described in this section. The cost of mobilization shall be averaged out over the estimated number of units (m) and the cost of the test pile is included in the estimated quantity shown in the unit price table.

PART 2 - MATERIALS

.1 Furnish materials new and without defects. Remove defective materials from the jobsite at no additional cost. Materials for micropiles shall consist of the following:

.1 **Admixtures for Grout**: Admixtures shall conform to the requirements of ASTM C494/AASHTO M194. Admixtures that control bleed, improve flowability, reduce water content, and retard set may be used in the grout, subject to the review and acceptance of the Engineer. Admixtures shall be compatible with the grout and mixed in accordance with the manufacturer's recommendations. Expansive admixtures shall only be added to the grout used for filling sealed encapsulations and anchorage covers. Accelerators are not permitted. Admixtures containing chlorides are not permitted.

.2 **Cement**: All cement shall be Portland cement conforming to ASTM C lSO/AASHTO M85, Types II, III or V.

.3 **Centralizers and Spacers**: Centralizers and spacers shall be fabricated from schedule 40 PVC pipe or tube, steel, or material non-detrimental to the reinforcing steel. Wood shall not be used. Centralizers and spacers shall be securely attached to the reinforcement; sized to position the reinforcement within 10 mm of plan location from center of pile; sized to allow grout tremie pipe insertion to the bottom of the drillhole; and sized to allow grout to freely flow up the drillhole and casing and between adjacent reinforcing bars.

.4 **Encapsulation**: Encapsulation (double corrosion protection) shall be shop fabricated using high-density, corrugated polyethylene tubing conforming to the requirements of ASTM D3350/AASHTO M252 with a nominal wall thickness of 0.8 mm. The inside annulus between the reinforcing bars and the encapsulating tube shall be a minimum of 5mm and be fully grouted with non-shrink grout conforming to PART 2.

.5 **Epoxy Coating**: The minimum thickness of coating applied electrostatically to the reinforcing steel shall be 0.3 mm. Epoxy coating shall be in accordance with ASTM A775 or ASTM A934. Bend test requirements are waived. Bearing plates and nuts encased in the pile concrete footing need not be epoxy coated.

.6 **Fine Aggregate**: If sand - cement grout is used, sand shall conform to ASTM C 144/AASHTO M45.

.7 **Grout**: Neat cement or sand/cement mixture with a minimum three (3)-day compressive strength of 14 MPa and a 28day compressive strength of 28 MPa per AASHTO T106/ASTM C109.

.8 **Grout Protection**: Provide a minimum 25 mm grout cover over bare or epoxy coated bars (excluding bar couplers) or minimum 12 mm grout cover over the encapsulation of encapsulated bars.

.9 **Permanent Casing Pipe**: Permanent steel casing/pipe shall have the diameter and at least minimum wall thickness shown on the approved Working Drawings. The permanent steel casing/pipe:

.1 Shall meet the Tensile Requirements of ASTM A252, Grade 3, except the yield strength shall be a minimum of 345 MPa to 552 MPa as used in the design submittal.

.2 .2 May be new “Structural Grade” (a.k.a. “Mill Secondary”) steel pipe meeting above but without Mill Certification, free from defects (dents, cracks, tears) and with two (2) coupon tests per truckload delivered to the fabricator.

.10 For permanent casing/pipe that will be welded, the following material conditions apply:

.1 The carbon equivalency (CE) as defined in AWS D1.1, Section X15.1, shall not exceed 0.45, as demonstrated by mill certifications

.2 The sulfur content shall not exceed 0.05%, as demonstrated by mill certifications

.11 For permanent casing/pipe that will be shop or field welded, the following fabrication or construction conditions apply:

.1 The steel pipe shall not be joined by welded lap splicing

.2 Welded seams and splices shall be complete penetration welds

.3 Partial penetration welds may be restored in conformance with AWS D1.1

.4 The proposed welding procedure certified by a welding specialist shall be submitted for approval

.12 Threaded casing joints shall develop at least the required nominal resistance used in the design of the micropile.

.13 **Plates and Shapes**: Structural steel plates and shapes for pile top attachments shall conform to CSA G40.21 Grade 350.

.14 Reinforcing Bars: Reinforcing steel shall be deformed bars in accordance with ASTM A615/AASHTO M31, Grade 420 or Grade 520 or ASTM A722/AASHTO M275, Grade 1035. When a bearing plate and nut are required to be threaded onto the top end of reinforcing bars for the pile top to footing anchorage, the threading may be continuous spiral deformed ribbing provided by the bar deformations (e.g., Dywidag or Williams continuous threadbars) or may be cut into a reinforcing bar. If threads are cut into a reinforcing bar, the next larger bar number designation from that shown on the Plans shall be provided, at no additional cost. All bars to be double corrosion protected.

.15 Bar tendon couplers, if required, shall develop the ultimate tensile strength of the bars without evidence of any failure.

.16 Sheathing: Smooth or corrugated plastic sheathing, including joints, shall be watertight. Polyvinyl chloride (PVC) sheathing shall conform to ASTM D1784, Class 13464-B.

.17 Water: Water used in the grout mix shall conform to AASHTO T26 and shall be potable, clean, and free from substances that may be injurious to cement and steel.

PART 3 - EXECUTION

.1 Site drainage control.

.1 The Contractor shall control and properly dispose of drill flush and construction related waste, including excess grout, in accord with the standard specifications and all applicable local codes and regulations. Provide positive control and discharge of all surface water that will affect construction of the micropile installation. Maintain all pipes or conduits used to control surface water during construction. Repair damage caused by surface water at no additional cost. Upon substantial completion of the Work, remove surface water control pipes or conduits from the site. Alternatively, with the approval of the Engineer, pipes or conduits that are left in place may be fully grouted and abandoned or left in a way that protects the structure and all adjacent facilities from migration of fines through the pipe or conduit and potential ground loss.

.2 Excavation

.1 Coordinate the work and the excavation so the micropile structures are safely constructed. Perform the micropile construction and related excavation in accordance with the Plans and approved submittals. No excavations steeper than those specified herein or shown on the Plans will be made above or below the micropile structure locations without written approval of the Engineer.

.2 Immediately contact the Engineer if unanticipated existing subsurface structures are discovered during excavation or drilling. Suspend work in these areas until remedial measures meeting the Engineer’s approval are implemented.

.3 Micropile Allowable Construction Tolerances

.1 Centerline of piling shall not be more than 75 mm from indicated plan location.

.2 Pile shall be plumb within 2% of total-length plan alignment.

.3 Top elevation of pile shall be plus 25 mm or minus 50 mm maximum from vertical elevation indicated.

.4 Centerline of reinforcing steel shall not be more than 15 mm from indicated location.

.4 Micropile Installation

.1 The micropile Contractor shall select the drilling method, the grouting procedure and the grouting pressure used for the installation of the micropiles. The micropile Contractor shall also determine the micropile casing size, final drillhole diameter and bond length, and central tendon reinforcement steel sizing necessary to develop the specified load

capacities and load testing requirements. The micropile Contractor is also responsible for estimating the grout take. There will be no extra payment for grout overruns.

.2 Drilling

.1 The drilling equipment and methods shall be suitable for drilling through the conditions to be encountered, without causing damage to any overlying or adjacent structures or services. The drillhole must be open along its full length to at least the design minimum drillhole diameter prior to placing grout and reinforcement.

.2 Temporary casing or other approved method of anchor drillhole support will be required in caving or unstable ground to permit the anchor shaft to be formed to the minimum design drillhole diameter. The Contractor's proposed method(s) to provide drillhole support and to prevent detrimental ground movements shall be reviewed by the Engineer. Detrimental ground movement is defined as movement which requires remedial repair measures. Use of drilling fluid containing bentonite is not allowed.

.3 Ground Heave or Subsidence

.1 During construction, the Contractor shall observe the conditions vicinity of the micropile construction site on a daily basis for signs of ground heave or subsidence. Immediately notify the Engineer if signs of movements are observed. Contractor shall immediately suspend or modify drilling or grouting operations if ground heave or subsidence is observed, if the micropile structure is adversely affected, or if adjacent structures are damaged from the drilling or grouting. If the Engineer determines that the movements require corrective action, the Contractor shall take corrective actions necessary to stop the movement or perform repairs. When due to the Contractor's methods or operations or failure to follow the specified/approved construction sequence, as determined by the Engineer, the costs of providing corrective actions will be borne by the Contractor. When due to differing site conditions, as determined by the Engineer, the costs of providing corrective actions will be paid as Extra Work.

.4 Pipe Casing and Reinforcing Bars Placement and Splicing

.1 Reinforcement may be placed either prior to grouting or placed into the grout - filled drillhole before temporary casing (if used) is withdrawn. Reinforcement surface shall be free of deleterious substances such as soil, mud, grease or oil that might contaminate the grout or coat the reinforcement and impair bond. Pile cages and reinforcement groups, if used, shall be sufficiently robust to withstand the installation and grouting process and the withdrawal of the drill casings without damage or disturbance.

.2 The Contractor shall check pile top elevations and adjust all installed micropiles to the planned elevations.

.3 Centralizers and spacers (if used) shall be provided at 3 m centers maximum spacing. The upper and lower most centralizer shall be located a maximum of 1.5 m from the top and bottom of the micropile. Centralizers and spacers shall permit the free flow of grout without misalignment of the reinforcing bar(s) and permanent casing. The central reinforcement bars with centralizers shall be

lowered into the stabilized drillhole and set. The reinforcing steel shall be inserted into the drill hole to the desired depth without difficulty. Partially inserted reinforcing bars shall not be driven or forced into the hole. Contractor shall redrill and reinsert reinforcing steel when necessary to facilitate insertion.

.4 Lengths of casing and reinforcing bars to be spliced shall be secured in proper alignment and in a manner to avoid eccentricity or angle between the axes of the two lengths to be spliced. Splices and threaded joints shall meet the requirements of PART 2. Threaded pipe casing joints shall be located at least two casing diameters (OD) from a splice in any reinforcing bar. When multiple bars are used, bar splices shall be staggered at least 0.3 meters.

.5 Grouting

.1 Micropiles shall be primary grouted the same day the load transfer bond length is drilled. The Contractor shall use a stable neat cement grout or a sand cement grout with a minimum 28-day unconfined compressive strength of 28 MPa. Admixtures, if used, shall be mixed in accordance with manufacturer's recommendations. The grouting equipment used shall produce a grout free of lumps and undispersed cement. The Contractor shall have means and methods of measuring the grout quantity and pumping pressure during the grouting operations. The grout pump shall be equipped with a pressure gauge to monitor grout pressures. A second pressure gauge shall be placed at the point of injection into the pile top. The pressure gauges shall be capable of measuring pressures of at least 1 MPa or twice the actual grout pressures used, whichever is greater. The grout shall be kept in agitation prior to mixing. Grout shall be placed within one hour of mixing. The grouting equipment shall be sized to enable each pile to be grouted in one continuous operation. The grout shall be injected from the lowest point of the drill hole and injection shall continue until uncontaminated grout flows from the top of the pile. The grout may be pumped through grout tubes, casing, hollow-stem augers, or drill rods. Temporary casing, if used, shall be extracted in stages ensuring that, after each length of casing is removed the grout level is brought back up to the ground level before the next length is removed. The tremie pipe or casing shall always extend below the level of the existing grout in the drillhole. The grout pressures and grout takes shall be controlled to prevent excessive heave or fracturing of rock or soil formations. Upon completion of grouting, the grout tube may remain in the hole, but must be filled with grout.

.2 The grout shall be injected from the lowest point of the drill hole and injection shall continue until uncontaminated grout flows from the top of the pile. The grout may be pumped through grout tubes, casing, hollow-stem augers, or drill rods. Temporary casing, if used, shall be extracted in stages ensuring that, after each length of casing is removed the grout level is brought back up to the ground level before the next length is removed. The tremie pipe or casing shall always extend below the level of the existing grout in the drillhole. The grout pressures and grout takes shall be controlled to prevent excessive heave or fracturing of rock or soil formations. Upon completion of grouting, the grout tube may remain in the hole, but must be filled with grout.

.3 Grout within the micropiles shall be allowed to attain the required design strength prior to being loaded.

.4 If the Contractor elects to use a postgrouting system, Working Drawings and details shall be submitted to the Engineer for review.

.6 Grout Testing

.1 Grout within the micropile verification and proof test piles shall attain the minimum required three (3)-day compressive strength of 14 MPa prior to load testing. Previous test results for the proposed grout mix completed within one year of the start of work may be submitted for initial verification of the required compressive strengths for installation of pre-production verification test piles and initial production piles. During production, micropile grout shall be tested by the Contractor for compressive strength in accordance with AASHTO T106/ASTM C109 at a frequency of no less than one set of three 50-mm grout cubes from each grout plant each day of operation or per every 10 piles, whichever occurs more frequently. The compressive strength shall be the average of the 3 cubes tested.

.2 Grout consistency as measured by grout density shall be determined by the Contractor per ASTM C188/AASHTO T133 or API RP-13B-1 at a frequency of at least one test per pile, conducted just prior to start of pile grouting. The Baroid Mud Balance used in accordance with API RP-13B-1 is an approved device for determining the grout density of neat cement grout. The measured grout density shall be as indicated on working drawings provided by the Contractor.

.3 Grout samples shall be taken directly from the grout plant. Provide grout cube compressive strength and grout density test results to the Engineer within 24 hours of testing.

.7 Micropile Installation Records

.1 Contractor shall prepare and submit to the Engineer full-length installation records for each micropile installed. The records shall be submitted within one work shift after that pile installation is completed. The data shall be recorded on the micropile installation log included at the end of this specification. A separate log shall be provided for each micropile.

.5 Pile Load Tests

.1 Perform verification and proof testing of piles at the locations specified herein or designated by the Engineer. Perform compression load testing in accord with ASTM D1143 and tension load testing in accord with ASTM D3689, except as modified herein.

.2 The maximum verification and proof test loads applied to the micropile shall not exceed 80% of the structural capacity of the micropile structural elements, to include steel yield in tension, steel yield or buckling in compression, or grout crushing in compression. Any required increase in strength of the verification test pile elements above the strength required for the production piles shall be provided for in the contractor’s bid price.

.3 The jack shall be positioned at the beginning of the test such that unloading and repositioning during the test will not be required. When both compression and tension load testing is to be performed on the same pile, the pile shall be tested under compression loads prior to testing under tension loads.

.4 For convenience of testing and set-up, pile testing may be performed in tension, regardless of the governing load, with reference to the maximum governing load, unless specified otherwise.

.5 Testing Equipment and Data Recording

.1 Testing equipment shall include dial gauges, dial gauge support, jack and pressure gauge, electronic load cell, and a reaction frame. The load cell is required only for the creep test portion of the verification test. The contractor shall provide a description of test setup and jack, pressure gauge and load cell calibration curves in accordance with the Submittals Section.

.2 Design the testing reaction frame to be sufficiently rigid and of adequate dimensions such that excessive deformation of the testing equipment does not occur. Align the jack, bearing plates, and stressing anchorage such that unloading and repositioning of the equipment will not be required during the test.

.3 Apply and measure the test load with a hydraulic jack and pressure gauge. The pressure gauge shall be graduated in 500kPa increments or less. The jack and pressure gauge shall have a pressure range not exceeding twice the anticipated maximum test pressure. Jack ram travel shall be sufficient to allow the test to be done without resetting the equipment. Monitor the creep test load hold during verification tests with both the pressure gauge and the electronic load cell. Use the load cell to accurately maintain a constant load hold during the creep test load hold increment of the verification test.

.4 Measure the pile top movement with a dial gauge capable of measuring to 0.025 mm. The dial gauge shall have a travel sufficient to allow the test to be done without having to reset the gauge. Visually align the gauge to be parallel with the axis of the micropile and support the gauge independently from the jack, pile or reaction frame. Use a minimum of two dial gauges when the test setup requires reaction against the ground or single reaction piles on each side of the test pile.

.5 The required load test data shall be recorded by the Engineer.

.6 Verification Load Tests

.1 Perform pre-production verification pile load testing to verify the design of the pile system and the construction methods proposed prior to installing any production piles.

.2 Verification load tests shall be performed to verify that the Contractor installed micropiles will meet the required tension load capacities and load test acceptance criteria and to verify that the length of the micropile load transfer bond zone is adequate. The micropile verification load test results must verify the Contractor’s design and installation methods, and be reviewed and accepted by the Engineer prior to beginning installation of production micropiles. Installation of production piles should not proceed until all verification test results have been reviewed and accepted by the Engineer.

.3 Piles used for pre-production testing should not remain in place for usage as production piles unless reviewed and accepted by the engineer. Test piles to be removed or cut-off and abandoned following completion of testing.

.4 Verification Test Pile Configuration and Construction

.1 The drilling-and-grouting method, casing size, and drill size for the verification test pile(s) shall be identical to those specified for the production piles at the given locations. The verification test micropile structural steel sections shall be sized to safely resist the maximum test load.

.2 Test verification piles can be full-scale (same configuration and dimensions as production piles) or they may be scaled to allowable practical limitations of testing equipment and materials.

.3 Where verification test piles are scaled:

.1 Effective bond length shall be no less than 50% of the production pile bond and a minimum of 1.5m.

.2 Maximum test load for verification testing shall be scaled to test for the corresponding nominal grout-to-ground bond strength

.5 Verification Test Quantities and Location

.1 One (1) sacrificial verification test pile (tension) shall be constructed in conformance with the approved Working Drawings.

.2 Verification test pile(s) shall be installed at the locations proposed by the Contractor and approved by the Engineer. Test piles are to be located such that their installation and performance is representative of production piles, and in locations that will not interfere with production pile installation. For the purpose of pricing, it should be assumed that the test pile will be located on the east side of the bridge contained within the area of the proposed wing walls.

.6 Verification Test Loading Schedule

.1 Test verification piles to a maximum test load corresponding to the nominal grout-to-ground bond strength based on the test pile configuration (full-scale or scaled) or Ultimate Load (UL).

LOAD	HOLD TIME
AL	1 min
0.10UL	1 min
0.15UL	1 min
0.20UL	1 min
0.25UL	1 min
0.30UL	1 min
0.35UL	1 min
0.40UL	1 min

0.45UL	1 min
0.50UL	1 min
0.55UL	1 min
0.60UL	1 min
0.65UL	1 min
0.70UL	1 min
0.75UL	1 min
0.80UL	1 min
0.85UL	1 min
0.90UL	1 min
0.95UL	1 min
1.00UL	CREEP TEST (10min to 60min)
0.80UL	1 min
0.60UL	1 min
0.40UL	1 min
0.20UL	1 min
AL	1min

.2 The verification pile load tests shall be made by incrementally loading the micropile in accordance with the load schedule for the governing load(s):

.3 The alignment load (AL) shall not exceed 5% of the UL. Dial gauges shall be reset to zero after the initial AL is applied.

.4 The test load shall be applied in increments of 10 percent of the UL. Each load increment shall be held for a minimum of 1 minute. Pile top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. Unloading shall be applied in decrements of 20% of the UL.

.5 The verification test pile shall be monitored for creep at the maximum test load (1.00UL): hold the pile load for 10min and record displacement at 0, 1, 2, 3, 4, 6, 10 minutes. If net creep from 1 to 10 minutes exceeds 1.0mm, hold for additional 50min with displacement readings at 20, 30, 50, and 60 minutes

.7 The acceptance criteria for micropile verification load tests are:

.1 At the end of the creep test at the maximum test load, test piles shall have a creep rate not exceeding 2.0mm/log cycle time. The creep rate shall be linear or decreasing throughout the creep load hold period.

.2 Failure does not occur at the maximum test load. Failure is defined as load at which attempts to further increase the test load simply result in continued pile movement.

.3 The Engineer will provide the Contractor written confirmation of the micropile design and construction within three (3) working days of the completion of the verification load tests. This written confirmation will either confirm the capacities and bond lengths specified in the Working Drawings for micropiles or reject the piles based upon the verification test results.

.8 Verification Test Pile Rejection

.1 If a verification tested micropile fails to meet the acceptance criteria, the Contractor shall modify the design, the construction procedure, or both. These modifications may include modifying the installation methods, increasing the bond length, or changing the micropile type. Any modification that necessitates changes to the structure shall require the Engineer's prior review and acceptance. Any modifications of design or construction procedures or cost of additional verification test piles and load testing shall be at the Contractor's expense. At the completion of verification testing, test piles shall be removed down to the elevation specified by the Engineer.

.7 Proof Load Tests *(NOT REQUIRED ON THIS PROJECT)*

.1 Proof Test Quantities and Locations

.1 Perform proof load tests on the first two (2) production piles installed, prior to the installation of the remaining production piles.

.2 Proof testing shall be conducted at a frequency of 5% (1 in 20) of the subsequent production piles installed beyond the first 20. Location of additional proof test piles shall be as designated by the Engineer.

.2 Proof Test Loading Schedule

.1 Test piles designated for tension proof load testing to a maximum test load of 100% of the factored micropile Design Load (DL) shown on the Plans or Working Drawings.

.2 Proof tests shall be made by incrementally loading the micropile in accordance with the following schedule:

LOAD	HOLD TIME
AL	1 min
0.20DL	1 min
0.40DL	1 min
0.60DL	1 min
0.80DL	1 min
1.00DL	CREEP TEST (10min to 60min)
AL	1min

.3 The alignment load (AL) shall not exceed 5% of the DL. Dial gauges shall be reset to zero after the initial AL is applied.

.4 The test load shall be applied in increments of 20 percent of the DL. Each load increment shall be held for a minimum of 1 minute. Pile top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. Unloading shall be applied in one decrement to the AL.

.5 The verification test pile shall be monitored for creep at the maximum test load (1.00DL): hold the pile load for 10min and record displacement at 0, 1, 2, 3, 4, 6, 10 minutes. If net creep from 1 to 10 minutes exceeds 1.0mm, hold for additional 50min with displacement readings at 20, 30, 50, and 60 minutes

.3 The acceptance criteria for micropile proof load tests are:

.1 At the end of the 1.00DL creep test load increment, test piles shall have a creep rate not exceeding 1 mm/log cycle time. The creep rate shall be linear or decreasing throughout the creep load hold period.

.2 Failure does not occur at the 1.00DL maximum test load. Failure is defined as the load at which attempts to further increase the test load simply result in continued pile movement.

.4 Proof Test Pile Rejection

.1 If a proof-tested micropile fails to meet the acceptance criteria, the Contractor shall immediately proof test another micropile within that footing. For failed piles and further construction of other piles, the Contractor shall modify the design, the construction procedure, or both. These modifications may include installing replacement micropiles, incorporating piles at not more than 50% of the maximum load attained, postgrouting, modifying installation methods, increasing the bond length, or changing the micropile type. Any modification that necessitates changes to the structure design shall require the Engineer’s prior review and acceptance. Any modifications of design or construction procedures, or cost of additional verification test piles and verification and/or proof load testing, or replacement production micropiles, shall be at the Contractor’s expense.

END OF SECTION – 02345

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 35 43 - Environmental Procedures

.2 Section 31 23 10 - Excavating, Trenching and Backfilling

.3 Section 31 05 17 - Aggregate Materials

.4 Section 32 11 23 - Aggregate Base Courses

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C 117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.

.2 ASTM C 131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.3 ASTM C 136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D 422-63(1998), Standard Test Method for Particle-Size Analysis of Soils.

.5 ASTM D 698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/m3).

.6 ASTM D 1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700kN-m/m3).

.7 ASTM D 1883-99, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

.8 ASTM D 4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

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

.3 Ontario Provincial Standard Specification (OPSS)

.1 OPSS 1010 (April 2013) – Material Specification for Aggregates, Base, Sub-Base, Select Sub-Grade and Backfill Material.

.2 OPSS 501 (Nov 2010) – Construction Specification for Compacting.

1.3 SAMPLES

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

.2 Submit to Contract, the gradation analysis at least 2 weeks before delivering to site.

1.4 MEASUREMENT FOR PAYMENT

.1 Measurement Procedures: In accordance with Section 01 11 22 – Measurement and Payment.

Part 2 Products

2.1 MATERIALS

.1 Granular Sub-Base: Granular B, 'Type II' to conform to the requirements of OPSS 1010.

Part 3 Execution

3.1 PLACING

.1 Place granular sub-base after proof rolling. Place granular sub-base after subgrade is inspected and approved by Departmental Representative.

.2 Construct granular sub-base 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.

.5 Place granular sub-base materials using methods which do not lead to segregation or degradation.

.6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Departmental Representative may authorize thicker lifts (layers) 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.

3.2 COMPACTION RQUIPMENT

.1 Compaction equipment must be capable of obtaining required densities in materials on project.

.2 Compact to density of not less than 100% SPMDD.

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

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

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.

3.3 SITE TOLERANCES

.1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

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

3.4 PROTECTION

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 32 11 19 - Granular Sub-Base

.2 Section 32 16 15 - Concrete Walks

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C 117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.

.2 ASTM C 131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.3 ASTM C 136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D 698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/mü).

.5 ASTM D 1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700kN-m/mü).

.6 ASTM D 1883-99, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

.7 ASTM D 4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

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

.3 Ontario Provincial Standard Specifications (OPSS) Division 10.

1.3 SAMPLES

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

.2 Submit to Departmental Representative, the gradation analysis at least 2 weeks before delivering to site.

1.4 MEASUREMENT FOR PAYMENT

.1 Measurement Procedures: In accordance with Section 01 11 22 – Measurement and Payment.

Part 2 Products

2.1 MATERIALS

.1 Granular base: Granular 'A' to OPSS 1010.

Part 3 Execution

3.1 PLACING

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

.2 Construct granular base 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 and ice.

.5 Place material using methods which do not lead to segregation or degradation of aggregate.

.6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.

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

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

3.2 COMPACTION EQUIPMENT

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

.2 Compact to density not less than 100% SPMDD.

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

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

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 The Work includes the supply, placement, and compaction of HL3 and HL8 hot-mix asphalt, sawcutting in asphalt pavements, pavement cleaning, tack coat, cold planing to create stepped joints, and elsewhere, as required, and asphalt patch repair.

1.2 RELATED SECTIONS

.1 Section 31 05 17 - Aggregate Materials

.2 Section 32 11 19 - Granular Sub-Base

.3 Section 32 11 23 - Aggregate Base Courses

1.3 REFERENCES

.1 Canadian Standards Association (CGSB).

- .1 CAN/CGSB8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .2 CAN/CGSB16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.
- .3 CAN/CGSB16.3-M90, Asphalt Cements for Road Purposes.

.2 American Society for Testing and Materials (ASTM).

- .1 ASTM C88/C88M, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
- .2 ASTM C117-17, Standard Test Method for Material Finer Than 0.075mm (No. 200) Sieve in Mineral Aggregates by Washing.
- .3 ASTM C123/C123M-14, Standard Test Method for Lightweight Pieces in Aggregate.
- .4 ASTM C127-15, Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.
- .5 ASTM C128-15, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Fine Aggregate.
- .6 ASTM C131/C131M-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/C136M-145, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- .8 ASTM D140/D140M-6, Standard Practice for Sampling Asphalt Materials.
- .9 ASTM D995-95b (2002), Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
- .10 ASTM D2419-M, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
- .11 ASTM D3203/D3203M-17, Standard Test Method for Percent Air Voids in Compacted Asphalt.

.12 ASTM D4791-10, Standard Test Method for Flat Particles and Elongated Particles on Flat and Elongated Particles in Coarse Aggregate.

.3 Asphalt Institute (AI).

.1 AI MS-2-(1994), Mix Design Methods.

.4 Ontario Provincial Standard Specification (OPSS).

.1 OPSS 310, Construction Specification for Hot Mixed, Hot Laid Asphaltic Concrete Paving and Hot Mix Patching.

.2 OPSS 1101, Asphalt Cement.

.3 OPSS 1150, Hot Mixed, Hot Laid Asphaltic Concrete.

1.4 SAMPLES

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

.2 Provide mix design two (2) weeks prior to commencing Work.

.3 Inform Departmental Representative of proposed source of aggregates and provide access for sampling at least two (2) weeks prior to commencing Work.

.4 Submit samples of following materials proposed for use at least two (2) weeks prior to commencing Work:

.1 One (1) Litre container of asphalt cement, if specifically requested by Departmental Representative. Provide name of supplier to Departmental Representative such that the necessity of supplying samples can be assessed.

1.5 PROTECTION

.1 Keep vehicular traffic off newly paved areas until paving surface temperature has cooled below 38°C. Do not permit stationary loads on pavement until 24 h after placement.

.2 Provide access to buildings as required.

.3 Protect landscaping, roads, curbs and walks on site and adjacent property that may be damaged by paving machinery, equipment or personnel. Make good property damaged due to paving operations.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 11 - Cleaning and Waste Management.

1.7 MEASUREMENT FOR PAYMENT

.1 Measurement Procedures: In accordance with Section 01 11 22 – Measurement and Payment.

Part 2 Products

2.1 MATERIALS

.1 Aggregates to OPSS.PROV 1010.

.2 Prime coat: SS-1 to OPSS 1103.

.3 Asphalt concrete: HL-3 and HL-8 to OPSS.MUNI 1150.

.4 Tack Coat: SS-1 to OPSS 1103.

.5 Asphalt concrete to OPSS 1150.

.6 Traffic paint: Alkyd yellow (505-308) and white (513-301) to CAN/CGSB-1.74 and OPSS 1712.

.7 Paint thinner: to CAN/CGSB-1.5.

Part 3 Execution

3.1 GENERAL

.1 The asphalt of each layer must be allowed to thoroughly cool in a natural manner. Methods such as using cooling water that cools the surface of a layer are not sufficient to allow multiple lifts to be delivered in one truck even with the use of box heaters. It is expected, and required, that a separate mobilization will be used for each lift.

.2 Asphalt shall be placed using good practices and appropriate cooling times. The roadway shall be constructed in the same manner as an arterial roadway.

.3 Equipment suitable for the construction of a roadway is required in accordance with OPSS 310. Small equipment intended for driveways is not acceptable.

3.2 EQUIPMENT

.1 Equipment to be in accordance with OPSS 310.

3.3 PLANT

.1 Plant to be in accordance with OPSS 1150.

.2 Plant to be MTO approved.

3.4 PREPARATION

.1 Prior to applying tack coat, clean surfaces of loose and foreign material.

.2 Apply tack coat evenly to clean dry pavement surface. Tack coat not to exceed 0.5 L/m² prior to paving on existing asphalt surface, or prior to surface-course paving.

.3 Mill existing asphalt and concrete surface, as indicated or directed, and clean milled surfaces from dust.

3.5 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. Elevate truck bed and thoroughly drain. No excess solution to remain in truck bed.

.3 Deposit mix from surge or storage silo to trucks in multiple drops to reduce segregation. Do not dribble mix into trucks.

.4 Deliver material to paver at uniform rate and in an amount within the capacity of the paving and compacting equipment.

.5 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at temperature within range as directed by the Departmental Representative, but not less than 135°C.

3.6 PLACING AND COMPACTING

.1 Place asphalt to thicknesses, grades, and lines as indicated on the Contract Drawings.

.2 Placing of asphalt shall be in accordance with OPSS 310.

.3 The vibration and compaction immediately behind the abutments will be assessed with the Departmental Representative. Do no damage to the abutment and progressively increase vibration and compaction behind the abutments while monitoring the abutments for movement or signs of movement.

3.7 ASPHALT THICKNESS

.1 The thickness of each asphalt lift shall match those shown in the Contract Drawing or, in cases where paving is occurring over existing asphalt, shall have a minimum lift thickness of 40 mm.

3.8 FINISH TOLERANCES

.1 Finished asphalt surface to be within 6 mm of design elevation, but not uniformly high or low.

.2 Finished asphalt surface not to have irregularities exceeding 6 mm when checked with 4.5 m straight-edge placed in any direction.

.3 At the abutment, concrete asphalt shall be finished within 3 mm and have no rutting.

3.9 DEFECTIVE WORK

.1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing, or adding, material, as required. If irregularities or defects remain after final compaction, remove surface-course promptly and lay new material to form 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.

3.10 ASPHALT PATCHING

.1 Asphalt patching on the approaches to the Bridge shall include saw cutting and cold patching of the area as shown in the Contract Drawing and as directed by the Departmental Representative, for the placement of asphalt.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 03 10 00 - Concrete Forming and Accessories

.2 03 30 00 - Cast-in-Place Concrete

.3 32 12 16 - Asphalt Paving

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C 117-04, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C 136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D 260-86(2001), Standard Specification for Boiled Linseed Oil.

.4 ASTM D 698-00ae1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ftü) (600 kN-m/mü).

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-3.3-99(March 2004), Kerosene, Amend. No. 1, National Standard of Canada.

.2 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.3 Canadian Standards Association (CSA International)

.1 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA B651-18, Accessible Design for the Built Environment.

.4 Ontario Provincial Standard Specifications (OPSS)

.1 OPSS.PROV 1010, April 2013, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.

.2 OPSS.PROV 1350, November 2016, Material Specification for Concrete – Materials and Production

1.3 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 11 – Cleaning.

1.4 MEASUREMENT FOR PAYMENT

.1 Measurement Procedures: In accordance with Section 01 11 22 – Measurement and Payment.

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.

.3 Curing Compound: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.4 Granular base: as per Section 31 23 1 requirements and OPSS.PROV 1010.

.5 Non-staining mineral type form release agent: chemically active release agents containing compounds reacting with free lime to provide water-soluble soap.

.6 Fill material: to OPSS.PROV 1010.

.7 Curing Agent: to ASTM C309, Type 1.

.8 Expansion Joint Filler: Premoulded bituminuous fibre board, conforming to ASTM D1751.

.9 Kerosene: to CAN/CGSB-3.3

.10 Tactile Walking Surface Indicators: Cast iron with truncated domes to CSA B651.

.11 Concrete curbs shall be pinned precast concrete curbs as per OPSD 603.020.

Part 3 Execution

3.1 GRADE PREPARATION

.1 Do grade preparation work in accordance with Section 31 23 10.

.2 Construct embankments using excavated material free from organic matter or other objectionable materials.

.1 Dispose of surplus and unsuitable excavated material at direction of Departmental Representative.

.3 When constructing embankment provide for minimum 0.6 m shoulders, where applicable, outside of neat lines of concrete.

.4 Place fill in maximum 150 mm layers and compact to at least 95 % of maximum dry density to ASTM D 698.

3.2 GRANULAR BASE

.1 Obtain Departmental Representative's 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 95% of maximum density to ASTM D698.

3.3 CONCRETE

.1 Obtain Departmental Representative approval of granular base 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 in direction normal to centre line.

.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 Departmental Representative can be demonstrated. Hand finish surfaces when 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 is stiff, but still plastic, at intervals of 1.5 m.

.2 Install expansion joints at intervals of 6 m.

.3 When sidewalk is 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 in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.3 Seal isolation joints with sealant approved by Departmental Representative.

3.7 CURING

.1 Cure concrete by adding moisture continuously in accordance with CSA-A23.1/A23.2 to exposed finished surfaces for minimum 1 day after placing, or sealing moisture in by curing compound as directed by Departmental Representative.

.2 Where burlap is 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.

3.8 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 indicated.

3.9 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Section 32 12 16 - Asphalt Paving

1.2 REFERENCES

.1 O.P.S.S. Form 710, 1712, 1713, 1714 and 1750.

1.3 SAMPLES

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

.2 Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, CGSB specification number and formulation number and batch number.

1.4 MEASUREMENT FOR PAYMENT

.1 Measurement Procedures: In accordance with Section 01 11 22 – Measurement and Payment.

Part 2 Products

2.1 MATERIALS

.1 Paint:

.1 To CGSB 1-GP-74M, alkyd traffic paint and OPSS 1712.

.2 Colour: to CGSB 1-GP-12C, Yellow 33538 - Shall match the yellow paint chip of the Ministry of Transportation of Ontario.

.3 Upon request, Contract Administrator will supply a qualified product list of paints applicable to work. Qualified paints may be used but Contract Administrator reserves right to perform further tests.

.2 Thinner: to CAN/CGSB-1.5.

Part 3 Execution

3.1 EQUIPMENT REQUIREMENTS

.1 Paint applicator to be an approved pressure type distributor capable of applying paint in single, double and dashed lines. Applicator to be capable of applying marking components uniformly, at rates specified, and to dimensions as indicated, and to have positive shut-off.

3.2 CONDITION OF SURFACES

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

3.3 APPLICATION

.1 Pavement markings in accordance with Contract Drawings.

.2 Unless otherwise approved by Departmental Representative, apply paint only when air temperature is above 10°C, wind speed is less than 60km/h and no rain is forecast within next 4h.

.3 Apply traffic paint evenly at rate of 3 m^2 /L.

.4 Do not thin paint unless approved by Departmental Representative.

.5 Symbols and letters to conform to dimensions indicated.

.6 Paint lines to be 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 to be within plus or minus 12mm of dimensions indicated.

3.5 PROTECTION OF COMPLETED WORK

.1 Protect pavement markings until dry.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 35 43 - Environmental Procedures

.2 Section 31 23 10 - Excavating, Trenching and Backfilling

1.2 REFERENCES

.1 Agriculture and Agri-Food Canada.

.1 The Canadian System of Soil Classification, Third Edition, 1998.

.2 Canadian Council of Ministers of the Environment (CCME).

.1 PN 1340-(2005), Guidelines for Compost Quality.

.3 Canadian Green Building Council (CaGBC)

.1 LEED Canada-NC V4, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations.

.4 U.S. Environmental Protection Agency (EPA)/Office of Water

.1 EPA 832-R-92-2005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

.5 Ontario Provincial Standard Specification

.1 OPSS.MUNI 802, November 2019, Construction Specification for Topsoil

1.3 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, C:N ratio below 25, and contain no toxic or growth-inhibiting contaminates.

.4 Composed bio-solids: to CCME Guidelines for Compost Quality, Category (A) (B).

1.4 SUBMITTALS

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

.2 Quality control submittals:

.1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in 2.3 - Source Quality Control.

.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements.

1.5 QUALITY ASSURANCE

.1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions, and warranty requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling.

.2 Divert unused soil amendments from landfill to official hazardous material collections site approved by Departmental Representative.

.3 Do not dispose of unused soil amendments into sewer systems, lakes, or streams, onto ground, or in locations where it will pose a health or environmental hazard.

1.7 MEASUREMENT FOR PAYMENT

.1 Measurement Procedures: In accordance with Section 01 11 22 – Measurement and Payment.

Part 2 PRODUCTS

2.1 TOPSOIL

.1 Topsoil for sodded and seeded areas as per OPSS.MUNI 802.

.2 All topsoil will be screened prior to placement. Topsoil will pass through a 25mm screen. Mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.

.1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70% sand, minimum 7% clay, and contain 2 to 10% organic matter by weight.

.2 Contain no toxic elements or growth inhibiting materials.

.3 Finished surface free from:

.1 Debris and stones over 25 mm diameter.

.2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 1% of soil volume.

.4 Consistency: friable when moist.

2.2 SOIL AMENDMENTS

.1 Fertilizer:

.1 Fertility: major soil nutrients present in following amounts:

.2 Nitrogen (N): 20 to 40 micrograms of available Nitrogen per gram of topsoil.

.3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.

.4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.

.5 Calcium, magnesium, sulfur, and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.

.6 PH value: 6.5 to 8.0.

.2 Peat Moss:

.1 Derived from partially decomposed species of Sphagnum Mosses.

.2 Elastic and homogeneous, brown in colour.

.3 Free of wood and deleterious material which could prohibit growth.

.4 Shredded particle minimum size: 5 mm.

.3 Sand: washed coarse silica sand, medium to course textured.

.4 Organic matter: compost Category A in accordance with CCME PN1340, unprocessed organic matter such as rotted manure, hay, straw, bark residue, or sawdust, meeting the organic matter, stability, and contaminant requirements.

.5 Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications in accordance with CCME PN1340.

.6 Limestone:

.1 Ground agricultural limestone.

.2 Gradation requirements: percentage passing by weight 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

.7 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium, and other micro-nutrients suitable to specific plant species or application or defined by soil test.

2.3 SOURCE QUALITY CONTROL

.1 Advise Departmental Representative of sources of topsoil and manufactured topsoil to be utilized with sufficient lead time for testing.

.2 Contractor is responsible for amendments to supply topsoil as specified.

.3 Soil testing by recognized testing facility for PH, P, K, and organic matter.

.4 Testing of topsoil will be carried out by testing laboratory designated by Departmental Representative.

.1 Soil sampling, testing, and analysis to be in accordance with Provincial Standards.

Part 3 EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

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

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction, until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.2 PREPARATION OF EXISTING GRADE

.1 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

.2 Remove debris, roots, branches, stones in excess of 25 mm diameter, and other deleterious materials.

.1 Remove soil contaminated with calcium chloride, toxic materials, or petroleum products.

.2 Remove debris which protrudes above surface.

.3 Dispose of removed material off site.

.3 Cultivate entire area which is to receive topsoil, to minimum depth of 100 mm.

.1 Cross-cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.3 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

.1 Place topsoil after Departmental Representative has accepted subgrade.

.2 Spread topsoil in uniform layers not exceeding 100 mm.

.3 For sodded areas, keep topsoil 15 mm below finished grade.

.4 Spread topsoil to following minimum depths after settlement:

.1 100 mm for sodded areas.

.5 Manually spread topsoil/planting soil around trees, shrubs, and obstacles.

3.4 FINISH GRADING

.1 Grade to eliminate rough spots and low areas and ensure positive drainage.

.1 Prepare loose, friable bed by means of cultivation and subsequent raking.

.2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.

.1 Leave surfaces smooth, uniform, and firm against deep foot-printing.

3.5 ACCEPTANCE

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

3.6 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 43 - Environmental Procedures.

.3 Section 32 91 21 - Topsoil Placement and Grading.

1.2 SUBMITTALS

.1 Samples:

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

.2 Submit:

.1 Sod for each type specified.

.1 Install approved samples in 1 m² mock-ups and maintain in accordance with maintenance requirements during establishment period.

.3 Obtain approval of samples by Departmental Representative.

1.3 QUALITY ASSURANCE

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

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements.

.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions, and warranty requirements.

1.4 SCHEDULING

.1 Schedule sod laying to coincide with preparation of soil surface.

.2 Schedule sod installation for when frost is not present in ground.

1.5 MEASUREMENT FOR PAYMENT

.1 Measurement Procedures: In accordance with Section 01 11 22 – Measurement and Payment.

.2 Any sodding required to repair damaged areas of the site shall be completed in accordance with this Specification. Seeding will not be accepted as an alternative.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.

.1 Turf Grass Nursery Sod types:

.1 Number One Kentucky Bluegrass Sod: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.

.2 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.

.3 Number One Named Cultivars: Nursery Sod grown from certified seed.

.2 Turf Grass Nursery Sod quality:

.1 Not more than two (2) broadleaf weeds or ten (10) other weeds per 40 m².

.2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.

.3 Mowing height limit: 35 to 65 mm.

.4 Soil portion of sod: 12 to 25 mm in thickness.

.2 Fertilizer:

.1 To Canada "Fertilizers Act" and "Fertilizers Regulations".

.2 Complete, synthetic, and slow release, with 65% of nitrogen content in water-insoluble form.

2.2 SOURCE QUALITY CONTROL

.1 Obtain approval from Departmental Representative of sod at source.

.2 When proposed source of sod is approved, use no other source without written authorization from Departmental Representative.

Part 3 EXECUTION

3.1 PREPARATION

.1 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil, or soil covered with snow, ice, or standing water.

.2 Fine grade surface free of humps and hollows to smooth, even grade to tolerance of plus or minus 8 mm, for Turf Grass Nursery Sod surface to drain naturally.

.3 Remove and dispose of weeds, debris, stones 25 mm in diameter and larger; and soil contaminated by oil, gasoline, and other deleterious materials, off site.

3.2 SOD PLACEMENT

.1 Lay sod within 24 hours of being lifted if air temperature exceeds 20° 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 At all edges, cut-in sod to existing grass so as to form a smooth surface. Do not overlay existing grass. Cut existing grass at location where existing grass is full and healthy. No noticeable change in grade shall occur at edges.

.4 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.

.5 Sod placed on slopes 2H:1V or steeper shall be staked using 19mmx19mmx300mm wood stakes. Stakes shall be installed within 100mm of the end of each roll of sod. Each roll of sod shall include a minimum of three stakes. Sodding to be countersunk to existing surface grade level at all match-in points.

3.3 SOD PLACEMENT ON SLOPES AND PEGGING

.1 Install and secure geotextile fabric in areas indicated, in accordance with manufacturer's instructions.

.2 Start laying sod at bottom of slopes.

3.4 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following operations from time of installation until acceptance:

.1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.

.2 Cut grass to 50 mm when or prior to it reaching, height of 75 mm. Remove clippings which will smother grassed areas.

.3 Maintain sodded areas weed-free 95%.

3.5 ACCEPTANCE

.1 Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:

.1 Sodded areas are properly established.

.2 Sod is free of bare and dead spots.

.3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50 mm.

.4 Sodded areas have been cut minimum three (3) times prior to acceptance.

.2 Areas sodded in fall will be accepted in following spring one month after start of growing season, provided acceptance conditions are fulfilled. Winter sodding will not be allowed.

3.6 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period:

.1 Water sodded Turf Grass Nursery Sod areas at bi-weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.

.2 Repair and re-sod dead or bare spots to satisfaction of Departmental Representative. Restart warranty period if spots requiring re-sodding cumulatively reach 10% of sodded area.

.3 Cut grass and remove clippings to height as follows:

.1 Turf Grass Nursery Sod:

.1 50 mm during normal growing conditions.

.2 Cut grass at two (2) week intervals, but at intervals so that approximately one-third of growth is removed in single cut.

.3 Eliminate weeds by mechanical or chemical means to extent acceptable to Departmental Representative.

3.7 CLEANING

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittals.

.2 Section 31 23 00 - Excavating, Trenching and Backfilling.

.3 Section 32 11 23 - Aggregate Base Courses.

.4 Section 33 41 00 - Storm Utility Drainage Piping.

.5 Section 33 46 16 - Subdrainage Piping

1.2 REFERENCES

.1 Ontario Provincial Standard Specifications (OPSS) by the Ontario Ministry of Transportation:

.1 OPSS 407 - Construction Specification For Maintenance Hole, Catch Basin, Ditch Inlet, and Valve Chamber Installation, November 2014.

.2 OPSS 1840 – Material Specification For Non-Pressure Polyethylene (PE) Plastic Pipe Products, November 2014.

.3 OPSS 1860 - Material Specification For Geotextiles, April 2012.

.2 Ontario Provincial Standard Drawings (OPSD) by the Ontario Ministry of Transportation.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittals.

.2 Submit manufacturer's shop drawings for all structures at least 4 weeks prior to beginning Work.

1.4 MEASUREMENT FOR PAYMENT

.1 Measurement Procedures: In accordance with Section 01 11 22 – Measurement and Payment.

Part 2 Products

2.1 MATERIALS

.1 Granular bedding and backfill: in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

.2 Unshrinkable fill: in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

.3 Geotextile sock: as per OPSS 1860.

.4 Structure and Frame shall be Nyloplast or approved equivalent.

Part 3 Execution

3.1 EXCAVATION AND BACKFILL

.1 Excavate and backfill in accordance with Section 31 23 33 - Excavating Trenching and Backfilling and as indicated.

.2 Obtain acceptance of Departmental Representative before installing precast structures.

3.2 INSTALLATION

.1 Construct units in accordance with details indicated, plumb and true to alignment and grade.

.2 Complete units as pipe laying progresses. Maximum of three units behind point of pipe laying will be allowed.

.3 Dewater excavation and remove soft and foreign material before placing structure.

.4 Set structure on 300 mm minimum compacted thickness of granular bedding compacted to 100% SPMDD.

.5 Compact granular backfill to 100% Standard Proctor Maximum Dry Density (SPMDD). Granular backfill shall extend from the base of the structure to 300mm above the inlet pipe obvert.

.6 Place unshrinkable backfill in accordance with Section 31 23 33 - Excavating, Trenching and Backfill.

.7 Set frame and cover to required elevation.

.8 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 33 05 14 - Precast Structures.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM C12-09, Standard Practice for Installing Vitrified Clay Pipe Lines.

.2 ASTM C14M-07, Standard Specification for Concrete Sewer, Storm Drain and Culvert Pipe (Metric).

.3 ASTM C76M-10a, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).

.4 ASTM C117-04, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.5 ASTM C136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

.6 ASTM C425-04 (2009), Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.

.7 ASTM C428-97 (06), Standard Specification for Asbestos-Cement Nonpressure Sewer Pipe.

.8 ASTM C443M-10, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).

.9 ASTM C506M-10b, Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain and Sewer Pipe.

.10 ASTM C507M-10b, Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe (Metric).

.11 ASTM C663-98 (2008), Standard Specification for Asbestos-Cement Storm Drain Pipe.

.12 ASTM C700-11, Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.

.13 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3(600 kN-m/m3)).

.14 ASTM D1056-07, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.

.15 ASTM D1869-95 (2010), Standard Specification for Rubber Rings for Asbestos-Cement Pipe.

.16 ASTM D2680-01 (2009), Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

.17 ASTM D3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.18 ASTM F405-05, Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.

.19 ASTM F667-06, Standard Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.

.20 ASTM F794-03 (2009), Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

.2 Bureau de normalisation du Québec (BNQ)

.1 BNQ-3624-115-2004, Polyethylene (PE) Pipe and Fittings - Flexible Corrugated Pipes and Drainage - Characteristics and Test Methods

.3 Canada Green Building Council (CaGBC)

.1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-M89, Sieves, Testing, Woven Wire, Inch Series.

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

.3 CAN/CGSB-34.9-94, Asbestos-Cement Sewer Pipe.

.5 CSA Group (CSA)

.1 CAN/CSA-A3000-08, Cementitious Materials Compendium.

.2 CSA A257 Series-M92 (R2009), Standards for Concrete Pipe.

.3 CAN/CSA-B1800-06, Thermoplastic Non-pressure Pipe Compendium - B1800 Series.

.4 CSA G401-07, Corrugated Steel Pipe Products.

.6 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.

.7 Ontario Provincial Standard Specification (OPSS):

.1 OPSS Form 410, 514, 517 and 518

1.3 SCHEDULING

.1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.

.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

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 pipes, and backfill 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.

.4 Samples:

.1 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.

.2 Submit to Departmental Representative for testing, at least 2 weeks prior to beginning Work, following samples of materials proposed for use.

.5 Certification to be marked on pipe.

.6 Test and Evaluation Reports: submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.

.7 Manufacturer's Instructions: submit to Departmental Representative a copy of manufacturer's installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer s recommendations.

.2 Store and protect pipes from damage.

.3 Replace defective or damaged materials with new.

1.6 MEASUREMENT FOR PAYMENT

.1 Measurement Procedures: In accordance with Section 01 11 22 – Measurement and Payment.

Part 2 Products

2.1 CONCRETE PIPE

.1 Non-reinforced circular concrete pipe and fittings: to CSA A257,

.2 Reinforced circular concrete pipe and fittings: to CSA A257,

.3 Lifting holes:

.1 Pipe 900 mm and less diameter: no lift holes.

.2 Pipe greater than 900 mm diameter: lift holes not to exceed two in piece of pipe.

.3 Provide pre-fabricated plugs to effectively seal lift holes after installation of pipe.

2.2 CORRUGATED STEEL PIPE

.1 Corrugated steel pipe and couplers: to CSA G401.

.1 Gaskets: to ASTM D1056.

2.3 PLASTIC PIPE

.1 Type PSM Poly Vinyl Chloride (PVC): to CAN/CSA-B1800.

.1 Standard Dimensional Ratio (SDR): 35.

.2 Separate Locked-in gasket and integral bell system.

.3 Nominal lengths: 6 m.

.2 Large diameter, ribbed PVC sewer pipe and fittings: to CAN/CSA-B1800.

.3 Corrugated polyethylene pipe: high density to BNQ-3624-115.

.4 Acrylonitrile - Butadiene - Styrene (ABS): to CAN/CSA-B1800.

2.4 PIPE BEDDING AND SURROUND MATERIAL

.1 Granular material in accordance with Section 31 05 17 - Aggregate Materials and following requirements:

.1 Crushed or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C117 ASTM C136. Sieve sizes to OPSS 1010.

.2 Concrete mixes and materials for bedding, cradles, encasement, supports: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

2.5 BACKFILL MATERIAL

.1 As indicated in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

.2 Unshrinkable fill: in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

2.6 JOINT MORTAR

.1 Portland cement: to CAN/CSA-A3000.

.2 Mortar: one part Portland cement to two parts clean sharp sand mixed with minimum amount of water to obtain optimum consistency for use intended. Do not use additives.

Part 3 Execution

3.1 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent requirements of authorities having jurisdiction sediment and erosion control drawings.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.2 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.

3.2 TRENCHING

.1 Do trenching Work in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

.2 Protect trench from contents of sewer.

.3 Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and pipe.

.4 Water jetting of backfill under haunches of corrugated steel pipe may be permitted if recommended by manufacturer and approved by Departmental Representative.

3.3 CONCRETE BEDDING AND ENCASEMENT

.1 Do concrete Work in accordance with Section 03 30 00 - Cast-in-Place Concrete. Place concrete to details as indicated by Departmental Representative.

.2 Position pipe on concrete blocks to facilitate placing of concrete.

.1 When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.

.3 Backfill over concrete once cured.

3.4 GRANULAR BEDDING

.1 Place bedding in unfrozen condition.

.2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.

.1 Do not use blocks when bedding pipes.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 95 % corrected maximum dry density.

.6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted common backfill.

3.5 INSTALLATION

.1 Lay and join pipes to: ASTM C12.

.2 Lay and join pipe in accordance with manufacturer’s recommendations and to approval of Contract Administrator.

.3 Handle pipe using methods approved by Departmental Representative.

.1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.4 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points.

.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.5 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.6 Lay corrugated steel pipe:

.1 With outside circumferential laps facing upgrade and longitudinal laps or seams at side or quarter points.

.2 With longitudinal centre line of paved invert coinciding with flow line.

.7 Joint deflection permitted within limits recommended by pipe manufacturer.

.8 Water to flow through pipes during construction only as permitted by Departmental Representative.

.9 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.10 Install plastic pipe and fittings in accordance with CAN/CSA-B1800.

.11 Joints:

.1 Corrugated steel pipe:

.1 Install gaskets as indicated.

.2 Match corrugations or indentations of coupler band with pipe sections before tightening.

.3 Tap coupler firmly while tightening, to take up slack and ensure snug fit.

.4 Ensure bolts are inserted and tightened.

.2 Concrete, pipe:

.1 Install gaskets as recommended by manufacturer.

.2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.3 Align pipes before joining.

.4 Maintain pipe joints free from mud, silt, gravel and other foreign material.

.5 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.

.6 Complete each joint before laying next length of pipe.

.7 Minimize joint deflection after joint has been made to avoid joint damage.

.8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer s recommendations.

.9 Mortared joints:

.1 Pipe interior: circular pipes 700 mm diameter and larger, shall have interior gap between ends of adjacent pipes filled with mortar.

.1 Apply mortar minimum 7 days after backfilling has been completed to allow pipe settlement to occur.

.2 Finish interior surface of joints smooth.

.2 Pipe exterior: for bell and spigot pipe, use mortar to seal outside of joints. Press and bed mortar into place.

.1 Allow mortar to set minimum of 1 hour before backfilling.

.12 When any stoppage of Work occurs, restrain pipes as directed by Departmental Representative, to prevent creep during down time.

.13 Plug lifting holes with Departmental Representative approved prefabricated plugs, set in shrinkage compensating grout.

.14 Cut pipes as required for special inserts, fittings or closure pieces, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.15 Make watertight connections to manholes and catch basins.

.1 Use shrinkage compensating grout when suitable gaskets are not available.

.16 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes.

.1 Joint to be structurally sound and watertight.

.17 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

3.6 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after the Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.

.1 Leave joints and fittings exposed until field testing is completed.

.3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.1 Do not dump material within

.4 Place layers uniformly and simultaneously on each side of pipe.

.5 Compact each layer from pipe invert to mid height of pipe to at least 95 % corrected maximum dry density.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 90 % corrected maximum dry density.

.7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.7 BACKFILL

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

.3 Under paving and walks, compact backfill to at least 95 % corrected maximum dry density. In other areas, compact backfill to at least 90 % corrected maximum dry density.

.4 Place unshrinkable backfill in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

3.8 UNDERCROSSING

.1 Excavate working pit to dimensions indicated, outside right-of-way to be crossed.

.2 Excavate working pit to minimum of 0.5 m below lowest invert of encasing pipe.

.3 Dewater excavation.

.4 Dewater area of undercrossing.

.5 Install steel frame backstop.

.6 Place encasing pipe to exact line and grade as indicated. Encasing pipe shall undercross obstruction at a minimum of 45 degree angle.

.7 Install encasing pipe by tunnelling.

.8 Ensure encasing pipe is not in tension.

.9 Use mechanical type joints for encasing pipe.

.10 Place concrete grout levelling pad in encasing pipe. Carefully control level of grout during placing.

.11 Provide shop drawings showing proposed method of installation for storm sewer pipe.

.12 Insert storm sewer pipe into encasement pipe, in end with largest opening after placement of levelling pad.

.13 Use approved blocking method to guide storm sewer pipe in true alignment.

.14 Clearance between blocks and encasement pipe: maximum 12 mm when storm sewer pipe is in position.

.15 Join storm sewer pipe one length at time outside encasement pipe. Push storm sewer pipe into position.

.16 Couplings of storm sewer pipe: not to rest on levelling pad when carrier pipe is in position.

.17 Place 20 MPa concrete cradle around storm sewer pipe after it is positioned.

.1 Cradle to be minimum of 225 mm and maximum of 300 mm above levelling pad.

.18 Pressure grout remaining void with grout consisting of one part Portland cement and two parts clean washed sand with only sufficient amount of water added to allow placement.

.1 Install pressure grout after storm sewer pipe is secure against flotation.

.2 Do not use additives.

.19 Do field testing before placing concrete cradle and grouting.

3.9 FIELD TESTS AND INSPECTIONS

.1 Repair or replace pipe, pipe joint or bedding found defective.

.2 Draw tapered wooden plug with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction directed by Departmental Representative.

.3 Remove foreign material from sewers and related appurtenances by flushing with water.

.4 Television and photographic inspections:

.1 Carry out inspection of installed sewers by television camera, photographic camera or by other related means.

.2 Payment for inspection services in accordance with Measurement Procedures in Part 1.

3.10 CLEANING

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

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

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

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

.1 Provide drainage at the locations as indicated on drawings.

1.2 RELATED SECTIONS

.1 Section 31 23 10 - Excavating, Trenching & Backfilling.

.2 Section 33 05 14 - Precast Structures.

.3 Section 33 41 00 - Storm Utility Drainage Piping.

1.3 REFERENCES

.1 CAN/CSA-B182.2, PVC Sewer Pipe and Fittings.

.2 Ontario Provincial Standard Specifications (OPSS).

.3 ASTM D3034 Specification for Type DSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.

.1 Ontario Provincial Standard Specification (OPSS):

.1 OPSS Form 405, 514, 517 and 518

1.4 MEASUREMENT FOR PAYMENT

.1 Measurement Procedures: In accordance with Section 01 11 22 – Measurement and Payment.

Part 2 Products

2.1 MATERIALS

.1 Filter aggregate: 19 mm Clear Stone as per OPSS.MUNI 1004.

.2 PVC-SDR35 pipe as per ASTM A2412 and in compliance with CSA B182.2, ASTM A3034, pipe stiffness minimum 320KPA. Pipe joints to be bell and spigot with rubber gaskets. Inside diameter as indicated on construction drawings complete with fittings. Where perforation is required, provide two rows of 15mm diameter holes positioned at 120° radially on the pipe and spaced to provide a minimum total cross-section hole area of 1933 mm2 per meter of length.

.3 Filter Fabric: Class II non-woven geotextile as per OPSS 1860.

Part 3 Execution

3.1 INSTALLATION

.1 Ensure graded subgrade conforms to required drainage pattern before placing drainage system materials.

.2 Ensure improper slopes, unstable areas, areas requiring additional compaction or other unsatisfactory conditions are corrected to approval of Departmental Representative.

.3 Ensure grading have been inspected and approved by Departmental Representative.

.4 Begin installation of underdrain system after deficiencies have been corrected.

.5 Pipe bedding and surround: excavate trenches in compacted sub-base, place geotextile within the trench prior to placing aggregate, ensure a minimum 150mm overlap of the geotextile surround. Place 150mm thickness minimum of filter aggregate on all sides compact and install to elevations as indicated.

.6 Pipe laying:

- .1 Ensure pipe interior and coupling surfaces are clean before laying.
- .2 Lay perforated pipe level to minimum slope as indicated. Face perforations and coupling slots downward.
- .3 Lay non-perforated pipe to slope as indicated from perforated pipe to disposal source. Make joints watertight.
- .4 Do not use shims to establish pipe slope.
- .5 Use fittings recommended by manufacturer except where indicated otherwise.
- .6 Install end plugs at ends of collector drains.
- .7 Protect pipe ends from damage and ingress of foreign material.
- .8 Connect subdrain to outlet as indicated on drawings.

END OF SECTION