

PROJECT TITLE REHABILITATION OF BOUNDARY ROAD SWING BRIDGE

PROJECT NUMBER 341

PROJECT DATE July 15th, 2022

END OF SECTION

Structural

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END OF SECTION

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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.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises the replacement of the Boundary Road Swing Bridge superstructure with a new replica steel swing bridge and rehabilitation of the, abutments, pier, shore works, roadway, and associated facilities in order to deliver a working swing bridge replicating the original swing bridge in general form and work as detailed on the drawings and specification.
- .2 The original swing bridge has been removed. The plans detail the original configuration, including rivet patterns etc. to allow it to be recreated. The bridge was the last of a set of five bridges and thus there is not an original bridge to review. The Bolsover Swing Bridge – Bridge 43 and the Lakeshore Swing Bridge – Bridge 50 are replicas built from the same plans but to the lengths for those locations. In general, the last panels at each end of the bridge are changed to match the requirements of the location as detailed on the drawings. The remainder of the bridge steel on the plans is for the most part similar however some sizes and thicknesses of individual members and plates have been changed as marked on the drawings. The Bolsover bridge has the correct and preferred orientation of the fasteners and is considered a better replica than the Lakeshore Bridge. The Bolsover bridge can be used as reference for most of the details that were present at the Boundary Road Bridge making the changes as marked on the contract drawings.
- .3 An attempt was made to remove references in these documents to the original bridge being available. If reference is made or implied the contractor must be aware that the bridge is not available. The fact that the bridge has been removed will not justify changes nor if the original bridge is referenced does this create an opportunity for extra costs or payment related to not being able to compare to the original bridge.
- .4 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 the delivery of all subcontractors.
- .5 The intent of the project is to replicate the original bridge in new steel, wood etc. with modifications only as specified in the contract drawings and specification.
- .6 There is significant new steel work. The steel work must be completed in a manner that replicates the existing bridge allowing the modern modifications specified in the drawings and must be coated with the coating system specified in the contract documents.
- .7 There is significant concrete work to be completed to reface, repair, and resurface the piers, and abutments above, at, and, below the waterline. Care must be taken to ensure

quality workmanship which results in a high-quality structure and protection of the environment.

- .8 The completion date 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 this date.

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 S6-06 Canadian Highway Bridge Design Code.
 - .2 National Building Code of Canada 2015, National Fire Code of Canada 2005, Ontario Building Code 2012 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 Park area to the north of the bridge will be partially available to the contractor such that all but a perimeter strip 1 meter wide may be used. The contractor shall minimize the time when this area is in use.
- .2 Contractor Parking is to be confined to the site and not is to 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 anyway, 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 Submit location of temporary buildings, roads, walks, drainage facilities, and services for approval 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.

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. Ensure protection includes protection for pedestrians, roadways, winter recreational uses and use of the waterway.

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. This will limit the size and location and capacity of cranes and must be considered especially during erection. Power interruptions of long duration are not possible and all interruptions would have to be coordinated by the contractor with the utility.
- .2 Connect to existing utilities with minimum disturbance to pedestrian and vehicular traffic.
- .3 There was wiring and control lines on the bridge. The wiring and control lines are to be replaced.
 - .1 Identify sensors, limit switches, and wires that prevent completion of the work to the Departmental Representative. All wires and sensors on the bridge are to be replaced, and should not pose an issue.
 - .2 Building wires in the hydraulic room exist and may interfere with installation. Loosen and relocate these wires as required to complete the work. Obtain approval to remove or relocate sensors from the Departmental Representative after describing how the wire/sensor will be moved prior to disturbing the wire/sensor.
- .4 Contractor shall arrange and pay for all temporary power and water connection, supply and reinstatement, for use on the Contract.
- .5 Any temporary connection to the existing electrical service from a contractor panel will be completed by the Parks Canada designated electrician. This connection will occur to the panels in the building and in close proximity to that power. It will be the Contractor's responsibility to bring the power to the site and to secure any location where cables have been brought from the building. At the end of the project, the Contractor must repair all areas affected by provision of power. The Contractor can use power for light tools, etc. but, Parks Canada does not represent that more than a 40-amp service will be available. No disturbances to navigation, pedestrian and vehicular traffic etc., due to cables etc. will be allowed. If connecting to the same power supply to be used for flashing warning lights for vehicle traffic, ensure the signals are operational before dusk and again before leaving the site such that they will work continuously to complete their function.

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. This does not relieve or remove the responsibility of the contractor to complete their own and primary quality control.
- .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.

1.18 DATUM

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

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.

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

- .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.
- .2 Prevent Damage to protective Coatings, Grease, and surfaces of structure.
 - .1 Do not place or allow any foot or other traffic on machinery.
 - .2 Access to the operator's room shall be limited. Protect the operating room and exposed portions of the mechanism against all threats including but not limited to grinding sparks etc. with plywood covered frames and waterproof tarps to the satisfaction of the Departmental Representative.
 - .3 Do not contaminate the grease on the works. Install all new grease to all mechanisms including locks etc. If dust or debris contaminates grease of operating parts, remove and reapply grease in accordance with the instructions of the Departmental Representative at no additional cost to the contract.
- .3 During the disassembly, the main bearing was salvaged and is to be reused. The Bearing and all salvaged parts will be made available for pick up at the Parks Canada yard at Kirkfield on Talbot River Road, Kawartha Lakes.

1.23 COMMISSIONING THE BRIDGE

- .1 In order to ensure that the bridge will be fully operational at the time that the Canal opens on or about May 24th for navigation, a Parks Canada commissioning period of two weeks after the contractor's commissioning period prior to the Canal opening date is required 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 bridge's 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.

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 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 combination 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 work 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 Items of longer duration shall be broken down into installation, maintenance and removal costs to facilitate payment. Payment for these items will be based on the overall project schedule and progress relative to that schedule and re-evaluated if progress is not as per the schedule.
- .5 No measurement for payment will be made for the work or 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 in accordance with the General Conditions and 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, be used as basis for applications for payment.
- .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 and distinguishing it from the installed price.

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 the same as the line item in Schedule of Values. Include in unit prices all costs associated with providing all labour, equipment, and materials, including:
 - .1 Cost of material.
 - .2 Delivery and unloading at site.
 - .3 Sales taxes.
 - .4 Installation, overhead, and profit.
- .3 Ensure the contract 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 the work which is not designated in the Unit Price Table, there shall be no measurement and 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 services.
 - .4 Environmental Management measures, plan and maintenance on each.
 - .5 Environmental Procedures, including control of work to provide effective environmental, waterbody, and fish habitat, etc. protection.
 - .6 Designing and installing all temporary access routes and temporary ramp required to access the Work areas.
 - .7 Providing construction fence and perimeter security measures around the work area and maintenance.
 - .8 Supplying, installing, and maintaining signs and luminated detour/warning signs.
 - .9 Maintaining the work/storage area for the duration of the Work.
 - .10 Removal of the temporary access routes and temporary ramp.
 - .11 Temporary utilities.

- .12 Progressive and final Site cleaning.
- .13 Design/build cofferdam (if contractor's selected method) and dewatering system.
- .14 Landscaping and site restoration.
- .15 Tasks of all sections designated or implied 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 two items listed below shall be paid at the Contract unit rate by the unit cubic metre.
 - .1 Item No. 1 - "Concrete Removals - Abutments" (Section 02 41 23).
 - .2 Item No. 2 - "Concrete Removals - Piers" (Section 02 41 23).
- .4 The item (No. 3) shall be paid at the Contract unit price by the unit kilogram (kg). This item shall be computed from the theoretical unit mass specified in ASTM A955/A955M for lengths and sizes of bars as indicated on the drawings or authorized in writing by the Departmental Representative.
 - .1 Item No. 3 – "Stainless Steel Reinforcing" (Section 03 20 00).
- .5 The two items listed below shall be paid at the Contract unit price, by the unit each.
 - .1 Item No. 4 - "Dowels Set in Epoxy" (Section 03 20 00).
 - .2 Item No. 5 – "Underwater Dowels Set in Epoxy" (Section 03 20 01)
- .6 The three items listed below shall be paid at the Contract unit price rate by the unit cubic metre.
 - .1 Item No. 6 - "Concrete in Abutments" (Section 03 30 00).
 - .2 Item No. 7 - "Concrete in Piers" (Section 03 30 00).
 - .3 Item No. 8 – "Tremie Concrete" (Section 03 37 26)
- .7 The item listed below shall be paid at the Contract unit price rate by area in square meters of the hole to be patched.
 - .1 Item No. 9 – "Under Water Formed and Pumped Patches" (Section 03 37 26)
- .8 The item listed below shall be paid at the Contract unit price rate by the bag of concrete successfully placed.
 - .1 Item No. 10 – "Under Water Unformed Patches" (Section 03 37 26)
- .9 The item listed below shall be paid at the Contract unit price rate by the unit tonne.
 - .1 Item No. 11 – "Rip Rap" (Section 31 37 00).
- .10 The item listed below shall be paid at the Contract unit price by the unit square metre. The unit price shall include all excavation, removals, granular materials, and layers of asphalt etc. for the area as specified in the contract drawings and specifications (Sections 31 05 17 through 32 12 16). While only the asphalt area is measured it is noted that granular for shoulders etc. is included in the contract lump sum price as shoulders will be required.

- .1 Item No. 12 "Full Depth Reconstruction of the Road" (Multiple Sections)
- .11 Two items are related to contaminated soils. All testing required for all excavation on site shall be included in the following item:
 - .1 Item No. 13 "Testing for Contaminated Soils".
- .12 If contaminated soils are found during testing the additional cost of disposal at a Class 1 Soil Management Site shall be included in the item:
 - .1 Item No. 14 "Disposal of Contaminated Soil"
- .13 Parks Canada may or may not want some duplicates of equipment and parts. The contractor is to price an additional swing cylinder (not gimble etc.) and seal kit for the complete swing cylinder and a complete manufactured end lift. The price will be for each additional unit but the quantities in the tender form will indicate how many are to be priced per unit. The item will only be executed at the option of Parks Canada and the quantity may be zero without any consideration for claims for lost costs such as loss of overhead and profit. If no quantity is actually purchased the contractor receives no money for these items such that the price should fully reflect the additional cost of each item delivered to the Parks Canada yard on Talbot River Road in Kirkfield, Kawartha Lakes. The items to be priced are as follows.
 - .1 Item No. 15 "Optional Spare Rotating Cylinder"
 - .2 Item No. 16 "Optional Spare Seal Kit for Rotating Cylinder"
 - .3 Item No. 17 "Optional Lift Mechanism"
 - .

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 and finally not completed. 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.

1.8 PROGRESS PAYMENT

- .1 Departmental Representative will issue to Owner, no later than 10 days after receipt of a properly executed application for payment and matching payment certificate an approval 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, the 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 with proof of completion such that the departmental representative can assess, 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 Quality checks in addition to contractor's own quality control procedures to allow the Owner to complete some quality control verification. 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 The contractor shall pay for all testing required to complete their own quality control and assurance procedures and to verify the quality of the work. At minimum the contractor shall arrange and pay for:
 - .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 contractor's own quality control program.
 - .3 Soil testing to review the appropriate disposal of contaminated soils.
 - .4 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.
 - .5 Mill tests and certificates of compliance.
 - .6 Tests specified to be carried out by Contractor under the supervision of the Departmental Representative.
 - .7 Testing by the contractor to verify quality control of the coating system and its application, not limited to thickness of each layer and preparation of the surface.
 - .8 Testing required to demonstrate the veracity of the contractor's quality control procedures and that they cover all forms of work.
- .2 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 at both 7 and 28 days. The Departmental Representative may run parallel tests at their discretion.
- .3 The Departmental Representative will confirm at their discretion any portion of the quality control and may run parallel or separate testing. The Departmental Representative will appoint and pay for services of testing laboratory for parallel or separate testing.
- .4 Where tests or inspections by the Departmental Representatives designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for

correction and 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 allow the Departmental Representative's testing:
 - .1 Provide access to Work to be inspected and tested.
 - .2 Facilitate inspections and tests.
 - .3 Make good, Work disturbed by inspection and test 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 test.
- .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by 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 Representative's 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. It is likely that the first meeting will be by teleconference.
- .4 Incorporate mutually agreed upon variations to Contract Documents into agreement, prior to signing.
- .5 Agenda generally to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Contractor's role as the Constructor.
 - .3 Schedule of Work: in accordance with Section 01 32 16.07.
 - .4 Environmental Protection issues and concerns
 - .5 Historical Canals Regulation permitting requirements
 - .6 Environmental Management Plan
 - .7 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00.
 - .8 Schedule location for provision temporary facilities, site sign, offices, storage sheds, utilities, and fences in accordance with Section 01 52 00.
 - .9 Site security in accordance with Section 01 56 00.
 - .10 Procedures for: proposed changes, change orders, approvals, time extensions, overtime, and administrative requirements.
 - .11 Record drawings in accordance with Section 01 33 00.
 - .12 Take-over procedures, acceptance, and warranties in accordance with Section 01 78 00.
 - .13 Schedule and Progress
 - .14 Monthly progress claims, administrative procedures, photographs, and hold backs.

- .15 Appointment of inspection and testing agencies or firms.
- .16 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 generally include the following:
 - .1 Site Safety Report
 - .2 Review minutes of previous meeting.
 - .3 Review of Work progress since previous meeting.
 - .4 Environmental Protection and Concerns.
 - .5 Field observations, problems, and conflicts.
 - .6 Problems which will impede construction schedule.
 - .7 Review of off-site fabrication delivery schedules.
 - .8 Corrective measures and procedures to regain projected schedule.
 - .9 Revision to construction schedule.
 - .10 Progress schedule during succeeding work period.
 - .11 Review submittal schedules (expedite as required).
 - .12 Maintenance of quality standards.
 - .13 Review proposed changes for affect on construction schedule and on completion date.
 - .14 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 Electronic transfer will be the preferred method of transfer but if issues develop with the delivery or opening of the files at the sole discretion of the Departmental Representative hard copy prints can be requested.
- .2 Print Size: 200 x 250 mm.
- .3 Type: glossy colour with binding margin at one end.
- .4 Paper: single weight.
- .5 Number of prints required: One (1) plus electronic file.
- .6 Identification: file names must reflect the project number, bridge name, location (viewpoint number) and date. If file names do not convey the information, then prints with typewritten name and number of project and date of exposure on white patch in upper right-hand corner.
- .7 Viewpoints: determined by Departmental Representative.
- .8 Frequency: at two-week intervals maximum, or as directed by Departmental Representative.

1.3 ELECTRONIC COPY

- .1 Submit electronic of colour digital photography in jpg format, fine resolution.
- .2 Place on designated transfer folder or Email photographs every two weeks and provide one set on each of two transferred electronic copies at the end of the project in the maintenance manual. The Departmental Representative will confirm access and transfer of the files. If the files can not 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 or viewpoint, and the date of exposure.
- .4 Number of viewpoints: Locations of viewpoints determined by Departmental Representative.
- .5 Frequency: Maximum every two weeks before project meetings, or 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 typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally, Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: Original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five-day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: Number of work periods (not including holidays or other nonworking periods) required to complete activity or 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 Detail 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 form interim targets for Project Schedule.
 - .1 Preconstruction Meeting and Master Plan as per specification.
 - .2 Finalized Detailed Schedule within 20 days of award.
Submit and comply to all Environmental Requirements and obtain approvals within 60 days of award.
 - .3 After EMP approval forms of mobilization that do not interfere with canal operations, does not affect the navigation channel (south abutment to center pier from edge to edge of the site) and provides protection to the environment and navigation may be considered. Submit all plans as part of the EMP submission.
 - .4 Oct 11th canal closing.
 - .5 Concrete work on Abutments and Pier completed by December 15th, 2022.
 - .6 Truss and Superstructure components on site Jan 15th, 2023
 - .7 Bridge operating by March 30th, 2023 and start of Commissioning.
 - .8 Preliminary Commissioning completed before May 1st, 2023 with commissioning requirements requiring Parks staff and canal operation continuing into the season.
 - .9 Site Occupation ended by date specified prior to, or two weeks before, the opening of the canal on the Friday before the May long weekend with all commissioning complete.

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 If progress on one task is stopped or slowed by an unknown the remainder of the schedule shall be maintained, and resources allocated to advance other and all tasks that can be advanced. One unknown in one portion of the project does not give justification to slow other tasks unless there is no way to proceed and a direct relationship between the task and the other tasks. Even the schedule of the stopped or slowed task must be

estimated with a best-case worse case such that the completion date can be maintained and estimated. It is unacceptable to not have a schedule.

- .5 Accepted revised schedule will become Master Plan and be used as baseline for updates. Production and 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 the Master Plan.
- .2 Ensure Master Plan and detailed Project Schedule includes, at minimum, milestone and activity types as follows:
 - .1 Award.
 - .2 Submission and return dates for Shop Drawings, Samples etc. allowing full time for review.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Times when there will be minimal activity on site.
 - .6 Installation of each phase of Access.
 - .7 Removals.
 - .8 Concrete Repairs.
 - .9 Structural Steel.
 - .1 Member/fabrication and schedule.
 - .2 Member/component assembly schedule.
 - .10 Progress of Painting by section of Truss and by progress of preparation, primer, intermediate, and top coats for each section of the bridge.
 - .11 Bridge Return to Site
 - .12 Bridge superstructure Completion.
 - .13 Deck Construction.
 - .14 Mechanical/Electrical installation.
 - .15 Traffic Lighting and Gates
 - .16 Site Work.
 - .17 Commissioning.
 - .18 Operational Testing
 - .19 Demobilization
 - .20 Supplied material delivery dates throughout all phases.

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 and ice 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 schedule.
- .4 Note that the schedule must include an allowance of two weeks before the Canal opens to navigation for canal maintenance boats and barges. This infers that the work on the bridge must be complete to the point that the bridge is ready for take over 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 and the lump sum. 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.

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 Shop drawings and product data.
- .2 Samples.
- .3 Certificates and transcripts.
- .4 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.
- .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. Also submittals with many errors may have the review truncated and not completed with the partially reviewed submittal returned to the contractor for correction and resubmittal.
- .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 clearly be listed, and the Departmental Representative review must specifically address with a note in writing that the deviation is accepted. If a written acceptance by the Departmental Representative is not obtained all deviations are considered not accepted even if they have been incorporated in the work and the contractor shall pay all costs and perform all work to correct the deviation.
- .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 or review by their designates of submittals.
- .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. If a submission is not returned provide a reminder to the Departmental Representative at the time that the submission was to be returned.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data which are to be provided by the Contractor to illustrate details of a portion of Work.
- .2 Indicate materials, methods of construction, environmental protections 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 same with contact information for the Contractor's Engineer.
- .4 Allow ten (10) working days for Departmental Representative's review of each version of each submission.
- .5 For the steel shop drawings if sets of shop drawings covering multiple sections of the bridge are submitted in one submission allow up to additional 10 working days for each version of the submission. The Departmental Representative will look to reduce this time, but large detailed submissions require time to review. Partial sub-assemblies are preferred but it is the contractor's responsibility to ensure compatibility between the sub-assemblies. Sufficient information needs to be submitted with each submission such that it can be properly assessed.
- .6 Allow an additional ten (10) working days for submittals related to Archaeological, Cultural, or Environmental procedures and methods which require acceptance by other departments or agencies (particularly the Environmental Management Plan) 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 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 is valid unless agreed upon by the Departmental Representative.
- .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 that were made other than those requested by The Departmental Representative marking them 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 Any Deviations
 - .6 Any changes to previous shop drawings not requested.
 - .7 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 Environmental Protections
 - .5 Capacities.
 - .6 Performance characteristics.
 - .7 Standards.
 - .8 Erecting Sequence and Procedures
 - .9 Operating weight.
 - .10 Wiring diagrams.
 - .11 Single line and schematic diagrams.
 - .12 Relationship to adjacent work.
 - .13 Equipment identification.
- .11 After Departmental Representative's review, distribute copies.
- .12 The Departmental Representative 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.
- .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 3 prints and 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 conformance with 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 and the 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. Note the bridge is on the Boundary of several municipalities and each must be contacted as appropriate.
- .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 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. The titles will be similar in form to:
 - .1 "Project 341 Boundary Road Swing Bridge: Shop Drawings 7 - East End Gussets – Rev 2" or
 - .2 "Project 341 Boundary Road Swing Bridge: Mill Certificates 3 - 3x3x1/2 angles Northwest Bearing".
 - .2 The format of electronic submissions shall be PDF format.
 - .3 Submissions such as “Project 341 Boundary Road Swing Bridge: Shop Drawings Steel Bridge” shall be unacceptable as too general and must be divided into subsections labelled correctly and submitted individually.
 - .4 Poorly labelled or named submissions may not be reviewed and will be returned to the contractor.
 - .5 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. Diving Operations should be required.
 - .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 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.
 - .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.
- .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 promptly 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.

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.
- .2 The Contractor shall coordinate and comply with 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 site and on the 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) in preserved wood and other wood preservatives on site.

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 comment or 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 site, and environment to the extent that they may be affected by conduct of Work.
- .2 Comply with, and enforce compliance by, employees with safety requirements of Contract Documents, applicable Federal, Provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- .3 Where applicable, the Contractor shall be designated "Constructor", as defined by Occupational Health and Safety Act for the Province of Ontario.
- .4 Request correction of any activity of Parks Canada employees or Parks Canada designates such that they conform with the Contractor's safety plan. Contact the Departmental Representative regarding any Parks Canada personnel or Parks Canada designates that are not comply with the contractor's safety plan or concerns such that they can be corrected in accordance with the contractor's safety plan.

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. Health and Safety Co-ordinator must:
 - .1 Have site-related working experience specific to activities associated with abatement of lead containing materials.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
 - .5 Be on site during execution of Work and report directly to 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.

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 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 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: <http://laws-lois.justice.gc.ca/eng/regulations/sor-93-220/>.
- .2 Contractor may not mobilize or begin any work until Parks Canada issues permit under Historic Canals Regulation (SOR/93-220 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

- .1 Comply with environmental requirements of Contract Documents, applicable federal, provincial, and local statutes, acts, regulations, and ordinances of Agencies having jurisdiction.
- .2 Owner, Parks Canada Agency, is main Environmental Authority for Trent-Severn Waterway projects.
- .3 Departmental Representative will seek and obtain acceptance of PCA Environmental Authority of submittals or changes in scope of work or methodologies that may affect archaeological resources, cultural resources or environment prior to providing direction to Contractor.
- .4 Owner will not issue permit to authorize start of Work, under Historic Canal Regulations, before review and acceptance of Environmental Management Plan.
- .5 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.
- .6 Changes to project scope of work not assessed under site-specific BIA will require review and acceptance by Departmental Trent-Severn Waterway. Bolsover Dam, Bolsover Bridge, Boundary Road Bridge and the entire Balsam Lake Division of the canal are Resources of National Heritage Value.
- .7 Preserve heritage elements of site by executing Work without damage to site features or character defining elements. This includes stone pitching adjacent to the bridge abutments.

1.6 HERITAGE PROTECTION

- .1 Trent-Severn Waterway and Crowe Bay Dam 12, Lock 14 and Headrace bridge are Resources of Other National Heritage Value.
- .2 Preserve heritage elements of site by executing Work without damage to site features or character defining elements. This includes stone pitching adjacent to the bridge abutments.
- .3 Notify Departmental Representative and PCA Environmental Authority immediately if heritage items are damaged.
- .4 Employ minimal intervention approach for all Work.
- .5 Access roads, staging areas, and work pads require review and approval.
- .6 Damage to heritage elements will not be tolerated.
- .7 Ensure appropriate supervision work, adequate training for workers, and other necessary precautions to protect existing structures.

- .8 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.
- .9 Protect possible archaeological and cultural resources by excavating only to limits indicated.
- .10 Excavation beyond indicated limits requires acceptance by PCA Environmental Authority.

1.7 RELICS AND ANTIQUITIES

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

1.8 ARCHAEOLOGICAL AND CULTURAL REQUIREMENTS AND RESTRAINTS

- .1 Site may contain possible cultural and archaeological resources.
- .2 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.
- .3 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.
- .4 Do not resume Work until directed by Departmental Representative.
- .5 Proceed with other work and wait further direction for work in affected area from Departmental Representative on how to proceed.
- .6 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

- .1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures and as below.
- .2 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. Detailed procedures limits and drawings are required.
- .3 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.
- .4 In order to allow for the timely commencement of project activities, the EMP can be submitted as separate components to cover all work to be commenced and prior to each work activity on site as project details become available until the full plan can be submitted. This will only be entertained for limited well controlled activities. 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.
- .5 The EMP, will be submitted in writing prior to implementation of project activities and must be reviewed and accepted by Parks Canada and the Departmental Representative prior to activities.
- .6 If Parks Canada provides comments a separate and clear revision document will be submitted with the next and each version of the submittal. The revision document will include:
 - .1 A list of every comment, request for additional information, request for deletion etc. with a column for each of
 - .1 Page number of EMP submission
 - .2 Comment made by Parks Canada
 - .3 How it was addressed.
 - .2 Any change that is not clearly highlighted in the revision document will not be considered accepted by Parks Canada. Parks Canada always has the ability to revise approvals if environmental conditions change but have additional ability to change approval where changes are misrepresented or not clearly included in the revision list and are changed in the documents.
 - .3 The revision document will include all past revision document items when it is resubmitted.
- .7 The complexity and level of detail of the EMP should be proportionate to the scope of work and level of complexity and risk involved.
- .8 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. The qualified professionals shall have experience with EMP plan and demonstrate competence. The Departmental Representative can review the credentials and competency of the senior individual preparing and attesting the EMP plan is complete. The Departmental Representative can request more qualified individuals be involved if

progress towards acceptance is not being made. An EMP accepted by PCA is required prior to the release of the Historic Canals Regulations Permit issued to the Contractor.

- .9 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.
- .10 Environmental Management Plan to detail frequency of monitoring and high-risk construction activities requiring environmental professional on site.
- .11 Environmental Management Plan to be prepared in accordance with requirements of Federal, Provincial, and Municipal laws and regulations.
- .12 Notify Departmental Representative of proposed changes to project plans or schedules effecting Environment Management Plan.
- .13 Contractor to ensure on-site personnel is aware of, and comply with prescribed mitigation measures in Environmental Management Plan
- .14 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .15 Environmental Management Plan (EMP) at minimum 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 wastewater 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 Summary 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

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

1.13 DRAINAGE

- .1 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.
- .2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sedimentations control plan.
- .3 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.

- .4 Do not pump water containing suspended materials into waterways, sewer, or drainage systems.
- .5 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.
- .6 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

- .1 Do not operate construction equipment in waterways.
- .2 Install sediment fences and erosion control structures, turbidity curtains and settling curtains prior to any work adjacent to waterways or on the pier.
- .3 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.

- .4 Do not use waterway beds for borrow material.
- .5 Do not dump excavated fill, waste material, or debris in waterways.
- .6 Design and construct temporary crossings to minimize erosion to waterways. Temporary crossings shall not be composed of loose aggregate/granular material.
- .7 Do not skid logs or construction materials across waterways.
- .8 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .9 Clean storm run-on shall be diverted around the site and away from exposed areas as detailed in the EMP
- .10 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.
- .11 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.
- .12 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.
- .13 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.
- .14 Stockpile excavated or fill materials must be stored and stabilized away from water. Runoff from the excavated or 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.
- .15 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

- .1 All work must comply with the Fisheries Act, as regulated by the Department of Fisheries and Oceans (DFO). Water Quality and Aquatic Life Protection'
- .2 All In-Water Work shall also be governed by these provisions.
- .3 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.
- .4 In-water work shall be performed in a manner that minimizes the disturbance of the watercourse bottom and dispersion of sediment.
- .5 The duration of in-water works should be minimized to the extent possible.

- .6 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.
- .7 Turbidity curtains shall be weighted on the bottom edge and long enough to sit on the canal bed.
- .8 Where necessary, fish salvages will be conducted by a qualified professional in areas isolated from flows prior to construction, under applicable permit(s).
- .9 Where possible, schedule work to avoid wet, windy, and rainy periods that may increase erosion and sedimentation.
- .10 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.
- .11 Refer to mitigation measures for Surface Water Quality for NTU and TSS requirements.
- .12 Maintain fish passage at all times.
- .13 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.
- .14 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.
- .15 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).
- .16 In-water work shall be performed in a manner that minimizes the disturbance of the watercourse bottom and dispersion of sediment
- .17 Place only clean, washed stone, free of fines in the waterbody.
- .18 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.

- .19 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.
- .20 In the event of significant sedimentation or debris caused by construction activities, contractor must take appropriate measures to confine work area.
- .21 Develop a contingency plan (e.g. 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.
- .22 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.
- .23 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.
- .24 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.
- .25 Monitor water quality for suspended sediment levels exceeding identified requirements during in and near-water activities
- .26 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.
- .27 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.
- .28 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.
- .29 If utilized, ensure that sediment settling basins are of adequate size to allow for excess sediment run-off and erosion.
 - .30 Record pH measurements of water inside and outside containment area.
 - .31 Water with pH>9 or <6.5 cannot be released directly into the watercourse, such water must be treated prior to release.
 - .32 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.
 - .33 Stop work in immediate area in the event pH, sedimentation or turbidity exceed identified thresholds and implement mitigation measures accepted by Departmental representative.
 - .34 The intakes of pumping hoses will be equipped with an appropriate device to avoid entraining and impinging fish, as per DFO guidelines.
 - .35 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.
 - .36 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

- .1 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.
- .2 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.
- .3 All lead-based paint shall be managed in accordance with Ontario Regulation 490/09.
- .4 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 abutments or pier or any of their component parts.
- .5 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.
- .6 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.
 - .7 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
 - .8 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.
 - .9 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.
 - .10 Do not bury rubbish and waste materials on site.
 - .11 Do not dispose of waste or volatile materials, such as mineral spirits, oil, or paint thinner, into waterways, storm, or sanitary sewers.
 - .12 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.
 - .13 Obtain and submit Waste Generator Numbers, permits, manifests, and other paperwork necessary to comply.
 - .14 Remove all garbage from site daily.
 - .15 Dispose of uncontaminated construction/demolition materials which cannot be recycled or reused, at an approved construction and debris disposal site.
 - .16 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.
 - .17 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.
 - .18 Departmental Representative may suspend work following the improper handling of hazardous materials.
 - .19 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).
 - .20 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.
- .21 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.
- .22 Dispose of hazardous materials and designated substances in accordance with Ontario Regulation 347/90.

1.17 PERMIT TO TRANSPORT

- .1 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.
- .2 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

- .1 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.
- .2 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.
- .3 Work shall be conducted in accordance with the Corporation of the City of Kawartha Lakes' "A By-Law to Regulate Noise in the City of Kawartha Lakes (By-Law 2005-25)" and any updates or other applicable by-laws.

1.19 SPILL CONTAINMENT

- .1 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.
- .2 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.
- .3 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.

- .4 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.
- .5 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.
- .6 Disposal of spilled materials and impacted/contaminated material to be off Parks Canada property and at approved locations for materials to be disposed of.
- .7 Contractor to protect all wells, catch basins, drywells, drains and watercourses from contamination in event of a spill.
- .8 Contractor to immediately remove as much or all of the contaminated soils as possible, from any spills created from Work of the Contractor.
- .9 Contaminated soils/materials to be placed in sealed, isolating containers compatible to the contaminants.
- .10 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
- .11 Documentation of remediation, testing, and results are to be submitted to Departmental Representative and PCA Environmental Authority.

1.20 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this contract for the duration of the Work.
- .2 Control emissions from equipment and plant to local authorities' emission requirements.
- .3 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.
- .4 Cover or wet down dry materials to prevent blowing dust and debris.
- .5 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.

- .6 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.
- .7 Use well-maintained heavy equipment and machinery, fitted with fully functional emission control systems/muffler/exhaust baffles, engine covers, etc.
- .8 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.
- .9 Machinery shall be left running only while in use, with the exception of during extreme temperatures which prohibit shutting machinery down.
- .10 Waste and debris shall be transported from site in a fashion that limits the loss of soils and dust.
- .11 Cleaning of heavy equipment, including concrete trucks, shall not be cleaned within the park boundaries.
- .12 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.
- .13 Be responsible for all costs of cleaning up any spills to the satisfaction of the Departmental Representative.
- .14 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.
- .15 Use biodegradable hydraulic fluids for machinery that will be working in or around the river.
- .16 Store all oils, lubricants, fuels and chemicals in secure areas on impermeable pads; provide berms and secondary containment systems as necessary.
- .17 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

- .1 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.
- .2 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).

- .3 Contractor, after receipt of such notice, shall inform the Departmental Representative of proposed corrective action and take such action to satisfy the Departmental Representative.
- .4 Departmental Representative may issue a stop-work order until satisfactory corrective action has been taken.
- .5 No time extensions will be granted, or equitable adjustments allowed, to Contractor for such suspensions.
- .6 Contractor to co-operate with the authorities having jurisdiction and correct any noncompliance issues.
- .7 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.
- .8 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 Trent Severn Waterway Parks Canada Warden Office (1-705-750-4949)
- .9 Following an environmental incident or emergency, the Contractor is to submit to Departmental Representative a 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.
- .10 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 (CO₂) 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 come 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 0°C and for a minimum of 72 hours if ambient temperature is below 0°C.
- .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 on line 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

- .1 There shall be no measurement for this work.
- .2 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

2.1 NOT USED

- .1 Not Used

Part 3 Execution

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
 - .1 Leave Work area clean at the end of each day.
- .2 Ensure public waterways, and storm and sanitary sewers remain free of waste and volatile materials disposal.
- .3 Final Cleaning: upon completion of Work, remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 11.
- .4 Waste Management: separate waste materials in accordance with Section 01 74 21 – Construction Demolition Waste and Disposal.
- .5 Clean up work area continuously as Work progresses.
- .6 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.
- .7 Permit no amount of debris, trash or garbage to accumulate on site.
- .8 Do not bury rubbish on site.
- .9 Separate and recycle materials that can be recycled.
- .10 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.
- .11 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.
- .12 Ensure emptied containers are sealed and stored safely for disposal away from children and wildlife.
- .13 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.
- .14 All work sites must be returned to a neat and tidy condition upon site abandonment.

- .15 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.
- .16 Clean areas under contract to a condition at least equal to that previously existing and to approval of Departmental Representative.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Temporary Erosion and Sedimentation Control Plan: in accordance with Section 01 52 00 – Construction Facilities.
- .2 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.
- .3 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .4 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION

Part 1 General

1.1 ENVIRONMENTAL PROTECTION

- .1 The portions of the bridge that were salvaged are now stored. The lead paint has not been removed and thus these constraints apply. Where the specification indicates parts that were to be salvaged they are now parts that have been stored.
- .2 While the majority of the bridge will be replaced and those portions that are not salvaged can be disposed of in accordance with regulations the following applies for parts that are to be salvaged which will require lead paint removal. The following applies to Salvaging, handling 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.
- .3 Lead paint removal shall be kept to a minimum but must include all parts to be salvaged. 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.
- .4 Comply with Ontario Ministry of Labour Guideline - Lead on Construction Projects.
- .5 Remove lead containing dust from air using appropriate extraction system and effective dust collection system with an appropriate HEPA filtration system.
- .6 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.

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 The paint samples taken from the inspection locations from the bridge were sent to a Testing Laboratory for chemical analysis. All samples contained large concentrations of lead, indicating the presence of lead in the paint system(s) used on the bridge and lead in all coating layers. The test result was Blue Paint 720 µg per g and Primer Paint 850 µg per g. These values are greater than applicable limits defining lead-based paint content. For all existing painted surfaces, it shall be assumed that the preparation activities on the structure will require sufficient

containment to protect the environment, as well as workers, from the hazards of lead.

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.
- .5 Equipment and system adjust and balance.

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 Place of Work, allow access to such Work whether it is in progress, or completed, for review.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections, or approvals by Departmental Representative instructions, or law of Place of Work.
- .3 If Contractor covers, or permits to be covered, Work that requires inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed, and make good such Work.
- .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 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 a quality assurance program to verify that the work is completed in accordance with the Contract requirements and to perform Work in accordance with Contract Documents.
- .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. Include for Work of all Sections required to provide mock-ups.
- .2 Construct in all 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.

The Departmental Representative may run parallel tests for any concrete work using their own inspector. Provide access and materials to allow testing.

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 function together 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.

1.4 INSTALLATION AND REMOVAL

- .1 Provide temporary utilities and controls in order to execute work expeditiously.
- .2 Remove from site all such work 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 Departmental Representative will provide for location of temporary power during construction for temporary lighting and operating of light power tools, to a maximum supply of 120 volts 40 amps. The Contractor shall wire from the panel out of the main building and will secure the building during construction and make good after construction.
- .2 The Contractor will provide a sub-panel and wire to the Departmental Representative who will arrange for connection to the power in the main building.
- .3 Temporary power for any use for example such as electric cranes and other equipment requiring in excess of above is responsibility of Contractor.
- .4 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 and sufficient areas to make the inspections efficient shall be provided in the sole judgement of the Departmental Representative.
- .5 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/A23.2-14, 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 ACCESS TO PIERS

- .1 Provide access to piers. If access to pier is by boat, provide all requested access for Departmental Representative, Consultant, and Inspectors.
- .2 Assume that channel navigation by the public in boats may occur and that such activities as snowmobiling will occur. Mark all obstructions such as abutments, bridges or restrictions to the channels. 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.
- .3 No obstructions will be allowed in the channels while and after the canal opens during normal operation hours. All work during canal season 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 The site area is tight and the location will have to be well planned so as to not interfere with work.
- .3 Provide a clearly marked and fully stocked first-aid case in a readily available location.
- .4 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.
- .5 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. 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 operator's 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 provide ambient temperatures and humidity levels for storage, application, installation, and curing of materials.
 - .9 To allow inspection of the work.
- .6 The requirements of this Section apply to all other Sections of the specification, 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 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.
- .3 SSPC Guide 6 - Steel Structures Painting Council Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations, May 2015.
- .4 SSPC Guide 16 - Steel Structures Painting Council Guide for Specifying and Selecting Dust Collectors, August 2003.

1.4 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. All environmental constraints will also be adhered to during the work.
- .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.

1.5 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, wattage, and location of temporary lights.
- .6 Environmental Protection measures.

1.6 SITE BARRIERS

- .1 Site barriers must be sufficient to protect public and exclude them from the work area.

1.7 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 Make no holes in the structural steel to attach scaffold. 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.

1.8 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.
- .4 Make no holes in structural steel to attach hoarding, housing, or scaffold.

1.9 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.

1.10 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.

1.11 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.

1.12 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.

1.13 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).
 - .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 control room 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, at all times 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 hearing 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 of the specification or 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. Overlapping panels fastened securely together will be required to conform to the slopes and tie in to locations where fences meet the water.

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 when traffic enters the site or during installation, repair, removal or modification to the detour signage.
- .2 When the road is to be fully closed and again when it is to be fully opened keep all emergency services 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 new 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. All old signs shall be returned to the owner. All additional temporary signs are the contractors.

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 The contractor is responsible for assessing and providing all signs and traffic control devices in accordance with OTM, Book 7. Record existing conditions on site and augment / adjust / bag to obscure existing conditions on site and beyond to fully conform to OTM, Book 7.
- .2 There are currently Parks Canada owned signs and traffic control devices on site. The contractor can use these as a source of signs and traffic control devices, but Parks Canada may want them returned at the end of the project. Although the signs and devices are currently in a configuration it is the contractor's responsibility to move to assess and to move and augment the devices and signs to their configuration. The Departmental Representative will review the condition of the signs and devices before directing which devices, signs or sign bases will be returned. Signs that are returned will be returned to the Parks Canada Kirkfield yard on Talbot River Road and stored as directed. Normal wear and even some minor damage is anticipated, and Parks Canada's choice may be based on desired inventory rather than condition at their sole discretion. Devices and Signs that the Departmental Representative does not want returned shall be disposed of by the contractor. No warranty is provided with the signs and traffic control devices. Those not meeting the assessed requirements of the contractor will be listed and reviewed with the Departmental Representative such that a return or dispose decision can be made by the

Departmental Representative. Note the permit for the current detour and all current signs and traffic control devices on site will expire on or shortly after the contract is executed and the contractor must obtain all permits for their traffic control.

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 not shown on the drawing but are required in accordance with the requirements of the Ontario Traffic Manual books. The drawing layout is intended as a start toward full signage. 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/or as supplemented on the Contract Drawings.
- .5 Note the shoulders of the roads for the detour are narrow and the ditches beside the roadway are deep with sharp slopes. Some signs will require tall posts and placement given winter snow maintenance will be key.
- .6 Meet with Departmental Representative prior to commencement of work to submit a traffic control plan and list of signs and other devices required for the project. If situation on site changes, revise list to approval of Departmental Representative.
- .7 Continually maintain traffic control devices in use by:
 - .1 Checking signs daily for legibility, damage, suitability, and location. Clean, repair, or replace to ensure clarity and reflectance 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 new and 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 as to whether any product specified or system is in conformance with applicable standards, Departmental Representative reserves the right to have such products or systems tested to prove or disprove conformance. Test results proving or certifying conformance of alternatives suggested by the contractor shall be submitted when the alternatives are submitted and any associated testing would be at the contractors cost.
- .4 The contractor is responsible to provide proof of conformance and the above testing is not to be used as a substitute for submissions of conformance but rather as a means of testing the actual conformance if the Departmental Representative doubts the actual product conforms.
- .5 The cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.
- .6 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, 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 Where fasteners are not specified use non-corrosive fasteners matching adjacent material or 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 Catalog as per the requirements of the waste management plan and 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 indications 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 waste products and debris
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .6 Make arrangements with, and obtain permits from, authorities having jurisdiction for disposal of waste and debris.
- .7 Remove stains, spots, marks, and dirt.
- .8 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.
- .9 Remove dirt and other disfiguration from exterior surfaces.
- .10 Sweep, and wash clean, paved areas.
- .11 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.
- .2 Waste is also generated by the burning of fossil fuels. Parks Canada has the desire to monitor the use of fossil fuels and will be developing a system of tracking. To aid in setting up the system for this project fuel use shall be monitored. Ideally this would be separated into
 - .1 Fuel used on site in equipment and for heating
 - .2 Fuel used to get to the site.Submit to the Departmental Representative a method for tracking fuel use. The method will be reviewed to see if it tracks use sufficiently. The exact method is not specified as depending on how fuel is purchased information can be collected in different ways. The information must be collected and submitted.

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 were salvaged as they are to be reused in the newly constructed bridge or returned to Parks Canada. The salvaged part will be picked up at the Parks Canada Kirkfield yard on Talbot River Road, Kawartha Lakes.
- .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 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.

1.8 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.

1.9 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.

1.10 COST/REVENUE ANALYSIS WORKPLAN (CRAW)

- .1 Prepare CRAW: Schedule D.

1.11 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.

1.12 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.

1.13 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.

1.14 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises.

1.15 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 After the Contractor's Inspection has been completed the Departmental Representative's Inspection will be completed: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
- .3 Completion: submit written certificate that 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 Complete Maintenance manual has be submitted and had a preliminary review.
 - .8 Work is complete and ready for Final Inspection.
- .4 Final Inspection: When items noted above are completed, request final inspection of Work by Departmental Representative, and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request reinspection.
- .5 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.
- .6 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.

- .7 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.
- .8 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 manuals and 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. Preliminary submissions on other projects have been incomplete and poorly organized and this will not be accepted.
- .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 no other logos should be visible.
- .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 CD; provide 2 copies of CD.
- .11 Provide electronic version of binder contents in PDF format and video of operational training.

1.4 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project;
 - .1 date of submission;
 - .2 names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties;
 - .3 schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 list names, addresses, and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to 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 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates and reports.
 - .8 Manufacturer's certificates.

- .9 Commissioning Log including Log of adjustments
 - .10 Operational Instructions and Check list
 - .11 Content of Instructional Video and actual video in Electronic Version
 - .12 Operators manuals for all equipment
-
- .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 included in the contract lump sum and a condition for substantial completion and 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 to ensure that problems are addressed and both are contract requirements.
- .2 Because the bridge has been removed measuring the existing dimensions, gaps, shims beneath wheels, bearings, and elevations prior to demolition can not be completed. While this would have provided a starting point from which adjustments could be made it would only apply if the old and new bridges behaved identically. It is the intent to replicate the former bridge.
- .3 For purposes of Section 4.3 - Commissioning Acceptance - Balance described below, it is assumed that the new bridge structure has been successfully positioned on the reconditioned pintle, that the balance wheel assemblies have been reconnected to the bridge sub-structure, and that the bridge is completely set up. It is also assumed that the bridge has been balanced and is completely operational and the operation has been proven to be reliable. If this is not the case the contractor shall rectify any discrepancies and set the bridge in that condition as part of the contract.
- .4 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 The previous bridge has been removed and care shall be used based on the drawings to establish the position of the center of the bridge and thus the entire bridge. In addition layout must be checked to establish the position of the abutments to allow swing including allowance for a gap. For reference the gap at Bolsover Bridge can be used as guide but note adjustments have to be made to account for temperature.

3.2 ELEVATION

- .1 At minimum, the following elevations shall be measured and recorded:
 - .1 Elevations of the center pier at eight evenly spaced points in each quadrant of the bridge, and at the pivot point and hydraulic bases.
 - .2 Elevations of the bearing points on the abutments.
 - .3 At a minimum of five locations across the roadway the elevation of the top of the south abutment at the roadway bridge interface.
 - .4 The Contractor shall establish two solid and secure benchmarks to ensure that they will have vertical control for when the concrete work is completed. Note: while the elevation of the bridge should be very close to the original, the elevation of the roadway will be adjusted to meet the new elevation of the bridge.

3.3 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 they 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, curbs, 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, the wheel ramps, and the lift cylinders, 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 some 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 Center beam erection with balance beams and center truss section.
 - .2 Finish of steel erection.
 - .3 Finish of deck construction.
 - .4 Finished curb/railing installation.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 When finishing concrete of pier, pay attention to elevations around track location such that shimming is less onerous.
- .2 Tolerances for rail elevation are extremely tight (0.5mm). Take care when accepting rolled sections of rail and during shimming and installation to produce a truly flat and level track.
- .7 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 after time and a number of rotations.
- .8 At the north end of the bridge, the wheels of the east and west side must be offset in elevation such that, as the east wheel crosses the west bearing pad, there is clearance. Typically, 30-50 mm of clearance is sufficient such that the elevation of both the east wheel and the east bearing pad are 30-50 mm higher than the west pad and west wheel.
- .9 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 elevation has been determined and the bridge is balanced. The pouring of the abutment cap shall occur after the new bridge is balanced 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 pre-commissioning and commissioning and adjustment of the bridge system, to ensure reliable operation of the bridge. 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 Contractor.
- .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.
- .3 Ensure "As-Built" system schematics are available.

4.2 COMPARISON OF AS-FOUND AND AS-BUILT DATA

- .1 The Contractor will survey the new bridge structure and submit dimensioned drawings showing overall dimensions and elevations. Including elevation of the bridge at the ends and center at 5 points across each section. Dimensions and the specification of balance weights that were applied during the balancing process should be recorded as well as operating pressures. Submit all information two weeks before commissioning.
- .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 roadway are level to the bridge approaches.
 - .2 Check that the center pier caster wheels are shimmed to correct gaps (typically 0.010" - 0.030").
 - .3 Check that the caster wheels located on the south 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 south end mechanical jacks and check that the north side caster wheels do not lift off the rest pads.
 - .5 Jack the south end of the bridge using an instrumented manual jack and check the out-of-balance load condition.
 - .6 Rotate the bridge until the fixed caster wheel clears the abutment wheel rest pads on the opposite side of the bridge.
 - .7 Check for north caster wheel engagement with the abutment. Check clearance on south side.
 - .8 Progressively rotate the bridge to the fully open position, checking central pier caster clearances.
 - .9 Close the bridge and raise the end mechanical jacks.
 - .10 Check that both ends of the bridge roadway are level to the bridge approaches.
 - .11 Any other tests warranted to confirm proper operation of the bridge.
 - .12 Repeating of any or all of the above tests as many times as warranted.
 - .13 This may be an iterative process requiring several cycles of weight/clearance adjustment to complete.

4.4 COMMISSIONING ACCEPTANCE - MECHANICAL SWING AND JACK SYSTEMS

- .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 Check swing cylinder alignment, function and operational clearances.
 - .2 Check south abutment jack alignment, function and operational clearances.
 - .3 Check Hydraulic system operating pressure and collect sample of new oil.
 - .4 Confirm operating pressures of cylinders are within design operating pressures.
 - .5 Check bleeding of cylinders and demonstrate no air is in the system.

4.5 COMMISSIONING ACCEPTANCE - ELECTRICAL SYSTEMS

- .1 Prior to commissioning, the Contractor must pre-commission all systems and equipment. Two months prior to pre-commissioning, provide complete checklists covering all pre-

commissioning work. The checklists must be in a form allowing each checked item to be initialled by the checker to confirm that the item is complete and operating correctly. Included all parameters to check operation as well as:

- (1) connection integrity,
- (2) correct polarities,
- (3) proper rotation,
- (4) correct direction for all wiring,
- (5) device operation and configuration.

It not sufficient that it just works it must be installed correctly and complete all functions as intended.

All work by the contractor must be included on the checklists and all check items must be reviewed to ensure the correctness of all work. In general, it is recommended to:

- .1 Check all of the 24 VDC interposing relays to ensure that the proper relay is being activated by the correct push-button or selector-switch.
 - .2 Verify that all contacts and relays activate the correct light, motor, or solenoid coil, and do so in the correct direction.
 - .3 Finally, ensure that the proper interposing relay activates the proper contact or relay at the correct time, as dictated by the control design.
 - .4 Any control boards are powered sufficiently in advance of receiving any signals such that they are fully operational.
- .2 After completion of the Contractor's pre-commissioning work the Departmental Representative will commission bridge operating controls and will provide an acceptance signoff of commissioning, conditional on completion of any noted deficiencies. It is anticipated that the Departmental Representatives review work will take five (5) eight-hour days the days might not be consecutive and if issues are found additional time will be required. The Contractor is required to provide all necessary manpower and assistance during this period to enable and assist in the Work.

4.6 TRAFFIC TEST PERIOD

- .1 Traffic shall be allowed to use the bridge or simulated using construction vehicles for a period of 7 days while the bridge is under initial pre-commissioning. Prior to traffic entering the bridge report to the Departmental Representative that traffic will be allowed on the bridge and ensure that all lift and support equipment are functioning correctly.
- .2 The timing of the traffic test period relative to the canal season will determine whether public or construction vehicles will be used for the testing. It is preferred that the contractor's controlled vehicles be used but the coordination with the testing of the operation of the bridge may necessitate that the bridge be opened to traffic.
- .3 The interaction with the traffic and the seating of the bridge as it turns must occur before the operational bridge testing.

4.7 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 highway loading for a period of 1 week and Departmental Representative has not witnessed 10 successful and consecutive bridge openings with no adjustments and the previous adjustments have been minor in 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
 - .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 opening and pressure during closing shall be recorded.
 - .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 identify 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 A “opening” for the test period will be defined as starting in the open to vehicle traffic position with the gates inactive 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 raised 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 of operational testing, or the test will be considered a failure and the opening count for the next round of testing will be restarted at zero. The operational test will continue until the required number of consecutive days of operation are achieved.

4.8 MAINTENANCE PERIOD

- .1 It is a condition of substantial completion that the commissioning and operational testing 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 Once the Test Period test is passed and confirmed in writing by the Departmental Representative. The Contractor will be responsible for all maintenance, adjustment, and repairs at the bridge for a period of 60 days after opening of the canal and the bridge being put into full normal Parks Canada operation. It is a requirement that the bridge is ready before canal opening however if for some reason that is not the case the 60 day period will start at the later of canal opening date or Substantial Completion date, or 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 their responsibility to respond or solve issues.
- .8 A portion of the Contract value 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 edit 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 includes managers, operators, and maintenance staff.
- .2 Trainees will be available at the opening of the canal season just before the May Long weekend for training after the Contractor has tuned the bridge and it is balanced and operating well. Training time will be coordinated with the Departmental Representative and suit Parks Canada Staff schedule.

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 a generator. (generator provided by Parks Canada)
 - .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 trouble-shooting.
 - .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 If any manufacturer's training videos are to be used as part of the training tool obtain clearance from the manufacturer and review with Departmental Representative's (1) month prior to 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 concrete and reinforcement at abutments and center pier.
 - .2 Removal asphalt and granular
 - .3 Removal of sections of guiderails and posts
 - .4 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 that have been salvaged and will be reused. These parts will be made available at the Parks Canada yard at Kirkfield on Talbot River Road, Kawartha Lakes.

1.2 RELATED SECTIONS

- .1 Section 01-35-43 - Environmental Procedures
- .2 Section 01 74 21 – Construction Demolition Waste Management and Disposal.
- .3 Section 05 12 33 - Structural Steel for Bridges.
- .4 Section 03 30 00 – Cast-in-Place Concrete and Patch Repairs.
- .5 Section 03 37 26 – Underwater Placed Concrete.

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.

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 "Miscellaneous Removals"
 - .2 "Removal of Existing Hydraulic and Electrical Systems"
 - .3 "Removal of Traffic Barriers"
 - .4 "Removals and Excavation for Approach Slabs: Note No Existing Approach Slabs"
 - .5 "Obtain and reuse salvaged 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 items shall be paid for under payment items in the unit price table:
 - .1 Item No. 1 - Concrete Removals - Abutments: All concrete removal from both abutments.
 - .2 Item No. 2 - Concrete Removals - Piers: All concrete removal from pier.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 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 into 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 tipping, 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.

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 not be used unless it can be demonstrated that no damage will occur to the structural steel of the bridge. This includes control of sparks and cutting, nicking, or otherwise affecting the new structural steel members.
- .4 Chipping hammers shall be 7.0 kg maximum.
- .5 Air compressor for abrasive blast cleaning shall supply a minimum pressure of 620 kPa within 3 m of the hose.

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 Locate and protect utilities. Preserve active utilities traversing site in operating condition. There are utilities immediately to the north and south of the bridge, for the full length of the bridge.

3.2 BRACING AND SHORING

- .1 Provide all temporary bracings and shoring to the structure so that stability is maintained throughout the project.
- .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.

3.4 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 REMOVAL OF SENSOR WIRING

- .1 Most if not all of the wiring and cabling to the bridge is to be replaced. If there is a location where the wiring and cabling related to the operation of the bridge is to be protected, identify sensors, limit switches, and wires that prevent completion of the work to the Departmental Representative and seek confirmation that the cables are to stay and that the proposed protection is sufficient. Free and relocate these wires as required to complete the Work as part of the Work. Obtain approval to remove or relocate sensors from the Departmental Representative after describing how the wire/sensor will be moved prior to disturbing the wire/sensor.

3.9 CONCRETE REMOVAL

- .1 The concrete of the various structures is variable in strength, condition, and consistency. The Contract drawings show approximate removal locations and volumes. During removals, direction will be given by the Departmental Representative as to how to increase or decrease the depth or change the location of the concrete repairs. The general concept of repairing the top of the center pier and refacing the abutments will not change.
- .2 As removals progress, confirm the limits of removals. It is the intent to keep the areas of repair relatively large and it is not intended that the majority of the repairs will be small, isolated patch repairs. If a significant section of concrete is found to be solid, depth of removal may be reduced. It is more likely that concrete behind the facing will be found to be in poor condition and require additional removals.
- .3 The sides of the pier in particular have deteriorated concrete it appears unwise to count on heavy anchor loads on the sides of the piers and this must be taken into account during all operations.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 It is anticipated that lead paint will generally not be removed from parts to be disposed of although mitigation will be required during disassembly to minimize the effect on the environment.
- .2 It is also anticipated that where required for salvage all lead-based paint removal will be completed in an appropriate facility off site that is required to meet regulations regarding lead removal and handling.
- .3 Lead-based paint removal will be required for all salvaged components, which represent a small portion of the total steel of the bridge.
- .4 Although lead-based paint removal on site is thought to be avoidable, if paint removal is to occur on site, first justify that it must be completed on site and second comply with requirements of this Section when performing following Work:
 - .1 Removal of lead-based paint on site.
- .5 Comply with sections of this Specification related to proper disposal of waste for all on and off-site removal of lead-based paint.
- .6 Remove lead-containing dust from the air using an appropriate extraction system including an effective dust collection system equipped with HEPA filter.
- .7 Comply with Ontario Guideline: Lead on Construction Projects, September 2004 (updated April 2011).
- .8 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)

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 **Diocetyl 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.
- .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.

3.7 LEAD CONTENT REPORT

- .1 The following presents the results of the Lead Content Report.
 - .1 The paint samples taken from the inspection locations from the bridge were sent to a Testing Laboratory for chemical analysis. All samples contained large concentrations of lead, indicating the presence of lead in the paint system(s) used on the bridge and lead in all coating layers. The test result was Blue Paint 720 Primer: $\mu\text{g per g}$ and Primer 850 $\mu\text{g per g}$. These values are greater than applicable lead content limits defining lead-based paint. Some variation in the lead content will occur. For all existing painted surfaces, it shall be assumed that the preparation activities on the structure, sufficient containment will be required to protect the environment, as well as workers, from the hazards of lead.

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 and the contract lump sum items for or involving concrete or concrete patching.

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 If form ties are used 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 mm²/s at 40°C, flashpoint minimum 150°C, open cup.
- .6 If connected walers and or a containment ring type approach is used to support forms the ring and connections must be stamped by the contractor's engineer and must list the acceptable pour rate for concrete within the containment.
- .7 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 The edges of the pier in particular contain deteriorated concrete where care and assessment will be required in the design of formwork and in particular the anchorage and support.
- .3 If formwork at the pier is supported vertically by hanging from falsework supported on the top of the pier complete wall repairs to the level of the center of the pier removals and then cast the top of the pier such that there is not an abrupt visible construction joint. Alternatively submit how the support legs will be removed and repaired. Methods likely to affect the durability of the pier will not be accepted. The contractor is responsible for these and other methods but there are some durability and aesthetic constraints important to Parks Canada.
- .4 Fabricate and erect falsework in accordance with CSA S269.1 and COFI Exterior Plywood for Concrete Formwork.
- .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 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, 7.7.3.6-Smooth-Form Finish.
- .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 all concrete reinforcing above water and bars that are not dowelled below water (i.e., bars that can be tied to dowels under water or that extend from above to below water).
- .2 This Section also covers the requirements for reinforcing steel dowels installed using an epoxy grout, above water.
- .3 This Section does not cover underwater concrete dowels.

1.2 RELATED SECTIONS

- .1 Section 01-35-43 - Environmental Procedures
- .2 Section 03 30 00 - Cast-in-Place Concrete and Patch Repairs.
- .3 Section 03 20 01 – Underwater Concrete Reinforcing.

1.3 MEASUREMENT PROCEDURES

- .1 Measurement Procedures: In accordance with Section 01 11 22 – Measurement and Payment.
- .2 Work covered by this Section will be paid for under payment Item No. 3 – Stainless Steel Reinforcing Steel and Item No. 4 - Dowels Set in Epoxy.
- .3 The price for Stainless Steel Reinforcing includes both steel reinforcing above and below water except for dowels above and below the water and all reinforcing associated with the approach slabs and sleeper slabs.
- .4 Note all concrete, reinforcing steel, removals, excavation, subgrade preparation and all work associated with the concrete approach slabs and sleeper slabs shall not be measured and shall be included in the contract lump sum price.
- .5 The price for Dowels Set in Epoxy shall include all costs associated with the steel for the dowel and the drilling and the bonding of the stainless-steel dowel reinforcing steel at the dowel location to develop the full strength of the bar. Embedment lengths are shown on the drawings and exact dowel spacing length and locations will be confirmed in the field, after removals.
- .6 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 A955 / A955M – 19, Standard Specification for Deformed and Plain Stainless Steel Bars for Concrete Reinforcement type AISI 316 L.
- .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 G30.3-M1983(R1998), Cold-Drawn Steel Wire 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

- .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, weights, 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.

Part 2 Products

2.1 MATERIALS

- .1 All reinforcing bars shall be stainless-steel reinforcing steel, conforming to ASTM A 955/ A 955M-19, and have a minimum yield strength of 420MPa.
- .2 Substitute different size bars only if permitted in writing by Departmental Representative.
- .3 All spacers, ties and components in contact with the stainless steel reinforcing shall be stainless steel or non conductive materials intended for stainless steel reinforcing.
- .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.

- .7 Dowel adhesive for reinforcing bars to be HILTI HIT HY 200, HILTI-ICE, or equivalent selected from Ministry of Transportation Ontario Designated Sources of Materials DSM#9.30.25, as approved by the 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 epoxy coated 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-passivate 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.
- .3 Upon request, inform the Departmental Representative of proposed source of material to be supplied.

Part 3 Execution

3.1 FIELD BENDING

- .1 Do not field-bend or field-weld reinforcement, except where indicated or authorized by 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 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .3 Ensure cover to reinforcement is maintained during concrete pour.
- .4 Protect stainless steel bars with covering during transportation and handling. During placing, use vibrators with protective sheaths.

- .5 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 ADDITIONAL STAINLESS STEEL REINFORCEMENT

- .1 Where existing reinforcement is rusted and has lost significant section the Departmental Representative will direct the addition of stainless steel reinforcing steel.

3.4 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.
- .2 For cold protective measures, see Section 03 30 00 – Cast-in-Place Concrete and Patch Repairs.

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 37 26 – Underwater Placed Concrete

1.2 MEASUREMENT PROCEDURES

- .1 Measurement Procedures: In accordance with Section 01 11 22 – Measurement and Payment.
- .2 Work covered by this Section will be paid for under payment:
 - .1 Item No. 3 – Stainless Steel Reinforcing
 - .2 Item No. 5 – Underwater Dowels Set in Epoxy.
- .3 Item No. 3 includes Stainless Steel Reinforcing placed above and below water excluding reinforcing placed under the dowel items.
- .4 The price for Underwater Dowels Set in Epoxy shall include all costs associated with the dowels themselves and in-water placing and drilling time, drilling, and the bonding of the stainless-steel dowel reinforcing steel at the dowel location to develop the full strength of the bar. Embedment lengths are shown on the drawings and exact dowel spacing and locations will be confirmed in the field after removals.
- .5 All other work of this Section that is not identified as a unit price item, shall be included in the Contract lump sum price.

1.3 QUALIFICATIONS

- .1 All work to be completed by skilled tradesmen experienced in the type of work specified.
- .2 The person to execute the underwater dowel installation shall be an installer approved/certified by the epoxy material manufacturer for the installation of their system and shall have a minimum of five (5) years experience in conducting underwater drilling and dowel installation.
- .3 The person to execute the underwater reinforcing placement/tying shall be an installer who has a minimum of five (5) years experience in conducting underwater rebar installation.

1.4 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM A 955/A955M-19, Standard Specification for Deformed and Plain Stainless Steel Bars for Concrete Reinforcement type AISI 316 L.
- .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 G30.3-M1983(R1998), Cold Drawn Steel Wire for Concrete Reinforcement.
 - .4 CSA G30.14-M1983(R1998), Deformed Steel Wire for Concrete Reinforcement.
 - .5 CAN/CSA-G30.18-M92 (R2007), Billet-Steel Bars for Concrete Reinforcement.
 - .6 CAN/CSA-G40.21--13 (R2018), Structural Quality Steels.
 - .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

- .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 Departmental Representative after consultation with the 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. All reinforcing lengths and dimensions will have to be confirmed and adjusted after concrete removals have occurred in order to maintain proper embedment, cover and configuration.
- .3 Detail lap lengths and bar development lengths to CAN3-A23.3, unless otherwise indicated.

Part 2 Products

2.1 MATERIALS

- .1 All reinforcing bars shall be stainless-steel reinforcing steel, conforming to ASTM A 955/A955M-19, and have a minimum yield strength of 420 MPa.
- .2 Substitute different size bars only if permitted in writing by Departmental Representative.
- .3 All spacers, ties, and any components in contact with the stainless steel reinforcing shall be stainless steel or non-conductive materials intended for stainless steel reinforcing.
- .4 Deformed steel wire for concrete reinforcement: to CSA G30.14.
- .5 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
- .6 Mechanical splices: subject to approval of Departmental Representative.
- .7 Dowel epoxy adhesive system shall be a product suitable for underwater rebar dowelling applications in cracked concrete and suitable use in expected construction season

temperature ranges and be selected from the Ministry of Transportation of Ontario Designated Sources of Material DSM 9.30.25.

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. Method of bundling and transportation shall be in accordance with the applicable standard(s) and special provision that all handling shall avoid contact with metals or materials 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. It is unlikely except in exceptional cases that field bending will be authorized.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure and 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 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .3 Ensure cover to reinforcement is maintained during concrete pour.
- .4 Protect stainless steel bars with covering during transportation and handling. During placing use vibrators with protective sheaths.
- .5 Install dowels as per epoxy manufacturer's instructions.
- .6 Repair all areas where the surface of the reinforcing steel has been de-pacified, regardless of the cause including all scrapes, embedment, and other issues.

3.3 ADDITIONAL STAINLESS STEEL REINFORCEMENT

- .1 Where existing reinforcement is rusted and has lost significant section the Departmental Representative will direct the addition of stainless steel reinforcing.

3.4 COLD WEATHER WORK

- .1 The contractor is advised that the work requires installation of epoxy anchors underwater during the winter navigational shut-down period. The contractor shall provide all required equipment required to complete the work of this section. The contractor is responsible for meeting and conforming to the requirements of the manufacturer of the epoxy adhesive. The schedule and sequence of work requires that pier work be completed early in the project and this work must be carefully scheduled so as to avoid bad weather and complete the work in the required time frame.

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 refacing of all surfaces of the concrete abutments, and swing pier, approach slabs, sleeper slabs as well as the requirements for patch repairs.
- .2 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.
- .3 Comply with restrictions stipulated in this and other Sections of these Specifications. Submit certification of mix design and or mix design will produce durable concrete with the specified properties.
- .4 Note the finished elevation of all surfaces that support the bridge are critical and require coordination with the steel fabrication 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. The timing, relative to the fabrication of the steel, as well as the precision with which the steel is fabricated, will be a significant factor in determining the final elevations.

1.2 RELATED SECTIONS

- .1 Section 01-35-43 - Environmental Procedures
- .2 Section 02 41 23 - Selective Site Demolition.

1.3 MEASUREMENT FOR PAYMENT PROCEDURES

- .1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.
- .2 Work covered by this Section will be paid for under payment items included in the Unit Price Table:
 - .1 Item No. 6 - Concrete in Abutments.
 - .2 Item No. 7 - Concrete in Piers.
- .3 Cast-in-place concrete will be measured by the cubic metres, calculated from neat dimensions indicated on the drawings, or measured finished dimensions in the field in the case of patch removals or areas of the designated removals altered or changed as authorized by the Departmental Representative. Concrete placed beyond approved removal lines will not be measured.
- .4 Note all concrete, reinforcing steel, removals, excavation, subgrade preparation and all work associated with the concrete approach slabs and sleeper slabs shall not be measured and must be included in the contract lump sum price.
- .5 The tendered price shall include all costs for labour, materials (including formwork), insulation, support, bonding agent and any other equipment or materials necessary to

finish the Work of these items, in accordance with the Contract Drawings and these Specifications.

- .6 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.
- .7 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 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

- .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:
 - .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.

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 substrate. Proposed patching material shall be approved by the Departmental Representative. Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

2.3 MIXES

- .1 Proportion normal density concrete in accordance with CSA-A23.1, Table 13, Alternative 1, to give following quality:
 - .1 Cement:
 - .1 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 m³/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.

- Schedule Work to avoid unusual conditions and allow flexibility in schedule to avoid poor weather.
- .3 The Contractor shall monitor the conditions and modify the protection system as required.
- .2 Protection - Minimum Requirements
- .1 The formwork and existing concrete 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
+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.

- .3 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.
- .4 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, laitance, 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 Parks Canada will pay for costs of tests. If retesting is required due to non-conformance, the Contractor shall pay all costs associated with retesting.
- .3 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

3.8 WATER LEVEL AND CONCRETE PLACEMENT

- .1 The water levels at the site will vary during the construction. Some information on historic water levels is provided on the drawings but any year can vary. 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. Movement of water from the lower levels of water 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 THE WORK

- .1 This section covers the requirements for the supply and subaqueous placement of concrete for the purpose of restoring concrete abutments and swing pier.

1.2 RELATED REQUIREMENTS

- .1 Section 01 35 43 – Environmental Procedures
- .2 Section 02 41 23 – Selective Site Demolition
- .3 Section 03 10 00 – Concrete Forming and Accessories
- .4 Section 03 20 00 – Concrete Reinforcing
- .5 Section 03 20 01 – Underwater Concrete Reinforcing
- .6 Section 03 30 00 – Cast-in-Place Concrete and Patch Repairs

1.3 QUALIFICATIONS

- .1 All work to be completed by skilled tradesmen experienced in the type of work specified.
- .2 The person to execute the underwater removals and surface preparation shall have a minimum of five (5) years experience in conducting underwater concrete removals and surface preparation.
- .3 The person to execute the underwater patch repairs shall be an installer approved by the patch material manufacturer for the installation of their system and shall have a minimum of five (5) years experience in conducting the underwater hand application of concrete patching compound, and underwater surface finishing.

1.4 MEASUREMENT FOR PAYMENT PROCEDURES

- .1 Measurement Procedures: in accordance with Section 01 11 02 – Measurement and Payment.
- .2 Work covered or related to this Section will be paid for under payment items included in the Unit Price Table:
 - .1 Item No. 8 – Tremie Concrete
 - .2 Item No. 9 – Underwater Formed and Pumped Patches
 - .3 Item No. 10 – Underwater Unformed Patches
- .3 Tremie-Placed Concrete will be measured by the cubic meter (m3) of concrete placed, as measured in the field in the case of patch removals or areas designated for removal as authorized by the Department Representative.
- .4 Proper delineation of areas to be repaired via Tremie-Placed Concrete shall be detailed and measured by the Contractor prior to the commencement of placement of the concrete and a detailed report submitted to the Department Representative for approval not later than two (2) weeks prior to the commencement of the placement work.

- .5 The placement of Tremie concrete shall include the cost of removal of loose material at the edges of the area where tremie is to be placed. The intent is to patch the existing edges and to minimize removal under water. The doweling at the edges of the patch should establish the reasonable condition concrete which will remain. If conditions vary report to the Departmental Representative and receive direction.
- .6 Underwater Formed and Pumped Patches shall be measured by the square meter and have an assumed average depth of 80 mm.
- .7 Underwater Unformed Patches shall consist of hand-placed fast-curing concrete and will be measured by the number of bags of fast-curing concrete that are placed, by hand, by the diver. No payment will be made for Fast-Curing Concrete that has been mixed, but not placed. Time in water will not be measured and is considered incidental to the work.
- .8 The tendered price for all of the above items shall include all costs for diving and labour, materials (including formwork), insulation, support, bonding agent, epoxy adhesive, and equipment necessary to conduct and to finish the work of these items, in accordance with the Contract Drawings and these specifications. Generally bonding agents will not be required under water unless a product manufacturer specifically requests them and products which do not require a bonding agent are not preferred by the contractor.
- .9 Heating or cooling of the water and aggregates, and providing hot and cold weather protection will not be measured, but are considered incidental to the work.
- .10 All other Work necessary to the completion of the work of this Section, including abrasive cleaning of the concrete, will not be measured separately for payment, but will be considered incidental of the work.

1.5 REFERENCE STANDARDS

- .1 American Concrete Institute (ACI)
 - .1 ACI 304R-[00], Guide for Measuring, Mixing, Transporting and Placing Concrete.
 - .2 ACI 546-2R-14, Guide to Underwater Repair of Concrete
- .2 CSA Group (CSA)
 - .1 CSA A23.1/A23.2-[09], Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

1.6 SAMPLES

- .1 Submit samples, formwork and environmental controls 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 confirmation of suitability of the source for concrete work and access for sampling.

1.7 CERTIFICATES

- .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:
 - .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, is suitable for the intended application/placement method/conditions, 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. Such certification must be provided from the manufacturer.

1.8 DEFINITIONS

- .1 Tremie concrete: concrete placed underwater through tube called a tremie pipe. Tremie concrete differs from pumped concrete in that gravity is the driving force by which the concrete moves away from the pipe, as opposed to pump pressure delivering traditional mass concrete. The concrete is delivered with the pipe held within the concrete and the mass of concrete is grown from the initial placement while limiting the exposure to the outer surface of water and preventing mixing of water into the concrete as it is placed.
- .2 Tremie pipe: pipe has hopper at upper end and may be open-ended or may have foot valve, plug or travelling plug to control flow of concrete. Pipe has diameter of 100 mm minimum, constructed from sections with flange couplings fitted with gaskets.
 - .1 Concrete is placed in hopper and sufficient head of concrete is maintained in tremie pipe to provide desired rate of flow.
- .3 Pumped concrete can in some circumstances with the correct control of the pump and mix be used to deliver concrete for tremie however the mix design while pumpable must also not separate or segregate at delivery.
- .4 Fast Curing Concrete: durable, high strength concrete patching compound with rapid set time suitable for use on vertical surfaces underwater and suitable for application and curing in low temperatures.

1.9 ADMINISTRATIVE REQUIREMENTS

- .1 Concrete pre-placement meeting; conduct pre-placement meeting [2] weeks minimum before tremie operation.
 - .1 Ensure meeting includes as minimum attendees as follows:
 - .1 General contractor.
 - .2 Ready-mix concrete supplier.
 - .3 Fast-Setting Concrete Supplier.
 - .4 Epoxy Supplier.
 - .5 Admixture supplier.
 - .6 Placing/formwork sub-contractor.
 - .7 Reinforcing sub-contractor.
 - .8 Testing agency representative.
 - .9 Structural engineer.
 - .10 Departmental representative.
- .2 Distribute minutes to attendees including copies of concrete mix designs, aggregate physical properties, placing schedule, rate of delivery, testing program, and, contingency plan for delay and breakdown.

1.10 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 all concrete and dowelling products and include product characteristics, performance criteria, physical size, finish and limitations.

1.11 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with this Section 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 Replace defective or damaged materials with new.

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, testing 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 Water
 - .1 Water shall be potable and free from contamination.
- .2 Tremie Concrete Materials
 - .1 To section 03 30 00 – Cast-in-Place Concrete and Patch Repairs.
- .3 Fast Curing Concrete Materials
 - .1 To Section 03 30 00 - Cast-in-Place Concrete.
 - .2 Be durable, high strength concrete patching compound with rapid set time for use on vertical surfaces underwater and suitable for application and curing in low temperatures. Products similar in properties and use to Speed Crete Blue by W.R. Meadows specifically intended for underwater placement.
 - .3 Rapid set.
 - .4 High compressive strength.
 - .5 High bond strength.
 - .6 Thermal coefficient of expansion equal to Portland cement concrete.
 - .7 High resistance to freeze-thaw and to salt.

2.3 CONCRETE MIXES

- .1 Tremie Concrete:
 - .1 Portland Cement: to CSA-A3000, Type GU
 - .2 Minimum compressive strength at 28 days: 35 MPa
 - .3 Class of exposure:C-1
 - .4 Maximum water cement ratio by mass: 0.45.
 - .5 Cement content for mixtures: 385]kg/m³minimum.
 - .6 Slump at point and time of discharge: 190 mm ± 40 mm.
 - .7 Admixtures: as approved in writing by Departmental Representative. Use admixtures to correct deficiencies in mix or to improve placement of concrete.
 - .1 Departmental Representative may withdraw prior approval of admixture if conditions encountered during course of work indicate unsatisfactory results.
 - .2 Do not use calcium chloride or materials containing calcium chloride.

- .3 Submit admixtures to produce self consolidating concrete to Departmental Representative for review.
- .2 Fast-Curing Concrete:
 - .1 Mix to meet requirements of product manufacturer.

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 concrete placement installation in accordance with manufacturer s written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Remove all marine growth, sediment, debris, and deteriorated concrete from the abutments and centre pier. Use high-pressure water jets, powered chipping hammers, mechanical scrapers, abrasive blasting, or other appropriate means capable of removing deteriorated concrete, exposing sound concrete, and creating a surface profile sufficient for the bonding of new concrete, and consistent with the requirements of the applicable Sections of this Specification and associated references, and with supplier's and manufacturers requirements. With all tools do not cause impact beyond the area intended for removal and as directed by the Departmental Representative. Tools such as rivet busters when directed into the surface of the concrete can cause damage and the repair of this damage will not be compensated.
- .2 Final concrete profile to be reviewed and approved by the Departmental Representative prior to the installation of dowels, or patching, to ensure proper surface profile has been achieved for adequate bond, and that the final concrete section shape is appropriate to eliminate the occurrence of voids during tremie placement of new concrete. Contractor is responsible to provide detailed documentation and proof of work completed to the satisfaction of the Departmental Representative.
- .3 Underwater forms must be sealed by gaskets or seals to prevent cement paste from leaking out through the joints.

3.3 INSTALLATION

- .1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete and Patch Repairs, OPSS.PROV 904 – Construction Specification for Concrete Structures, and Section 03 20 00 - Concrete Reinforcing and to CSA A23.1/A23.2. Testing for concrete to CSA A23.1/A23.2.

- .2 During the seven (7) days following placing, the concrete or patching temperature shall not fall below 10°C or exceed 70°C.
- .3 For cold weather conditions, protection of concrete and patching shall at least conform to the requirements of Table 1 of Section 03 30 00 Cast-in-Place Concrete and Patch Repairs. However, the temperature of the concrete and patching shall be checked to ensure that at least the minimum temperature specified above is maintained.
- .4 Place concrete in one continuous operation to full depth required.
 - .1 Supply complete equipment for every phase of operation.
 - .2 Provide sufficient supply of concrete to complete pour without interruption.
- .5 Tremie method:
 - .1 Tremie-placed concrete shall not be conducted without the Departmental Representative's approval and be placed in a manner approved by the Departmental Representative with the designate of the Departmental Representative present.
 - .2 Provide environmental mitigation measures for placement of tremie concrete in accordance with Section 01 35 43 – Environmental Procedures.
 - .3 Provide water-tight tremie pipe sized to allow free flow of concrete. Diameter of tremie pipe to be minimum 200 mm and minimum eight times maximum size of coarse aggregate.
 - .4 Provide hopper at top of tremie pipe and means to raise and lower tremie pipe.
 - .5 Provide plug or foot valve at bottom of tremie pipe to permit initial filling of the pipe with concrete initially.
 - .6 Provide minimum of one (1) tremie pipe for every 30]m² of plan area and to maximum spacing of 6 m centre to centre. Do not move tremie pipes laterally through concrete.
 - .7 The pipe of the tremie shall be positioned vertically and shall be long enough to reach the lowest point of the concrete deposit.
 - .8 Start placement with tremie pipe full of concrete. Keep bottom of pipe buried minimum 400 and preferably 900 mm in freshly placed concrete.
 - .9 If seal is lost, allowing water to enter pipe, withdraw pipe immediately. Refill pipe, and continue placing as specified.
 - .10 If tremie operation is interrupted so that horizontal construction joint has to be made, cut surface laitance by jetting, within 24 to 36 hours and remove loose material by pumping or air lifting before placing next lift.
 - .11 A continuous flow of concrete at a minimum rate of 15 m³/hr shall be maintained through the tremie pipe.
 - .12 Continuous soundings shall be taken during the concrete pour, and all irregularities and voids shall be remedied immediately.
 - .13 The top underwater surface of the concrete shall be kept level during the concrete placement.
 - .14 After placement, the tremie concrete shall not be disturbed, puddled or vibrated.
 - .15 Concrete shall only be placed in water that has a temperature of 2°C or greater.
 - .16 Do not place concrete in flowing water when current exceeds 3 m/min.

- .17 Tremie concrete shall not be placed above the existing water level.
- .18 When a placement operation is completed and work is to continue in the dry, the Contractor shall prepare a construction joint by removing surface laitance to expose coarse aggregate.
- .19 Unwatering shall not be permitted until at least 24 hours after the concrete placement is completed.

3.4 TESTING

- .1 Testing to be in accordance with Section 01 45 00 – Quality Control.
- .2 The Contractor shall obtain two (2) continuous test cores from locations in the pier, as select by the Departmental Representative, seven (7) days after the pour. The cores shall be taken vertically through the full depth of the tremie concrete and complete recovery of the cores will be required. The minimum diameter of the cores shall be 50 mm.
- .3 In the event that the concrete, test in accordance with the requirements outlined in this Specification, proves to be deficient in any way, the Departmental Representative may require additional testing cores be taken to establish the condition of Work. The Contractor shall subsequently correct the deficient Work by either pressure grouting the entire mass, removing the concrete, or by any other means deemed acceptable by the Departmental Representative. No measurement or payment shall be made for testing or correcting the deficient Work in the underwear concrete.
- .4 All holes resulting from the coring operation shall be regouted at the Contractor's expense.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 – Construction Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Dispose of waster materials in accordance with applicable local, provincial, and National regulations.

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

- .1 This Section covers the requirements for replacement of original steel work, and the supply and installation of all steel to fully replace the original Bridge with a Replica Bridge of the same general form, constructed of new steel.
- .2 All steel member components of the Bridge shall be replaced, in kind, using new steel conforming to CSA G40.20-13 / G40.21 - 13 (R2018) General Requirements for Rolled or Welded Structural Quality Steel.
- .3 All connections shall be made with twist off Tension Control Bolts with heads resembling rivets, unless specifically designated to have regular ASTM A325 or A325M Bolts. The rivet heads of the Tension Control Bolts shall be oriented such that they are on Publicly visible side of all connections, toward the exterior of each member. This will require special short guns. See Contract Drawings for more detail.
- .4 Copies of the original bridge drawings shall be used to build the new bridge. All details will be copied, except as expressly detailed on Contract Drawings or in this Specification. Because of clearances required to install bolts, some adjustments to bolt positions will be required. Note that as described in the specification Bolsover Road Bridge is similar in many ways but some plate and member sizes have been changed and the end panels of that bridge are of different length than required at Boundary Road. It can be used as a loose general guide.
- .5 Due to the clearances between bolts, sequenced installation of bolts, particularly at floor beam connections, will be required.

1.2 RELATED SECTIONS

- .1 Section 02 41 23 - Selective Site Demolition.
- .2 Section 02 83 12 – Lead-Based Paint Abatement.
- .3 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-18, 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
- .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-S6-14 Highway Bridge Design Code.
 - .4 CSA-S16.-14, 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 -09 (R2014) Certification of Companies for Fusion Welding of Steel.
- .3 American Society of Civil Engineers (ASCE).

1.5 SHOP DRAWINGS

- .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 and highlight them and receive direction in writing as it is anticipated that welding of the truss will not be required. Some mechanical components do require welding.
- .3 The Shop Drawings shall designate the preferred sequence of bolt installation. Some variability is inherent in the actual sequence of replacement; however, the order shall be reviewed prior to the start of construction.
- .4 Welding to the structural members of the bridge is not anticipated on this Project. The structure is a dynamic structure and the use of any welding should be avoided and would be contingent on the details exceeding the fatigue life required by the CHBDC for infinite life. Where attachments such as navigation lights were currently welded, alternate connections using bolts shall be provided and the cost shall be included as part of the Contract Lump Sum Price. Any other proposed welding procedures would have to be stamped by the contractor's engineer a Professional Engineer licensed in the Province of Ontario, specializing in weld design with demonstrated minimum 10 years in that specialty representing the bulk of their work and approved by the Canadian Welding Bureau, and receive special written approval for use on the structure from the Departmental Representative and Owner. It is unlikely this approval will be given.
- .5 Submitted bracing erection 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. The structure shall be supported during all removals and erections such that no Section is overloaded, and support and stability are maintained.
- .6 Shop details shall provide:
 - .1 Full detail dimensions and sizes of all component parts of the structure. These dimensions shall make allowance for changes in shape due to weld shrinkage,

camber, and any other effects that cause finished dimensions to differ from initial dimensions.

- .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 Any variation from original drawings including specified contract changes shall be highlighted and brought to the attention of the reviewer by listing them in the transmittal as variations.

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 All structural steel shall conform to CAN/CSA G40.20-13/G40.21-13 (R2018). Structural steel members and connections labeled “Fracture Critical” or “Primary Tension” member shall be Grade 350WT, Category 1. All other structural steel shall be 350W or 350WT.
 - .2 For each component of a “Fracture Critical” or “Primary Tension” member, record shall be kept identifying the heat number of the material and its corresponding mill test certificate.

- .3 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. It is recognized that supply of the various shapes with the corresponding testing requirements will be difficult. The contractor may have to arrange for certified testing on their own to obtain the shapes. Primary tension members shall be considered the bottom chord in middle panels of the spans and the top chords of the truss one panel either side of the center of the bridge. Due to the built up nature of the members no members will be considered fracture critical.
- .4 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 may be used, as permitted by CSA G40.21.
- .2 Bolts:
 - .1 Bolts on coated steel shall be A325M Type 1.
 - .2 Tension Control Bolts with Rivet Shaped Heads: to ASTM F1852-14
 - .3 High strength bolts, nuts, and hardened washers: to ASTM F 3125.
- .3 Welding electrodes: to CSA W48.
- .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 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 Provide certification that tension control bolts, bolts, nuts, and washers comply with applicable standards.
- .4 Provide Departmental Representative with two copies of certified test reports for Charpy V-notch tests for plates and Sections.
- .5 The Contractor shall have a quality control program that will demonstrate to the Inspector the consistency of the fabrication and the bolt tightening.
- .6 The preparation for painting of the tension-control and 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.

- .7 Regardless of the method or timing of preparation and painting. 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.
- .8 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.
- .9 Provide suitable facilities and cooperate with inspection organization and Departmental Representative in carrying out inspection and tests required.
- .10 The Contractor Shall:
 - .1 For each component of a fracture-critical or primary tension member, records shall be kept to identify the heat number of the material and its corresponding mill test certificate;
 - .2 As early as possible, consult with suppliers regarding the availability of notch-tough materials. In general for Grade WT material, plates are more readily available than rolled shapes. CSA G40.21 Grade t or W steel may be substituted for CSA G40.21 Grade WT steel when the Charpy impact energy requirements are verified by the submission of test documentation;
 - .3 The Charpy impact energy requirements for "WT" steel shall be 27 joules and the test temperature shall be 0°C for "Primary Tension Members;"
 - .4 The Charpy V-notch requirements specified herein shall apply only to standard full-size specimens. For plates from 8 to 11mm thick, subsize specimens with adjusted energy levels may be used, as permitted by CSA G40.21;
 - .5 In the fabricator's plant, the specification and grade of steel used for main components shall be identified by use of suitable markings or recognized colour coding. Cut pieces that are identified by piece mark and contract number need not continue to carry specification identification markings when it has been established that such pieces conform to the required material specifications. Records shall be kept to identify the heat number of the material and the corresponding mill test report for each component of a fracture-critical or primary tension member.

Part 3 Execution

3.1 USE OF TENSION CONTROL BOLTS

- .1 Tension control bolts with heads that resemble rivets shall be used on all truss connection outriggers, exterior stringer connections, connections of cross bracing, balance beam casting beams, railings, all members etc., unless indicated otherwise.
- .2 Interior stringers and floor beams can be connected with regular A325 bolts, however, clearances at stringer and floor beam connections must be checked.

3.2 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. Enlarge 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.

3.3 REMOVAL OF EXISTING RIVETS

- .1 It is anticipated that rivet removal will be required to complete salvage of parts to be reused. Below provides guidance as to methods of adjustment but in general the salvaged parts will be connected to new fabricated parts and the new fabricated parts must be fabricated to accommodate the existing positions of holes etc. such that no adjustment to the salvaged part will occur and that all adjustment will occur in the new part.
- .2 The Contractor shall submit to the Departmental Representative the proposed method for rivet removal. Rivet removal shall not be permitted until the rivet removal method has been approved by the Departmental Representative. Any method (such as using a torch), which has the potential of damaging, weakening, or changing any property of the adjacent steel, will not be approved and can not be used unless the cut is more than 300 mm from any part to be salvaged.
- .3 The use of a torch, or other methods which melt the rivets, will not be permitted. Burning will not be permitted.
- .4 Existing rivets shall be removed using approved mechanical means that do not cause damage to steel to be salvaged. In the event that the Departmental Representative determines that rivet removal Work is resulting in damage to the structure, the Contractor shall cease rivet removal operations until a modified method of removal has been submitted to the Departmental Representative and approved.
- .5 It is anticipated that rivets to be removed shall have their heads chipped off with a rivet buster, and the shank driven, drilled, cored, or jacked out, as required. Care shall be taken not to enlarge the rivet hole or to damage the surrounding and remaining material.
- .6 Heat resulting from any removal method shall not be allowed to damage rivet holes or surrounding material. If heat is generated, methods shall be modified to ensure no damage.

- .7 Difficult rivet removal is anticipated due to the presence of restricted access to existing rivets. In addition, the multiple plies of material are likely to result in misaligned holes that will cause rivets to be difficult to remove. The Contractor is to account for these difficulties and include these factors when pricing the Work.
- .8 Where existing rivets are removed and holes require enlargement due to misalignment, the holes shall be enlarged by NOT more than 2mm and only after the proposed enlargement is reviewed and approved by the Departmental Representative. Holes shall be enlarged by reaming. Full compensation for enlarging holes up to 2 mm shall be considered as included in the Contract Price for removal of rivets and replacement with bolts or in the items included in the Contract Lump Sum Price.
- .9 At locations where, surrounding material is damaged as a result of the Contractor's operations, the surrounding material shall be repaired. When reaming of more than 2 mm in diameter greater than the nominal rivet diameter and installing an oversize bolt is required for the repair, the cost of the reaming, furnishing and installing oversized bolts shall be at the Contractor's expense. This method of repair shall not be used without prior approval of the Departmental Representative for each rivet hole.
- .10 At locations where, small nicks and burrs in the vicinity of the bolt head are created, they can be ground smooth to result in a less than 10:1 slope, as long as the bolt will be properly seated and the thickness of the plate to remain is verified by the Departmental Representative, await permission to proceed.
- .11 At locations where rivet holes contain cracked, torn, or otherwise damaged material due to conditions other than the Contractor's operations, the contractor shall immediately contact the Departmental Representative for review before rivet removal. It is likely, where the defect is minor and the piece must be salvaged, that the hole shall be reamed to remove the defect and that an oversized bolt shall be used.

3.4 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-S6-14.
- .3 Do welding in accordance with CSA W59.
- .4 All fabrication, installation, erection removals, and steel work to be completed by a fabricator and the fabricator's workers certified under Division 1 or 2 of CSA W47 Certification of Companies for Fusion Welding of Steel. The fabricator must provide proof that the workers have been employed by the fabricator for a period of longer than 1 year, completing similar tasks, or the workers experience must be reviewed and approved by the Departmental Representative.
- .5 Assign one lead fabricator to coordinate, have knowledge and provide direct information to the Departmental Representative and his assignees. Lead fabricator to have knowledge of all parts of the process, schedule and methods being used related to the steel and salvaged parts. Lead fabricator to have 10 years experience in directly related tasks and/or prove themselves capable to the Departmental Representative.
- .6 High strength bolting where torque control bolts are in accordance with CSA-S6. Use 'Turn-of-Nut' tightening method.

- .7 Finish members 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.
- .8 The bridge shall be erected to the proper alignment on plan and in elevation, with trusses and members plumb and in-plane, taking into account the specified dead load camber, and under full dead loading.
- .9 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:
- | <u>Centre-to-Centre
distance in metres</u> | <u>Tolerance in plus
or minus mm</u> |
|--|--|
| 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.
- .10 Field splices: to approval of Departmental Representative.
- .11 Mark members in accordance with CSA G40.20/G40.21. Do not use die stamping.
- .12 All match marking shall be executed in the fabricator's shop.
- .13 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.
- .14 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.
- .15 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.

3.5 BOLTS AND RIVET REPLACEMENT

- .1 Tension Control Bolts 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 shall be replaced.

3.6 ALIGNMENT OF BEARING

- .1 The alignment of the center 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.

3.7 CRANE RAIL

- .1 The rail on which the wheels of the bridge travel has been designated as a crane rail to match the common designation of the ASCE rail Sections.
- .2 The installation of the crane rail will involve adjustment to the rail to suit the travelled wheel path of the wheels. This will be facilitated if, prior to disassembly, both the horizontal and vertical location of the wheels and rail are documented and the location and thickness of shims are noted.
- .3 The alignment and elevation of the rail is critical to the eventual function of the bridge. The rail must be placed accurately. The tolerance for vertical placement shall be ± 0.5 mm. The rail must essentially be perfectly level and flat. Verify the level and demonstrate to the Contract Administrator that the rail is, in fact, within tolerance prior to installation of the bridge.
- .4 It is the Contractor's responsibility to locate the rail both vertically and horizontally such that the wheels exert more or less light, equal pressure on the rails, and travel centered on the rails. The alignment of the assemblies and wheels as well as the shimming of the wheels is considered part of the Work and will be reviewed by the Departmental Representative.
- .5 Rails shall be joined with rail joiners on both sides of the rail with a minimum of four (4) bolts, (two (2) bolts per rail). Rail joints shall not interfere with, or introduce variability to, the travelled wheel path. The number of joints shall be minimized and located away from the wheel locations when the bridge is in the open to road traffic position (generally considered the closed position).

3.8 PARTS TO BE SALVAGED

- .1 Gears track from bridge was salvaged.
- .2 All parts of the main bearing were salvaged. Do not attempt to torque the threaded pin from the casting. Submit plan for reconditioning the bearing. Plan to include name, experience profile and examples of past similar work for the individuals from the contractor or subcontractor who will be assigned the work. Contractor must have minimum 5 years experience completing similar machining type refurbishment. Preference is for a contractor experienced with mechanical bearings. Departmental Representative reserves right to refuse work being completed by unqualified trades. In the submission outline the tools, equipment and methods that will be used to execute the refurbishment including measurements, machining and quality control. The Departmental

Representative is to be granted access to shop to inspect refurbishment for the purposes of Owner's Quality Assurance. When the bearing is picked up from the Kirkfield yard thorough out the end of the project the contactor will protect the working surfaces and any greases and fluids especially when preparing the surface for the application of the full coating system

- .3 The gears on the bridge if they can be located by Parks Canada will be re-mounted as decorative features. It is possible that the shaft of the gear extends into the deck. The shaft may require modification before installation and be cut so they do not interfere with the new deck during installation as indicated on the Contract Drawings.
- .4 The rods and unique equipment of the latching/locking system if found will be remounted. The operating portion will be separated from the decorative portion.
- .5 Inventory parts when they are received, weigh and apply the full coating system to the counterweights that are provided for the bridge. Additional counterweight may be required if the bridge is not built as balanced as the original bridge.

3.9 HOLD DOWN CLIPS FOR NAIL LAMINATED DECK

- .1 Hold down clips to be fabricated with steel conforming to the provisions of this section and galvanized after fabrication.
- .2 Care shall be taken to protect galvanization coating during transportation and installation. Should damage to the protective coating occur generally the clips will be rejected, but if incorporated into the deck the Departmental Representative may or may not allow touch up. Touch-up/repair shall be conducted in accordance with ASTM 123, and to the satisfaction of the Departmental Representative. Removal for the installed deck clips is nearly impossible such that review of the clips should be requested before they are incorporated in the deck in order to avoid complete rejection of the deck at the contractor's expense

END OF SECTION

Part 1 General

1.1 TREATMENT AVAILABILITY

- .1 Chromated Copper Arsenate preservative treatment is specified, and it is increasingly difficult to acquire wood treated with this preservative. The Contractor must pre-arrange and account for long lead times to ensure supply that 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. Possible suppliers include:

Stella-Jones Incorporated
Truro, Nova Scotia
(902) 893-9456

Goodfellow Incorporated
Montreal/Delton, Québec
(450) 635-6511

A list of other potential suppliers is provided in the Canadian Wood Preservation Certification Authority Certified Plants list available on Wood Preservation Canada's website. All wood will have to 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 Canada Green Building Council (CaGBC)
 - .1 LEED Version 4.1, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package for New Construction and Major Renovations.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA O80 Series-15, Wood Preservation.
 - .2 CAN/CSA O80.20-1.1-M97(R2002), This Standard applies to the fire-retardant treatment of lumber by pressure processes.
 - .3 CAN/CSA O80.27-1.1-M97(R2002), This Standard covers the fire-retardant treatment of Douglas Fir, hardwood, softwood, and Poplar plywood by pressure processes.

- .4 CAN/CSA O80.201-M89, This Standard covers hydrocarbon solvents for preparing solutions of preservatives.
- .5 CAN/CSA O322-15, Procedure for Certification of Pressure-Treated Wood Materials for Use in Permanent Wood Foundations.
- .6 CSA A123.22-08 (R2013), Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- .4 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)
 - .1 SCAQMD Rule 1113-04, Architectural Coatings.
- .5 Western Wood Preservatives Institute (WWPI)
 - .1 Best Management Practices for the use of Treated Wood in Aquatic and Other Sensitive Environments.
- .6 ASTM International
 - .1 ASTM D1970/D1970M-18, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- .7 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 AWP A M2 and revisions specified in CSA O80-15 Series, Supplementary Requirement to AWP A 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 AWP A M2, and revisions specified in CSA O80 Series, Supplementary Requirements to AWP A M2.
- .2 Inspection and testing of will be carried out by a Testing Laboratory designated by Departmental Representative.
- .3 Departmental Representative will pay for costs of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.

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.

Part 2 Products

2.1 MATERIALS

- .1 Preservatives: Preservatives shall be chromated copper arsenate (CCA) conforming to AWP A Standard P5, Type A, Type B, or Type C. The CCA treated wood shall meet the requirements of the applicable CSA standards, conforming to Use Category UC4.1. All wood with preservative treatment shall be marked using a certification mark authorized by the Canadian Wood Preservers Bureau (CWPB). If the mark 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. 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
- .2 All wood for Nail laminated deck to be SPF Grade No. 1 and No 2. as described in the rough carpentry section.
- .3 All wood for Running Boards to be Western Hemlock, Grade No.1.
- .4 Repair of field cuts, abrasions, and holes in material treated with water-borne preservative shall be in accordance with CAN/CSA O80.
- .5 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 treatment. The Contactor shall ensure that board lengths in the material takeoff sent to the fabricator account for the local deck-width reduction where the outrigger truss struts pass through the bridge deck. 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.

3.2 APPLICATION: PRESERVATIVE

- .1 Treat all wood to CSA O80 Series using CCA preservative and the plant shall use the quality control procedures according to CSA O80 Series.
- .2 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 and 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 Following water-borne preservative treatment, dry material to maximum moisture content not exceeding 25% at a depth of 25mm prior to preservative treatment.

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. 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. Contractor shall create a designated temporary Work area for undertaking the site-modification and treatment of wood. 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.

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 deck, including curbs, decking, and running boards, hold-down clips, and waterproofing membrane.

1.2 RELATED SECTIONS

- .1 Section 02 41 23 - Demolition and Removal.
- .2 Section 05 12 33 - Structural Steel for Bridge.

1.3 REFERENCES

- .1 American Wood Preservers Association (AWPA)
 - .1 AWP A M2-16, Standard Inspection of Preservative Treated Products for Industrial Use.
 - .2 AWP A M4-15, Standard for the Care of Preventive-Treated Wood Products.
- .2 Canadian Standards Association (CGSB)
 - .1 CAN/CSA O80 Series-15, 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 (R2014), Softwood Lumber.
 - .5 CSA O86-14 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 D1970/D1970M-18, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

- .5 ASTM F1667-18a, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .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).
- .2 Timber nosing blocking: Field measure existing end of deck at beginning of project, and prior to fabrication of preservative treated timber nosing blocking piece. Submit shop drawings of the curved nose-assembly showing all details and measurements, including radius from centre pintle. Curved nose assembly shall be pre-fabricated and preservative treated along with other dimensional lumber.

1.5 SHOP DRAWINGS

- .1 The Contractor shall be responsible for visiting the site and taking all measurements necessary to ensure that the wood deck is accurately replicated with the modifications indicated in the Contract Drawings.
- .2 The Contractor shall submit shop drawings showing all of the members that make up the deck and curbs, their location, size of holes to be drilled, and the lengths of the members based on the Contractor's field measurements.
- .3 The Contractor shall coordinate with suppliers and sub-contractors to ensure that all holes and cuts are made and nosing curvature is created prior to preservative treatment.

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 Laminated Wood Decking." 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 Contract Drawings and these Specifications shall be included in the Contract Lump Sum Price.

Part 2 Products

2.1 MATERIALS

- .1 Wood: All wood shall be new and conform to the grade, species, size, and surface-finish specified. If not indicated, wood shall be SPF Grade No. 1, preservative treated, 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 running boards shall be full dressed Western Hemlock, Grade No. 1. No preservative treatment will be required for the running boards.
- .3 Wood for the laminated portion of the deck shall be SPF, Grade No. 1 and No 2, preservative treated, and graded in accordance with NGLA Standard Grading Rules for Canadian Lumber. It is recognized that the grading of preservative treated lumber results from the assessment of the number and combination of defects. We anticipate that the wood supplied for the laminated deck will be a combination of Grade No. 1 and Grade No. 2 (sometimes referred to as Grade No. 2 and better). For the wood to be accepted, the majority of the wood must be far from the extreme limits of the Grade No. 2 criteria. If a significant portion (20%) of the wood is close to the lower extreme of the Grade No. 2 criteria, verging on being Grade No. 3, the wood will be rejected and the Contractor will be required to supply wood more representative of the entire combined grade with no extension to the Contract time. The lack of ready supply of CCA treated wood will allow more careful selection prior to treatment such that the majority of the wood must meet the criteria of Grade No 1.
- .4 Care shall be exercised to ensure that, for laminates that have defects close to the limits of the criteria for knots, splits, shakes, and waness of the grading rules, that the defects are not placed within three (3) adjacent laminations of another similarly less than ideal piece of dimensional lumber.
- .5 Wood for Curbs blocking, end of deck shall be SPF Grade No. 1, preservative treated, and graded in accordance with the NLGA Standard Grading Rules for Canadian Lumber. All sizes of sawn wood are dressed finished sizes not nominal sizes.

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.
- .6 Preservatives: all preservatives shall conform to the requirements described in Section 06 05 73 – Wood Treatment.

2.2 ACCESSORIES

- .1 Fasteners: all fasteners called for on the Contract Drawings shall be galvanized and shall conform to the applicable referenced standard.
- .2 Nail hold-down clips, utilized as connectors between laminated deck and top flange of steel beams, shall be fabricated from 2 mm thick steel sheet, grade 350W, conforming to the applicable referenced standard, and shall be galvanized after fabrication.
- .3 Nails, spikes, and staples: to CSA B111/ASTM F1667, where applicable.
- .4 Curb Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers to ASTM 307.
- .5 Lag screws shall be 5/8" diameter for attaching the timber nosing block to the stringer flange. All lag screws and associated washers shall conform to the applicable referenced standard.
- .6 Waterproofing shall be self-sealing waterproofing membrane similar to Grace Ice and Watershield 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
- .7 Proprietary fasteners: toggle bolts, expansion shields, lag bolts, screws, and lead or inorganic fibre plugs, recommended for purpose by manufacturer.

2.3 FINISHES

- .1 Galvanizing: to CSA G164/ASTM A653. Use galvanized fasteners for all work.

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.

3.2 LAMINATED 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 Gauge lines for horizontal nailing shall be followed. Nails in the upper gauge line shall be inclined slightly downward and those in the lower gauge line inclined slightly upward. The heads shall be flush and well set so that they do not protrude from the surface.
- .3 Each lamination shall be placed in the bridge so that, initially, full and accurate bearing is achieved. Finally, the laminations shall be brought to position by nailing.
- .4 Install galvanized nail hold-down clips as detailed for on the Contract Drawings. Install so that the lower face of the slot in the clip is tight to the underside of the top flange of the supporting steel stringer.
- .5 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.
- .6 The deck boards shall be placed vertically. Plumbness of the vertical face of the deck boards shall be checked regularly and maintained as construction progresses. The galvanized hold-down clips have a potential to cause out of plumb tilting of the deck boards. Joints between deck board laminations shall be as tight as possible and uniform along the length on the laminate.
- .7 Running boards and decking shall be fabricated to allow a 50 mm gap around the outrigger truss brace struts. This gap shall be detailed on the shop drawings.
- .8 Holes in the curb timbers shall be bored prior to preservative treatment and deck shall be liberally treated with repair preservative to the satisfaction of the Departmental Representative, prior to installation of curb and bolt assemblies.
- .9 C-channels at the edge of the bridge will have the same pattern of hold down clips as all other stringers. On the "open" side of the C-channel the clips will hook the flange in the same way as on other stringers. On the back of the channel the clips will be turned around so the straight edge is tight against the back of the C-channel. Where the C-channel is doubled (as at the splices) clips shall hook the flange of each of the C-channels.
- .10 Nail placement and angle is critical. Spacing can be controlled and completed with the use of a template (board with marker-drawn or painted lines dictating nail spacing). Each laminate of wood should have the nails staggered so that nails are not in the same location. The top and bottom orientation should also be alternated (flipping the nail position on a horizontal axis along the deck width). The angle of insertion should be checked such that it is approximately 4 degrees toward the centre of the laminate and the offsets from the edges are respected. The first set of nails will be placed, the next board placed, the next set of nails will be offset on number two position (offset one third of the spacing 83 mm), a third board will be placed, nails placed at position 3 (another 83-mm offset) and then the next board with the nails in position 1 will be nailed. Also, the first board will start with a nail at the top, second will start with a nail at the bottom, third back at the top, Forth (back in position 1) at the bottom. Repeat and repeat and repeat in this way we get an evenly spaced nailed deck.

3.3 HOLD DOWN CLIPS FOR NAIL LAMINATED DECK

- .1 Hold down clips to be fabricated with steel conforming to the provisions of 05 12 33 Structural Steel for Bridges and this section and galvanized after fabrication.
- .2 Care shall be taken to protect galvanization coating during transportation and installation. Should damage to the protective coating occur generally the clips will be rejected, but if incorporated into the deck the Departmental Representative may or may not allow touch

up. Touch-up/repair shall be conducted in accordance with ASTM 123, and to the satisfaction of the Departmental Representative. Removal for the installed deck clips is nearly impossible such that review of the clips should be requested before they are incorporated in the deck in order to avoid complete rejection of the deck at the contractor's expense

3.4 END OF DECK

- .1 Complete the end of deck as shown in the Contract Drawings, using an end nosing timber that matches the nail laminated deck in height. The width of the timber shall be cut to follow the radius of the existing deck end, as field-measured by the Contractor. The timber shall have a minimum dimension 200 mm wide at the outer edges of the bridge and increase in width in a smooth curve, reaching a maximum width at the centre-line of the bridge.
- .2 Ensure that the steel stringers extend to support the nosing timber. Extend the center stringers further than the exterior such that they are close to the abutments without scraping. The ends of the steel stringers should be no more than 15 mm from the edge of the timber. Review the current gap and swing of the bridge with the Departmental Representative to arrive at the final gapping at each end of the bridge. Gapping is dependent on temperature such that the temperature must be recorded when the gaps are measured. A temperature range of -45 degrees C to +50 degrees C shall be accounted for when finalizing the stringer lengths considering the potential for expansion and contraction from the measurement and assumed construction temperatures.
- .3 Fasten end nosing timber to stringers using 5/8" galvanized lag screws as detailed in the Contract Drawings. Fasteners should have similar strength to the curb bolts. The method for protecting or countersinking the lag screws shall be reviewed with the Departmental Representative

3.5 DECK WATERPROOFING

- .1 The deck shall be waterproofed using a self-sealing waterproofing membrane such as Grace Ice & Water shield approved by the Departmental Representative. The above product will be used as a standard for the review of substitutes.
- .2 Waterproofing shall be adhered to the top of the nail laminated deck, have full laps, and cover the entire deck.

3.6 RUNNING BOARDS

- .1 Running boards shall be installed so as to provide a level, continuous surface. A 1/2" chamfer shall be cut at the ends of the deck as detailed in the Contract Drawings. The pouring of the concrete abutment end cap shall not occur until the height of the bridge is set. Nails securing the running boards to the laminated deck (or wood nosing blocking), shall have heads flush or slightly countersunk so that they do not protrude from the surface.
- .2 Running boards shall be installed such that the adjacent boards are at the same level and the thickness of all boards is uniform.
- .3 The edges of the board shall be placed tight together.

- .4 The outer-most running board on each side of the bridge shall be an unmodified, full-width board. If a combination a 140 mm and 191 mm (wearing surface) board width does not result in a total running board surface width that matches the laminated 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.
- .5 Running boards and decking shall be fabricated to allow a 50 mm gap around the outrigger truss brace struts. This gap shall be detailed on the shop drawings.
- .6 Gauge lines for horizontal nailing shall be followed. As detailed in the Contract Drawings, 5" galvanized common wire nails shall be installed in pairs spaced 304 mm along the deck, at a distance of 30 mm from the longitudinal board edges, and at 95 mm from the end of each plank.
- .7 Running board plank ends shall be staggered by a minimum of 152 mm and be arranged such that two courses separate end joints in the same general line, transverse to the length of the deck.
- .8 Running board plank lengths must be a minimum of 12 ft in length where ever 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 nails securing the running boards to the deck below pass through the running boards into the centre of deck planks below. Nail spacings given on the Contract Drawings have been detailed to accommodate this.

3.7 CURB INSTALLATION

- .1 Care shall be taken when drilling bolting locations for curbs. Pressure when puncturing through the bottom of the deck shall be reduced such that a clean hole is produced at both the top and bottom of the deck. This may be achieved by utilizing a forester bit, and clamping a sacrificial backing board to the underside of the deck.
- .2 Where the drilling operation results in the lifting of fibres on the top of the deck, or blowout on the underside shall be liberally treated with repair preservative to the satisfaction of the Departmental Representative.
- .3 All holes shall also be liberally treated with repair preservative to the satisfaction of the Departmental Representative prior to the installation of the curb.

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. 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. 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 two (2) 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 The paint samples taken from the inspection locations from the Bridge were sent to a Testing Laboratory for chemical analysis. Previous samples from other Bridges contained large concentrations of lead, indicating the presence of lead in the paint system(s) used on the Bridge with lead in all coating layers. The test result was Blue Paint: μg 720 per g and 850 Primer μg per g. These values are greater than applicable Lead content limits defining lead-based paint. For all existing painted surfaces, it shall be assumed that, for the preparation activities on the structure, sufficient containment will be required to protect the environment, as well as workers, from the hazards of 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 lacing contact points 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 (generally matching existing blue: which approximates National Blue). Note the colour National Blue varies from manufacturer to manufacturer, submit samples.
- .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 Representative 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 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 connections.
- .3 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 whether it is new or old steel. Pay particular attention when sections of the bridge are transported to site as road salt can contaminate the field splice locations requiring paint.

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. Any old permanent signs that are still present at the site are to be reviewed with the

Departmental Representative and salvaged as well as all lighting materials to the Parks Canada Yard at Kirkfield.

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/m².
 - .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.

END OF SECTION

Part 1 General

1.1 GENERAL DESCRIPTION

- .1 All mechanical equipment on the Boundary Road Swing Bridge, Bridge No. 44 on the Trent-Severn Waterway shall be either refurbished or replaced. This includes the following equipment:
 - .1 Replace - swing cylinders, cylinder pivot brackets.
 - .2 Replace - all four balance wheels and shafts.
 - .3 Refurbish or replace – balance wheel brackets.
 - .4 Replace - balance wheel track.
 - .5 Refurbish – center pivot
 - .6 Replace – north end bearing wheels, axles and abutment mounted ramp plates.
 - .7 Refurbish - north end bearing wheel brackets.
 - .8 Replace - the two south end bridge lift cylinder assemblies will be replaced with two new end lift assemblies.
 - .9 Refurbish and modify – bridge closed locking pin mechanism to be refurbished and modified to be hydraulically operated with limit switches.
 - .10 Add - new bridge-closed rubber bumpers.
 - .11 Replace – operators station sunshade.
 - .12 Replace - hydraulic power unit including reservoir, motor/hydraulic pump and oil filtration system.
 - .13 Replace – two hydraulic valve control manifolds will be replaced with one new manifold and control valves.
 - .14 Replace – all hydraulic tubing, hose and tube supports.
 - .15 Replace – position sensing limit switches, mounting brackets and targets for bridge swing open/closed/nearly closed.
- .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 While the following components will not be reused in the new installation if they exist still on site notify the Departmental Representative. These were originally considered for salvage and the Departmental Representative may wish to review their condition before disposal or possible salvage:
 - .1 Hydraulic tank
 - .2 Electric motor currently driving hydraulic pump, including motor starter.
- .4 Note that some components identified in this specification may have already been removed during a previous contracting phase. The Contractor shall identify which components are no longer in place and work with the Departmental Representative to come up with an appropriate solution that is in keeping with the intent of this design.

1.2 DRAWINGS

- .1 It is the contractor's responsibility to prepare all detail, assembly and installation 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.
 - .1 Hydraulic Schematic – Drawing No. 200
 - .2 Swing Cylinder Installation – Drawing No. 201 Sheets 01 to 06
 - .3 Centre Pivot, Balance Wheels, North End Wheels and Balance Wheel Track – Drawing No. 202 Sheets 01 & 02
 - .4 End Lift Mechanism Details and Installation – Drawing No. 203 Sheets 01 to 26
 - .5 Bridge Swing Position Limits Installation Photo – Drawing No. 204
 - .6 Bridge Closed Locking Pin Installation Photo – Drawing No. 205
 - .7 Operators Station Sunshade Installation Photo – Drawing No. 206
- .2 Where sufficient details are not given in the specifications or shown on the drawings to determine the loading of each component, the Contractor shall request additional details from the Departmental Representative. The Contractor ultimately will be responsible to confirm that each component is suitably designed for the intended application.

1.3 MEASUREMENT AND PAYMENT

- .1 No measurement for payment will be made for the items "Removal of Existing Mechanical Components", "Refurbish Existing Mechanical Components" and, "Supply and Installation of New Mechanical Components". Payment shall be by lump sum.
- .2 Payment at the lump sum price for these items shall include all costs for labour, materials and equipment necessary to complete the work of these items in accordance with the drawings and specifications.

Part 2 Engineering and Design

2.1 GENERAL

- .1 All stainless steel shall be ASTM 316 unless otherwise specified.
- .2 All anchor bolts, cap screws, nuts, washers and threaded rod shall be 316 Stainless Steel unless otherwise specified.
- .3 All shims shall be 316 Stainless Steel.
- .4 Anchors shall be set in place using the HILTI HIT-HY 200R Safe Set System or an equivalent approved by the Departmental Representative.
- .5 All anchor bolts and mounting bolts shall be torqued to manufacturer's recommended torque.
- .6 All grout shall be non-shrinking pourable epoxy type suitable for 20 year life in the outdoor Ontario road-side environment.

- .7 All hydraulic hose shall be SAE 100R2 0.75 inch ID high pressure hose. The hose lengths shall be as short as practical, i.e. ensure the minimum hose bend radius is greater than the minimum allowable hose bend radius, for all cylinder positions.
- .8 All hydraulic tubing shall be ASTM A269 - Seamless, 316 Stainless Steel, 3/4 inch Outside Diameter x 0.095 wall unless otherwise specified. Tubing shall be provided using coiled material to eliminate the need for joints. No joints shall be permitted below the water for underwater applications nor below the final grade for underground applications.
- .9 All hydraulic fittings (Hose and Tube) shall be 316 Stainless-Steel, High-Pressure type. All connections from tube to hose shall be JIC 37 degree. All connections to cylinders, valves and valve manifold shall be SAE - Straight Thread O-ring.
- .10 All hydraulic manifolds not contained within the building containing the HPU shall have stainless steel manifolds with zinc plated valves.
- .11 All components shall be painted as per contract paint specifications.

2.2 DETAIL, ASSEMBLY AND INSTALLATION DRAWINGS

- .1 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.
- .2 All final drawings shall bear the stamp of approval from a Licensed Professional Engineer in the Province of Ontario who will assume full design responsibility for the mechanical design.
- .3 All drawings to be dual dimensioned with SI units first and Imperial dimensions in brackets.
- .4 All fabricated weldments shall be stress relieved prior to final machining.
- .5 Shop drawings shall show all details for new and refurbished mechanical components and assemblies complete with Bills of Materials.
- .6 Installation drawings shall show dimensions for location, in plan and elevation, of critical items, i.e. center pivot, balance wheel track, swing cylinders, etc.
- .7 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.
- .8 Product information for all purchased components shall be submitted to the Departmental Representative.

2.3 DESIGN AND INSTALLATION DETAILS

- .1 Swing Cylinders and Pivot Brackets
 - .1 See Drawing No. 201 Sheets 01 to 06 for installation and details reference. The heavy duty swing cylinders shall be 5.00 inch diameter bore with 3.5 inch diameter rods and include the following features:
 - .1 SAE10 - Straight Thread O-ring ports

- .2 Nominal Maximum Working Pressure – 20.7 MPa (3000 psi)
 - .3 Cushions on both ends
 - .4 Air bleed ports on both ends
 - .5 17-4PH Stainless Steel Piston Rod
 - .6 Trunnion mounted
 - .7 Spherical bearing connection on rod-end
 - .8 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.
 - .9 Epoxy base and top coated exterior of head, cap, body & retainer with Type 316 Stainless Steel tie-rods, nuts and fasteners.
- .2 The cylinder stroke shall be maximized so the maximum torque to rotate the bridge can be developed. The existing swing cylinders have a stroke of 1016mm (40 in). The installation shall include the ability to shim the cap end pivot bracket by +/- 5 mm. The hose connections to the cylinders shall be arranged so that, under all swing positions of the bridge, the hoses do not make contact with any part of the bridge or pier. All air bleeds and cushion needle valves shall be easily accessible. At extreme open and closed positions of the bridge, the cylinders shall not contact the end of stroke. Cylinders shall be mounted to within +/- 0.5 degree of horizontal. It is the contractor’s responsibility to determine the location and elevation of cylinder brackets and gimbals.
- .3 Pier mounted and bridge mounted brackets and mounting hardware shall withstand the maximum cylinder force at maximum rated working pressure of 20.7 MPa with a minimum factor of safety of 2.0. The gimbal mount base shall include a shear block mounted under the base to engage a pocket in the pier. The cylinder gimbal bases shall be anchored in place. Once correct cylinder positions have been verified during bridge swing commissioning, the base shall be grouted in-place. The shear block pocket shall be filled with grout at this time as well.
- .4 The swing cylinders shall have Type 316 stainless steel cylinder mounted manifolds containing the cross-port relief and anti-cavitation check valve design shown on the hydraulic schematic. All valves shall be zinc plated.
- .2 Balance Wheels, Shafts and Brackets
- .1 All four balance wheels and shafts shall be replaced. The wheels shall be manufactured from Pre-Heat Treated 4140 and shafts shall be manufactured from 17-4PH COND. H1150 Stainless Steel. The wheels shall be fitted with flanged bushings manufactured from AMCO18 or equal. The shafts shall be fitted with grease fittings to deliver grease to the wheel bushings.
- .2 The wheel brackets shall be refurbished. On disassembly, all brackets shall be inspected for any signs of damage or cracking and be repaired or replaced with new. The shaft bores shall be bushed. The units shall be reassembled, shimmed with stainless steel shims to the required elevation and fastened in place with stainless steel hardware. Wheel location is critical since the wheels shall track the centre of the rail to within +/- 10 mm. Wheel elevation shall be such that, when the bridge is in the closed position with the end lifts engaged, the vertical clearance between the wheels and the track is 1 to 3 mm.

.3 Track - Balance Wheel

- .1 The balance wheel track shall be replaced with a new track manufactured from ASCE60 cane rail. See Drawing No. 202 Sheet 02. The rail shall be formed in a circle with a diameter of approximately 4.6 meters (15 ft.) and a maximum run-out from a perfect circle of 5 mm. Contractor shall determine exact diameter based on balance wheel locations during design layouts and field measurements. The rail shall be installed level to within +/- 1 mm. Rail location is critical since the wheels shall track the centre of the rail to within +/- 10 mm for all bridge swing positions.
- .2 Rail shall be shimmed with stainless steel plates to the correct elevation and clamped in position on the centre pier with stainless steel clamp plates and stainless steel anchor bolts. Pitch of rail shim/clamp/anchor bolts shall be no greater than 600 mm centre to centre. Rail shall be grouted in place once bridge swing has been commissioned.
- .3 The existing ring gear with corresponding pinion and gears shall be refurbished for looks only and reinstalled as decoration. The pinion shall not engage with the ring gear.

.4 Centre Pivot

- .1 The centre pivot shall be refurbished. See Drawing No. 202 Sheet 01 for the current design. The castings shall be cleaned and sandblasted. The pivot span pin shall have the lower face machined until a clean surface is achieved. Steel spacers in the base casting shall be replaced. Additional thickness shall be added to the steel spacers to restore the material removed from machining of the pivot pin. The bronze base disc shall be machined out of the base casting, replaced with equivalent and restored to the original profile. The base shall be reassembled and installed on the pier with stainless steel anchors, shimmed as required with stainless steel shims and grouted in place. The bridge mounted casting and threaded centre pin assembly shall be mounted under the bridge with stainless steel fasteners.

.5 North Bearing Wheels, Axles, Brackets and Ramps

- .1 Both bearing wheels and shafts shall be replaced. See Drawing No. 202 Sheet 01 for existing design. The new wheels shall be manufactured from Pre-Heat Treated 4140 and the axles shall be manufactured from 17-4PH COND. H1150 Stainless Steel. The wheels shall be fitted with flanged bushings manufactured from AMCO18 bronze or equal. The shafts shall be fitted with grease fittings to deliver grease to the wheel bushings.
- .2 The wheel brackets shall be refurbished. On disassembly, all brackets shall be inspected for any signs of damage or cracking and be repaired or replaced with new. The shaft bores shall be bushed if worn.
- .3 New wheel ramps shall be manufactured from Pre-Heat Treated 4140. Ramps shall be shimmed with Type 316 Stainless Steel plates to the correct elevation and held in place with suitable Stainless-Steel anchors. Note that the north-east ramp to be at a slightly higher elevation than the north-west unit. Once bridge swing function has been commissioned the ramps shall be grouted in place.

.6 South End Bridge Lift Assemblies

- .1 The existing bridge lift cylinders shall be replaced with two new bridge lift assemblies as show in Drawing No. 203, Sheets 01 to 26. A hydraulic cylinder retracts to rotate a wheeled lever to lift the bridge. The wheel on the lever engages a bridge mounted bearing plate. When the cylinder is fully retracted, the lever is approximately 90 mm over-centre. The vertical force of the live-loaded bridge is transferred to the assembly base plate through the over-centre stop and the pivot pin. The south end of the unloaded bridge in the closed position, with the north bearing wheels in contact with the ramps, will sag by 38 mm (1.5 inches) and requires a force of 54 KN (12,140 lbs.) to lift the 38 mm. When levers travel over-centre, the estimated vertical force per lever is 31 KN (7000 lbs.) With maximum load on the bridge, the maximum vertical force per lever is 445 KN (100,000 lbs.). When the wheeled lever is in the over centre position, the wheel contacts a bearing plate mounted stop which holds the bridge in the closed position. The minimum clearance between the disengaged lever, i.e. cylinder extended, and the bridge mounted bearing plate is 100 mm (4 inches). The lever assembly shall also withstand the forces generated when the bridge length changes due to expansion and contraction caused by temperature changes. This load case is only valid for an unloaded bridge. The Lift Assembly shown in the reference drawing shall withstand all forces generated by these load cases with a minimum factor of safety of 2.0. It is the contractor's responsibility to verify the factors of safety for all load cases based on their detail design.
- .2 The heavy duty lift assembly cylinders shall be 5.00 inch diameter bore with 3.5 inch diameter rod and include the following features:
 - .1 SAE10 - Straight Thread O-ring Cap End port
 - .2 Cylinder mounted Counterbalance valve assembly as shown in Drawing No. 203 Sheet 16.
 - .3 Nominal Maximum Working Pressure – 20.7 MPa (3000 psi)
 - .4 Cushions on both ends
 - .5 17-4PH Stainless Steel Rod
 - .6 Heavy Chrome Piston Rod plating
 - .7 End-of-stroke limit switches, cylinder mounted.
 - .8 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.
 - .9 Epoxy base and top coated exterior of head, cap, body & retainer with Type 316 Stainless Steel tie-rods, nuts and fasteners.
- .3 The cylinder mounting shall include stainless steel shims to adjust the assembly so that when the cylinder is fully retracted, i.e. wheeled lever engaged, the lever just contacts the over-centre stop. All pivots shall be fitted with flanged bushings, manufactured from AMCO18 bronze or equal, as well as grease fittings.
- .4 Stainless steel counterbalance manifolds as shown on the hydraulic schematic shall be mounted directly to the cylinder rod port to prevent overrunning of the lift when the end is lowered.

- .5 The hose connections to the cylinders 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.
- .6 The End Lift Assemblies shall have a shear block welded to the base that engages in a pocket in the abutment. The assembly shall be shimmed with stainless steel shims to the required elevation and anchored to the abutment with stainless steel anchors. Once the End Lift Assemblies have been commissioned the bases and sheer blocks shall be grouted in place.
- .7 Bridge Closed Locking Pin Mechanism
 - .1 The bridge closed locking pin mechanism shall be replaced. See reference Bridge Closed Locking Pin Installation, Drawing No. 205, for a picture of the existing locking pin and original drawing.
 - .2 The bridge closed locking pin mechanism shall be replaced with a hydraulically released operator. The mounting shall be designed to resist the forces generated during retraction and extension of the pin. The hydraulic cylinder shall be used for retraction of the pin. A stainless-steel spring shall be used to extend the pin when the hydraulic cylinder is retracted, so that if the span is not properly aligned, the pin will remain retracted until properly aligned. This will avoid damage to the mechanism.
 - .3 If the hydraulic cylinder rod is left exposed when the pin is extended, the rod shall be protected by a rod boot designed for the operating environment.
 - .4 Locking pin extended and locking pin retracted limit switches shall be retrofitted in this design. The limit switches shall be Eaton E50 Style with Stainless Steel Operators.
 - .5 The entire mechanism shall be enclosed in a stainless steel enclosure which is removable for service.
- .8 Bridge Closed Rubber Bumpers
 - .1 Bridge closed rubber bumpers shall be incorporated in the design. These bumpers include 19mm fabricated angle approximately 325mm x 325mm with two 19mm gussets and capable of mounting a black EPDM extruded bumper with stainless steel inner retainer, similar to Duramax Marine Code No DB-125 or approved equal.
 - .2 The bumper frame shall be mounted with six 25mm diameter Type 316 Stainless steel threaded anchor set in epoxy with sufficient embedment to develop full strength of the anchors.
 - .3 One assembly is required on each of the North and South abutments. Complete assemblies including bumpers, weldments and strike plates are required.
 - .4 The location of the bumper frame shall be coordinated with the Departmental Representative.
- .9 Hydraulic Power Unit and Valve Assembly Manifold
 - .1 The existing hydraulic power unit and valve manifold shall be replaced with new. See reference Hydraulic Schematic, Drawing No. 200, for specification and detail requirements for this system.

- .2 All hydraulic circuits shall contain either a manual or solenoid operated valve to be used for flushing or oil circulation, as indicated on Drawing No. 200.
- .3 Hydraulic reservoir, containment tray and motor stack frame shall be made from 304 stainless steel or equivalent.
- .4 The HPU shall be housed in the room under the bridge operator's office. The access to this room is limited. In order to move equipment into this space the size of the assemblies shall be considered. The reservoir and containment assembly shall be one assembly and the pump/motor assembly another. The two hydraulic pump/ motor assemblies shall be mounted in a frame one above the other with flexible suction hoses joining them to the reservoir. The complete assembly shall be designed to operate while floating on the existing bare earth floor, as well as be easily relocated onto a hard surface support at a future date. Contractor shall ensure the assembly components will fit through the existing doorway, site dimensions can be verified following award of contract.
- .5 Oil containment tray shall be provided beneath all valve and motor assemblies. Preference is to have one single containment tray under all assemblies, however to minimize size/weight the Contractor may provide separate containment trays for each assembly. Oil containment tray volume is at the discretion of the Contractor provided the tray can capture all oil from leakage and the containment tray can be installed in the limited access location.
- .6 Anti-cavitation check valve shall be installed in oil return flow to reservoir, oriented to permit oil to flow back from reservoir without pulling through return filter.
- .7 Further details regarding the existing HPU, containment tray and valve bank arrangement can be site verified following award of contract.
- .8 Industrial quality temperature and pressure switches, Barksdale or equivalent, shall be used and integrated as shown on Electrical Sheet E1.
Suction ball valves as indicated on Drawing No. 200 shall be installed for manual selection of pump. No electrical indication of valve position is required.
- .10 Hydraulic Tubing, Hose and Tube supports
 - .1 All hydraulic tubing shall be installed in neat horizontal and vertical parallel lines. The tubing shall be supported at no more that every 1.3 meters in stainless steel with rubber grommet style supports. The tubing shall be mounted in concrete trench from the valve manifold location to the edge of the canal. The trench shall be enclosed with a galvanized steel checker plate cover. The hydraulic lines from the trench to the centre pier shall be fed through a 6 inch ABS pipe and buried in the canal bottom, covered with a precast concrete channel and anchored to the bottom so dragging anchors cannot become caught on these lines or cover plates. Details of the dry land trench and submarine cable protection can be found on Drawing No. 1911-1-003 Sheet C5.
 - .2 The lines will be travel vertically down the canal side and up the side of the centre pier. These lines shall also be protected by 3/16 in. thick stainless-steel covers anchored to the canal side and pier wall. The lines shall travel across above the surface of the centre pier on appropriate stainless steel rubber grommet style supports. All pier mounted valves shall also be mounted above the pier surface on appropriate stainless-steel brackets.

- .3 SAE 100R2 hydraulic hose may be used instead of stainless tubing as required in any location not exposed or underwater.
 - .4 Tubing shall be provided using coiled material to eliminate the need for joints. No joints shall be permitted below the water for underwater applications nor below the final grade for underground applications.
 - .5 All hydraulic lines connected to a hydraulic cylinder or manifold outside of the HPU building enclosure shall have manual stainless steel ball valves within 2m of the end connection point to facilitate service. These valves shall be easily accessible, however located where chance of accidental activation is minimized.
 - .6 The swing, end lift and locking pin cylinders shall have a valve connected between the A and B lines within 1m of the cylinder ports to facilitate fluid circulation during maintenance. The end lift and locking pin lines shall have a manual ball valve. The swing cylinder lines shall have a double-blocking solenoid valve as shown in the hydraulic schematic to facilitate the cycling of oil at lower temperatures.
- .11 Bridge Position Sensing Limit Switches
- .1 The bridge shall be fitted with the following Eaton E50 Limit Switches with E50KL201 Adjustable Stainless Steel Roller Type Operators:
 - .1 Bridge Closed (1)
 - .2 Bridge Nearly Closed (2)
 - .3 Bridge Nearly Open (2)
 - .4 Bridge Open (1)
 - .2 The “Bridge Closed” limit switch shall be mounted near the bridge closed bumper. When the bridge makes contact with the bumper this switch shall be made. The switch shall be installed in such a way to limit the possibility of being damaged or falsely triggered. The other limit switches shall be installed on a bracket mounted to the bridge structure. See reference Drawing No. 204 for photo of limit switch installation. This photo also shows limit switch actuation beams installed on the surface of the centre pier on another refurbished swing bridge. This installation is approved by Parks Canada.
 - .3 The “Bridge Nearly Closed” limit switch shall be made when end of the bridge is approximately 1 meter from contacting the bridge closed bumper. The “Bridge Nearly Open” limit switch shall be made when the end of the bridge is approximately 1 meter from its fully open position. When the bridge is fully open the “Bridge Open” limit switch shall be made.
- .12 Operators Station Sunshade
- .1 The existing operators sunshade shall be removed and replaced. See reference Operators Sunshade Installation Photo, Drawing No. 206, for the existing sunshade.
 - .2 The operators sunshade shall be similar to the existing sunshade in design however constructed from Type 304 Stainless-steel. The contractor is responsible to design the sunshade to handle all potential wind, snow and ice loading based in the installation location conditions, as well as other potential load conditions such as a person hanging from the unsupported side.

- .3 The sunshade roof shall be slanted to permit drainage and this drainage shall not fall on the operators station nor where the operator will stand.
- .4 The sunshade shall be positioned to maximize shade on the operator at midday without impeding the operators view of either the canal or roadway traffic. The contractor shall propose a design and location to the Departmental Representative who will assist in determining the ideal location.
- .5 The sunshade shall be constructed at an elevation and location so as to not impede travel paths for normal operation activities and/or emergency evacuation.

Part 3 Execution

3.1 GENERAL DESCRIPTION

- .1 The work specified in the "EXECUTION" 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 30, Health and Safety Requirements.

3.2 GENERAL REQUIREMENTS

- .1 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 the existing structure, is correct.
- .2 Before grouting of any pier or abutment mounted equipment, the bridge shall be winched 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.
- .3 The complete hydraulic system, less the hydraulic cylinders, shall be filled with new hydraulic oil and the system flushed through a fine particle filter until the ISO Cleanliness (per ISO 4406-1999) meets ISO Code 17/15/12. The testing shall be done at a qualified fluid testing facility. An oil cleanliness report shall be provided to the Departmental Representative for approval.
- .4 All mechanical equipment, other than Stainless Steel, balance wheel rail and electrical components, shall be painted as per the contract.
- .5 It is the contractor's responsibility to provide all equipment, materials and labour to ensure that bridge meets all functional and safety requirements.
- .6 Mill specification sheets shall be provided for all steel used in the manufacture of mechanical components.
- .7 Welding shall be made in accordance with CSA W59 and shall be performed by a welder qualified under CSA W47.1.
- .8 All anchor bolts and mounting bolts shall be torqued to manufacturer's recommended torque.

3.3 BRIDGE CLOSED - INSTALLATION CONDITION

- .1 The Bridge Closed Limit Switch shall be made and the Locking Pin shall be engaged and the pin engaged limit switch made. The ends of the bridge shall be in contact with the Bridge Closed Bumpers. Before the End Lift is engaged, the bridge balance shall be such that both North End Bearing Wheels are in contact with the ramps with a maximum force of 400 to 800 N each.
- .2 With the End Lift fully engaged, i.e. cylinders fully retracted, the bridge deck shall be level with the north and south roadway to within +/- 5 mm. The End Lift lever wheels shall be just in contact with the reaction plate mounted wheel stops and the cylinder fully retracted limit switches made. All four balance wheels shall be clear of the balance wheel track by 1 to 5 mm.

3.4 HYDRAULIC SYSTEM STARTUP

- .1 All tubing and hoses shall have been connected as indicated on approved drawings and that brackets and supports have been fabricated and installed to support all hydraulic lines.
- .2 With the cylinder vent valves open or cylinder fittings loosened, jog the hydraulic pump and directional valves to completely fill the system. (Note: Prior to this task, the hydraulic system must have been flushed and the level of oil cleanliness has been determined to be within allowable limit.)
- .3 Check that all tube and hose connections are tight.
- .4 Start each motor and run at the lowest possible pressure. Check pressure gauges to verify low pressure build up and the reading is constant without spikes.
- .5 Operate swing cylinders by operating the directional control valve. Verify that no air is trapped in the system.
- .6 Swing of the bridge slowly to make sure that there are no interferences. Ensure that all hydraulic hoses are clear of the swing bridge components and pier/abutment surfaces.
- .7 Check the fluid level of the HPU, and refill the oil if required.
- .8 The hydraulic system is now ready for commissioning.

3.5 OPERATION AND MAINTENANCE MANUAL

- .1 The contractor shall assemble the Operation and Maintenance Manual, in electronic format, for the bridge mechanical systems. This manual shall include the following sections.
 - .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 completeness of the Operation and Maintenance Manual is approved by the Departmental Representative.

END OF SECTION

PART 1 - GENERAL

1.1 Scope

The contractor shall replace the swing bridge power distribution and control system. It is the intent of this specification section to describe the scope of this work effort. "Electrical Documentation" references within this section will refer to electrical documentation drawing set no.1911-1-003 Revision D.

The existing main building will be replaced at a later date; therefore the swing bridge design and build shall consider this future requirement.

The existing 100A service shall be upgraded to 200A. This service upgrade may require a new pole transformer from the service provider. A new cable shall be provided and installed from pole transformer to main building, sized to support the 200 amp service requirement. A new transformer 37.5kW (600Vac to 120/240Vac) for interface between existing Parks 600Volt portable generator and transfer switch shall be provided. A new power distribution panel with all required circuit breakers shall be provided. A mechanical transfer switch, transformer and generator cord-set with connectors as defined in Electrical Documentation shall be provided. The distribution equipment described above shall be mounted to a common structure that can be temporarily removed and re-installed during the future main building replacement.

A new relay based system shall control the swing bridge movements (swing, end lifts and locking pin). Supply a new main control panel (+CP1) with relay circuitry as depicted in the Electrical Documentation. New selector switch, pushbutton and pilot light operators shall be mounted in the new main control panel and new operator station enclosures as per the Electrical Documentation. All new electrical enclosures shall include a minimum of 20% spare panel space for future additions or modifications.

A new hydraulic power unit located in the mechanical room shall power the bridge movement. This hydraulic unit shall be equipped with two 7.5HP supply pumps. New and complete full-voltage-non-reversing motor starters, one for each pump, shall be supplied and installed. A new proportional valve setup maintenance station (+MS2) for proportional valve configuration shall be supplied and installed. This station shall be located on the HPU stand.

New traffic equipment and controls (traffic gates, traffic lights and marine navigation lights) as per Electrical Documentation and contract documents shall be supplied and installed. Purchased gate assemblies shall include all circuit protection, position limit switches, motor and associated control relays, lights and audible horns as depicted in the Electrical Documentation in order to provide a fully functional gate system.

All electrical field devices as per Electrical Documentation (bridge, end lifts and locking position limit switches) shall be supplied and installed.

1. 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 OHSA, other relevant regulations and in accordance with Section 01 35 30, Health and Safety Requirements.
2. Documentation to support the electrical work effort is provided in the Electrical Documentation. Documentation is organized by a high level letter and sheet number (Example: E1). High levels are:

A = Preface/Table of Contents
B = Specifications
C = Installation

D = Power
E = Control/Elementary
F = Layouts

The Electrical Documentation is intended to provide a design concept only. It is not intended to be used 'as is' for construction purposes however this design concept including identified materials should be followed as closely as possible.

The contractor shall develop and produce electrical drawings and documentation to support the installation and maintenance of the bridge power and control system. The contractor is responsible to complete all necessary design details including but not limited to design layouts, assembly and installation drawings, bills of material, schematics diagrams, wiring details, cable and wire tags, terminal layouts etc. in order to manufacture a fully functional system that meets all applicable electrical safety codes and functional requirements.

3. All labour, materials, tools and equipment required to complete the installation and testing of electrical work as specified herein shall be furnished.
4. The contractor is responsible for the work effort to demolish and dispose, replace, and cleanup the entire electrical power and control system. The electrical contractor shall remove existing equipment, raceway and wiring to support the installation of new equipment. It is the Contractor's responsibility, as part of their Scope of Work, to remove and dispose of, in a proper manner all replaced components and scrap material and, maintain a tidy and safe work site.
5. The electrical contractor shall purchase and install the following equipment:
 1. Required equipment to upgrade the electrical service from 100A to 200A.
 2. New 120/240Vac, 200Amp power distribution panel.
 3. Co-ordinate existing building distribution panel with new distribution panel. This may require supply of new circuit breaker(s) to feed existing building distribution panel.
 4. New manual transfer switch for existing Parks portable generator.
 5. Portable generator cable plugs and receptacles as defined in Electrical Documentation.
 6. New 600Vac to 120/240Vac, 37.5Kw transformer for portable generator interface.
 7. All equipment to build new main control panel (+CP1) as per Electrical Documentation. All relays to be rated 10 AMP minimum.

8. All equipment to build new operator & maintenance stations (+OS1) & (+MS2) as per Electrical Documentation.
9. Two new FVNR motor starters, 7.5HP, 240Vac for hydraulic power unit supply pumps. Starter configuration as per Electrical Documentation.
10. All bridge control field devices including but not limited to limit switches, junction and pull boxes and associated mounting hardware.
11. All traffic control and marine navigation equipment.

Please refer to Electrical Documentation page B4 for additional equipment specifications.

6. The electrical contractor shall provide all raceways and field cables for the complete installation, specifically but not limited to:
 1. Power cable from utility service transformer required to upgrade service to 200Amps.
 2. Portable generator cables as defined in Electrical Documentation.
 3. Install wire, cable and raceways to hydraulic power unit instrumentation, valves and pump motors.
 4. Mechanical contractor to supply new hydraulic valve stand valve coils, proportional controllers and connectors. Electrical contractor to supply and install new cables and raceway to these components.
 5. Install cable and raceways to bridge, lock and lift control limit switches.
 6. Multi-conductor cables from main control panel (+CP1) to operator station (+OS1) and maintenance station (+MS2), and terminate.
 7. Install all cables and raceways required for power distribution circuits.
 - New manual transfer switch to distribution panel.
 - New power distribution panel to existing distribution panel.
 - New distribution panel to main control panel (+CP1).
 - Distribution panel to hydraulic pump motor starters.
 - Distribution panel to hydraulic power unit heater.
 - Distribution panel to traffic gates.
 8. Field cables and raceways, on dry land, from the building to the bridge to be mounted in covered trench wherever practicable. At minimum, allow for 2.5m of trench from 0.5m inside the mechanical room extending outside of the exterior under the wall. Where not practicable to install in dryland trench, electrical and hydraulic services to be direct buried.
 9. Supply and install field cables and raceway for traffic controls on north side. All cables and raceway to be installed in dry covered trenches where practical. Where not practical to install in dryland trench, cables to be direct buried.
7. A new main control panel (+CP1) shall be built and installed as per Electrical Documentation.
8. A new operator station (+OS1) with sun shelter shall be built and installed as per Electrical Documentation.

9. A new maintenance station (+MS2) shall be built and installed as per Electrical Documentation.
10. New junction boxes (+JB1) & (+JB2) shall be built and installed as per Electrical Documentation.
11. All electrical connections on equipment in the mechanical room shall be checked and re-torqued.
12. Contractor shall configure proportional valve controller to meet functional requirements as per all project specifications.
13. Contractor shall complete electrical check out, support the setup and configuration of bridge the power and control equipment for the full duration of commissioning. Utilizing maintenance station +MS2, contractor is to tune flows, pressures, positions and record final commissioned settings on the 'as built' documentation.
14. At end of commissioning, the contractor shall provide:
 1. Modified electrical drawings marked 'as built' in AutoCAD .dwg format and in .pdf format.
 2. Electrical drawings to include detailed proportional valve configuration settings.
 3. Signed validation document. Validation document details all performed checks and functional tests. It signifies the completion of the project and that the equipment is ready for service, having met the requirements described in the mechanical and electrical specifications.
15. The contractor shall update all documentation 'as built'. The contractor shall support all project activities, until all commissioning is completed, in accordance with Section 01 91 37, and the bridge is signed off by the Departmental Representative and is ready to be placed into service.

1.2 Scheduling

1. Do not start work prior to the approval of the Departmental Representative.

1.3 Continuity of Service

1. If, during this period there is a need to restrict or impede roadway traffic, this shall be coordinated with the Departmental Representative. The Departmental Representative shall be made aware at least one (1) week in advance and his approval must be obtained prior to the event.
2. All required permits shall be obtained, and full responsibility for all required provisions and activities and pay all associated fees related to the closure or traffic restriction shall be undertaken.

3. After substantial completion of the work and during commissioning, there will be a need to operate the bridge. All required permits shall be obtained, and full responsibility for all required provisions and activities and pay all associated fees related to the closure or traffic restriction shall be undertaken.

1.4 Codes and Standards

1. The work shall be installed to comply with the latest issue of all applicable codes and standards.
2. The work shall conform to the editions of the following codes and standards in force at the time of tender as applicable.
 1. Ontario Electrical Safety Code.
 2. Municipal Regulations.
 3. Utility Regulations and Requirements.
 4. Fire Marshal's Act.
 5. Ontario Building Code.
 6. Canadian Standards Association.
 7. Electrical Equipment Manufacturer's Association of Canada.
 8. Ontario Ministry of Labour.

1.5 Permits, Fees and Certificates

1. Give notices, obtain permits, pay fees and furnish certificates as evidence that the work installed conforms to the laws and regulations of all governing authorities.
2. On completion of the job, deliver to the Owner three (3) copies of the certificate of approval from the Inspection Department.

1.6 Approvals

1. All work shall be installed for the approval and/or acceptance of the Electrical Safety Authority and all other agencies having jurisdiction.
2. Pay all inspection and approval fees.
3. On completion of the work, deliver to the Owner three (3) copies of the certificate of approval from the Inspection Department.

1.7 Qualifications

1. The Contractor for the electrical installation shall be a qualified electrical Contractor, licensed by the Province of Ontario and regularly engaged in the installation of electrical systems.
2. Use only qualified electricians holding valid Ontario certificates to perform the electrical work with a minimum of five (5) years of related experience.

3. The Contractor shall have qualified personnel to continuously direct and monitor all electrical work.
4. Electricians skilled in their trade shall perform all labour in the best and most workmanlike manner. Standards of work required throughout shall be of such standards as will bring results of first quality only. What is known, as "local practice" will not be allowed unless it conforms to this standard.

1.8 Site Visits and Existing Conditions

1. The Contractor must visit the site to familiarize himself with the existing installation and conditions. The contractor shall make a proper evaluation of the extent of the work and will be considered to know the effects of all site conditions of the work. No extras will be considered which result from the Contractor's failure to consider the extent of the required work.
2. Report any discrepancies between these specifications and site conditions to Departmental Representative.

1.9 Shop Drawings and Product Data

1. Prior to carrying out any associated work, submit to the Departmental Representative for his review, shop drawings, calculations and manufacturer's product data for any custom assembled or manufactured items, consisting of dimensioned layouts and schematic diagrams containing all necessary details to define the equipment proposed to be installed, in accordance with Section 01 33 00 and including the following equipment and arrangements:
 1. Control panels and operator stations.
 2. Junction boxes, where they contain terminal strips and/or control equipment.
 3. Modifications to existing distribution panels.
 4. Motor starters and all control relays.
 5. Panel devices such as push buttons, selector switches and indicating lights.
 6. Lamicoid nameplates.
 7. Breakers and disconnect switches.
 8. Plugs and receptacles.
 9. Traffic control equipment.
 10. Marine navigation equipment.
 11. Bridge position limit switches.
2. Any work carried out by the Contractor prior to obtaining reviewed Shop Drawings from the Departmental Representative may be required to be redone. All such work will be at the Contractor's expense.

1.10 Inspections and Tests

1. Arrange and pay for all inspections, examinations and tests required by the authorities and/or agencies specified in Clause 1.5 above as necessary, to obtain complete and final acceptance of the system.
2. Furnish to Departmental Representative Certificates of Acceptance from Inspection Department on completion of work.
3. The Contractor shall arrange with the Departmental Representative for final inspection. Any deficiencies discovered during final inspection shall be promptly rectified by the Contractor and to the satisfaction of the Departmental Representative.

1.11 Warranties

1. Provide signed certificates warranting each electrical system covering labour and material for a period of at least one (1) year from the date of Final Acceptance by the Owner. Attach manufacturer's extended equipment warranties, each made out in the name of the Owner.

1.12 Trial Usage

1. The Departmental Representative reserves the right for trial usage of any electrical device, machinery, apparatus, equipment and other work supplied under this Division before final completion and acceptance.
2. The Departmental Representative will have the privilege of such trial usage for such reasonable length of time as Owner deems sufficient for making a complete test as soon as Contractor claims that said work is completed, in accordance with the drawings and specifications. No claims for damage may be made by the Contractor for injury to or breaking of any parts of such tested work, whether caused by weakness or inaccuracy of structural parts or by defective materials or workmanship of any kind whatsoever.
3. Such trial usage of any electrical device, machinery, apparatus, equipment or other work is not to be construed as evidence of acceptance of the system.

1.13 Wiring Methods

1. All wiring shall be protected by a suitable raceway. Above grade raceways shall be rigid metal conduit. Flexible liquid tight metal conduit shall be permitted for the 1.5 metres of raceway prior to the final electrical device. Rigid PVC conduit is permitted for underground raceways.
2. Fastening hardware shall be stainless steel.

3. Exposed wiring shall be minimized. Exposed wiring shall be used, only, where raceway is not feasible.
4. Connectors, plugs and receptacles shall be certified weatherproof or marine grade as required.

1.14 Field Verification and Shop Drawings

1. Before any parts are ordered it is essential to field verify the "as built" system configuration. Some changes may have been made that are not included in the reference drawings.
2. All Shop Drawings shall be submitted for approval before procurement and manufacturing.

1.15 Measurement and Payment

1. No measurement for payment will be made for the work of this Section. Payment shall be made under the lump sum item "Electrical Works".
2. All costs for labour, materials and equipment necessary to complete the work of this Section, shall be included in the item, "Electrical Works".

PART 2 - PRODUCTS

2.1 Approved Materials

1. All materials and equipment must be CSA approved or must bear an Electrical Safety Authority Special Approvals label.
2. All custom equipment such as control panel assemblies must be certified to CSA C22.2 No.14 (Industrial Control Equipment) and must be marked as such with a valid, official CSA label.
3. Deviations from this specification will only be permitted when prior written approval is obtained from the Departmental Representative.

2.2 Wire and Cable

1. All conductors shall be copper, unless otherwise stated.
2. Wiring in conduits: copper minimum 12 AWG, type RW90, X-link. Size all wiring to maintain a maximum voltage drop of 2½%.
3. Armoured Cable: PVC jacketed, copper Teck cable may be used in lieu of conduit and wire.

4. Minimum wire sizes shall be as follows:
 1. Power - 12AWG
 2. Control - 14AWG
 3. Analog Control - 18AWG
5. Conductor insulation colour coding shall be as follows:
 1. AC Power (all voltages) Black
 2. DC Power (all voltages) Blue
 3. Neutral White
 4. Grounding Green or Bare
 5. Control (all conductors) Red

2.3 Conduit, Raceways and Fittings

1. All conduits shall be sized, at minimum, according to Ontario Electrical Safety Code.
2. Use rigid PVC for all direct buried conduit or where encased in concrete.
3. Conduit shall be rigid galvanized steel where the wiring may be subject to mechanical harm, otherwise rigid PVC or equivalent may be used. Teck cable is also permissible for surface run wiring.
4. Submarine cable shall be armoured and rated for its intended use. Parks Canada has previously permitted the use of Electro Cables models 6PESAUS10-12C-V and 6PESAUS12-25C-18-2-V. The submarine cable part numbers identified in the electrical documentation package are generated numbers based on the numbering system of these previously approved cables and therefore will require verification when purchasing. If Contractor recommends cable substitutes Contractor shall submit cable specifications with bid submission.
5. Submarine cables shall be installed with a continuous concrete channel cover as depicted in Electrical Documentation.
6. Liquid tight flex shall be used where a raceway is connected to equipment subject to movement or vibration. The length of this flexible connection shall not to exceed 36".

2.4 Junction and Pull Boxes

1. Pull boxes shall be stainless steel type 304 NEMA 4X, CSA type 4.
2. Size all boxes for the cables entering them and the conductors and connections therein in compliance with the Ontario Electrical Safety Code. Minimum size of any box shall be 6" by 6".
3. Doors shall be hinged to their enclosures or held captive when removed.

4. Where boxes contain joints or connections use terminals for these connections. Provide a sub-panel for terminal strips.
5. Junction boxes accessible to public shall include padlock mechanism and padlock. All padlocks shall share custom key and be common with all other site control panel and junction box locks. No universal key systems shall be permitted.

2.5 Control & Distribution Panels

1. All modifications to or inside of all control and distribution panels shall be laid out in a neat, organized and functional manner.

PART 3 - EXECUTION

3.1 Design

1. Power and control system design must accommodate all functional and mechanical requirements identified in the Mechanical Specification Section 13 10 00.
2. Specification of electrical components to align with PCA standards as outlined in the Electrical Documentation.

3.2 Installation Methods and Materials

1. Electrical installation shall be co-ordinated with mechanical and all other discipline works to achieve the most efficient and orderly arrangement.
2. All materials shall be new, best in quality, shall conform to the applicable standards of the Canadian Standard Association and shall be manufactured to applicable EEMAC and NEMA specifications.
3. All equipment shall be installed in accordance with the best commercial practices, specifications and manufacturer's instruction.
4. All runs between equipment, junction boxes and panels shall be continuous with no splices allowed.
5. All wiring shall be run in conduit or as armoured cable.
6. All conduit and cable shall be parallel to building lines and support at intervals, as required by the Ontario Electrical Safety Code.
7. All necessary pull and connection boxes shall be provided.
8. All TECK cables and liquid tight conduit shall be terminated with watertight fittings.

9. EEMAC12 enclosures for indoor locations and EEMAC4 stainless steel or PVC boxes when located outdoors shall be used.
10. Sufficient space shall be provided in boxes to allow for pulling in and bending of cables.
11. Boxes shall be so installed as to be accessible after completion of the building.
12. Boxes shall be securely mounted and shall be plumb with surrounding structural members.
13. Necessary openings in the boxes for conduit entrance shall be drilled. Openings shall have close-tolerance and no unused openings shall be left in the boxes when the installation is complete. No openings permitted in top of enclosures unless written permission of the Departmental Representative is obtained.
14. A complete system of raceways and wiring for work indicated and specified shall be provided. Provide support systems where necessary to comply with the requirements of the Electrical Safety Code and this specification.
15. All supports, inserts and sleeves for the installation shown on the drawings and specifications shall be provided.
16. Do not cut or drill structural steel, unless written permission of the Departmental Representative is obtained.
17. Outlet boxes, junction boxes, panel tubs, etc. shall be supported independently of the tray or conduit running to them. Where necessary, steel brackets or rods shall be used to fasten them securely to the structure.
18. Cable and conduit shall be bent according to the manufacturer's recommendations and the requirements of the Ontario Electrical Safety Code.
19. All cables and conductors shall be run in single lengths.
20. All wiring shall be formed, grouped and taped all to provide a neat and orderly appearance.
21. Conductors may be coated with a lubricant manufactured for such purpose. In no case grease or coat conductors with substances injurious to the conductor jacket or insulation.
22. All wiring shall be separated into three (3) classes: power, control and signal. Each class shall be run in a separate cable or conduit.
23. Where cables contain more conductors than shown on interconnection diagrams, tag each spare as SP-1, SP-2, etc. at every terminal point and tie back neatly with PVC tape.

24. When cables or conduits are to be run underground, coordinate with the owner's forces to ensure worker safety. Identify and locate all underground services and devices that may be damaged by the new work.

3.3 Grounding

1. Grounding for new work shall be provided to comply with Ontario Safety Authority inspection requirements.
2. Ground resistance shall be tested for compliance with the Ontario Electrical Safety Code.
3. Grounding shall meet requirements of specification section 26 05 28.

3.4 Identification and Labelling

1. Wires at each termination point shall be permanently identified with numbers, per the schematic drawings. Brady, self-laminating, thermal transfer tags or equal shall be used. Every wire at each connection point or terminal shall be labelled, and in addition the terminal to which the wire(s) are connected.
2. All disconnects, panels, pull boxes, etc. shall be labelled. For all items, supply and mount white plastic nameplates with engraved black lettering.
3. Nameplates shall be attached with metal self-tapping stainless steel screws. Lettering shall indicate name and equipment number of the device or of the load being served.
4. Lettering shall be approximately 1/4" high for labels identifying panels, 5/32" high for labels identifying groupings of push buttons and similar devices, and 1/8" for individual devices.

3.5 Inspection, Testing and Commissioning

1. Prior to final commissioning, the Contractor shall pre-commission all systems and equipment. Within three (3) weeks of awarding the contract, provide complete checklists covering all pre-commissioning work. The checklists shall be in a form allowing each checked item to be initialed by the checker to confirm that the item is complete and operating correctly. Included items are connection integrity and polarity for all wiring, device operation, configuration and correct directions of motors and solenoids. All work by the contractor shall be included on the checklists and all check items shall be included to ensure the correctness of all work.
2. The following testing and commissioning measures are in addition to those called for in Section 01 91 37.
 - 1) It is anticipated that testing and commissioning will take three, eight-hour days to complete. The Contractor shall notify the Departmental Representative three working days prior to commencing final

commissioning. During final commissioning, the Contractor shall provide all necessary manpower and assistance for the entire period to enable and assist in the work. During final commissioning, the bridge and subsystems shall be operated multiple times and roadway traffic will therefore be interfered with. Roadway traffic control shall be the responsibility of the Contractor during this period.

- 2) If during commissioning, problems are encountered with the Contractor's work that should have been detected by the Contractor's pre-commissioning work, commissioning will be temporarily suspended until the problems are fixed. These periods of time shall not be counted as commissioning time and the Contractor will therefore not be entitled to additional reimbursement. If the extent of required repairs warrants it, commissioning may, at the Departmental Representative's discretion, be temporarily terminated until another date, after required repairs and additional pre-commissioning has been carried out by the Contractor.

3.6 Protection and Storage

1. The Contractor shall be responsible for the storage of all equipment, tools, etc. The storage shall always be kept under lock and key. The Departmental Representative shall not be responsible for any lost or damaged materials or tools on the site. Coordinate with the site supervisor for storage facilities if suitable space is available.
2. All finishes in the areas of work shall be protected from damage that would impair its existing efficiency or mar its appearance.
3. Factory-finished equipment shall be protected from damage. Damaged finishes shall be restored to original condition. Equipment shall be returned to the manufacturer for refinishing, if so directed by the Departmental Representative.
4. During the progress of construction, existing installations shall be protected from physical damage, construction debris, dust and similar hazards resulting from the construction work.
5. It is the responsibility of the contractor to unload all materials and equipment (covered in this contract) arriving on the site and to provide all necessary handling equipment. These materials and equipment shall be stored as directed by the Departmental Representative.
6. It is the Contractor's responsibility before unloading any material or equipment to verify that it is in proper condition. Should the contractor discover any damage, he shall not proceed with unloading until he has received instructions from the Departmental Representative.
7. During handling of the equipment, the Contractor shall be responsible for any damage which should occur to the equipment (covered in this Contract), or to

nearby equipment which may have become damaged while handling said equipment.

3.7 Disposal and Clean up

1. Premises shall be left in a clean, safe and usable condition and remove all excess debris at the end of each working day.
2. All removed electrical equipment and materials shall be disposed of.
3. Debris shall be cleaned up on completion.

3.8 Record Documents

1. One set of prints shall be kept on site for the sole purpose of recording changes to the work and exact locations for all work concealed at the completion of the project.
2. In accordance with Section 01 78 00, the 'As Built' drawings shall be turned over prior to final payment being due from Departmental Representative.
3. An extra set of white prints shall be maintained on the project and, as the work progresses, clearly note all the changes in location and/or the sizes of wiring, fixtures, panels and equipment, preferably in red ink.
4. After completion of the work, all such drawings and associated product information shall be provided to the Departmental Representative as a complete set of 'As-Built' records and, in accordance with Section 01 78 00.
5. All electrical documentation shall be co-ordinated with and incorporated into the Operation and Maintenance Manual identified in the Mechanical Specification 13 10 00. This electrical documentation includes but is not limited to 'As-Built' drawings (schematics, installation arrangements, cable and termination schedules, panel layouts and bills of material), commissioning and validation documentation, equipment and vendor data sheets and manuals, recommended spare parts, and maintenance and inspection requirements.
6. The Final Certificate of Acceptance will not be issued until satisfactory 'As-Built' record drawings are filed with the Departmental Representative.

3.9 Cutting and Patching

1. Do all cutting and patching. Appropriate trades shall be employed to perform cutting, patching and making good existing walls (or other), as required. Before commencing, approval for extent and nature of cutting shall be obtained from the Departmental Representative. All disturbed surfaces shall be made good and work debris cleaned up on completion.

2. Departmental Representative's approval shall be obtained before cutting, boring or sleeving any load bearing members.

3.10 Accessibility and Space

1. The Contractor shall follow the approved shop drawings and Contract Drawings in laying out work and check Drawings of other trades, to verify spaces in which work will be installed. Maintain maximum headroom or space conditions at all points. Where headroom or space conditions appear inadequate, the Departmental Representative shall be notified before proceeding with installation.

***** **END OF SECTION** *****

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Common Work Results for Electrical - Section 26 05 17

PART 2 - PRODUCTS

2.1 GROUND WIRES

- .1 As per OPSS 609 and contract drawings

2.2 BURIED CONNECTORS - COMPRESSION TYPE

- .1 As per OPSS 609 and contract drawings

2.3 GROUND RODS

- .1 As per OPSS 609 and contract drawings

PART 3 – EXECUTION

3.1 GENERAL

- .1 Clean all paint, rust and dirt from all surfaces to which ground lugs are bolted.
- .2 Protect exposed grounding conductors from mechanical damage.
- .3 Ensure that molds, for exothermic type connections, are not used for more than 50 connections.
- .4 At junction and terminal boxes, bond grounding conductors to ground stud.
- .5 Bond the main substation ground grid to the building grounding system.

3.2 GROUND WIRES

- .1 Installed as per OPSS 609 and contract drawings.

3.3 BURIED CONNECTORS - COMPRESSION TYPE

- .1 Installed as per OPSS 609 and contract drawings.

3.4 GROUND RODS

- .1 Installed as per OPSS 609 and contract drawings.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 35 43 - Environmental Procedures
- .2 Section 31 23 10 - Earth Excavation
- .3 Section 32 11 18 - Granular 'A'.
- .4 Section 32 11 19 - Granular 'B', Type II.

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 No measurement for payment will be made under this Section.

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 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water. Remove sand base and restore stockpile site at completion of the work.

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 PROCEDURES

- .1 No Measurement for payment will be made for the work of "Clearing and Grubbing". All costs associated with this portion of the work shall be included in the contract lump sum.

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 SECTIONS

- .1 Section 01 35 43 - Environmental Procedures
- .2 Section 31 05 17 - Aggregate Materials.

1.2 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.

1.3 MEASUREMENT PROCEDURES

- .1 Earth Excavation shall include all labour, equipment, and materials necessary to complete the Work in accordance with these Specifications and the Contract Drawings. No measurement for payment shall be made for this Work. All costs associated with excavation to the lines required to complete the Work shall be included in the Contract Lump Sum Price for all Work except that associated with the full-depth reconstruction of the road.
- .2 Earth excavation associated with the Item "Full-Depth Reconstruction of the Road" shall be included in the Contract Unit price for that item.
- .3 Testing for contamination of the soils shall be included in the Contract Unit Price for the item "Testing for Contaminated Soils". The contractor shall complete the number of tests required for the excavation and disposal of soils to complete all work associated with this project. Note the contract unit price is not per test but for all testing.
- .4 The disposal of contaminated soil based on the above testing shall be paid under the item "Disposal of Contaminated Soil" and shall be paid under the unit price for that item. All additional cost of disposal if this is not a soil that is not contaminated shall be included in this unit cost assuming that the soil has to go to a Class 1 Soil Management Site.
- .5 Note all concrete, reinforcing steel, removals, excavation, subgrade preparation and all work associated with the concrete approach slabs shall not be measured be included in the contract lump sum price.

1.4 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.

1.5 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.

1.6 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 Existing utilities to be exposed in advance by means of a badger (hydro-vac) truck system or land excavation if work is to occur near the utility. Near will be defined as if the work affects the area at 150% of the stated locate accuracy or if

- no accuracy is specified contact the utility regarding work in proximity to their plant.
- .4 Maintain and protect from damage, water, sewer, gas, electric, telephone, and other utilities and structures encountered.
- .5 Where 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 Protect existing features from damage while Work is in progress. In event of damage, immediately make repair to approval of Departmental Representative.

Part 2 Products

2.1 NOT USED

- .1 Not Used

Part 3 Execution

3.1 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.

3.2 STRIPPING OF TOPSOIL

- .1 Strip topsoil and disposal of surplus off-site. Do not mix topsoil with subsoil.

3.3 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.

3.4 EXCAVATION

- .1 Excavate to lines, grades, elevations, and dimensions as indicated.
- .2 Dispose of waste material (i.e. asphalt, excess or unsuitable excavated material) off-site.
- .3 Do not obstruct flow of surface drainage or natural watercourses.
- .4 Earth bottoms of excavations to be undisturbed soil, level, and free from loose, soft, or organic matter.
- .5 Notify Departmental Representative when bottom of excavation is reached.
- .6 Obtain Departmental Representative approval of completed excavation.

- .7 Remove unsuitable material from trench bottom to extent and depth as directed by Departmental Representative.
- .8 Correct unauthorized over-excavation as follows:
 - .1 Fill with Granulars to depths indicated on Contract Drawings, compacted to not less than 95% of corrected maximum dry density.
- .9 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.

3.5 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.

3.6 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.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation of geomembranes for use in waste water ponds, sewage lagoons, landfill, and other containment structures as an impermeable membrane.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 35 43 - Environmental Procedures.
- .3 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.3 MEASUREMENT PROCEDURES

- .1 Geomembranes will not be measured and will be considered as incidental to the Work of the rip-rap, and shall be included in the associated unit price.

1.4 REFERENCES

- .1 American Society for Testing and Materials International (ASTM).
 - .1 ASTM D413-98(2017), Standard Test Methods for Rubber Property-Adhesion to Flexible Substrate.
 - .2 ASTM D638-14, Standard Test Method for Tensile Properties of Plastics.
 - .3 ASTM D746-14, Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
 - .4 ASTM D792-13, Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
 - .5 ASTM D882-18, Standard Test Methods for Tensile Properties of Thin Plastic Sheeting.
 - .6 ASTM D1203-16, Standard Test Methods for Volatile Loss from Plastics Using Activated Carbon Methods.
 - .7 ASTM D 1004-13, Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
 - .8 ASTM D1204-14, Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature.
 - .9 ASTM D1238-13, Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.
 - .10 ASTM D1593-13, Standard Specification for Nonrigid Vinyl Chloride Plastic Film and Sheeting.
 - .11 ASTM D1603-14, Standard Test Method for Carbon Black Content in Olefin Plastics.
 - .12 ASTM D1693-14, Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.

- .13 ASTM D1790-14, Standard Test Method for Brittleness Temperature of Plastic Sheeting by Impact.
- .2 Federal Test Method Standard (FTMS)
 - .1 FTMS 1016-Method 2065, Puncture Resistance and Elongation Test.

1.5 SUBMITTALS

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative at least four (4) weeks prior to beginning Work the following samples.
 - .1 Minimum 2 m length of standard width membrane.
 - .2 Minimum of 1 m seam with at least 300 mm of membrane on both sides of seam.
- .3 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Indicate installation layout, dimensions, and details, including both fabricated and field seams, anchor trenches, and protrusion details.

1.6 CERTIFICATES

- .1 Submit to Departmental Representative copies of manufacturer's mill test data at least four (4) weeks prior to start of Work.
- .2 Submit to Departmental Representative certificates, including test results, at least two (2) weeks prior to delivery to job site.

1.7 QUALITY ASSURANCE

- .1 Test quality of resin and membrane to ensure consistency of raw material and geomembrane quality in accordance with manufacturer's recommendations.
- .2 Test seams in strength and peel at beginning of each seaming period, and at least once every 4 hours if welding operation is interrupted, for each seaming apparatus and seamer used that day. Also, test at least two (2) samples from each panel, with samples taken from extra material, such that panel is not damaged and blanket geometry is not altered.
- .3 If seam test specimen fails in seam, repeat on new specimen. If new specimen fails in seam, material will not be used for seaming until deficiencies are corrected and two (2) consecutive successful seam tests are conducted.
- .4 Test seams by non-destructive methods over their full length, using vacuum test unit or air pressure test.
 - .1 Vacuum chamber to contain glass viewport and seal for sealing chamber to seam area. With chamber sealed in place, and after partly filling chamber with water, apply vacuum of 17.2 kPa. Seam failure is detected by presence of air bubbles through water.
 - .2 Use air lance to apply air at 343 kPa through nozzle directed at edge of overlap seam. Seam failure is indicated by inflation or lifting of any part of geomembrane.
- .5 Provide test results to Departmental Representative, for each shift's production, including documentation of non-destructive testing and repairs at the end of each shift.

1.8 DELIVERY, STORAGE, AND HANDLING

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

1.9 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal, paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Fold metal banding, flatten, and place in designated area for recycling.

Part 2 Products

2.1 MATERIALS

- .1 Geomembrane: extruded synthetic sheet.
 - .1 Supplied in:
 - .1 Rolls of 1 m minimum width.
 - .2 Panels of size as indicated.
 - .2 Composed of non-reinforced high-density polyethylene polyvinyl chloride resin with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 60 days.
 - .3 Reinforced with 9 x 9 - 1000 denier woven polyester scrim.
- .2 Physical properties:
 - .1 Specific gravity of resin: to ASTM D792, Method A, minimum 0.93.
 - .2 Melt index of resin: to ASTM D1238, Condition E, minimum 0.14 g/min.
 - .3 Thickness: to ASTM D1593, minimum 2 mm.
 - .4 Tensile strength and elongation at yield: to ASTM D638.
 - .1 Tensile strength: minimum 35 N/mm.
 - .2 Elongation: minimum 13 %.
 - .5 Tensile strength and elongation at break: to ASTM D638:
 - .1 Tensile strength: minimum 40 N/mm.
 - .2 Elongation: minimum 700 %.
 - .6 Modulus of elasticity: to ASTM D638, minimum 550 kPa.
 - .7 Tear resistance: to ASTM D1004, Die C, minimum 250 N.
 - .8 Puncture resistance: to Federal Tests Methods Standards, USA, 101C-Method 2065; minimum 300 N.
 - .9 Resistance to soil burial: maximum 10%.

- .10 Dimensional stability, each direction: to ASTM D1204, 100° C, 1 hour, maximum 1%.
 - .11 Environmental stress crack: to ASTM D1693 minimum 1000 h.
 - .12 Low temperature brittleness: to ASTM D746, Procedure B, minus 40° C.
 - .13 Brittleness temperature: to ASTM D1790.
 - .14 Carbon black content: to ASTM D1603, minimum 2%, maximum 3% by mass.
 - .15 Seam strength (at yield point): 280 N and film tear bond.
 - .16 Seam peel adhesion: to ASTM D413, ASTM D638, ASTM D882.
 - .17 Total content of additives, fillers or extenders: maximum 3% by weight.
 - .18 Geomembrane: free of striations, roughness, pinholes, bubbles, blisters, undispersed raw materials, and any sign of contamination by foreign matter.
 - .19 Volatile loss: to ASTM D1203, maximum %.
- .3 Seams: welded in accordance with manufacturer's recommendations. Physical properties for resin used for welding to be same as those for resin used in manufacture of membrane.

Part 3 Execution

3.1 INSTALLATION

- .1 Maintain area of installation free of water and snow accumulations.
- .2 Prepare excessively soft supporting material as directed by Departmental Representative.
- .3 Do not proceed with panel placement and seaming when ambient temperatures are below minus 5° C or above 40° C, during precipitation, in presence of excessive moisture (e.g. fog, dew), nor in presence of high winds.
- .4 Place and seam panels in accordance with manufacturer's recommendations on graded surface, in orientation and locations indicated. Minimize wrinkles, avoid scratches and crimps to geomembranes, and avoid damage to supporting material.
- .5 Protect installed membrane from displacement, damage, or deterioration before, during, and after placement of material layers.
- .6 Replace damaged, torn, or permanently twisted panels to approval of Departmental Representative. Remove rejected, damaged panels from site.
- .7 Keep field seaming to minimum. Locate field seams up and down slopes, with no horizontal field seam less than 1.5 m beyond toe of slope.
- .8 Keep seam area clean and free of moisture, dust, dirt, debris, and foreign material.
- .9 Make field-seam samples in accordance with requirements described in PART 2 of this Section on fragment pieces of geo-membrane, and test to verify that seaming conditions are adequate.
- .10 Test field-seams as seaming Work progresses by non-destructive methods over their full length. Repair seams which do not pass non-destructive test. Reconstruct seam between failed location and any passed test location, until non-destructive testing is successful.

- .11 Repair minor tears and pinholes by patching until non-destructive testing is successful. Patches to be round or oval in shape, made of same geomembrane material, and extend minimum of 75 mm beyond edge of defect.

3.2 CLEANING

- .1 Remove construction debris from Project site and dispose of debris in an environmentally responsible and legal manner.

3.3 PROTECTION

- .1 Do not permit vehicular traffic directly on membrane.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 35 43 - Environmental Procedures
- .2 Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

1.2 MEASUREMENT PROCEDURES

- .1 Measurement and payment for random rip-rap Item No. 11 (such as at the back of the North Abutment) shall be measured in tonnes of material placed.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C144-18, Standard Specification for Aggregate for Masonry Mortar.
 - .2 ASTM C618-19, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- .2 Canadian Standards Association (CSA)
 - .1 CSA-A23.1-14, Concrete Materials and Methods of Concrete Construction.
 - .2 CAN/CSA-A3000-18, Cementitious Materials Compendium.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 RIP RAP

- .1 Hard, durable quarry stone, free from seams, cracks or other structural defects with relative density not less than 2.65, to meet following size distribution for use intended:
 - .1 Random rip-rap:
 - .1 Not more than 10% of total volume of stones with individual volume less than 15 dm³.
 - .2 Not less than 50% of total volume of stones with individual volume of 85 dm³ or more.
 - .3 Remaining percentage of total volume to have uniform distribution of stones between 15 and 85 dm³ size.

2.2 GEOTEXTILE FILTER

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

Part 3 Execution

3.1 PLACING

- .1 Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.
- .2 Place Geotextile fabric under stone area.
- .3 Place rip-rap to thickness and details as indicated.
- .4 Place stones in manner approved by Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.
- .5 Place stones that are to be set in concrete at side of abutment while concrete is plastic and within standard delivery times. Waste-concrete from other pours can be used, provided that stones are placed prior to end of placement timing constraints.

END OF SECTION

Part 1 General

1.1 MEASUREMENT PROCEDURES

- .1 Payment for the task of supplying Granular 'A' shall include all labour, equipment, and material necessary to complete the Work in accordance with these Specifications and Contract Drawings.
- .2 No measurement for payment shall be made, all costs shall be included in the Contract Lump Sum Price, except for the area of full-depth reconstruction of the road. The reconstruction of the shoulders shall be included in the contract lump sum price.
- .3 All granular material associated with the Item "Full Depth Reconstruction of the Road" shall be included in the contract unit price for that Item.
- .4 The following shall be included in both the Lump Sum and unit price portion of this Work
 - .1 Supply, placement, and compaction for the areas indicated on the Contract Drawings. Supply of water and calcium chloride for compaction and dust control shall not be measured for payment, but shall be considered incidental to the Work.
- .5 The Work of the Lump Sum Price shall also include placement of Granular 'A' along the edge of the asphalt, after placement of asphalt, to form all shoulders and embankments blended into natural ground elevations.

1.2 RELATED SECTIONS

- .1 Section 01 35 43 - Environmental Procedures
- .2 Section 31 23 10 - Earth Excavation.
- .3 Section 31 05 17 - Aggregate Materials.

1.3 REFERENCES

- .1 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.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver and stockpile aggregates in accordance with Section 31 05 17 - Aggregate Materials.

Part 2 Products

2.1 MATERIALS

- .1 Granular 'A' shall be in accordance with the provisions of OPSS 1010.

Part 3 Execution

3.1 GENERAL

- .1 All granular material shall be placed in small lift, that can be fully compacted to 100% standard proctor density in accordance with the technical provisions of OPSS 501.

END OF SECTION

Part 1 General

1.1 MEASUREMENT PROCEDURES

- .1 Payment for the task of supplying Granular 'B' Type II shall include all labour, equipment and material necessary to complete the work in accordance with these Specifications and Contract Drawings.
- .2 No measurement for payment shall be made. All costs shall be included in the Contract Lump Sum Price except for the area of full depth reconstruction of the road. The reconstruction of the shoulders shall be included in the lump sum contract price.
- .3 All granular material associated with the Item "Full Depth Reconstruction of the Road" shall be included in the contract unit price for that Item.
- .4 The following shall be included in both the Lump Sum and unit price portion of this Work
 - .1 Supply, placement, and compaction for the areas indicated on the Contract Drawings. Supply of water and calcium chloride for compaction and dust control shall not be measured for payment, but shall be considered incidental to the Work.

1.2 RELATED SECTIONS

- .1 Section 01 35 43 - Environmental Procedures
- .2 Section 31 23 10 - Earth Excavation
- .3 Section 31 05 17 - Aggregate Materials
- .4 Section 32 11 18 - Granular 'A'

1.3 REFERENCES

- .1 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.

Part 2 Products

2.1 MATERIALS

- .1 Granular 'B' to conform to the requirements of OPSS 1010.

Part 3 Execution

3.1 GENERAL

- .1 All granular material shall be placed in small lifts that can be fully compacted to 100% standard proctor density in accordance with the technical provisions of OPSS 501.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 05 17 - Aggregate Materials

1.2 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.

1.3 MEASUREMENT AND PAYMENT

- .1 Payment for the tasks "Hot Mix Asphalt, HL3", "Hot Mix Asphalt, HL8" shall be included in the Unit Price Item "Full Depth Reconstruction of the Road". All costs associated with the Work shall be included in the contract unit price for that Item. The asphalt area that has had full granular roadbed replaced under it shall be the basis for measurement of that item.
- .2 All labour, equipment, and material necessary to complete the Work in accordance with these Specifications and Contract Drawings shall be included. The following shall be included in the Contract Lump Sum Price, no additional payment shall be made.
 - .1 Sawcutting
 - .2 Pavement cleaning
 - .3 Tack coat
 - .4 Cold planing
 - .5 Any other Work required to fully tie in and place the asphalt.

1.4 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.

1.5 PRODUCT DATA

- .1 Upon request, submit manufacturer's test data and certification that asphalt cement meets requirements of this Section.

1.6 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.

Part 2 Products

2.1 MATERIALS AND MIX DESIGN

- .1 Asphalt cement shall meet the requirements of OPSS 1101. Material Specification for Asphalt Cements shall be in accordance with the MTO Guide for the use of Performance Grade Asphalt Cement (PGAC); a PGAC grading of 64-28 will be used for this roadway.
- .2 HL3 and HL8 shall meet the requirements of OPSS 310 and OPSS 1150.
- .3 Mix designs will be the responsibility of the Contractor.
- .4 The requirements of OPSS 1150, Table 3, for AADT >5000 shall apply. Marshall stability shall be a minimum of 8900 for HL3
- .5 No recycled material will be permitted for this project.

Part 3 Execution

3.1 GENERAL

- .1 The quantity of asphalt required to repair the roadway at the Bridge is relatively small but involves multiple lifts of asphalt. 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 planing of the area as shown in the Contract Drawing and as directed by the Departmental Representative, for the placement of asphalt.
- .2 Asphalt shall include two (2) base courses of HL8 asphalt paving and one (1) lift of HL3 top course.

END OF SECTION

Part 1 General

1.1 MEASUREMENT PROCEDURES

- .1 Preparation of sub-grade for placing of topsoil will not be measured for payment and shall be included in the supply of topsoil and in the detour restoration.
- .2 Topsoil stripping will not be measured.
- .3 Topsoil for the restoration of the areas disturbed by construction activities shall be included in the Contract Lump Sum Price and shall be completed in accordance with the requirements of this Specification.
- .4 Specified depth of topsoil: as shown on Contract Drawings, and approved by Departmental Representative after settlement and consolidation.

1.2 RELATED SECTIONS

- .1 Section 01 35 43 - Environmental Procedures

1.3 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.

1.4 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 contaminants.
 - .4 Composed bio-solids: to CCME Guidelines for Compost Quality, Category (A) (B).

1.5 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.

1.6 QUALITY ASSURANCE

- .1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions, and warranty requirements

1.7 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.

Part 2 Products

2.1 GENERAL

- .1 Topsoil: mixture of particulates, microorganisms, and organic matter which provides suitable medium for supporting intended plant growth. Topsoil to meet the following requirements:
 - .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.
- .7 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.
- .8 Sand: washed coarse silica sand, medium to coarse textured.
- .9 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.
- .10 Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications in accordance with CCME PN1340.
- .11 Limestone:
 - .1 Ground agricultural limestone.
 - .2 Gradation requirements: percentage passing by weight 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- .12 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 150 mm.
- .3 For sodded areas, keep topsoil 15 mm below finished grade.
- .4 Spread topsoil to following minimum depths after settlement:
 - .1 135 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 MEASUREMENT PROCEDURES

- .1 No measurement for payment will be made for sodding required for the restoration of the construction area, and all costs for sodding in accordance with the Specification required to restore the preconstruction condition of the site shall be included in the Contract Lump Sum Price.
- .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.

1.3 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.

1.4 QUALITY ASSURANCE

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

1.5 SCHEDULING

- .1 Schedule sod laying to coincide with preparation of soil surface.
- .2 Schedule sod installation for when frost is not present in ground.

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.

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 SECTIONS

- .1 Section 01 35 43 - Environmental Procedures
- .2 Section 02 41 23 - Selective Site Demolition.

1.2 MEASUREMENT PROCEDURES

- .1 No measurement for payment will be made for the Work of this Section. All costs for the end treatments modified and standard, posts, offset block, bases on structure where required, guiderail etc. and, all Work of this Section shall be included in the Contract Lump Sum Price and separated in the breakdown of prices submitted after award under a task "New Guiderail Approaches" and Protection".

1.3 REFERENCES

- .1 American Association of State Highway and Transportation Officials (AASHTO).
 - .1 AASHTO M180-18, Standard Specification for Corrugated Sheet Steel Beams for Highway Guardrail.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM A307-14e1, Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
 - .2 ASTM A27/A27-M17 - Specification for Steel Castings, Carbon, for General Applications.
 - .3 A 780/A 780M-09 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- .3 Canadian Standards Association (CSA)
 - .1 CSA-O80 Series-15, Wood Preservation.
 - .2 CSA-G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-G40.20-13/G40.21-13 - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .4 CSA W47.1-92 - Certification of Companies for Fusion Welding of Steel Structures.
 - .5 CAN/CGSB-1.181-99 - Ready-Mixed Organic Zinc-Rich Coating.
 - .6 CSA W59-18, Welded Steel Construction.
- .4 National Lumber Grades Authority (NLGA).
 - .1 Standard Grading Rules for Canadian and New Line Lumber, 2017.
- .5 Ontario Provincial Standard Specifications (OPSS).
 - .1 Ontario Provincial Standards OPSS 908 - Construction Specification for Metal Traffic Barriers and Metal Railings for Structures.

- .6 CGSB 31-GP-107M (1990), Non-Inhibited, Phosphoric Acid Base Metal Conditioner and Rust Remover.

1.4 SAMPLES

- .1 Inform Departmental Representative at least two (2) weeks prior to beginning Work, of proposed sources of guide rail and components.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Divert unused metal materials from landfill to metal recycling facility, as approved by Departmental Representative.
- .4 Unused paint or coating material must be disposed of at an official hazardous material collections site, as approved by Departmental Representative.
- .5 Fold metal banding, flatten, and place in designated area for recycling.
- .6 Do not dispose of preservative-treated wood through incineration.
- .7 Do not dispose of preservative-treated wood with other materials destined for recycling or reuse.
- .8 Dispose of preservative-treated wood, end pieces, wood scraps, and sawdust at a sanitary landfill.
- .9 Dispose of unused preservative material at an official hazardous material collections site. Do not dispose of unused preservative material into the sewer system, streams, lakes, or on ground, or in any other location where they will pose a health or environmental hazard.

Part 2 Products

2.1 MATERIALS

- .1 Steel W-beam guide rail as indicated, and to following requirements:
 - .1 Steel rail and terminal Sections: to AASHTO M180, Class A Type 1 zinc coated.
 - .2 Bolts, nuts and washers: to ASTM A 307, hot-dip galvanized to CSA G164.
- .2 Organic zinc-rich coating: to CAN/CGSB-1.181.
- .3 Generally Sawn timber posts shall not be used and would require approval of the Departmental Representative but if use the Sawn Timber Posts and offset blocks shall be:
 - .1 No. 1 Grade-structural posts and timbers graded according to NLGA standard grading rules for Canadian lumber. Use jack pine, red pine or southern yellow pine.
 - .2 Type: pressure treated in accordance with CAN/CSA-O80 Series.
 - .3 Dimensions: as indicated.

- .4 Steel, unless otherwise approved, shall be according to CSA G40.21.
- .5 Rails shall be Grade 350W.
- .6 Rolled Sections and steel plate shall be Grade 350W.
- .7 Galvanized bolts and nuts shall be according to ASTM A307.
- .8 Cast steel posts shall be according to ASTM A27, Grade 65-3 2.2.
- .9 Set-screws shall have a zinc-nickel plating applied to a thickness of 10 µm. The plating shall show no red rust after 1000-hour exposure to salt spray according to ASTM B117.
- .10 All steel surfaces shall be protected by hot-dip galvanizing according to CSA G-164M providing a minimum zinc mass of 610 g.
- .11 Bolts, set screws, nuts, and washers shall be Type 304 stainless steel according to ASTM A314.
- .12 Anchor bolts shall be according to ASTM A325M. The anchorage cage shall be according to SAE 1030. The bolts and cage shall be hot-dip galvanized according to CSA G164M. The anchorage assembly shall be supplied with the bolts installed in a template.
- .13 Zinc-rich paint shall be according to CAN/CGSB-1.181M.
- .14 Shop Bend all radii smaller than 45 meters.
- .15 End treatments using similar material and conforming to OPSD configuration and materials.

Part 3 Execution

3.1 ERECTION

- .1 Set posts by instrument for alignment, and locations as indicated, and as directed by Departmental Representative.
- .2 Wood posts shall be used. Wood is preferred, as it is thought that it better suits the heritage nature of the site.
- .3 Where concrete is present at the location of post holes, use standard galvanized post bases to support posts.
- .4 Excavate post holes to depths as indicated, and to diameter of 360 mm plus or minus 20 mm. Compact bottom to provide firm foundation. Set post plumb and square in hole.
- .5 Backfill around posts using excavated material and compact in uniform layers not exceeding 150 mm compacted thickness.
- .6 Cut off tops of posts as indicated, with tops parallel to grade of pavement edge.
- .7 Worker protection: workers must wear protective clothing when handling, drilling, sawing, cutting, or sanding preservative-treated wood and applying preservative materials.
- .8 Treat cut tops with two (2) coats of approved preservative treatment compatible with post treatment.

- .9 Construct anchorages to details as indicated. Place and compact backfill for anchors as directed by Departmental Representative.
- .10 Erect steel W-beam components to details as indicated. Lap joints in direction of traffic. Tighten nuts to 100 Nm. torque. Maximum protrusion of bolt 12 mm beyond nut.

3.2 PAINTING TOUCH UP

- .1 Galvanized steel-touch up:
 - .1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two (2) coats of organic zinc-rich paint to damaged areas. Pre-treat damaged surfaces according to manufacturer's instructions for zinc-rich paint.

3.3 END PROTECTION

- .1 Construct end protection in complete conformance with applicable OPSS Drawings, Specifications, and Standards.

3.4 CONSTRUCTION

- .1 Railing components shall be protected from damage and distortion during handling, transportation, storage, and installation.
- .2 Lattice railing, frames, and posts will be painted as per Section 09 97 19 - Painting Exterior Metal Surfaces, but W and Thrie beam railing shall be Galvanized.
- .3 The railing shall be installed to the elevations and alignment shown on the Contract Drawings with a tolerance of ± 3 mm and with no kinks or other visible breaks in alignment throughout the length of the installation. In most cases a distance above finished pavement is shown and not a
- .4 Anchorages shall be accurately and securely located.
- .5 The railing system components shall be fabricated according to the details specified. Field modification shall only be done when approved by the Departmental Representative.
- .6 Where welding is required, the fabricator shall be certified according to Division 2.1 of CSA W47.1 for steel railings.
- .7 Unless otherwise specified in the Contract, fabrication and welding shall be according to CSA W59.
- .8 All flame cut edges shall be as smooth and regular as those produced by edge planing and shall be free of slag.
- .9 When a galvanized surface is damaged, the exposed steel shall be immediately cleaned of all rust, oil, and grease and coated with a 75 μ m maximum thickness of zinc-rich paint. After erection, the surface shall be given a second coating of zinc-rich paint of the same thickness.
- .10 The sequential Kinking Terminal at the Northwest end of the guiderail to be installed following specified Radius including shop bent rail segments.

END OF SECTION