

Project Title _____ Bobcaygeon Swing Bridge

Project Number _____ 1356-30030321

Project Date _____ October 2019

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PART 1 - GENERAL

1.1 Precedence

1. For Federal Government projects, Division 1 Sections take precedence over technical specification sections of other Divisions of these Specifications.

1.2 Related Sections

1. Section 01 32 16.07 - Construction Progress Schedule.
2. Section 01 33 00 - Submittal Procedures.
3. For this project, the Contractor shall read all Sections in conjunction with each other. Section references are to aid the Contractor but do not relieve them from reading the Sections in combination with other Sections where no references are present.

1.3 Work Covered by Contract Documents

1. Work of this Contract comprises the rehabilitation of the Bobcaygeon Swing Bridge superstructure, abutments, central pier, lock house and associated facilities. To complete the work, it will be necessary to close the bridge site to vehicular traffic during non-navigation season from November 2019 to May 2020. See Section 01 32 16.07 – Construction Progress Schedule for milestone dates. During this period, the swing bridge and substructure is to be rehabilitated and mechanical and electrical components are to be removed and new components installed. The Contractor will be responsible to design, supply, install and maintain a temporary pedestrian bridge over the navigation channel. The pathway immediately adjacent to the downstream lock gate shall be maintained by the Contractor.
2. The Contractor will be responsible, as per the general conditions as well as the specifications and drawings, for the timely completion of the work associated with this Contract and ensuring the quality of the work of their own forces and all subcontractors.
3. There is a significant amount of steel work on this project and this must be completed in a manner that is similar but not identical to the existing bridge. The steel work must be coated with the specified coating system to thoroughly protect the steel. It is intended that new structural steel components will be fabricated off-site, pre-assembled on site (as required) and erected by crane into the final location.

4. There is concrete work to be completed to reface/repair the north and south abutments. Care must be taken to produce a good, solid and durable end product.
5. There are key milestone and completion dates that are significant to the Owner and the schedule. Work must be monitored and completed to meet the goals at the milestone and completion dates specified.

PART 2 - PRODUCTS

2.1 Not Used

1. Not used.

PART 3 - EXECUTION

3.1 Not Used

1. Not Used.

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

PART 1 - GENERAL

1.1 Minimum Standards

1. Execute work to meet or exceed:
 1. The provisions of the CAN/CSA S6-14 Canadian Highway Bridge Design Code (CHBDC).
 2. National Building Code of Canada 2015, National Fire Code of Canada 2015, Ontario Building Code 2012 and any other code of provincial or local application, including all amendments up to project 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.
 7. Canadian Labour Code Part 2.

1.2 Taxes

1. Pay applicable Federal, Provincial and Municipal taxes.

1.3 Fees, Permits and Certificates

1. Provide authorities having jurisdiction with information requested.
2. Pay fees and obtain certificates and permits required.
3. Furnish certificates and permits when requested.

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 Contract.

1.5 Site

1. Confine work, including temporary structures, plant, equipment and materials to the minimum required to complete construction. The area on the northeast corner of the swing bridge will be available to the Contractor as a work and storage area.
2. Contractor Parking is to be confined to the site and not to interfere with the adjacent properties, driveways etc.
3. Make adjustments, as directed by the Departmental Representative, to correct any issues which may affect neighbouring properties.
4. Off site work is required to complete the work at a facility arranged and paid for by the Contractor.
5. Locate temporary buildings, roads, walks, drainage facilities, services as directed and, maintain in a clean and orderly manner.

1.6 Construction and Storage Areas

1. The limits of the Construction and Storage Area are shown on the drawings. Should the Contractor require additional area(s) 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 shall become part of the Contract Documents.

1.10 Reproduction of Contract Document

1. Reproduce and distribute Contract Documents and all drawings to all Sub-Contractor and Contractor employees required to adequately control the work and provide information to all trades.

1.11 Layout of Work

1. Immediately upon entering the 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 and Protections

1. Execute work with minimum disturbance to occupants, public and normal use of site (outside of delineated work and storage areas). Make arrangements with Departmental Representative to facilitate execution of work.
2. Maintain access and exits.
3. Provide necessary barriers, warning lights and signs. Replace damaged existing and new signs and work with material and finish to match work of similar nature specified elsewhere in the Contract or to match the original in good condition if no similar work is specified.

1.13 Existing Utilities

1. Establish location, protect and maintain existing utilities.
2. Connect to existing utilities with minimum disturbance to pedestrian and vehicular traffic.
3. There are wiring and control and hydraulic lines on and around the south abutment and to the pivot pier. The wiring and control and hydraulic lines are to be removed or replaced as indicated on the mechanical / electrical drawings and as per the associated specifications.
4. Parks Canada will supply power for construction. Contractor shall arrange and pay for all heating, power for heating, and water connection, supply and reinstatement, for use on the Contract.

1.14 Material and Equipment

1. Use new products unless otherwise specified.
2. Deliver and store material and equipment to manufacturer's instructions with manufacturer's labels and seals intact.
3. When material or equipment is specified by standard or performance specifications, upon request of Departmental Representative, obtain from manufacturer an independent testing laboratory report, stating that material or equipment meets or exceeds specified requirements.

1.15 Inspection and Testing

1. The Departmental Representative may employ an Inspection and Testing company to ensure work conforms with Contract Documents.
2. When initial tests and inspections reveal work not to Contract requirements, 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 monthly progress photographs from four locations.
2. Viewpoints, which will best illustrate progress of work, will be selected by the Departmental Representative.
3. Forward electronic photos to Departmental Representative each month.

1.18 Datum

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

1.19 Site Meetings

1. Site meetings will be held at a maximum interval of every two weeks unless otherwise directed by the Departmental Representative.
2. Ensure that all key site personnel and a representative from the Contractor, who is designated to speak on behalf of the Contractor and can commit the Contractor to action and price, is present at the meetings.

1.20 Washroom Facilities

1. Existing washroom facilities at the lock house are available for the Contractor's use. Approval for use of these facilities depends on the Contractor's workers leaving these facilities in a clean and orderly manner at all times. If this is not adhered to, these services could be withdrawn and the Contractor will have to make his own arrangements.
2. If the Contractor is required to supply his own services, he shall supply an acceptable chemical toilet and locate as directed by the Departmental representative. The toilet shall be thoroughly cleaned at least once a week and shall be a minimum of 10 meters 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. OPSS Ontario Provincial Standard Specifications and OPSD Ontario Provincial Standard Drawings are quoted in these specifications. Copies of these standards are not included in these documents but the latest editions will be considered to be an integral part of these specifications. Generally they are available online at <http://www.raqsa.mto.gov.on.ca/techpubs/ops.nsf/OPSHomepage>.

1.22 Protection of the Structure

1. Prevent overloading and damage of any part of the existing bridge superstructure to remain.
2. Prevent damage to the portions of the pier and abutment structures to remain during any demolition operations. Modify removal operations, as directed by the Departmental Representative, if the methods being used are considered to be detrimental to the integrity of the structure to remain in place.

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 measurement of work for payment purposes, and the items of work included in the pay items in the Lump sum and Unit Price Tables. 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 lump sum price and unit price items for all works as described on the Contract Drawings and these Specifications. For the items with no specific unit price item, the Contractor shall be responsible for determining quantities necessary to fully complete the work and 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. For the lump sum prices, all associated costs, as specified in these documents, shown or indicated on the drawings or necessary to complete the work, shall be included.
3. Within 5 days of award, provide a breakdown of the Contract lump sum prices in accordance with this and other sections of this specification.
4. Develop the cost breakdown through at least two levels:
 1. Breakdown of lump sum portion of contract into a lump sum item list in detail appropriate to the size and complexity of the project; and
 2. Breakdown of lump sum items into sub-items appropriate to the size and complexity of each lump sum item.
5. Cost breakdowns must reasonably reflect the costs associated with the work. Do not submit unbalanced ("Front End Loaded") breakdowns under any circumstances.
6. Submit supporting documentation for all breakdowns that the Departmental Representative considers unbalanced.

1.3 Applications for Progress Payment

1. Make applications for payment on account as provided in Agreement as Work progresses.

2. Date applications for payment the last day of payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and products delivered to the place of work 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 Work, aggregating total amount of 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 to establish value and delivery of products.

1.5 Preparing Schedule of Unit Price Table Items

1. Submit 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 the Schedule of Values. Include in unit prices all costs associated with providing all labour equipment, materials including:
 1. Cost of material.
 2. Delivery and unloading at site.
 3. Sales taxes.
 4. Installation, overhead and profit.
3. Ensure unit prices, multiplied by quantities given, equal the aggregate cost of the breakdown of that item in Schedule of Values times the same quantity.

1.6 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, updated, maintained and distributed on a monthly basis, the Departmental Representative will assess the appropriate extent of the full provisions of the General Conditions (pertaining to failure to complete this work) that will be enforced. Disregard for falling behind 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.

1.7 Progress Payment

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

1.8 Substantial Performance of Work

1. Contractor to prepare and submit to the Departmental Representative a comprehensive list of items to be completed or corrected and apply for a review by the Departmental Representative to establish Substantial Performance of the Work or substantial performance of a designated portion of the work when the work is substantially performed if permitted by lien legislation applicable to the Place of Work for the designated portion thereof which the Departmental Representative agrees to accept separately as 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 the work is completed.
3. Departmental Representative will, no later than 10 days after receipt of an application for final payment, review the 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 the work.
4. Departmental Representative will issue a Certificate of Completion and a Certificate of Measurement when application for final payment is found valid.

1.9 Measurement and Payment

1. Lump Sum Price - For work which is not designated in the Unit Price Table, there shall be no measurement and this work shall be paid for at the Contract lump sum price. This item includes all costs associated to perform the work associated with these items including but not limited to material, equipment, personnel, overhead, etc. Items included in the Lump Sum Price are below. Develop and add items to the list below to cover costs associated to all works for which no unit price item is provided. The cost breakdown approved by the Departmental Representative will be used as the basis of payment.
 1. Mobilization/Demobilization
 2. Traffic Control
 3. Environment Management Plan
 4. Connect to Existing Facilities

5. Temporary Barriers and Enclosures
6. Temporary Utilities
7. Sitework and Restoration
8. Storage Area
9. Access and Housing
10. Heating and De-Humidification
11. Waste Management Plan
12. Temporary Pedestrian Bridge
13. Decommission/Commissioning the Bridge
14. Remove Open Grid Steel Deck
15. Remove Timber Curbs
16. Remove Sidewalk Timber Deck
17. Remove Sidewalk Stringers
18. Remove Sidewalk Flange Angles
19. Remove Stringers for New Balance Wheel Beams
20. Remove Steel Counterweights
21. Remove Rail Concrete Supports at Pivot Pier
22. Miscellaneous Removals
23. Structural Steel Repairs to Main Plate Girders
24. Structural Steel Repairs to Pivot Girders
25. Install New Balance Wheel Beams and Supports
26. Install New Sidewalk Stringers
27. Install New Sidewalk Flanges Angles
28. Structural Steel Repairs to Pedestrian Railing
29. Abrasive Blast Clean and Coat Structural Steel
30. Soluble Salt Remover to Superstructure
31. Sulphonate Sealer Application to Main Girders
32. Install New Laminated Timber Deck and Curbs
33. Install New Sidewalk Timber Decking
34. Install New Stainless Steel Flashings
35. Install New Steel Counterweights
36. Install New Nosing Angle on Timber Deck
37. Install New Armouring Angle at South Abutment
38. Armouring Angle Grout Assembly
39. Concrete Sealer on Bridge Deck
40. Concrete Sealer on Abutments
41. Concrete Sealer on Pivot Pier
42. Replace Hazard Marker Signs at Main Girder Ends
43. Replace Steel Beam Guide Rail
44. New Utility Trenches and Pier Vault Rehabilitation
45. Mechanical Removals
46. Install New Hydraulic Power Unit
47. Install New Hydraulic Bridge Control Manifold
48. Install New Bridge Rotation Hydraulic Cylinders, Hoses, Lines
49. Install New Hydraulic Cylinder Mounting Clevis Brackets, Pier Anchors, and Girder Clevis Mounting Plate
50. Install New Hydraulic Hoses and Lines from Lock House
51. Install and Adjust New Centre Pivot Bearing
52. Install and Adjust New Live Load Wheels and Ramps

53. Install and Adjust New End Support Wheels and Ramps
 54. Install and Adjust New Center Pier Balance Rail
 55. Install and Adjust New Balance Wheels
 56. Install New Locking Pin Assembly
 57. Refurbish Existing End Stop
 58. Electrical Removals
 59. Install New Wiring and Cables
 60. Install New Grounding and Bonding
 61. Install New Splitter
 62. Install New Dry-type Transformer
 63. Install New Service Entrance Equipment
 64. Install New Panel Boards
 65. Install New Field Instrumentation Devices
 66. Install New Safety Disconnect Switches
 67. Install New Motor Starters
 68. Install New Navigation Lights
 69. Install New Traffic Warning Gates
 70. Install New Bridge Operators Control Console
 71. Install New Lock Gate Control Cabinet
 72. Install New Proportional Driver Junction Boxes
 73. Install New Safety Circuit Devices
2. Unit price items are listed in the unit price tender form and are described in the specifications. A 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 Contract Lump Sum Price. Items included in the unit price tender form are:
1. Concrete Removals on Abutments
 2. Earth Excavation at North Abutment
 3. Galvanized Reinforcing Steel
 4. Drilling and Grouting for Dowels
 5. Concrete in North Abutment
 6. Concrete in South Abutment
 7. Granular 'A' Backfill
 8. Ream Rivet Hole (Allowance)

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 List of Designated Substances

1. In accordance with the Occupational Health and Safety Act, R.S.O. 1990, c. 0.1, the presence of the following Designated Substance(s) that may be found on the project:

Substance	Location
Acrylonitrile	Not Identified
Arsenic	Wood preservative in new and existing timber
Asbestos	Assumed presence in the ceiling tiles, drywall and drywall compound in the Lock House
Benzene	Identified in gasoline, paint thinners and tar
Coke Oven Emissions	Not Identified
Ethylene Oxide	Identified in coolant in vehicles
Isocyanates	Potential of presence in the wood preservative in new construction
Lead	Assumed presence in the coating of the bridge. Assumed presence in the paint on the electrical and mechanical equipment in the Lock House.
Mercury	Identified in vehicle emissions
Silica	Identified in concrete, concrete products and gravel
Vinyl Chloride	Not Identified

2. The Contractor is to confirm presence and level of any of the above Designated Substances that will impact his work.
3. In addition to the above, the Contractor is advised of the following potentially harmful substances:
 1. Roadway Salts
 2. Bird Droppings
 3. Vehicles and machinery emissions.
 4. Petroleum Hydrocarbons (PHC) F3 above the Federal and Provincial Limits were detected in the soils near the south bridge abutment and pier.
4. The Contractor is to confirm presence and level of any of the above Designated Substances that will impact his work.

PART 2 - PRODUCTS

2.1 Not Used

1. Not Used.

PART 3 - EXECUTION

3.1 Designated Substance

1. Treat removal of designated substances in accordance with Occupational Health and Safety Act, R.S.O. 1990, c. 0.1 and Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
2. Treat section of the work containing designated substances which are to remain in accordance with Occupational Health and Safety Act, R.S.O. 1990, c. 0.1.
3. Treat the removal of the coating on the bridge according to Section 01 35 44 – Environmental Protection.

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

PART 1 - GENERAL

1.1 Description

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

1.2 Precedence

1. For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of these contract specifications.

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. Contractor will arrange for testing services and submit invoices for this work directly to the Departmental Representative for payment as follows:
 1. Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 2. Inspection and testing performed exclusively for Contractor's convenience.
 3. Testing, adjustment and balancing of mechanical and electrical equipment and systems of the bridge.
 4. Mill tests and certificates of compliance.
 5. Tests specified to be carried out by Contractor under the supervision of the Departmental Representative.
 6. Testing specified to be completed by the Contractor to verify quality control of the coating system.
 7. Concrete testing will be arranged and paid for by the Contractor using an independent CSA Certified Testing Company and field personnel. Representative samples from each concrete pour shall be taken, tested and copies of reports provided to the Departmental Representative who may run parallel tests at his/her discretion.
 8. Additional tests specified in the following paragraph.
2. Where tests or inspections by designated testing laboratory reveal work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

1.5 Contractor's Responsibilities

1. Provide labour, equipment and facilities to:
 1. Provide access to Work to be inspected and tested.
 2. Facilitate inspections and tests.
 3. Make good, Work disturbed by inspection and 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 regular intervals that will vary depending on the complexity of work being undertaken throughout the progress of the work and at the call of the Departmental Representative. Meetings will generally occur every two weeks or as required by the Departmental Representative.
2. Representative(s) of Contractor, Subcontractor and suppliers must attend the meetings and the individual(s) 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 5 days after 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 will be in attendance.
3. The time and location of meeting will be established and notification of the parties concerned will occur a minimum of 5 days before meeting.
4. Incorporate mutually agreed variations to Contract Documents into agreement, prior to signing.
5. Agenda to include:
 1. Appointment of official representative of participants in the Work.
 2. Schedule of Work: in accordance with Section 01 32 16.07 Construction Progress Schedule - Bar (GANTT) Chart.
 3. Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 Submittal Procedures.
 4. Schedule, location for provision of temporary facilities, site sign, offices, storage sheds, utilities, and, fences in accordance with Section 01 52 00 Construction Facilities.
 5. Site security in accordance with Section 01 56 00 Temporary Barriers and Enclosures.
 6. Environmental Protection issues and concerns.
 7. HCR permitting requirements
 8. Environmental Management Plan
 9. Procedures for: proposed changes, change orders, approvals, time extensions, overtime, administrative requirements.
 10. Record drawings in accordance with Section 01 33 00 Submittal Procedures.

11. Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 Closeout Submittals.
12. Schedule and Progress
13. Monthly progress claims, administrative procedures, photographs, hold backs.
14. Appointment of inspection and testing agencies or firms.
15. Insurances, transcript of policies.

1.3 Progress Meetings

1. During course of Work, schedule regular progress meetings at two week intervals and, depending on construction activities.
2. Contractor, major Sub-contractors, involved in Work, and Departmental Representative are to be in attendance.
3. Agenda will include the following:
 1. Review minutes of previous meeting.
 2. Review of Work progress since previous meeting.
 3. Field observations, problems, conflicts.
 4. Problems which will impede construction schedule.
 5. Review of off-site fabrication delivery schedules.
 6. Environmental Protection issues and concerns.
 7. Corrective measures and procedures to regain projected schedule.
 8. Revision to construction schedule.
 9. Progress schedule, during succeeding work period.
 10. Review submittal schedules: expedite as required.
 11. Maintenance of quality standards.
 12. Review proposed changes for effect on construction schedule and on completion date.
 13. 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 photos shall be taken and submitted monthly.
2. Date and location shall be displayed in names of photos.

1.3 Electronic Copy

1. Submit electronic copy in addition to hard copy of colour digital photography in jpg format, fine resolution.
2. Email photographs every month and Provide one set on each of two cd's at the end of the project. The Departmental Representative will confirm access and transfer of the files. If the files cannot be accessed, resubmit an accessible form.
3. Identification: The name of each file shall include the project number, the name of the bridge, name of subject and, date of exposure.
4. Number of viewpoints: Locations of viewpoints to be determined by Departmental Representative.
5. Frequency: Before project meetings as directed by Departmental Representative.

PART 2 - PRODUCTS

2.1 Not Used

1. Not Used.

PART 3 - EXECUTION

3.1 Not Used

1. Not Used.

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

PART 1 - GENERAL

1.1 Definitions

1. Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
2. Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
3. Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
4. Construction Work Week: Monday to Friday inclusive, 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 other project element. Usually expressed as workdays or work weeks.
6. Master Plan: summary-level schedule that identifies major activities and key milestones.
7. Milestone: significant event in project, usually completion of major deliverable.
8. Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
9. Project Planning, Monitoring and Control System: overall system approved by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.2 Requirements

1. The schedule of the work requires attention to detail and generally must be maintained on a monthly basis unless otherwise approved by the Departmental Representative. The Contractor is to include in his lump sum price all shift premiums, overtime acceleration costs for Sub-contractors, acceleration costs for

suppliers, etc. in order to complete the work on schedule. The Contractor will be held responsible for the actions, timing and delivery by his suppliers and Sub-contractors and it is suggested that the Contractor take steps to ensure that all contracts in relation to this project recognize this emphasis on delivery and schedule. All additional crews, overtime and multiple shifts required to complete the Work within the specified time frame and to achieve the required milestones shall be included in the Contract lump sum price.

2. Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration and ensure that specific key milestones are met.
3. Plan to complete Work in accordance with prescribed milestones and time frame.
4. Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting. It is anticipated that for the shut-down period, activities will be indicated on a day-to-day hour-to-hour basis.
5. 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 Schedule Milestones

1. Navigation season official begins on May 18, 2020.
2. Project completed to the point that traffic can once again be on the bridge and bridge is operational: May 15, 2020.
3. The bridge will be temporarily closed to vehicular and pedestrian traffic for the period of November 4, 2019 to May 15, 2020. The Contractor must complete all works within this period in order that the bridge can be re-opened to traffic after the scheduled closure period.
4. The lock gates must be operational by May 01, 2020 to allow Parks Canada staff to perform maintenance along the Canal prior to the beginning of navigational season. During this time, staff will have navigation traffic through and around the

site as well as duties to complete before the Canal is officially opened for navigation. The Contractor must complete all rehabilitation work inside the lock house before May 01, 2020.

5. The temporary pedestrian bridge and accessibility ramps must be installed 1 week prior to permanently closing the bridge to vehicular and pedestrian traffic in order to carry out the rehabilitation work.
6. The temporary pedestrian bridge and accessibility ramps must be removed 1 week prior to reopening the lock gates.
7. The date for road closure will be coordinated with Parks Canada and the City of Kawartha Lakes. Parks Canada requires 4 weeks notice to plan the closure.
8. Install designated signs with date specific advance notice tab 4 weeks before scheduled bridge closure. All other detour signs must be installed, approved, and covered a minimum of 3 days prior to closure.

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 optimistic schedule and resubmit within 5 working days. Allocate additional resources to realize plan.
4. Accepted revised schedule will become Master Plan and be used as baseline for updates.
5. 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, or worse, weather events will be considered for adjustments to the schedule.

1.6 Project Schedule

1. Develop detailed Project Schedule derived from Master Plan.
2. Project Schedule to include all Project Schedule Milestone Dates and the method to ensure these critical dates are met.
3. Project Schedule shall include the lead times for the delivery of electrical and mechanical components including drive cylinders and HPU unit. Contractor to identify items with long lead time and to purchase those items shortly after award to ensure the critical dates identified are met.

4. Ensure detailed Project Schedule includes, as minimum, milestone and activity types as follows:
 1. Award.
 2. Submission and return dates for Shop Drawings, Submittals, Samples etc.
 3. Permits.
 4. Structural Steel:
 1. Member/fabrication and schedule.
 2. Member/Component assembly schedule.
 3. Member repair schedule.
 5. Progress of Painting by section of bridge and by progress of primer, intermediate and top coats for each section of the bridge.
 6. Mobilization and preparation of work area.
 7. Detailed survey of existing deck ends, abutment ends and pivot pier.
 8. Installation of each phase of access.
 9. Selective concrete removals on abutments and pivot pier.
 10. Removal of selective structure components (designated for removal) from Site.
 11. Concrete repairs.
 12. New bridge component delivery to site and installation.
 13. Deck construction.
 14. Mechanical/Electrical installation.
 15. Commissioning.
 16. Site work.
 17. Supplied material delivery dates.
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 locks are to be fully operational (May 01, 2020) as an access period for Canal Staff to access, adjust and grease components of the lock gates.

1.7 Project Schedule Reporting

1. Update Project progress on Schedule one day prior to each site meeting reflecting activity changes and completions, as well as activities in progress.
2. Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.
3. Distribute copies of approved schedule to:
 1. Job site office.
 2. Sub-Contractors.
 3. Other concerned parties as directed.
4. Instruct recipients to report to Contractor within 2 days, any problems anticipated by timetable shown in schedule.

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.

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. If the schedule is not produced, updated, maintained and distributed, the Departmental Representative will assess the appropriate extent of the full provisions of the General Conditions (pertaining to failure to complete this work) that will be enforced. 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 Description

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 coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall not be considered.
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.
7. Verify field measurements and affected adjacent Works are coordinated.
8. Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals or review by their designates.

9. Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative's review or review by their designates.
10. Keep one reviewed copy of each submission on site.
11. Submit number of hard copies specified for each type and format of submittal and submit also in electronic format as pdf files. Forward pdf files on CD or through email.
12. Confirm receipt of submission and check on progress of review.

1.3 Shop Drawings and Project 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 the work.
2. Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the 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. Note that in all cases, the Contractor's Engineer must be experienced in the work for which he/she is providing their stamp and must be able to provide proof of this experience when requested by the Departmental Representative.
4. Allow ten (10) business days for Departmental Representative's review of each submission.
5. Allow an additional ten (10) working days for submittals related to Archaeological, Cultural, or Environmental procedures which require acceptance by Client Department and coordinated through Departmental Representative.
6. Adjustments made on shop drawings, by Departmental Representative, are not intended to change Contract Price. If adjustments affect value of work, state such in writing to Departmental Representative 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.
7. Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental

Representative in writing of any revisions other than those requested on both the submission and the submission transmittal.

8. Accompany submissions with transmittal letter, containing:
 1. Date.
 2. Project title and number.
 3. Contractor's name and address.
 4. Identification and quantity of each shop drawing, product data and sample.
 5. Other pertinent data.
9. Submissions shall include:
 1. Date and revision dates.
 2. Project title and number.
 3. Name and address of:
 1. Sub-Contractor.
 2. Supplier.
 3. Manufacturer.
 4. Contractor's stamp, signed by Contractor's authorized Representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 5. Details of appropriate portions of Work as applicable:
 1. Fabrication.
 2. Layout, showing dimensions, including identified field dimensions, and clearances.
 3. Setting or erection details.
 4. Capacities.
 5. Performance characteristics.
 6. Standards.
 7. Erection Sequence and Procedures
 8. Operating weight.
 9. Wiring diagrams.
 10. Single line and schematic diagrams.
 11. Relationship to adjacent work.
 12. Equipment identification.
10. After Departmental Representative's review, distribute copies.
11. 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.
12. Submit 3 prints and 1 electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
13. Submit 3 prints and 1 electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by

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

14. Submit 3 prints and 1 electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 1. Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accordance with specified requirements.
 2. Testing must have been within six months of date of Contract award for project or after Contract award.
15. Submit 3 prints and 1 electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 1. Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 2. Certificates must be dated after award of project Contract complete with project name.
16. Submit 3 prints and 1 electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 1. Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
17. Submit 3 prints and 1 electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and 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.
18. Delete information not applicable to project.
19. Supplement standard information to provide details applicable to project.
20. 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.
21. Confirm existing deck, abutment and pivot pier elevations in open and closed position as part of decommissioning process and as detailed on the Contract Drawings.

22. 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. 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.
23. Submit 3 prints and 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 to 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 01 45 00.

1.6 Progress Photographs and Video

1. Submit progress photographs in accordance with Section 01 32 00.

1.7 Fees, Permits and Certificates

1. Provide authorities having jurisdiction with information requested.
2. Pay fees and obtain certificates and permits required.
3. Furnish certificates and permits.

1.8 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 "Project 1356-30030321 Bobcaygeon Swing Bridge: Shop Drawings 7 – East Girder Bottom Flange Angle" or "Project 1356-30030321 Bobcaygeon Swing Bridge: Mill Certificate 3 - 6x6x5/8 Angle South Pivot Girder".
 2. The format of electronic submissions shall be pdf.
 3. The electronic mail submissions shall be divided into sections such that the file size of each submission is less than 5 megabytes.

1.9 Measurement and Payment

1. The work considered under this Section will not be measured for payment but will be considered an integral part of the work of the Contract and a condition for payment.

PART 2 - PRODUCTS

2.1 Not Used

1. Not Used.

PART 3 - EXECUTION

3.1 Not Used

1. Not Used.

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

PART 1 - GENERAL

1.1 References

1. Canadian Standards Association (CSA):
 1. CSA S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structures.
 2. CSA Z460-13 (R2018) – Control of Hazardous Energy
 3. CSA Z462-18 – Workplace Electrical Safety
2. National Building Code 2015 (NBC):
 1. Division B, Part 8 Safety Measures at Construction and Demolition Sites
3. National Fire Code 2015 (NFC):
 1. NFC 2015, division B, Part 2 Emergency Planning, subsection 2.8.2 Fire Safety Plan.
4. Province of Ontario:
 1. 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, Reg. 834, O. Reg. 278/05 (Asbestos - Construction).
 2. Workplace Safety and Insurance Act, 1997
 3. Municipal statutes and authorities.
5. Fire Commissioner of Canada (FCC):
 1. FC-301 Standard for Construction Operations, June 1982.
 2. FC-302 Standard for Welding and Cutting, June 1982.
6. Canadian Labour Code Part 2.

1.2 Submittals

1. Make submittals in accordance with 01 33 00 Submittal Procedures.
2. Submit site-specific Health and Safety Plan: Within 5 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. Measures and controls to be implemented to address identified safety hazards and risks.

4. Contractor's and Sub-contractors' Safety Communication Plan.
5. 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.
3. Departmental Representative will review Contractor's site-specific Health and Safety Plan and may provide comments to Contractor within 5 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 Site Specific Health and Safety Plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction site health and safety.
5. Submit records of Contractor's Safety Meetings at site meetings.
6. Submit 1 copy of the Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative when requested.
7. Submit copies of reports or directions issued by safety inspectors of authority having jurisdiction.
8. Submit copies of near-miss, incident, and accident reports, and/or confirmation monthly that no incidents have occurred.
9. Submit WHMIS Safety Data Sheets (SDS) for all products and items used on site to Departmental Representative.
10. Submit names of personnel and alternates responsible for site safety and health.
11. Submit WSIB - Workplace Safety and Insurance Board, Experience Rating Report for Province of Ontario.
12. Contractor shall submit signed Parks Canada Attestation and Proof of Compliance with Occupational Health and Safety form prior to start of work.
13. Lock walls are a fall hazard. Employ required mitigations in accordance with safety regulations.

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 identifying all potential hazards.

1.5 Meetings

1. Pre-construction meeting: schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of work.

1.6 Regulatory Requirements

1. Comply with Acts and regulations of the Province of Ontario.
2. Comply with specified standards and regulations to ensure safe operations at site.
3. In event of conflict between any provisions of specified standards and regulations, the most stringent provision governs.

1.7 Project Site Conditions

1. Work at the site will also involve:
 1. A Hazard Assessment and listing of designated substances on site.
 2. Contact with silica/dust in concrete and masonry rubble.
 3. Work near water.
 4. Work at heights.
 5. Lead-based paints in almost all painted areas.
 6. Asbestos in Lock House.
 7. Mechanical systems and moving equipment.
 8. Guano on structure.
 9. Ice.
 10. Work near utilities including overhead utilities.
 11. Working with electrical energy.
 12. Arsenic (CCA) in preserved wood.

1.8 General Requirements

1. Develop an independent written site-specific Health and Safety Plan based on hazard assessment prior to commencing any site Work and continue to implement, maintain, and enforce plan until after final demobilization from site. Health and Safety Plan must address project specifications.
2. Relief from or substitution for any portion or provision of minimum Health and Safety Guidelines specified herein or reviewed site-specific Health and Safety Plan shall be submitted to Departmental Representative in writing. Departmental Representative will respond in writing, where deficiencies are noted and request

resubmission with correction of deficiencies either accepting or requesting improvements.

1.9 Responsibility

1. Be responsible for safety of persons and property on site and for protection of environment to extent that they may be affected by conduct of Work.
2. Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, 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 Ontario Act.

1.10 Compliance Requirements

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

1.11 Unforeseen Hazards

1. Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, immediately stop work and advise Departmental Representative verbally and in writing.
2. Follow procedures in place for Employees Right to Refuse Work as specified in the Act for the Province of Ontario and Canada Labour Code Part 2.

1.12 Health and Safety Coordinator

1. Employ and assign to Work, competent and authorized representative as Health and Safety Coordinator. Health and Safety Coordinator must:
 1. Have site-related working experience specific to activities associated with abatement of lead and asbestos 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.
 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. WHMIS 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.
2. Comply with Provincial general posting requirements.

1.14 Correction of Non-Compliance

1. Immediately address health and safety non-compliance issues identified by Departmental Representative and regulatory agency having jurisdiction in the Province or any individual who notes a safety related issue.
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 is perceived to not be immediately corrected.

1.15 Work Stoppage

1. Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.
2. Assign responsibility and obligation to Competent Supervisor to stop or start Work when, at Competent Supervisor's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative or 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 Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
2. Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.
3. Deleterious Material: any substance that, if added to a 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).
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. CEPA – Canadian Environmental Protection Act
17. Impact Assessment Act (2019)

1.3 Environmental Impact Assessment Best Management Practices and Mitigation Measures Summary

1. Abide by and implement all applicable measures outline in the PCA document; ***“Parks Canada National Best Management Practices Work in and Around Waterbodies (2017)”***.
2. All materials and equipment used for the purpose of site preparation and project completion shall be operated and stored in a manner that prevents and deleterious substance (e.g. petroleum productions, debris etc.) from entering the water.
3. Ensure any waste materials from the project do not enter the water (e.g. through the use of a platform with a catchment or berm system, or sided with geotextile, as appropriate).
4. Activities causing turbidity or release of sediment will comply with the CCME Guidelines on Total Particulate Matter (see <http://cegg-rcqe.ccme.ca/download/en/217>).
5. 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. (ie. Sediment fence installed at the side of the approaches if there is likely to be soil disturbance).

6. All disturbed areas of the work site shall be stabilized as soon as possible with erosion protection (mulch, erosion control blanket, sod, etc.).
7. Drip trays shall be placed under all fuel-powered equipment. Drip trays shall be sized appropriately to encompass the outer perimeter of the equipment/machinery, providing adequate spacing for refueling activities.
8. Spill control and emergency plans will be in place prior to initiation of construction; an emergency spill kit shall be kept on-site and employed immediately should a spill occur. The contractor shall ensure that adequate additional spill clean-up resources are available.
9. In the event of a spill, PCA and the Ontario Spill Action Centre (1-800-268-6060) shall be notified immediately. Remediation will be conducted immediately to contain and clean up in accordance with federal and provincial regulatory requirements **AND to the satisfaction of PCA**. Documentation of remediation, testing and results will be provided to PCA. Spills should be reported directly to the PCA Environmental Officer on file (705-750-4900).
10. If a Species at Risk is observed or suspected on or near the worksite (this includes birds, snakes, turtles and/or eggs), the species must not be harmed or harassed. If the species does not leave or cannot leave the site, the Contractor must immediately stop the works and contact Parks Canada on how to proceed. Additional measures to avoid impacts may be required before work can restart. Wildlife encounters should be recorded and reported to PCA.
11. Bird deterrent meditative strategies (i.e. deflectors, roosting barriers, daily scans and removal of preliminary nest structures, etc.) should be employed to discourage and prevent the spring nesting of Barn Swallows and Chimney Swifts in the work area.
12. The Contractor is to ensure that prior to construction, an inspection for nests within the construction area shall be completed by a certified biologist. Should best structures be observed at this time upon the bridge, PCA EA is to be contacted for further guidance and direction.
13. After May 1st, daily inspections of the bridge structure for bird nesting attempts and removal of preliminary nest structures (i.e. initial deposition of nest-building material by breeding birds) shall be completed.
14. Should active nests within the work area be identified and be required to be removed, PCA should be contacted for further direction.
15. Attractants (i.e. waste) shall be regularly removed from site to further deter the presence of wildlife in the work area.

16. The Contractor is required to provide in writing an outline of measures to be implemented throughout the duration of the project, addressing those BMPs and environmental components listed above.

1.4 Wildlife and SAR

1. Migratory birds utilize the vegetation adjacent to the bridge, and waterfowl can also be found on the water as well and on the surrounding lands.
2. Migratory birds, their nests and eggs are protected under the MBCA (1994). Project works that are potentially disruptive activities to nesting birds, such as vegetation clearing, should avoided during the nesting period.
3. Observations which have been reported within approximately 250m radius of the site include Barn Swallow (*Hirundo rustica*) and Chimney Swift (*Chaetura pelagica*). To date, the presence and nesting of Barn Swallows and Chimney Swift at the bridge site has yet to be confirmed. However, Barn Swallows and Chimney Swifts are known to commonly nest on bridge structures and buildings.
4. Blanding's Turtle (*Emydoidea blandingii*), Eastern Musk Turtle (*Sternotherus odoratus*), and Snapping Turtle (*Chelydra serpentina*) have been observed and reported within approximately 250m radius of the site by PCA staff at Lock 32. In addition to this, the ORAA has reported Blanding's Turtle, Eastern Milksnake (*Lampropeltis triangulum*), Jefferson Salamander (*Ambystoma jeffersonianum*), Midland Painted Turtle (*Chrysemys picta*), Snapping Turtle and Western Chorus Frogs (*Pseudacris triseriata*) within the greater general area.
5. Although unlikely, it is possible that there is turtle nesting habitat along the embankments up and downstream to the construction area.
6. 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 within the immediate vicinity of the animal will cease. Contact the Departmental Representative and PCA Environmental Authority on how to proceed if the specimen does not or cannot leave site on its own accord.
7. Detail procedures for preventing turtle entry and nesting within disturbed project area in EMP.
8. Place temporary reptile exclusion fencing around stockpiled material and construction areas that may attract turtle nesting activities.
 1. Reptile exclusion fencing must follow the guidance in the document titled Species at Risk Branch, Best Practices Technical Note, Reptile and Amphibian Fencing, ver.1.1, developed by the Ontario Ministry of Natural Resources and Forestry:
http://files.ontario.ca/environment-andenergy/species-atrisk/mnr_sar_tx_rptl_amp_fnc_en.pdf

9. Environmental Management Plan to detail procedures for avoiding disturbance to wildlife, nesting birds, and Species at Risk.
10. Do not use synthetic plastic erosion control mats or blankets to reduce potential for entrapment hazard for wildlife.
11. Standard sediment fencing on site should not have mesh/netted backing.
12. 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.
13. When possible, complete work during daylight. If nighttime lights are used, they are to be installed to illuminate the work area only to minimize impacts to nighttime activities of wildlife.
14. Daily ongoing observation for SAR and wildlife in general shall be undertaken for the duration of the project by all personnel on site.
15. 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.
16. Park on roads or disturbed areas only.
17. 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.
18. Minimize disturbed areas and clearly mark Work space.
19. 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.

1.5 Canal Regulations and Permits

1. "Historic Canal Regulations" apply to and govern work under this Contract.
2. Regulations may be obtained from Justice Canada's website at: <http://laws-lois.justice.gc.ca/eng/regulations/sor-93-220/>.
3. Contractor may not mobilize or begin any work until Parks Canada issues permit under Historic Canals Regulation (SOR93-220 Sections, 11, 14 and 15)
 1. Permit will not be issued before following submittals are submitted and accepted:
 - .1 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 the site-specific Environmental Assessment will require review and acceptance by Departmental Representative and may require issuing revised permit.

1.6 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 Environmental Assessment (EA) 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 EA will require review and acceptance by Departmental Representative and may require issuing revised permit.
7. Allow PCA Environmental Authority full access to affected Work area and cooperate to provide reasonable facilities for such access.
8. Submit copies of environmental orders and directions to Departmental Representative.

1.7 Heritage Protection

1. Preserve heritage elements of site by executing Work without damage to site features or character defining elements.
2. Notify Departmental Representative and PCA Environmental Authority immediately if heritage items are damaged.
3. Employ minimal intervention approach for all Work.

4. Access roads, staging areas, and work pads require review and approval.
5. Damage to heritage elements will not be tolerated.
6. Ensure appropriate supervision work, adequate training for workers, and other necessary precautions to protect existing structures.
7. Notify Departmental Representative immediately where reasonable concern exists that damage may result from work.
8. 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.
 1. Excavation beyond indicated limits requires acceptance by PCA Environmental Authority.

1.8 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.

1.9 Archaeological Requirements

1. Main vehicular access routes and staging areas will be restricted to present-day roadways and parking lots. If this is not possible, the use of protective covering such as a geotextile protective covering with a wood chip lift or granular "A" gravel is required. All protective covering must be removed following construction and the area restored to pre-construction state. Excavation is not permitted during installation or removal of protective covering.
2. If unrecorded archaeological resources (e.g. structural features or artifact concentrations) are encountered during construction activities, work must cease in the immediate area, and the Parks Canada Project Manager be informed. The Project Manager will contact Parks Canada's Terrestrial Archaeology section for advice and assessment of significance, which will in turn determine what will be required to mitigate the find.
3. Site may contain possible cultural and archaeological resources.
4. PCA Environmental Authority may monitor and record some or all aspects of excavations, site access routes, and disturbances to soil overburden due to equipment and general work operations.
5. Do not resume Work until directed by Departmental Representative.

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

1.10 Submittals

1. Submittals: in accordance with Section 01 33 00 Submittal Procedures.
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 EA.
 1. 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 EA and BMPs.
 2. To allow for the timely commencement of project activities, the EMP can be submitted as separate components as project details become available.
 3. The EMP, or its components, will be submitted in writing prior to implementation of project activities and must be accepted by Parks Canada and the Departmental Representative.
 4. The complexity and detailedness of the EMP should be proportionate to the scope of work and level of complexity and risk involved.
3. Address topics at level of detail commensurate with environmental issue and required construction tasks.
4. The contractor is required to provide in writing an outline of measures to be implemented throughout the duration of the project, addressing those BMPs and environmental components listed above.
5. Environmental Monitoring Plan (EMP) to include as applicable to this project:
 1. Names of persons responsible for ensuring adherence to EMP.
 2. Names and qualifications of persons responsible for monitoring hazardous waste to be removed from site.
 3. Names and qualifications of persons responsible for training site personnel.
 4. Descriptions of environmental protection personnel training program.
 5. Erosion and sediment control plan which 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.
6. 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.
7. 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.
8. 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.
9. 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.
10. Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
11. Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.
12. Contaminant prevention plan that: 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 detailed 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.
13. Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
 - .1 Do not pump water directly into the waterway. Send all discharge to a settling pond or filtration area before being released into the waterway. Refer to ESG for waste water management. 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.
 - .2 Prior to dewatering, submit a Dewatering Plan for approval by the Departmental Representative.
14. 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 resources, biological resources and wetlands.

15. Names of persons responsible for monitoring the adherence to the EMP.
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.

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.
5. The Contractor shall obtain all permits, licenses, and approvals required to construct/rehabilitate the canal walls 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. Provide erosion and sediment control plan as part of the EMP submission that identifies type and location of erosion and sediment controls to be provided. Plan: include 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.
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 site free from water. 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.

1.14 Work Adjacent to Waterways

1. Do not operate construction equipment in waterways.
2. Do not use waterway beds for borrow material.
3. Do not dump excavated fill, waste material or debris in waterways.
4. Design and construct temporary crossings to minimize erosion to waterways.
5. Do not skid logs or construction materials across waterways.
6. Avoid indicated spawning beds when constructing temporary crossings of waterways.
7. The Contractor shall employ appropriate sediment retention methods to ensure no sediment is discharged into the watercourse. Turbidity barriers and floating booms (if utilized) 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.
8. CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life will form the baseline for water and streambed quality monitoring and assessment.

9. 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 \geq 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 removed from site.
10. 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.
11. 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.
12. Clean storm run-on shall be diverted around the site and away from exposed areas as detailed in the EMP.
13. 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.
14. Concrete debris from the barge (or other vessel) shall be properly contained to ensure that no concrete debris escapes or remains at the site.
15. 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.
16. 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.
17. 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.

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

1.15 Hazardous and Non-hazardous Waste Management

1. Lead paint is assumed to be present on site. See Section 01 35 44 Environmental Protection – Lead Paint, Section 02 83 12 Lead–Base Paint Abatement – Maximum Protection; and Section 09 97 19 - Painting Exterior Metal Surfaces.
2. Asbestos may be present on site at the lock house.
3. 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.
4. All lead–based paint shall be managed in accordance with Ontario Regulation 490/09.
5. An adequate containment system shall be provided and inspected daily to effectively confine and capture any debris that could potentially become detached during the removal and replacement of the canal walls, or any of their component parts.
6. 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.
7. 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.
8. 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 Quinte West “Waste Management By–law” (No. 98– 118).
9. 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.
10. 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.

11. Do not bury rubbish and waste materials on site.
12. Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.
13. 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.
14. Obtain and submit Waste Generator Numbers, permits, manifests, and other paperwork necessary to comply.
15. Remove all garbage from site daily.
16. Dispose of uncontaminated construction/demolition materials which cannot be recycled or reused, at an approved construction and debris disposal site.
17. 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.
18. 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.
19. Departmental Representative may suspend work following the improper handling of hazardous materials.
20. 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).
21. 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.
22. 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.
23. Dispose of hazardous materials and designated substances in accordance with Ontario Regulation 347/90.

1.16 Permit to Transport

1. All waste described as subject to Ontario Regulation 347 as amended of 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. Obtain a TDGA permit for all lead waste prior to transporting the waste.

1.17 Noise Control

1. Should the Contractor remove rivets as part of the work, note that many methods of rivet removal create a significant amount of noise. Limit the timing of rivet removal and noise from the removal as much as possible. In all cases comply with local noise by-laws including the by-laws, related to noise and construction
2. Minimize the noise levels 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.

1.18 Spill Containment

1. The Contractor shall have a spill containment kit on site and available at all times.
 1. Spill kits must have the capacity to handle the volume of chemical liquids of the largest size tank at the site.
 2. Spill control kits to be available to Contractor's 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
 1. Documentation of remediation, testing, and results are to be submitted to Departmental Representative and PCA Environmental Authority.

1.19 Pollution Control

1. Maintain temporary erosion and pollution control features installed under this Contract.
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 and waterways beyond removal/application area, by providing temporary enclosures or other suitable methods acceptable to the Departmental Representative.
4. Cover or wet down dry materials to prevent blowing dust and debris. Any rubbish should be removed and disposed of.
5. Spills of deleterious substances:
 1. Immediately contain, limit spread and clean up in accordance with provincial regulatory requirements and to the satisfaction of PCA. Documentation of remediation, testing and results should be provided to PCA.
 2. Report immediately to Ontario Spills Action Centre: 1-800-268-6060. Once the spill is reported to the Ontario Spills Action Centre, report to PCA.
 3. 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 collect.

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, except for 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.

1.20 Notification

1. The Contractor shall monitor compliance with the Contractor's EMP logging compliance and non-compliance issues. The log shall be completed on a daily basis and provided to the Departmental Representative for review on a weekly basis (at minimum).
2. While the 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 EMP.
3. Contractor: after receipt of such notice shall inform the Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
4. Departmental Representative may issue stop order of work 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 non-compliance issues.
7. Should any suspected species at risk as listed in the EA 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 immediate vicinity of the specimen 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.

1.21 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.
 1. 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. 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 should 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.

1.22 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.

1.23 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.

1.24 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.

1.25 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 removed from site.

1.26 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):
 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.

1.27 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.

1.28 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 or 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.

1.29 Invasive Species

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

2. Equipment and vehicles to be used in waterbody, to be cleaned before and after use. This includes any visible mud, vegetation, mussels.
 1. Drain of standing water.
 2. Clean with hot water (>50°C) at high pressure (>250 psi).
 3. Allow to dry for 2-7 days in sunlight before transporting between waterbodies.
 4. Conduct cleaning minimum 30 m from edge of waterbody.
3. Submit photo and report to Invading Species Hotline (1-800-563-7711) or online at EDD Maps 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.

1.30 Cleaning

1. Clean up work area continuously as Work progresses.
2. At end of each work period, and more often if ordered by Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.
3. Permit no amount of debris, trash or garbage to accumulate on site.

4. Do not bury rubbish on site.
5. Separate and recycle materials that can be recycled.
6. Dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner by taking them to special designated waste facility. Do not dump these into storm or sanitary sewers, or in any location where material may enter the waterway.
7. 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.
8. Ensure emptied containers are sealed and stored safely for disposal away from children and wildlife.
9. 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.
10. All work sites must be returned to a neat and tidy condition upon site abandonment.
11. 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.
12. Clean areas under contract to a condition at least equal to that previously existing and to approval of Construction Manager.

1.31 Measurement and Payment

1. No measurement for payment will be made for the work of implementing the environmental protection measures indicated on the drawings or as required by applicable legislation. Payment shall be made under the lump sum price item "Environmental Management Plan" and shall include all costs for labour, materials and equipment necessary to do the work for this item.

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 Environmental Protection

1. The following applies when performing the removal, salvage, handling or disposal of articles with lead paint, including abrasive blasting or any other removal method or item of work which removes or affects paint with lead content. Note that the paint of the structure has not been tested and it is assumed that it contains lead. Prevent the release of lead paint, chips and dust etc. into the environment.
2. Lead paint removal shall be kept to a minimum.
3. Comply with Ontario Ministry of Labour Guideline - Lead on Construction Projects.
4. In the case of conflict between any regulations or, 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 Related Sections

1. Section 01 35 43 - Archaeological, Cultural and Environmental Procedures

1.3 References

1. Ontario Regulation 347 General Waste Disposal.
2. Fisheries Act.
3. CEPA - Canadian Environmental Protection Act.
4. Impact Assessment Act (IAA), 2019

1.4 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 cleanup and mitigation methods.
5. Dispose of lead paint removal waste in accordance with requirements of Provincial and Federal authority having jurisdictions.
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 Parks Canada.
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.

1.5 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.

1.6 Lead Content

1. The content of lead in the paint has not been tested. The Contractor shall test the lead content of the paint, in particular in hard to reach areas that have previous generations of paint.
2. For all existing painted surfaces, it shall be assumed that sufficient containment will be required to protect the environment, as well as workers, from the hazards of lead

1.7 Measurement and Payment

1. All costs associated with removal and disposal of existing bridge components containing lead paint will not be measured and will be included in the related Contract prices for the components being removed.

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. 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 whenever it is in progress or for review of completed work.
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 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.

2. Provide equipment required for executing inspection and testing by appointed agencies.
3. Employment of inspection/testing agencies does not relax responsibility for the Contractor to have a quality assurance program to verify that the work is completed in accordance with the Contract requirements and to perform Work in accordance with Contract Documents.
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 re-inspection.

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 that also meet Ministry of Labour requirements and Health and Safety Policies.

1.6 Procedures

1. Notify appropriate agency and Departmental Representative far enough in advance of requirement for tests and inspections, in order that attendance arrangements can be made.
2. Submit samples and/or materials required for testing and review, 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 and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
2. Make good other Contractor's work damaged by such removals or replacements promptly. Have skilled sub-trades complete repairs to work that was originally completed by these sub-trades.
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, amount of which shall be determined by Departmental Representative.

1.8 Reports

1. Submit 4 copies of inspection and test reports to Departmental Representative when the Contractor is required to provide reports.
2. Provide copies to Sub-contractor, 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 as well as illustrating that the steel meets the requirements of the specification.

1.11 Electrical Tests

1. Submit electrical test reports for transformer as provided by the manufacturer. The results must show compliance with all applicable regulations and standards.
2. Provide field test reports for power cabling.
3. Provide Departmental Representative with the Electrical Safety Authority partial and final inspection certificates, as well as any notes provided by ESA.
4. Submit a commissioning plan to the Departmental Representative for review at least two weeks prior to verification of electrical and controls for the bridge, as well

as the Lock Station/gates. Provide copies of the Contractor completed wiring and cable verification sheets.

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. 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 using 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, Heating and Ventilation.
4. Maintain temperatures of minimum 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 a 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. Temporary power is available for use by the Contractor and any requirements for power hook-ups, metering and disconnect shall be the responsibility of the Contractor. Any power/fuel requirements for heating shall be the responsibility of the Contractor.
2. Provide and maintain temporary lighting throughout project. 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 judgment of the Departmental Representative.
3. Good lighting is required to complete the cleaning and painting of the bridge (in shop and in the field). 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 required by insurance companies having jurisdiction and governing codes, regulations and bylaws.

2. Burning rubbish and construction waste materials is not permitted on site.

1.9 Measurement and Payment

1. No measurement for payment will be made for the supply, fabrication and installation of temporary utilities. Payment shall be made under the lump sum price items "Temporary Utilities" and "Connect to Existing Facilities" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

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. 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-M1978(R2013), Douglas Fir Plywood.
 3. CAN/CSA-S269.2-M87(R2003), 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 832R92005, 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 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 and details of fence installation.

Note that it is anticipated that the areas delineated on the drawings are sufficient for the purposes of this work. Any additional areas or change in location from that indicated are to be approved by the Departmental Representative.

2. Identify areas which have to be graveled to prevent tracking of mud. Where gravel is to be applied on any grounds, an approved geotextile fabric shall be applied to the ground area prior to placement of gravel. 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.
3. Indicate use of supplemental or other staging area.
4. Secure the site whenever 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.
5. Provide construction facilities in order to execute work expeditiously.
6. Remove from site all such work after use and restore all ground and other surfaces to the satisfaction of the Departmental Representative.

1.5 Scaffolding

1. Scaffolding in accordance with CAN/CSA-S269.2.
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 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 with a weight or force that will endanger the Work or Workers.

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 or, the use of the roadway by the public. All work and parking must be within the Parks Canada land.
2. Provide and maintain adequate access to project site. Reserve parking spaces for Parks Canada, Designated Representatives and Inspectors.

1.9 Offices

1. Provide office for the full duration of site work heated to 22°C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
2. Provide a clearly marked and fully stocked first-aid case in a readily available location.
3. Provide for the sole use of the inspector a lockable office with a layout table desk and file cabinet meeting the lighting and heating requirements. This room can be used for meetings provided it is not used for any other purpose.
4. Sub-contractors may provide their own offices as necessary. Offices to be located within the designated work and storage area.

1.10 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.

1.11 Sanitary Facilities

1. If permission to use the Lock House facilities is revoked, provide sanitary facilities for work force in accordance with governing regulations and ordinances.
2. Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.12 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. 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 devices and specific references in the specifications and on the drawings.

5. Maintain approved signs and notices in good condition for duration of project, and dispose of off-site on completion of project or earlier if directed by Departmental Representative.

1.13 Clean-up

1. Remove construction debris, waste materials, packaging material from work site daily.
2. Clean dirt or mud tracked onto paved or surfaced roadways to satisfaction of Departmental Representative.
3. Store materials resulting from demolition activities that are salvageable.
4. Stack stored new or salvaged material.

1.14 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Storage Area" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

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 specifications. In addition, this item includes design, supply, installation, maintenance and removal of a negative pressure environmental protection enclosure system over the bridge superstructure for surface preparation and coating of structural steel.
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 removal of the existing structure, which has paint containing lead, are provided in Section 02 83 12 "Lead-Based Paint Abatement - Maximum Protection".
4. Note that the existing buildings on site are not available for use as storage or staging, by this Contractor, at any time during this Contract.
5. The access, housing, heating and ventilating must be sufficient to:
 1. To ensure a safe working environment.
 2. To facilitate progress of Work in an efficient manner.
 3. To eliminate any chance of debris falling to the waterway below.
 4. To protect areas or features adjacent to the Work during procedures which may damage those areas or features.
 5. To protect Work and products against dampness and cold.
 6. To prevent moisture condensation on surfaces.
 7. To provide ambient temperatures and humidity levels for storage, application, installation and curing of materials.
 8. 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, to provide an appropriate environment to complete the work is required to achieve the best quality of the finished product. This section is especially important to all demolition, concreting and painting operations.

1.2 Related Sections

1. Section 01 35 30 - 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 During Paint Removal Operations October 2004 (R2015)
4. SSPC Guide 16 - Steel Structures Painting Council Guide for specifying and selecting Dust Collectors

1.4 Design

1. It should be assumed that work is likely to occur on site in inclement weather, so 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.
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.
3. The Contractor must design the access and containment 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 from anywhere else out of the enclosure. The filters must be cleaned at 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.
 5. Number, wattage and location of temporary lights.

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, 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 scaffolding. 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 from damage in the course of the Work. Remove 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 refer to Section 09 97 19 - Painting Exterior Metal Surfaces.
 2. Ensure no water can drip onto surfaces at any time between surface preparation to 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 air quality inside the enclosure and the integrity of housing. Rectify deficiencies in monitoring, control and containment as per Departmental Representative or MOE inspectors 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 Watchkeeping attendance, maintenance, and fuel.
2. Be responsible for damage to Work and structure due to failure in providing adequate or too much heat and protection during construction.
3. For coating application:
 1. Additional temperature and relative humidity requirements refer to Section 09 97 19 - Painting Exterior Metal Surfaces.

2. Ensure no water can drip onto surfaces at any time between surface preparation to the time that 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 dust.

1.13 Measurement for Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price items "Access and Housing" and, "Heating and De-Humidification" and shall include all costs for labour, materials and equipment necessary to do the work of this item.
2. Unless an accepted alternative breakdown is provided in accordance with the general conditions, the following shall apply. For purposes of facilitating progress payments during construction, the "Access and Housing" breakdown item shall be paid for as follows:
 1. 50% of the breakdown item will be paid for upon satisfactory completion of set-up, (pro-rated for the percentage of set-up accomplished).
 2. 15% of the breakdown item 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.
3. For purposes of facilitating progress payments during construction, the "Heating and De-Humidification" 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.
4. 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 site buildings 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 a 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, on heating equipment, 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 normally performed on any shift.
 6. Complete emergency repairs of minor complexity.
 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.
2. Suspect work shall be considered all work that is not fully cured based on 150% of either written direction by the Departmental Representative as to allowable reductions in site curing times or 150% of manufacturer's written curing times, whichever is longer. Where the additional 50% of the curing times is longer than 36 hours, then the limit for suspect work shall be the shorter of the full curing times plus 36 hours and 150% of the curing time.

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

PART 1 - GENERAL

1.1 Related Sections

1. Section 01 52 00 - Construction Facilities.
2. Section 01 55 50 - Access, Housing, Heating and Ventilation.
3. Section 01 57 00 - Traffic Control.
4. Section 02 76 60 - Temporary Pedestrian Bridge.

1.2 References

1. Canadian Standards Association (CSA International)
 1. CSA-O121-08 (R2013), Douglas Fir Plywood.
2. Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions.

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.

1.5 Guardrails 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, canal 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.

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.

1.10 Measurement and Payment

1. No measurement for payment will be made for this section Payment shall be made under the lump sum price item "Temporary Barriers and Enclosures" and shall include all costs for labour, materials and equipment necessary to complete the work of the item.

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. Ontario Traffic Manual, Book 7, March 2014 - Temporary Conditions (OTM Book 7)
2. Ontario Traffic Manual - Manual of Uniform Traffic Control Devices.

1.2 Maintenance of Traffic

1. There are signs currently on site. Record existing conditions on site and augment existing conditions on site to fully conform to Ontario Traffic Manual Book 7 Temporary Condition Requirements.

1.3 Protection of Public Traffic (including Pedestrians)

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 of 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 and pedestrians, erect suitable signs and devices in accordance with instructions contained in the Ontario Traffic Manual.

1.4 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 or pedestrian 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 drawings but are required in accordance with the requirements of the Ontario Traffic Manual books.
4. Place signs and other devices in locations recommended in OTM Book 7, and/or as supplemented on the Contract Drawings.

5. Meet with Departmental Representative prior to commencement of work to submit a list of signs and other devices required for the project. If situation on site changes, revise list to approval of Departmental Representative.
6. Continually maintain traffic and pedestrian 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 flagpersons during any transitional periods.

1.5 Control Public Traffic

1. Provide flag persons, trained in accordance with, and properly equipped as specified in, OTM Book 7 in 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.
 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.

1.6 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Traffic Control" and shall include all costs for labour, materials and equipment necessary to do the work of this item.
2. In addition to the requirements for temporary signage and control devices to allow construction, the hazard signs at the main girder ends shall be replaced. No measurement for payment will be made for the supply, fabrication and installation of new hazard signs at the girder ends. Removal of the existing hazard signs are included under this item. Payment shall be made under the lump sum price item "Replace Hazard Marker Signs at Main Girder Ends" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Materials

1. New Permanent hazard signs at end of the main girders as indicated and as follows:
 1. Two new WA-33L Signs, 300x900 Aluminum
 2. Two new WA-33R Signs, 300x900 Aluminum

PART 3 - EXECUTION

3.1 Permanent Signs

1. The final position of the permanent signs will be confirmed with the Departmental Representative.
2. All permanent signs will be new, installed securely and fully compliant with the Manual of Uniform Traffic Control Devices for Ontario.

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

PART 1 - GENERAL

1.1 Description

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 Control.

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.
3. If there is question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
4. The cost for such testing will be borne by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.
5. Conform to latest date of issue of referenced standards in effect on date of submission of 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 responsibility, but is precaution against oversight or error. Remove and replace

defective products at own expense and be responsible for delays and expenses caused by rejection.

3. Should any dispute arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
4. Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout.
5. Permanent labels, trademarks and nameplates on products are not acceptable in highly visible locations, except where required for operating instructions.

1.5 Availability

1. 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, 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 standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.10 Co-ordination

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

1.11 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. Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.12 Fastenings

1. Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
2. Prevent electrolytic action between dissimilar metals and materials.
3. Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section or Contract Drawings.
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 (*also refer to Mechanical & Electrical Specifications*)

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.304 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 without 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 Description

1. Progressive cleaning.
2. Final cleaning.

1.2 Related Sections

1. Section 32 91 21 - Topsoil Placement and Grading.
2. Section 32 92 23 - Sodding.
3. Section 01 35 43 – Archaeological, Cultural and Environmental Procedures

1.3 Project Cleanliness

4. Maintain Work in tidy condition, free from accumulation of waste products and debris.
5. Maintain Work in tidy condition, free from accumulation of waste products and debris.
6. Remove waste materials from site at regularly scheduled times. Do not burn waste materials on site.
7. Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
8. Provide on-site containers for collection of waste materials and debris.
9. Provide and use clearly marked separate bins for recycling.
10. Remove waste material and debris from site and deposit in waste container at end of each working day.
11. Dispose of waste materials and debris off site.
12. Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.
13. Store volatile waste in covered metal containers, and remove from premises at end of each working day.

14. Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
15. Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
16. Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate systems.
17. Prior to opening the roadway clean all debris, sand and salt.

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. 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 and Payment

1. No measurement for payment will be made for the work of this section. Payment shall be made under the lump sum price item "Site Work" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

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. 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. Materials Source Separation Program (MSSP).
 6. Canadian Governmental Responsibility for the Environment Resources - Schedule E.

1.2 Related Sections

1. Section 01 35 43 – Archaeological, Cultural and Environmental Procedures

1.3 Definitions

1. Demolition Waste Audit (DWA): Relates to actual waste generated from project.
2. 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.
3. 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.
4. Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
5. 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.
6. Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 1. Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 2. Returning reusable items including pallets or unused products to vendors.
7. Salvage: Removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

8. Separate Condition: Refers to waste sorted into individual types.
9. Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.
10. Waste Audit (WA): Detailed inventory of materials on project. 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.
11. Waste Management Coordinator (WMC) : Contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
12. 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 and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Waste Management Plan" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

1.5 Documents

2. Maintain at job site, one copy of following documents:
 1. Waste Audit.
 2. Waste Reduction Workplan.
 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 Materials Source Separation Program (MSSP) description.
3. Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form.

1. Failure to submit could result in hold back of final payment.
2. Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled, co-mingled and separated off-site or disposed of.
3. For each material reused, sold or recycled from project, include amount quantities by number, type and size of items and the destination.
4. For each material land filled or incinerated from project, include amount of material and identity of landfill, incinerator or transfer station.

1.7 Quality Assurance - Site Visit

1. Pre-bid site visit:
 1. Walk-through of project site prior to completion of bid submittal is mandatory.

1.8 Waste Audit (WA)

1. Conduct WA prior to project start-up.
2. Prepare WA: Schedule A.
3. Record, on WA - Schedule A, extent to which materials or products used consist of recycled or reused materials or products.

1.9 Waste Reduction Workplan (WRW)

1. Prepare WRW prior to project start-up.
2. WRW should include but is not limited to:
 1. Destination of materials and listing of material.
 2. Deconstruction/disassembly techniques and sequencing.
 3. Schedule for deconstruction/disassembly.
 4. Location.
 5. Protection.
 6. Clear labelling of storage areas.
 7. Details on materials handling and removal procedures.
 8. 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 content.

7. Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.
8. Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

1.10 Demolition Waste Audit (DWA)

1. Prepare DWA prior to project start-up.
2. Complete DWA: Schedule C.
3. Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

1.11 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. Locate containers in locations, 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, mechanical and electrical 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 recycle 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, paint thinner into waterways, storm, or sanitary sewers.
3. Keep 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. Provide to Department Representative.
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 project area.

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 %
Cardboard	100%	
Plastic Packaging	100%	
Rubble	100%	
Steel	100%	
Wood (uncontaminated)	100%	
Other	100%	

3.4 Waste Audit (WA)

- The following pertains to Schedule A - Waste Audit (WA). Column-1 refers to the category and type of waste materials. and a physical description of the material (eg. off-cuts, clean drywall, etc). Column-2 refers to the total quantity of materials received by the Contractor. Measurement units must be specified. Column-3 refers to the estimated percentage of material that is waste. Column-4 refers to the total quantity of waste (column-2 x column-3). Column-5 refers to the areas(s) in which the waste was generated. Column-6 refers to the total percentage of recycled material from the specified total quantity of waste (column-4). 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	(2) Material Quantity Unit	(3) Estimated Waste %	(4) Total Quantity of Waste (unit)	(5) Generation Point	(6) % Recycled	(7) % Reused
Wood and Plastics						
Material Description						
Off-cuts						
Warped Pallet Forms						
Plastic Packaging						
Cardboard Packaging						
Other						

3.5 Waste Reduction Workplan (WRW)

- The following pertains to Schedule B - Waste Reduction Workplan (WRW). Column-1 refers to the category and type of waste materials. Column-2 refers to

the persons responsible for completing the WRW. Column-3 refers to Column-4 of Schedule A. Column-4 refers to the amount of reused waste predicted and realized. Column-5 refers to the amount of recycled waste predicted and realized. Column-6 refers to the approved recycling facility.

2. Schedule B

(1) Material Category	(2) Person(s) Responsible	(3) Total Quantity of Waste (unit)	(4) Reused Amount (unit)		(5) Recycled Amount (unit)		(6) Material Destination
			Projected	Actual	Projected	Actual	
Wood and Plastics							
Material Description							
Warped Pallet							
Other							
Material Description							
Wood							
Metal							
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 102/07 and Ontario Regulation 103/94.
 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 or treated wood or laminated wood.
 4. Steel.
3. Submit a waste reduction workplan 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 Description

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 Sub-contractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 1. Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
 2. Request Departmental Representative's Inspection.
2. Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
3. Completion: submit written certificate that following have been performed:
 1. Work has been completed and inspected for compliance with Contract Documents.
 2. Defects have been corrected and deficiencies have been completed.
 3. Equipment and systems have been tested, and are fully operational and the performance of the equipment and system has been verified.
 4. Certificates required have been submitted.
 5. Operation of systems have been demonstrated to Owner's personnel.
 6. Work is complete and ready for Final Inspection.
4. Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative, and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
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 re-inspection.
8. Payment of Holdback: After issuance of Certificate of Substantial Performance of Work, submit an application for payment of holdback.

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. As-built, samples, and specifications.
2. Equipment and systems.
3. Product data, materials and finishes, and related information.
4. Operation and maintenance data.
5. Spare parts, special tools and maintenance materials.
6. Warranties and bonds.
7. Final site survey.

1.2 Submission

1. Prepare instructions and data using personnel experienced in maintenance and operation of described products.
2. Copy will be returned after final inspection, with Departmental Representative's comments.
3. Revise content of documents as required prior to final submittal.
4. Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of maintenance manuals and commissioning documentation in English.
5. Ensure touch up materials, spare parts, maintenance materials and special tools provided are new, undamaged and defect-free, and of same quality and manufacture as products provided in Work.
6. If requested, furnish evidence as to type, source and quality of products provided.
7. Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
8. 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 and identify subject matter of contents.
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.

1.4 Contents - Each Volume

1. Table of Contents: provide title of project;
 1. date of submission; names,
 2. 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.
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 61 00.

1.5 As-Builts and Samples

1. In addition to requirements in General Conditions, include in the binders one record copy of:

1. Contract Drawings.
 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.
 8. Manufacturer's certificates.
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, 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, and colour and texture designations.

1.8 Storage, Handling and Protection

1. Store spare parts and maintenance materials, in manner to prevent damage or deterioration.
2. Store in original and undamaged condition with manufacturer's seal and labels intact.
3. Store components subject to damage from weather in weatherproof enclosures.
4. Store paints and freezable materials in a heated and ventilated room.
5. Remove and replace damaged products at own expense and 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 principal.
3. Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.
4. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of 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 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.

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 Commissioning and Decommissioning of a swing bridge requires precision in measuring the dimensions, gaps, wheel shims, bearings and elevations. The Contractor must record baseline measurements which they can use to establish the correct position of the new bridge structure. The Contractor is responsible for confirming the dimensions and gaps of the existing bridge in sufficient detail to ensure that the dimensions can be used as reference for troubleshooting the operation of the bridge when the balancing and running of the rehabilitated bridge is completed by the Contractor.
2. For purposes of Section 4.3, Commissioning Acceptance, described below, it is assumed that the rehabilitated bridge structure has been successfully positioned and realigned on the pier top, that the balance wheel assemblies have been installed and that the bridge is completely set up according to the dimensions and elevations as described below in Sections 3.2 and 3.3. and adjusted as required to accommodate differences between the original and rehabilitated structure or as amended by the drawings. It is also assumed that the bridge has been balanced and is completely operational.
3. Prior to swinging the bridge for the first time, the Contractor shall verify that all systems and equipment have been installed and are adjusted. Demonstrate to the Departmental Representative the presence of all equipment and perform all functional tests that can be performed including testing to confirm that the bridge can be operated.
4. If any failure occurs during any phase of testing, commissioning, or Contractor operation, a written report will be prepared by the Contractor. The Contractor shall identify the cause of all issues, document the repair and adjustment actions taken and, document the tests of the system involved and adjacent or dependent systems. The Contractor shall transmit the information within 24 hours and keep a copy of the report in the commissioning log book. Submit the commissioning log book at the end of the project. The Departmental Representative will determine if an on- site meeting is required. At the meeting, the Contractor shall demonstrate the actions taken and that the system functions as intended.
5. Tests and functional operation period will occur in all types of weather, including extremely hot conditions to check clearances for operation.
6. Prior to substantial completion, a period of system verification will occur. The Contractor shall verify that all systems which have been installed operate as intended and that all electrical controls, sensors, and hydraulics function and are configured in positions which will ensure continued reliability. It is assumed this period will occur prior to the opening of the Canal such that only roadway traffic

must be accommodated. All roadway traffic shall not be delayed unless approval is given by the Departmental Representative. The Contractor will test, adjust and verify the reliability of all systems. A minimum of fifteen openings a day for a period of two weeks shall be completed and a log of all issues, actions taken and resolution shall be kept.

7. After the initial test period or during the final four days of the two week period, the bridge must operate for four (4) consecutive days with no adjustments, no issues or faults. If the four day period is satisfied, then the Contractor can move to the Contractor operation phase. If not, the tests will continue until four consecutive days with no issues, adjustments or faults are achieved.
8. The Contractor will be required to complete a Contractor operation phase where the Contractor shall operate the bridge, accommodating both navigation and roadway traffic. If less than fifteen openings for navigation per day are required, the Contractor shall run the bridge through the full cycle of an opening and closing to simulate the passage of a boat to reach the minimum of fifteen cycles each day. The Contractor operation phase will last a minimum of two weeks and will continue seven (7) days a week during normal Canal hours until such time as one week of problem free operation is completed with no breakdowns, no adjustments and no issues for the entire seven (7) day period. At the satisfaction of this criteria, substantial completion shall be reviewed.
9. During the period of Contractor Operation, the Contractor will also complete the training and manual requirements.
10. After substantial completion and preliminary acceptance, the bridge shall be allowed to run for a period of sixty days. Opening for normal navigation traffic during this period will be termed the maintenance period and the Contractor will be responsible for maintenance and adjustment of the bridge during this period.

1.2 Related Sections

1. Section 01 35 43 – Archaeological, Cultural and Environmental Procedures

1.3 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Commissioning / Decommissioning the Bridge" and shall include all costs for labour, materials and equipment necessary to do the work of this item.
2. A portion of the lump sum price for the item, "Commissioning / Decommissioning the Bridge" equal to \$30,000, will be held until the end of the maintenance period. The Contractor shall respond within 3 hours of being notified of an issue. Should the Contractor not respond within the required 3 hours, the Canal Staff will make arrangements to get the bridge operational, the costs of which will be deducted from the Contract.

PART 2 - PRODUCTS

2.1 Not Used

1. Not Used.

PART 3 - EXECUTION

3.1 General Decommissioning

1. Contractor shall submit dimensioned drawings showing at minimum the dimensions and elevations described in this section and as detailed in the Contract Drawings to the Departmental Representative prior to any construction at the site. Contractor shall decommission the bridge electrical and mechanical systems as described below.

3.2 Elevation

1. At minimum the following elevations shall be measured and recorded.
 1. Elevations of the centre pier at the pivot points and hydraulic bases.
 2. Elevation of at least eight points on the pivot rail in the area of swing confirming whether the track is currently level or on a pitch.
 3. Elevations of the bearing points on the abutments.
 4. At a minimum of five locations across the roadway: a) the elevation of the top of the abutment and b) the elevation at the bridge deck ends.
 5. The Contractor shall establish two solid and secure benchmarks to ensure that they will have vertical control when the concrete and steel work is completed.

3.3 Dimensions

1. At minimum the following dimensions shall be confirmed:
 1. The overall length of the bridge, the gap between the bridge and the abutment at a minimum of five locations across the bridge horizontally to the deck and to the end of the stringers and at the minimum gap when the bridge is swung by each abutment. Record the temperature at the time of measurement of the gap.
 2. The overall length of the bridge and the dimension between webs of floor beams to check the actual panel lengths. The temperature at the time of measuring must be recorded.
 3. Record the elevation of three points on the rail used and determine if the girder originally sat level. Measure the distance and/or record the existing elevations of the deck surface, top of the outside girders and center pier.

3.4 Mechanical

1. 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.
2. The number, weight and location of each counterweight steel block and steel basket along both sides of the bridge shall be recorded and reported to the Departmental Representative.
3. Record the overall length, position and angle, relative to the bridge, of the hydraulic cylinders in the open and closed position.

3.5 Electrical

1. The replacement of the Motor Control Center at the Lock Station will include the temporary disconnection of cables pertaining to the general distribution of power to Lock Station loads, as well as to Lock Gate controls. All 120/240V circuits for the Lock Station shall be marked and recorded for reconnection to the new distribution panel. Ensure this is completed prior to MCC removal.
2. Mark and record the cabling, including the individual wires, interconnecting the Lock Gate field operator stations, existing hydraulic unit, and lock gate limit switches/sensors. Wires shall be marked according to the terminal number they are connected to and in accordance with existing control drawings. Ensure this is completed prior to MCC and HPU removal.
3. Mark and record the cabling, including the individual wires, interconnecting the existing navigation lights and receptacles for the North end (East and West) of the bridge. These cables and equipment may be reused depending on condition and the approval of the Departmental Representative. Mark and record cabling any wires for any other bridge loads not specified on drawings or documents for removal.

3.6 Physical Dismantling

1. Remove disconnected hydraulic hosing/piping ensuring there is no spillage of hydraulic fluid into the waterway.

3.7 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 seated into the new adjustments before they can be fully assessed.

2. While the bridge must be stabilized throughout the work, 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 connections 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 central bearing assembly. Confirm alignment during assembly to ensure that the main girder will hang as level as possible.
4. In the setting of the central bearing assembly and wheel ramps the Contractor shall include the time and costs for supporting the items on stainless steel nuts and shims to set the relative elevations and then grout 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 require 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. To allow for adjustment, the Contractor shall prepare twice as many shims as it is anticipated will be required and the shims will be sufficiently thin such that good adjustment can be achieved. It is anticipated that the final shims will be as thin as 0.75 mm.
6. At all stages of construction, the position relative to level should be monitored in orthogonal directions parallel and perpendicular to the bridge. This should be completed at minimum at the following stages:
 1. Before removal of bridge components in the open and closed position.
 2. Center beam erection with balance beams and main girders.
 3. Finish of steel component installation.
 4. Finish of Deck construction.
 5. Finished curb/railing installation.

All stages should be recorded and submitted to the Departmental Representative before proceeding to the next stage.

7. The level and consistency of installation of the rail used as the balance rail is important in the success of commissioning.
 1. Take elevations of old rail.
 2. Tolerances for rail elevation are extremely tight (0.5 mm) take care when accepting rolled section and during shimming and installation to produce a truly flat track.
8. When setting wheel heights at pier, it should be possible to have the bridge balanced on only the center pier bearing with due regard to the fact that the wheels directly under the main girders will be fully engaged (in the closed position) and will be the primary supports to the superstructure in the pivot area. All other (balance) wheels can be set to have the specified gap but must be checked after time and a number of rotations.

9. At the ends of the bridge, the trailing abutment ramp and end wheel assembly must be offset in elevation such that as the leading wheel crosses the trailing ramp, there is clearance. On the North bearing seat allow for a difference in elevation between the trailing ramp and the leading wheel of 26 mm. On the South bearing seat allow for a difference in elevation between the trailing ramp and the leading wheel of 26 mm.
10. The height of concrete at the top of the South abutment and the elevations across the nose armouring can only be set after the bridge elevation has been determined and the bridge is balanced. The abutment cap is a separate pour to allow this sequence to occur.

3.8 Bridge Alignment Correction

1. The swing bridge is shifted and does not have equal expansion joint gaps between the north and south abutment. The bridge is too close to the south abutment and there is interference between the pedestrian rail post and the abutment wall. The Contractor shall account for correcting the alignment of the bridge after the bridge has been rehabilitated such that the expansion joint gaps between the north and south abutments are approximately equal within ± 5 mm of each other. It is possible that the center of the existing pivot bearing assembly may not coincide with the center of the new pivot bearing assembly.
2. Contractor shall coordinate the work of relocating the bridge from its shifted position with work on the centre-pivot bearing, rail, live load wheel ramps, end ramps and all other affected mechanical and structural components. Fix/grout all anchorages for the centre-pivot bearing, rail, ramps and mechanical components only when the bridge is in its proper confirmed and final realigned position.

PART 4 - ACCEPTANCE CRITERIA

4.1 General Commissioning Acceptance

3. The Contractor is responsible for commissioning of the bridge system as outlined in this document. The following procedure outlines the steps that will be taken by the Departmental Representative in the acceptance of the bridge system once it has been commissioned by the Contractor.
4. If during acceptance, problems are encountered with the Contractor's work that should have been detected during the Contractor's commissioning work or, develop or are identified during the acceptance, acceptance will be temporarily suspended until the problems are rectified. These periods of time will not be counted as acceptance time and the Contractor will therefore not be entitled to reimbursement for this time. If the extent of required repairs warrants it, acceptance may, at the Departmental Representative's discretion, be temporarily terminated until another date, after required repairs and additional commissioning

or a complete new and full round of commissioning has been carried out by the Contractor.

4.2 Comparison of As Found and As Built Data

1. The Contractor will survey the new bridge structure and submit dimensioned drawings showing each of the dimensions and elevations noted above in Sections 3.2 Elevations, 3.3 Dimensions and the specification of balance weights that were applied during the balancing process 2 weeks prior to commissioning acceptance.
2. The Departmental Representative will review the decommissioning and commissioning data and provide observations and recommendations.
3. The Contractor will make corrections and adjustments as part of the original work.

4.3 Commissioning Acceptance - Balancing

1. On the day of commissioning acceptance, the Owner's engineer will check the following parameters at the bridge site, and will provide an acceptance signoff conditional on completion of any noted deficiencies. This may be an iterative process requiring several cycles of weight/clearance adjustment to complete:
 1. Check that both ends of the bridge roadway are level to the bridge approaches.
 2. Check that the central balance wheels at the pier are shimmed to correct gaps (typically 3 mm) and wheels directly under the main girders are in appropriate contact.
 3. Check that the wheels located on the ends of the bridge, are in appropriate contact with the abutment ramps, to be approved by the Mechanical Engineer.
 4. Progressively rotate the bridge to the fully open position checking central pier wheel caster clearances.

4.4 Commissioning Acceptance - Mechanical Swing Systems

1. On the day of commissioning acceptance, the Owner's engineer 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 hydraulic system operating pressure and collect sample of new oil.
 3. Confirm operating pressures of cylinders are within design operational pressures.

4.5 Commissioning Acceptance - Mechanical and Electrical Systems

1. Prior to commissioning, the Contractor must pre-commission all systems and equipment. Within three weeks of award of the Contract, provide complete checklists covering all pre-commissioning work. The checklists must 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, proper rotation, device operation and configuration. All work by the Contractor must be included on the checklists and all check items must be included to ensure the correctness of all work.

2. After completion of the Contractor's commissioning work, the Departmental Representative will commission bridge operating controls and will provide an acceptance signification conditional on completion of any noted deficiencies. It is anticipated that this work will take two eight-hour days. The Contractor is required to provide all necessary manpower and assistance during this period to enable and assist in the work.

4.6 Maintenance Period

1. The Contractor will be responsible for all maintenance, adjustment and repairs at the bridge for a period of 60 days after substantial completion or, until final acceptance, whichever is longer.
2. During the maintenance period the Contractor will make all adjustments, and service the bridge such that operations can be maintained.
3. The performance of the bridge will be evaluated for reliability and consistency.
4. For any issue where the bridge is not 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 without the consent of the Departmental Representative. The Contractor must have personnel on site within 3 hours of the incident being reported to the Contractor's office.
5. A portion of the Contract Lump Sum value equal to \$30,000 will be held until the end of the maintenance period. The Contractor shall respond within 3 hours of being notified of an issue. Should the Contractor not respond within the required 3 hours, the Canal Staff will make arrangements to get the bridge operational, the costs of which will be deducted from the Contract.

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

PART 1 - GENERAL

1.1 Description of Work

1. This section covers the requirements for the demolition and removal of:
 1. Designated existing steel structure components.
 2. The open grid steel deck and wooden curbs.
 3. The pedestrian wood deck including running boards and running boards (nailers).
 4. Concrete and reinforcement (if any) removals on abutments and pivot pier.
 5. Removal of Electrical and Mechanical items shall be covered under their appropriate removal items.
 6. Any other removals not covered by the above that are necessary for the completion of the work shall be placed under "Miscellaneous Removals".
 7. Diamond core drilling out any anchors in the pier and abutment concrete structures that are leftover from the removals of other items, and, grouting of the holes after removal.
2. All removed materials that are not to be 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.

1.2 Related Sections

1. Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
2. Section 01 35 43 – Archaeological, Cultural and Environmental Procedures
3. Section 03 30 00 - Cast-in-Place Concrete.
4. Section 05 12 33 - Structural Steel for Bridges.
5. Section 31 23 10 - Earth Excavation.
6. All of Section 13 Specifications defined for the mechanical work.
7. All of Section 26 Specifications defined for the electrical work.

1.3 References

1. Canadian Federal Legislation
 1. Canadian Environmental Protection Act (CEPA), 1999.
 2. Impact Assessment Act (IAA), 2019.
 3. Transportation of Dangerous Goods Act (TDGA), 1992.
 4. Motor Vehicle Safety Act (MVSA), 1995.

1.4 Storage and Protection

1. Perform all work in accordance with Section 01 35 43 – Archaeological, Cultural and Environmental Procedures.
2. Protect existing items designated to remain / be salvaged for re-use or turn over to Owner (see mechanical and electrical). 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, 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.

1.5 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.

1.6 Regulatory Requirements

1. Ensure all work is performed in compliance with CEPA, IAA, TDGA, MVSA, and all applicable Federal and Provincial regulations.
2. Follow mitigation requirements of IAA.

1.7 Submittals

1. Prior to commencement of work on site, submit detailed waste reduction workplan indicating anticipated percentages of reuse, recycling and landfill, schedule of selective demolition, material description and quantities of materials to be salvaged, number and location of dumpsters, anticipated frequency of tippage, and name and address of all waste receiving organizations.
2. Supply certified bills of lading from authorized disposal sites and reuse and recycling facilities for all material removed from site. Written authorization from the

Departmental Representative is required to deviate from the receiving organizations listed in waste reduction workplan.

1.8 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price items "Remove Open Grid Steel Deck", "Remove Timber Curbs", "Remove Sidewalk Timber Deck", "Remove Sidewalk Stringers", "Remove Sidewalk Flange Angles", "Remove Stringers for New Balance Wheel Beams", "Remove Steel Counterweight", "Remove Rail Concrete Supports at Pivot Pier", and "Miscellaneous Removals" and shall include all costs for labour, materials and equipment necessary to do the work of the item. Any removals required for the completion of the work and not covered by other items of the Contract, shall be completed under the "Miscellaneous Removals" breakdown item.
2. Measurement for payment for the unit price item shall be as indicated below. All costs for labour, materials and equipment necessary to do the work of the unit price items, in accordance with the drawings and these specifications, shall be included in the tendered Contract prices for these items.
 1. "Concrete Removals on Abutments" m3
 2. "Earth Excavation at North Abutment" m3

PART 2 - PRODUCTS

2.1 Equipment

1. Equipment and heavy machinery used to meet or exceed all applicable emission requirements.
2. Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.
3. Chipping hammers shall be 7.0 kg maximum.
4. Air compressor for abrasive blast cleaning shall supply a minimum pressure of 620 kPa within 3 m of the hose.
5. Diamond core drilling equipment suitable for the intended use.
6. Steel removals adjacent to items to remain will not be completed using cutting torches. See Section 05 12 33 - Structural Steel for Bridges for additional restrictions.

2.2 Materials

1. Grout to be used for the filling of core drilled holes in the pier and abutments shall be compatible with surrounding concrete, not susceptible to frost and de-icing chemicals. Submit details of proposed materials to Departmental Representative, for approval, in accordance with Section 01 33 00 - Submittal Procedures.

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.

3.2 Bracing and Shoring

1. Provide all temporary bracings and shoring to structures 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 and adjacent connections to increase such that any loosening of the riveted or bolted 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 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 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 Items to Salvage

1. See Mechanical and Electrical drawings for items to be protected, salvaged and turned off to Departmental Representative. The following will be salvaged and turned off:
 1. Center pivot bearing for bridge.
 2. Hydraulic cylinders and components.
 3. HPU in center pier mechanical vault.
 4. End jack lifts and HPU at South abutment.
 5. The HPU in the lock building.
 6. 600V breakers, motor starters and limit switches.

3.8 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.

3.9 Concrete Removal

1. The concrete of the various structures is variable in strength, condition and consistency. The drawings show approximate removal locations and extent. During removals, direction will be given by the Departmental Representative as to how to increase, decrease or change the location of the concrete removals. The general concept of partial refacing of the ballast and abutment walls will not change.
2. As removals progress, confirm the limits of removals. It is the intent to keep the areas of removals to the limits as indicated on the drawings. It is possible that concrete behind the facing will be found to be in poor condition and additional removals may be required but shall only be done as directed by the Departmental Representative.

3.10 Core Drilling

1. At locations where existing anchors remain in the pier and abutments after removals are completed for other items of work, diamond core drill out the anchors and install grout to the remaining holes as per the recommendations of the grout manufacturer.

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

PART 1 - GENERAL

1.1 Description

1. This section covers the requirements for the provision of the following: The design, supply, installation, maintenance and removal of a temporary pedestrian bridge (used by pedestrians and cyclists) as indicated in the Contract Drawings and Specifications and any fencing and signing required for direction of pedestrians and separation from work areas. Accessibility access (wheelchair use) to the temporary bridge from Canal Street in the form of ramps is included. Temporarily, disconnecting the sidewalk railing on Canal Street to provide the accessibility ramps is included. Reinstating the railing after removal of the pedestrian bridge is also included. The maintenance (including snow and ice removal) of the walkway adjacent to the lock house from the Canal lock to Main Street, including the bridge and ramps is included in the work. Reinstatement of the area to existing conditions.

1.2 Related Sections

1. Section 01 11 00 - Summary of Work
2. Section 01 33 00 - Submittal Procedures
3. Section 01 35 00 - Health and Safety
4. Section 01 35 43 – Archaeological, Cultural and Environmental Procedures
5. Section 01 56 00 - Temporary Barriers and Enclosures
6. Section 01 57 00 - Traffic Control
7. Section 01 74 21 - Construction/Demolition Waste Management and Disposal
8. Section 05 12 33 - Structural Steel for Bridges
9. Section 06 10 11 - Rough Carpentry

1.3 References

1. Canadian Standards Association (CSA)
 1. CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel.
 2. CAN/CSA-S6-14, Canadian Highway Bridge Design Code (CHBDC).
 3. CAN/CSA-S16.1-01 (R2007), Limit States Design of Steel Structures.
 4. CAN/CSA-O86-14, Engineering Design in Wood.
2. National Building Code 2015 (NBC) Division B.

3. Ontario Traffic Manual, Book 7, March 2014 – Temporary Conditions.
4. Ontario Traffic Manual – Manual of Uniform Traffic Control Devices.
5. City of Toronto – Accessibility Design Guidelines (2015).

1.4 Materials

1. Plywood in accordance OPSS 919.
2. Structural steel in accordance with Section 05 12 33 - Structural Steel for Bridges.
3. Timber in accordance with Section 06 10 11 - Rough Carpentry.

1.5 Action and Informational Submittals

1. Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
2. Submit design for the temporary pedestrian bridge, bearing assemblies and accessibility ramp(s) a minimum of 2 weeks prior to desired installation date.
 1. Working drawings shall be signed and sealed by two Professional Engineers licenced to practice in the province of Ontario. Provide allowable loads on working drawings.
 2. The Contractor's Engineer shall establish all loads and corresponding load factors in accordance with CSA S6-14 and NBC 2015 (as applicable). At a minimum, the bridge shall support an unfactored uniform live load of 4 kPa. Vehicular loading is not required.
 3. Railings shall be provided on both sides of the bridge and be at least 1370 mm high (CHBDC bicycle barriers). Railings shall support simultaneous horizontal and vertical unfactored uniform loads of 1.20 kN/m.
 4. Minimum bridge width between inside face of railings shall be 1800 mm.
 5. Submit shop drawings indicating all dimensions, materials, material grades, connections, railings, anchorage details and other relevant information.
 6. Provide erection drawings if required.
 7. Bridge design shall provide anchorage for the expected lateral loads as per CSA S6. Any holes made in the existing lock walls shall be filled with non-shrink grout after use.
 8. The design shall include all appropriate protection of lock walls including protection from staining.
 9. Maximum factored stress on lock walls from the bridge support shall not exceed 0.5 MPa.
 10. Bridge shall be designed for serviceability such that deflection and vibration are not noticeable during typical use.
 11. Ends of bridge shall be ramped or sloped such that the bridge can be used by wheelchair users. Ramps shall not be steeper than 1:20 with individual ramp sections no longer than 9 m. For intermediate level landings, a minimum of 1670 mm in depth by the width of the ramp shall be provided. Handrails on ramps should be mounted between 865 mm and 965 mm and provide a smooth continuous surface from the top to bottom of the ramp without breaking the handhold. Handrails shall extend a minimum distance of 300 mm beyond the top and bottom of the ramp.

12. All surfaces shall be hard, durable and even without significant gaps large enough to catch high heels or obstruct small wheels. Open grating deck is not permitted.
 13. Repair any damage to the lock walls associated with the installation, operation or removal of the temporary pedestrian bridge to original or better conditions. Obtain approval from Departmental Representative for proposed repair methodology.
3. Provide photo survey of lock walls a minimum of 1 week prior to installation of temporary bearing assemblies.

1.6 Quality Assurance

1. Provide stamped certification letter from Design Engineering after the bridge and ramps are installed, certifying that it is properly installed in accordance with the design and shop drawings and ready for use.

1.7 Delivery, Storage and Handling

1. Follow all provincial and municipal laws and regulations during shipping of temporary bridge. Obtain all necessary permits.

1.8 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Temporary Pedestrian Bridge" and shall include all costs for labour, equipment and materials necessary to do the work of this item

PART 2 - PRODUCTS

2.1 Not Used

1. Not Used

PART 3 - EXECUTION

3.1 Temporary Pedestrian Bridge

1. Bridge shall not be in place during navigation season (see Section 01 11 00).
2. The approximate location for the temporary pedestrian bridge over the Canal lock and accessibility ramp from Canal Street is shown on the drawings. The Contractor shall determine the dimensions of the bridge and accessibility ramps to satisfy the requirements of this section and confirm with field measurements. Shop drawings shall be submitted for the design and construction of the pedestrian bridge and

accessibility ramp(s). Drawings shall be stamped by two professional engineers registered in the Province of Ontario. Install temporary pedestrian bridge as per the reviewed shop drawings. Maintain pedestrian bridge for duration of work and remove only after approval has been given by Departmental Representative.

3. The following scope of work is indicative in nature and it is not intended to be an exhaustive list of all items required to carry out the work. The following items are associated with the installation of the temporary pedestrian bridge, accessibility ramp(s) and maintenance of pedestrian access throughout the duration of the bridge rehabilitation.
 1. Remove and store existing pedestrian handrails on Canal Street to provide access to install accessibility ramp(s).
 2. Install temporary accessibility ramp(s). Ramp drawings shall be stamped by two professional engineers registered in the Province of Ontario.
 3. Install temporary bearing assemblies on lock walls for temporary bridge and protection of existing lock canal walls. Bearing assemblies shall be stamped by two professional engineers registered in the Province of Ontario.
 4. Install temporary bridge on temporary bearing assemblies. Bridge drawings shall be stamped by two professional engineers registered in the Province of Ontario.
 5. Install accessibility ramps leading up to bridge.
 6. Install fencing and signs as required to delineate the walkway route and separate pedestrians from the work area.
 7. Maintain pedestrian access routes including accessibility ramps, temporary pedestrian bridge and route adjacent to lockhouse which leads from the Canal to Main Street. Access routes shall be free of snow and ice Monday through Friday of each week.
 8. Remove temporary accessibility ramps, bearing assemblies, pedestrian bridge, signs and fencing after completion of work as directed by Departmental Representative. All material from the temporary bridge and accessibility ramp shall be disposed of off-site in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
 9. Reinstate and make good all disrupted areas (including pedestrian railing at Canal Street) to original or better conditions after completion of work.

3.2 Maintenance

1. The Contractor shall be responsible for the maintenance of the temporary accessibility ramps and pedestrian bridge. The pathway adjacent to lock house from the canal to Main Street shall be maintained. All routes shall be kept clear of any obstructions at all times.
2. Carry out snow removal when more than 5 cm of snow fall occurs and/or more often as required to maintain access routes.

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

PART 1 - GENERAL

1.1 Summary

1. Comply with sections of this specification related to proper disposal of all removed components off-site which have lead paint.
2. Comply with Ontario Guideline: Lead on Construction Projects.
3. 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 Related Sections

1. Section 01 35 43 - Archaeological, Cultural and Environmental Procedures
2. Section 01 35 44 – Environmental Protection – Lead Paint

1.3 References

1. Ontario Regulation 347 General Waste Management
2. Fisheries Act
3. CEPA - Canadian Environmental Protection Act.
4. Canadian Standards Association (CSA International)
 1. CAN/CSA-Z180.1-13, 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), Safety Data Sheet (SDS).
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 (R2011).
9. Transport Canada (TC)
 1. Transportation of Dangerous Goods Act, 1992 (TDGA).

10. U.S. Environmental Protection Agency (EPA)
 1. EPA 747-R-95-007-1995, Sampling House Dust for Lead.
11. U.S. Department of Health and Human Services/Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health (NIOSH)
 1. NIOSH 94-113 - NIOSH Manual of Analytical Methods (NMAM), 4th Edition (1994).
12. U.S. Department of Labour - Occupational Safety and Health Administration (OSHA) - Toxic and Hazardous Substances
 1. Lead in Construction Regulation - 29 CFR 1926.62-1993.
13. Underwriters' Laboratories of Canada (ULC)
14. Impact Assessment Act (IAA), 2019.

1.4 Definitions

1. HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with a filter system capable of collecting and retaining fibers 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 and designated representatives or the public could access.
4. Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Appropriate capacity for scope of work.
5. 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.
6. Competent person: individuals or Departmental Representative capable of identifying existing lead hazards in workplace and taking corrective measures to eliminate them.
7. 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.

1.5 Submittals

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

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. Quality Control:
 1. Provide Departmental Representative necessary permits for transportation and disposal of lead based paint waste and proof it has been received and properly disposed.
 2. Provide proof satisfactory to Departmental Representative that employees had instruction on hazards of lead exposure, and aspects of work procedures and protective measures.
6. Product data:
 1. Provide documentation including test results, fire and flammability data, and WHMIS Safety Data Sheets (SDS) for chemicals or all materials used in this project.

1.6 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.

1.7 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. Health and Safety:
 1. Require construction work to be in compliance with the occupational health and safety regulations in Section 01 35 30.

1.8 Waste Management and Disposal

1. Disposal of waste materials in accordance with Section 01 74 21.
2. Handle and dispose of hazardous materials in accordance with CEPA, TDGA, 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 landfill for burial.

1.9 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 and 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 high lead content.

1.10 Scheduling

1. Upon award of Contract, not later than ten 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.

1.11 Measurement and Payment

1. No measurement for payment will be made for the work of this section. All costs for the removal and disposal of lead based paint and / or items containing lead paint, shall be included in the tendered prices for the related work items.

PART 2 - PRODUCTS

2.1 Materials

1. Polyethylene 0.15 mm unless otherwise specified; in sheet size minimize joints.

2. FR polyethylene: 0.15 mm 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 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. Label containers with pre-printed bilingual cautionary Warning Lead clearly visible when ready for removal to disposal site.

PART 3 - EXECUTION

3.1 Preparation

1. Work Area:
 1. Prevent lead dust and particulate dispersal into the environment or outside of the work areas.

3.2 Lead - Base Paint Abatement

1. Remove lead based paint waste debris in small sections as it is being removed in labeled sealable and transportable containers.
2. Use appropriate methods to reduce dust generation.

3.3 Inspection

1. Perform inspection to confirm compliance with specification and governing authority requirements. Deviations from requirements not 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.

3.4 Final Cleanup

1. Cleanup Work areas and equipment.

2. Remove sealed waste containers.
3. Conduct final check to ensure no dust or debris remain on surfaces as result of dismantling operations.

3.5 Lead Content Report

1. The content of lead in the paint has not been tested. The Contractor shall test the lead content of the paint, in particular in hard to reach areas that have previous generations of paint.
2. For all existing painted surfaces, it shall be assumed that 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 – Archaeological, Cultural and Environmental Procedures
2. Section 03 20 00 - Concrete Reinforcing.
3. Section 03 30 00 - Cast-in-Place Concrete.
4. Section 03 35 00 - Concrete Sealer.

1.2 References

1. Canadian Standards Association (CSA)
 1. CAN/CSA-A23.1-09 (R2014), Concrete Materials and Methods of Concrete Construction.
 2. CAN/CSA-O86-14, Engineering Design in Wood (Limit States Design).
 3. CSA O121-R2013, Douglas Fir Plywood.
 4. CSA O151-R2014, Canadian Softwood Plywood.
 5. CSA S269.1-R2003, Falsework for Construction Purposes.
 6. CAN/CSA-S269.3-R2013, Concrete Formwork.
2. Council of Forest Industries of British Columbia (COFI)
 1. COFI Exterior Plywood for Concrete Formwork.

1.3 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, conduit trenches and chases and, locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings. Comply with CAN/CSA-S269.3 for formwork drawings.

1.4 Measurement and Payment

1. No measurement will be made under this Section. Include costs of this work in associated cost items for concrete.

PART 2 - PRODUCTS

2.1 2.1 Materials

1. Formwork materials:
 1. Use wood and wood product formwork materials to CSA-O121 and CAN/CSA-O86.
2. Form ties:
 1. Use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface. All holes shall be patched with appropriate materials approved by the Departmental Representative and arranged in a symmetrical pattern.
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: colourless 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. 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 area of swing bridge.
2. Fabricate and erect falsework in accordance with CSA S269.1 and COFI Exterior Plywood for Concrete Formwork.
3. Do not place shores and mud sills on frozen ground.
4. Provide site drainage to prevent washout of soil supporting mud sills and shores.
5. Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1.
6. Align form joints and make watertight. Keep form joints to minimum.

7. Use 20 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
8. Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
9. Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
10. Clean formwork in accordance with CAN/CSA-A23.1, before placing concrete.

3.2 Removal and Reshoring

1. Leave formwork in place for three days, unless otherwise indicated or approved by the Departmental Representative after placing concrete.
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 A23.1, 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. 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.

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

PART 1 - GENERAL

1.1 Related Sections

1. Section 01 35 43 – Archaeological, Cultural and Environmental Procedures
2. Section 03 30 00 – Cast-in-Place Concrete

1.2 References

1. American Concrete Institute (ACI)
 1. ACI 315R-94, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.
2. American National Standards Institute/American Concrete Institute (ANSI/ACI)
 1. ANSI/ACI 315-99, Details and Detailing of Concrete Reinforcement.
3. 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 for Buildings.
 3. CAN/CSA-G30.18-09 (R2014), Carbon Steel Bars for Concrete Reinforcement.
 4. CAN/CSA-G40.21-13, Structural Quality Steels.
 5. CAN/CSA-G164-18 Hot Dip Galvanizing of Irregularly Shaped Articles.
 6. CSA W186-M1990 (R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.3 Shop Drawings

1. Submit Shop Drawings including placing of reinforcement, in accordance with Section 01 33 00 - Submittal Procedures. All reinforcing dimensioning to be based on Contract Drawing information and as confirmed by field measurements.
2. Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings. 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 CAN3-A23.3, unless otherwise indicated. Provide Class B tension lap splices unless otherwise indicated.

1.4 Measurement and Payment

1. Work covered by this Section will be paid for under the unit price items "Galvanized

Reinforcing Steel” and “Drilling and Grouting for Dowels” and for the units as indicated.

2. The price for dowels shall include all costs associated with the drilling and grouting of the 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. The cost for drilling and grouting shall be incorporated in the unit price item “Drilling and Grouting for Dowels”, while the cost to supply the reinforcing steel shall be fully compensated for in the “Galvanized Reinforcing Steel” unit price item.
3. All other work of this Section that is not identified as a unit price item shall be included in the Contract lump sum price.

PART 2 - PRODUCTS

2.1 Materials

1. All reinforcing steel to be galvanized in accordance with ASTM A767/A767M-09 unless indicated otherwise.
2. Substitute different size bars only if permitted in writing by Departmental Representative.
3. Reinforcing steel: carbon steel, grade 400W, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
4. Cold-drawn annealed steel wire ties: to CSA G30.3.
5. Welded wire reinforcement: to ASTM A1064/1064M.
6. Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
7. Mechanical splices: subject to approval of Departmental Representative.
8. Plain round bars: to CAN/CSA-G40.21.
9. Grouting of Dowels: Grout for dowels shall be a solvent free, moisture insensitive, high modulus, high strength structure epoxy paste adhesive. An acceptable product is HILTI HIT-HY 200 produced by Hilti.

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 and in accordance with OPSS MUNI 905.
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.

2.3 Source Quality Control

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

PART 3 - EXECUTION

3.1 Field Bending

1. Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
2. When field bending is authorized, bend without heat, 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 bars with covering during transportation and handling. During placing, use vibrators with protective sheaths.

3.3 Grouting of Dowels

1. Drill holes for dowels at locations and to depths indicated on the drawings or as directed by the Departmental Representative.
2. Hole size to be as recommended by grout manufacturer.
3. Install dowel and grout in conformance with grout manufacturer recommendations.

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

PART 1 - GENERAL

1.1 Description of the Work

1. The work of this section covers the requirements for the supply and placement of concrete for refacing of concrete abutments and patch repairs. The placement of the galvanized reinforcing steel is included under this item.
2. The supply and placement of anchor bolts for new mechanical components to be attached to the abutments is included under this item.
3. Abrasive blast cleaning of the concrete surfaces and existing reinforcing steel to which the concrete is to be placed, as well as all formwork is also part of this work.
4. Epoxy injection grouting below the armouring angle on the south abutment is also part of this work.
5. Supply and installation of galvanized steel dowels with epoxy/grout is covered under Section 03 20 00 - Concrete Reinforcing.
6. Supply of the galvanized reinforcing steel is covered under Section 03 20 00 – Concrete Reinforcing.
7. Comply with restrictions stipulated in this and other sections of these specifications.
8. Note: the finished elevation of all surfaces that support the bridge and mechanical / electrical components are critical and require coordination with the steel fabrication process. The actual finished elevations of bearing points on the abutments and pivot pier will be reviewed to ensure that sufficient allowance for adjustment with shims and grout is allowed.

1.2 Related Sections

1. Section 01 35 43 – Archaeological, Cultural and Environmental Procedures
2. Section 02 41 23 - Selective Site Demolition.
3. Section 03 20 00 - Concrete Reinforcing.

1.3 References

1. All concrete supply and placement shall conform to CAN/CSA A23.1-14, Concrete Materials and Method of Concrete Construction.

2. All formwork shall conform to CAN/CSA S269.3-M92 (R2013), Concrete Formwork as supplemented by the Contract Specifications.
3. All falsework shall conform to CSA S269.1-16. Falsework for Construction Purposes.
4. Canadian Standards Association (CSA).
 1. CAN/CSA-A3001-13, Cementitious Materials for use in Concrete.
 2. CAN/CSA-A23.1-14, Concrete Materials and Methods of Concrete Construction.
 3. CAN/CSA-A23.2-14, Methods of Test for Concrete.
5. Abrasive blast cleaning of concrete to general method and cleanliness of SSPC-SP6-89, Commercial Blast Cleaning.

1.4 Samples

1. Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
2. At least 2 weeks prior to commencing work, inform Departmental Representative of proposed source of aggregates and provide access for sampling.

1.5 Certificates

1. Submit certificates for concrete in accordance with Section 01 33 00 - Submittal Procedures.
2. A minimum of 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 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 CAN/CSA-A23.1.
4. Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/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.

1.6 Quality Assurance

1. A minimum of 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.
 3. Cold weather concrete.
 4. Curing.
 5. Finishing.
 6. Formwork removal.
 7. Joints.

1.7 Waste Management and Disposal

1. To Section 01 35 43 – Archaeological, Cultural and 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 work adequately.

1.8 Measurement for Payment

1. Work covered by this Section will be paid for under the unit price items "Concrete in North Abutment" and "Concrete in South Abutment" and for the units as indicated.
2. Case-in-place concrete will be measured by the cubic meter calculated from neat dimensions indicated on the drawings 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 for payment.
3. The tendered prices for the above items shall include all costs for labour, materials, including formwork, installation support, bonding agent and equipment necessary to place and finish the work of these items, in accordance with the Contract Drawings and these Specifications.
4. Heating and cooling of water and aggregates, and providing hot and cold weather protection will not be measured but are considered incidental to the work.

5. All other work, necessary to the completion of the work of cast-in-place concrete, including abrasive cleaning of concrete and existing reinforcing steel, the placement of new reinforcing bars and the supply and placement of anchor bolts will not be measured separately for payment but will be considered incidental to the work.
6. No measurement for payment will be made for the supply and installation of grout including injection hoses and fittings under the armouring angle at the south abutment. Payment shall be made under the lump sum price item "Armouring Angle Grout Assembly" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Substitution

1. Substitution of specified products may be considered by the Departmental Representative provided that 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 that the proposed product meets or exceeds the specified products performance criteria tested in accordance with standards designated in the specified product manufacturer's technical data sheet.
2. Substitute products 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-A3001.
2. Supplementary cementing materials: to CAN/CSA- A3001.
3. Cementitious hydraulic slag: to CAN/CSA-A363.
4. Water: to CAN/CSA-A23.1.
5. Aggregates: to CAN/CSA-A23.1. Coarse aggregates to be normal density.
6. Abrasive 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 C 260.

8. Chemical admixtures: to ASTM C 494. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
9. Grout: meet or exceed specified provincial standards using only materials that are approved for use in the Ministry of Transportation of Ontario (MTO) construction projects. Grout injection system shall be supplied from a Manufacturer listed in DSM 9.40.18. Demonstrate in writing that the product meets or exceeds provincial requirements.
10. Anchor Bolts: as called for in mechanical specifications.

2.3 Mixes

1. Proportion normal density concrete in accordance with CAN/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: 5% to 8% except for concrete with 10 mm aggregate which shall have air content 6% to 9%.
 8. Chemical admixtures: in accordance with ASTM C 494. 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 Reaction" of CAN/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 testing 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 amount of admixtures to ensure that the concrete does not segregate.

PART 3 - EXECUTION

3.1 Housing and Heating

1. Protection - General:
 1. The Contractor shall protect the concrete 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. Due to the accelerated schedule for this project, it is critical that concrete placement occurs without delay due to weather. Therefore, concrete placement locations are to be housed, heated and protected from inclement weather conditions by constructing protective enclosures as required to complete concrete pouring and curing without delay.
 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 5°C for a period of 36 hours prior to pouring concrete.
 2. During the 7 days following placing, the concrete temperature shall not fall below 10°C or exceed 70°C.
 3. For cold weather conditions, protection of concrete shall at least conform to Table 1. The temperature of the concrete shall be checked to ensure that at least the minimum temperature specified above is maintained at all times.

**TABLE 1 - MINIMUM COLD WEATHER PROTECTIVE MEASURES
 ALL CONCRETE**

Anticipated Minimum Air Temperature (°C)	Thickness			
	>1.0m	1.0-0.5m	<0.5-0.25m	<0.25m
+5 to 0	pm1	pm1	pm1	pm2
-1 to -10	pm2	pm2	pm3	pm4
-11 to -20	pm3	pm3	pm4	pm5
less than -20	pm4	pm5	pm5	pm5

**Maximum Allowable Drop in Concrete or Patching
 Temperature / 24h**

>2.0m	10°C
1.0-0.99m	15°C
<1.0m	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 an R-Value of 0.67**.
- pm3 - Cover concrete as for pm1, then cover the moisture vapour barrier with insulation having an R-Value of 1.33**.
- pm4 - Cover concrete as for pm1, then cover the moisture vapour barrier with insulation having an 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, and grouting. 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 temperature for each 24 h period as specified in Table 1 is not exceeded.
2. The protection shall not be totally removed nor shall the concrete be fully exposed to the air until the average temperature of the concrete is within 10°C of the air temperature.

3.2 Preparation

1. Obtain Departmental Representative's written approval before placing concrete. Provide 72 hours' notice prior to placing of concrete.
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 until authorized in writing by Departmental Representative.

3.3 Construction

1. Do cast-in-place concrete work in accordance with CAN/CSA A23.1.
2. Finishing:
 1. Finish concrete in accordance with CAN/CSA-A23.1.
 2. Use procedures acceptable to Departmental Representative or those noted in CAN/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 Abrasive Blasting

1. Applicable to all existing concrete surfaces against which new concrete is to be placed.

2. Must take place not more than 48 hours before the placement of any concrete. 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 is to be placed, by hand chipping. Expose and clean the coarse aggregate of the existing concrete by blasting with abrasive. Remove all dirt, laitance, loose material, paint, hardened concrete slurry, or any other contaminant(s) which would inhibit the bonding of the new concrete 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 concrete 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 30 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. Immediately before placing concrete, place bonding agent to ASTM C1059 or cement slurry bonding agent.
2. Install wet burlap and white plastic over the newly placed concrete after it has initially set and so 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 7 days.

3.6 Site Tolerance

1. Unless otherwise noted, concrete application tolerance shall be in accordance with CAN/CSA-A23.1 straight edge method.

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 CAN/CSA-A23.1.

2. Departmental Representative will pay for costs of tests (to be reimbursed by Parks Canada). 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.

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

PART 1 - GENERAL

1.1 Description of Work

1. This section covers the preparation of concrete surfaces and application of penetrating sealer including all required cleaning, protection and access. The following concrete surfaces shall be sealed: concrete bridge deck, north abutment, south abutment and pivot pier. All exposed vertical and horizontal surfaces of the abutment and pivot pier shall be sealed after completing all structural and mechanical rehabilitation.

1.2 Related Sections

1. Section 01 33 00 - Submittal Procedures.
2. Section 01 35 43 – Archaeological, Cultural and Environmental Procedures
3. Section 01 35 30 - Health and Safety.
4. Section 03 35 00 - Cast-in-Place Concrete.

1.3 Submittals

1. Contractor shall submit technical data sheets of the proposed penetrating sealer to the Department Representative a minimum of 1 week prior to the commencement of application/preparation.

1.4 Measurement and Payment

1. No measurement of payment will be made for the supply, preparation and application of sealer to the concrete surfaces (deck, abutments and pivot pier). Payment shall be made under the lump sum price items "Concrete Sealer on Bridge Deck", "Concrete Sealer on Abutments", "Concrete Sealer on Pivot Pier", and shall include all costs for labour, materials, and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Materials

1. Concrete Sealers:
 1. Sealer shall be clear, breathable, low VOC, VOC-compliant, greater than 40 percent alkylalkoxysilane penetrating sealer (40% silane). The sealer shall be compatible with the surface over which it is to be applied. The

resultant coating shall have the ability to breathe, be water resistance, durable, non-yellowing and resistance to ultraviolet light and weathering.

2. The penetrating concrete sealer shall comply with the following:

Active ingredient: monomeric silane or alkylalkoxysilane

Active ingredient content: Minimum 40% by weight

Appearance: Clear

PART 3 - EXECUTION

3.1 Preparation

1. The Contractor shall follow the Manufacturer's recommended surface preparation and application of the coating system throughout all stages of work.
2. The Contractor shall take all necessary protection measures when working adjacent to other facilities or the public to ensure that the materials from the application of the sealer to not fall onto adjacent facilities, into the Canal or damage property.
3. Surfaces to receive concrete sealer treatment shall be cleaned thoroughly by power washing with high pressure water (5000 psi minimum) and appropriate cleaners to ensure concrete surfaces are free of dust, surface dirt, oil and other contaminants. Water used in cleaning shall be from an approved source by the Departmental Representative prior to the start of cleaning work. The surface of the concrete to be sealed must be clean and dry at the time of sealer application. Relative humidity conditions during time of application shall be per the manufacturer's requirements and recommendations. The seal shall be applied in strict accordance with the manufacturer's recommendations, observing all necessary safety precautions required by regulating authorities.
4. The Contractor shall take precautions to ensure that workers and work areas are adequately protected from fire and health hazards resulting from the handling, mixing and application of material, observing all necessary safety precautions required by regulating authorities.
5. All materials shall be delivered in original sealed containers, clearly marked with the manufacturer's name, brand name, type of material, batch number, date of manufacture and all other WHMIS required labeling.
6. Delivery, storage, handling, applicable temperature range, and environmental restrictions on use shall be in accordance with manufacturer's recommendations.
7. Asphalt and timber curbs shall be taped or otherwise masked during sealer applications. Overspray and application of sealer to surfaces other than specified shall be removed at the Contractor's expense.

8. Apply in strict conformance with the manufacturer's written instructions and provisions contained herein including the minimum curing time for concrete that has been rehabilitated. The concrete sealer shall not be applied until the concrete has cured for a minimum period of 28 days unless recommended otherwise by the manufacturer.
9. Do not apply below temperature of +5°C or when ambient temperature is expected to fall below +5°C within 12 hours upon application. Do not apply when rain or inclement weather is forecasted within 12 to 24 hours following application.
10. Do not apply in direct sunlight when substrate temperature exceeds +32°C.
11. The Contractor shall dispose of all excess material, waste material and debris in conformance with environmental regulations specified elsewhere in the contract.

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

PART 1 - GENERAL

1.1 Description of Work

1. This section covers the requirements for the supply, fabrication and installation of new structural steel components and rehabilitation or strengthening of existing steel components (those to remain). The supply and installation of all new steelwork is intended to resemble the existing bridge form in general (with some details being modified).
2. All components of the bridge shall use new steel conforming to CAN/CSA G40.20/ G40.21 - 13 General Requirements for Rolled or Welded Structural Quality Steel.
3. All connections visible to the public shall be made with Tension Control Bolts conforming to ASTM F1852 with heads resembling rivets (dome shaped) unless specifically designated to have regular ASTM F3125 Bolts or Rivets (sidewalk). The dome heads of the Tension Control Bolts shall be oriented such that they are on the visible side of all connections, to the Public, toward the exterior of each member. This may require special short guns.
4. The original design of the bridge was done in 1921 using Imperial units. The dimensions on the Contract drawings were soft-converted to Metric units. The Contractor to verify all dimensions shown on the Plans.
5. The drawings for the original bridge shall be used as a guideline for the rehabilitation of the bridge together with the Contract Drawings and most importantly, the confirmation with field measurements. Copies of the drawings for the existing bridge are available upon request.
6. Due to the clearances between bolts, sequenced installation of bolts may be required.
7. Counterbalancing of the bridge is required and this shall be achieved with steel plates. Existing steel counterweight baskets and blocks are to be removed from the existing bridge as per the Contract Drawings. New counterweight plates are to be fabricated with dimensions and quantities as provided on the Contract Drawings. Any weights not used for balancing shall be turned over to Parks Canada for use as spares. This balance adjustment operation will be completed as part of the bridge commissioning operation. It is anticipated that the final quantity of counterweight will not be finalized/confirmed until the bridge is confirmed to be balanced. It may be necessary to provide temporary counterweights during the commissioning stage to finalize counterweight requirements prior to fabricating the permanent counterweight. No measurement for payment for these temporary counterweights is to occur, as this balancing operation is to be included in the Contract lump sum price.

1.2 Related Sections

1. Section 01 33 00 - Submittal Procedures.
2. Section 01 35 44 - Environmental Protection, Lead Paint.
3. Section 01 61 00 - Common Product Requirements.
4. Section 01 91 37 - Decommissioning / Commissioning.
5. Section 02 41 23 - Selective Site Demolition.
6. Section 03 30 00 - Cast-in-Place Concrete.
7. Section 06 10 11 - Rough Carpentry.
8. Section 09 97 19 - Painting Exterior Metal Surfaces.

1.3 References

1. American Society for Testing and Materials (ASTM)
 1. ASTM F3125/F3125M-18, Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
 2. ASTM F436/436M-18 Standard Specification for Hardened Steel Washers.
 3. ASTM A563-15 Standard Specification for Carbon and Alloy Steel Nuts.
 4. ASTM A123/ASTM M-17 Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
 5. ASTM A502-03 (2015) Standard Specification for Rivets, Steel, Structural.
2. Canadian Standards Association (CSA)
 1. CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel.
 2. CAN/CSA-G164-18 Hot Dip Galvanizing of Irregularly Shaped Articles.
 3. CAN/CSA-S6-14 Canadian Highway Bridge Design Code (CHBDC).
 4. CAN/CSA-S16-14 Limit States Design of Steel Structures.
 5. CSA S269.1-16 Falsework for Construction Purposes.
 6. CSA W48-18 Filler Metals and Allied Materials for Metal Arc Welding.
 7. CSA W59-18 Welded Steel Construction, (Metal Arc Welding).
 8. CSA W47.1-09 (R2014) Certification of Companies for Fusion Welding of Steel.

3. ASME B18.1.2-1972 (R2016) Large Rivets (1/2 Inch Nominal Diameter and Larger).

1.4 Shop Drawings

1. Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures. Shop drawings to be stamped and signed by a professional engineer registered in the Province of Ontario and who is experienced in the work.
2. Indicate shop and erection details including shop splices, cuts, copes, connections, holes, bearing plates, threaded fasteners, bolts, welds and the supply, fabrication and installation of appurtenances. Indicate welds by CSA W59 welding symbols. Proposed welding procedures to be stamped and approved by the contractor's engineer certified by the Canadian Welding Bureau.
3. The shop drawings shall designate the preferred sequence of installation and description of methods, temporary bracing and strengthening, sequence of erection and type of equipment proposed for use in erecting structural steel and supporting existing steel work on which repairs are being completed. Interfacing with structural and mechanical components are also to be indicated.
4. Welding to the members of the bridge is not anticipated on this project. The structure is a dynamic and the use of any welding shall be avoided except as noted. Any proposed welding procedures shall be stamped by a Professional Engineer licensed in the Province of Ontario specializing in weld design and approved by the Canadian Welding Bureau and receive special approval, for use on the structure, from the Departmental Representative and Owner.
5. Bracing and Falsework drawings submitted shall bear the signature and stamp of a qualified Professional Engineer registered or licensed in the Province of Ontario, Canada. The structure shall be supported during all removals and erections such that no section is overloaded and support is maintained.

1.5 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 structural members, plates and sections. Do not notch edges of members. Do not cause excessive stresses.
3. Protect threads of bolts and nuts during storage.
4. Ensure that no portion of delivered material comes into 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 a minimum of 7 days prior to shipping.

1.6 Record Drawings

1. The Contractor shall complete As-Built drawings for the structure. It is anticipated for the most part that the shop drawings will form the basis for the As-Built Drawings for the steel work marked with changes that have occurred during fabrication.

1.7 Measurement and Payment

1. The work of this Section for the supply, fabrication and installation of new steel bridge components in the superstructure will not be measured for payment. It will be paid for under the Contract lump sum price.
2. No measurement for payment will be made for the supply, fabrication and installation of new steel bridge components for the main plate girders and pivot girders. Payment shall be made under the lump sum price items "Structural Steel Repairs to Main Plate Girders" and, "Structural Steel Repairs to Pivot Girders" and shall include all costs for labour, materials and equipment necessary to do the work of this item.
3. No measurement for payment will be made for the supply, fabrication and installation of new bent armouring angle c/w welded studs on the south abutment. Payment shall be made under the lump sum price item "Install New Armouring Angle at South Abutment" and shall include all costs for labour, materials and equipment necessary to do the work of this item.
4. No measurement for payment will be made for the supply, fabrication and installation of new bent nosing angle and supporting structure on the end of the laminated timber deck. Payment shall be made under the lump sum price item "Install New Nosing Angle on Timber Deck" and shall include all costs for labour, materials and equipment necessary to do the work of this item.
5. No measurement for payment will be made for the supply, fabrication and installation of new posts, lattice and rivets for the pedestrian railing. Straighten of selected lattice as per the Contract Drawings is to be included under this item. Payment shall be made under the lump sum price item "Structural Steel Repairs to Pedestrian Railing" and shall include all costs for labour, materials and equipment necessary to do the work of this item. This item includes the supply and installation of pressure-driven rivets at locations where lattice plates are to be replaced as detailed on the Contract Drawings.
6. No measurement for payment will be made for the supply, fabrication and installation of the balance wheel beams and balance wheel supports (HSS strut, lateral bracing, gusset plates, base plates, bolts). Payment shall be made under the lump sum price item "Install New Balance Wheel Beams and Supports" and

- shall include all costs for labour, materials and equipment necessary to do the work of this item.
7. No measurement for payment will be made for the supply, fabrication and installation of new sidewalk stringers. Salvaging of existing connection clip angles (including cleaning) is to be included under this item. Payment shall be made under the lump sum price item "Install New Sidewalk Stringers" and shall include all costs for labour, materials and equipment necessary to do the work of this item.
 8. No measurement for payment will be made for the supply, fabrication and installation of new flange angles on the cantilever sidewalk floor beams. Payment shall be made under the lump sum price item "Install New Sidewalk Flange Angles" and shall include all costs for labour, materials and equipment necessary to do the work of this item.
 9. It is anticipated that some rivet holes may need to be reamed depending on access, number of steel plies connected or corrosion. Contractor shall provide an allowance unit price item cost under "Ream Rivet Hole (Allowance)" to ream a rivet hole and shall include all costs associated with reaming, furnishing and installing oversized bolts c/w washers and bolt. This method of repair shall not be used without prior approval of the Departmental Representative. This method of repair is different than the light reaming expected to dress an existing hole after rivet removal. The cost of this light reaming shall be considered incidental to the structural steel work and shall be covered under the respective lump sum price for the component(s) being replaced.
 10. No measurement for payment will be made for the supply, fabrication and installation of individual steel counterweight plates and steel straps. Payment shall be made under the lump sum price item "Install New Steel Counterweights" and shall include all costs for labour, materials and equipment necessary for the supply, fabrication and installation of individual counterweight plates. It is anticipated that the final quantity of counterweight will not be finalized / confirmed until the bridge is confirmed to be balanced. It may be necessary to provide temporary counterweights during the commissioning stage to finalize counterweight requirements prior to fabricating the permanent counterweight. No measurement for payment for these temporary counterweights is to occur, as this balancing operation is to be included in the "Decommissioning/Commissioning the Bridge".

PART 2 - PRODUCTS

2.1 Materials

1. Structural steel: to CSA G40.21-13, grade and types, 350W for rolled sections, 350WT Category 2 for plates, HSS members to 350W Class C unless otherwise noted on Contract Drawings. Pivot girders and all its attachments are fracture critical.

2. ASTM F1852 Tension Control Bolts with Rivet Shaped Heads.
3. High strength bolts, nuts and hardened washers: to ASTM F3125 Grade A325.
4. Rivets: to ASTM A502-03 (2015) Grade 1.
5. Welding electrodes: to CSA W48 series.
6. Hot dip galvanizing: to CAN/CSA-G164, minimum zinc coating of 600 g/m².
7. Anchor bolts, washers and nuts: to CSA G40.20/G40.21, galvanized.
8. Grout to base plates to be an approved non-shrink premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents.
9. Stud connectors for nosing angles shall be according to CSA W59, Appendix H. Only studs of Type B shall be used.

2.2 Source Quality Control

1. Provide Departmental Representative, prior to fabrication, two copies of steel producer certificates, in accordance with CSA G40.20/G40.21.
2. Provide certification that tension control bolts, bolts, nuts and washers comply with applicable standards.
3. Provide Departmental Representative with two copies of certified test reports for Charpy V-notch tests for plates.

2.3 Quality Control

1. The Contractor shall have a quality control program that will demonstrate to the Departmental Representative the consistency of the bolt tightening.
2. All new bolts shall be installed prior to coating of the superstructure including the bolts. Coat all bolts in the field after the connection has been fully assembled with the bolt correctly installed (splines sheared off for tension control bolts). Recoat and repair areas where bolts are installed after coating.
3. Tension control 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 inconsistent results are being achieved, regular hex heavy 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.

4. 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.
5. Provide suitable facilities and cooperate with inspection organization and Departmental Representative in carrying out inspection and tests required.

PART 3 - EXECUTION

3.1 Preparation

1. If staining or defacing occurs, clean steel surfaces to Departmental Representative's approval.
2. Verify location of existing steel components to be strengthened or rehabilitated, before erection of structural steel; report discrepancies to Departmental Representative.
3. 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 steelwork must be completed in conjunction with the operations of the Bridge and shall allow time for commissioning specified elsewhere in this specification.

3.2 Fabrication

1. Do fabrication and erection of structural steel in accordance with CAN/CSA-S6, Canadian Highway Bridge Design Code and to the requirements of this specification. Where there is contradiction with the requirements of this specification, this specification shall take precedence.
2. For detailing and fabrication, "typical" or "similar" does not necessarily mean "identical".
3. 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 for painting.
4. All plate edges, re-entrant or end cuts and blocks shall be surfaced to an approximate 3 mm radius to prevent paint cracks from forming on sharp corners of structural steel work. All re-entrant cuts shall be 50 mm minimum radius, unless otherwise noted.
5. Drill the maximum amount of full size holes in required material in the shop. The spacing between existing rivets and bolt holes is not shown on the Contract Drawings as it is variable and approximate. Bolt holes in new structural steel components that are to match locations where rivets or bolts are to be removed

shall be field drilled. The Contractor has the option to create an accurate field-measured template in order to drill these holes in the shop. If template method is chosen, a written procedure must be submitted for approval 7 days before commencement of work.

6. All bolts holes shall be a maximum of 2 mm larger than the diameter of the bolt unless noted otherwise on the Contract Drawings.
7. Oversize holes shall not be more than 4 mm larger than bolts 22 mm or less in diameter, not more than 6 mm larger than bolts 24 mm in diameter, and not more than 8 mm larger than bolts 27 mm or more in diameter. Oversized washers shall be used with oversized holes. For oversize holes, the distance between edges of adjacent holes or edge of holes and edges of members shall not be less than permitted with conventional holes.
8. Field splices: to approval of Departmental Representative.
9. Mark members in accordance with CSA G40.20/G40.21. Do not use die stamping.
10. Match marking: shop mark.
11. 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.

3.3 Welded Construction

1. All welded construction shall be according to CSA W59 and Clause A10.1.5 of CAN/CSA-S6, and to the requirements of this specification. Where there is contradiction, this specification shall take precedence.
2. 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 W47.1-09 (R2014) 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.
3. Do welding in shop unless otherwise permitted by the Departmental Representative.
4. Weld only at locations indicated. All welds shall be continuous unless otherwise noted on the plans.
5. Field welding will only be permitted where shown on the plans. Field welding to structural components will not be permitted unless specifically authorized by the Departmental Representative.

6. Temporary tack welds are not permitted. Temporary welds shall not be used on any existing members.
7. The minimum fillet weld shall be as specified on the Contract Drawings.
8. All welding inspection shall be in accordance to CSA W59.

3.4 Bolted Construction

1. Bolted construction shall be according to CAN/CSA-S6, Clause A10.1.6, and to the requirements of this specification. Where there is contradiction, this specification shall take precedence.
2. Bolts shall be sufficiently long to exclude threads from the shear plane.
3. Beveled washers shall be provided for all connections to the sloped faces of rolled sections, and at any other location where the lack of parallelism is sufficient to require it, as stipulated in Clause A10.1.6.6.
4. Tension Control Bolts with heads that resemble rivets shall be used on all visible bolted connections on the exterior faces of the main bridge girders.
5. All other connections can be made with regular heavy hexagon structural A325 bolts with semi-finished hexagon nuts. Two hardened washers shall be required, one under each end of bolt. Bolt spacing shall be in accordance with the design drawings, shop drawings, and the requirements of the design specifications.
6. Tension control bolts are single use bolts and shall be replaced if they are loosened.
7. During the erection of steel work, A325 bolts that are torqued and later loosened, may not be reused. Re-tensioning previously tensioned bolts loosened by the tensioning of adjacent bolts is not considered to be reuse.
8. All regular heavy hexagon structural bolts shall be installed by the "Turn-of-Nut Method" in accordance with CAN/CSA-S6 and CSA S16. Supply a calibrated (certified) torque wrench to ensure satisfactory tensions are being obtained.
9. Dimensional and workmanship tolerances shall be according to CSA W59 and Clause A10.1.7 of CAN/CSA-S6, and to the requirements of this specification. Where there is contradiction, this specification shall take precedence.
10. Allowable tolerance for bolt holes:
 1. Matching holes for bolts to line up so that a dowel 1 mm less in diameter than the intended 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. Center-to-center distance between any two holes of group to vary by not more than 1 mm from dimensioned distance between such holes.
4. Center-to-center distance between any two groups of holes to vary not more than following:

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

5. Correct mispunched or misdrilled members only as directed by Departmental Representative. Submit intended connection for approval prior to attempting repair.

3.5 Rivet Construction

1. Rivet holes for new structural steel plates shall be drilled.
2. All holes shall be drilled at 90 degrees to the work surface. Extreme pressure shall not be applied to the drilling device as to punch through the material. When drilling through more than one member, the members shall be secured tightly to prevent misalignment of holes due to shifting or separation of the members.
3. All holes shall be 1mm to 2 mm greater than the rivet shank diameter.
4. Before members are riveted together, all burrs and foreign material resulting from drilling shall be removed from the surfaces to be joined.
5. Members to be riveted together shall be temporarily pinned or bolted and rigidly clamped together while riveting. Drifting of parts during assembly shall not distort or enlarge the holes. The Contractor shall determine the number and pattern of temporary pins or bolts necessary to bring surfaces into adequate contact for riveting. Such pattern shall be approved by the Departmental Representative.
6. Rivet grip length will vary depending on location. The length of un-driven rivets shall be sized to provide minimum head dimensions as specified in ANSI B18.1.2.
7. The rivets shall be heated in an electric, gas or kerosene furnace and shall be driven within the range of 815 °C to 1065 °C. Direct flame impingement on the rivets shall be avoided during heating. Prior to working the rivet, the diameter length, temperature and fit shall be evaluated. Any slag formed on the rivets shall be knocked prior to riveting.
8. Rivets shall be pressure-driven using a machine. The driven rivets shall be tight and in uniform contact with the surfaces of the joined members. The surfaces of the plates to be riveted shall not be scared from the process of driving the rivets.
9. Installation of rivets shall be accomplished in a workmanlike manner. Rivet assemblies shall be of uniform quality and free from cracks, gaps, sharp edges,

burrs, loose parts or other defects which might render the assemblies unsuitable for its intended purpose.

10. The Contractor shall be responsible for all riveting quality control. All rivets shall be inspected immediately upon completion of driving and forming to ensure the rivet heads are seated against the plate and are not cracked. The Contractor shall visually inspect each rivet for the conformance with ANSI Standard B18.1.2. Sound each rivet to ensure it is clamped tightly in place.

3.6 Erection

1. Bolted construction shall be according to CAN/CSA-S6, Clause A10.1.6, and to the requirements of this specification. Where there is contradiction, this specification shall take precedence.
 1. Erection shall be according to CAN/CSA-S6, Clause A10.1.10 and other relevant clauses, and to the requirements of this specification. Where there is contradiction, this specification shall take precedence.
 2. Erection shall not commence until Erection Procedures submitted in conformance with this Section have been reviewed and returned by the Departmental Representative.
 3. The Departmental Representative shall be notified in writing of the starting erection date at least 3 weeks prior to the commencement of field operations. Work shall not be carried out until the Departmental Representative is on site.
 4. Repairs to erected material shall only be permitted after the Departmental Representative has approved the repair procedure.
 5. Welding shall not be used to fill misplaced holes.
 6. Hammering that can damage or distort the members is not permitted.
2. Erection Conditions (CAN/CSA-S6, Clause A10.1.10.1)
 1. Additional permanent material may be provided to ensure that the member capacities are not exceeded during erection, if approved by the Departmental Representative. The additional material shall be shown in the erection diagram.
 2. Be responsible to ensure the stability of the existing bridge structure and its components at all times until the structural steel is in its final location with all permanent bracing, connections, and supports in place.
3. Falsework (CAN/CSA-S6, Clause A10.1.10.2)
 1. Do falsework in accordance with CSA S269.1 except where specified otherwise.
 2. Temporary bracing method calculations and drawings shall be stamped by a Professional Engineer licensed to practice in the Province of Ontario. Drawings and calculations shall be submitted to the Departmental Representative prior to the work being performed.

3. Keep all staging and falsework in a safe condition and provide such temporary stairways, gangways, staging, railing or other means of access as the Departmental Representative may direct for a thorough inspection of the work during erection and prior to the final acceptance.
 4. Falsework and staging shall meet or exceed all applicable Occupational Health and Safety regulations.
 5. Use netting and other means necessary to prevent bolts, tools, etc from falling into the Canal or onto roadways, pathways, sidewalks, staging areas, etc.
4. Field Assembly (CAN/CSA-S6, Clause A10.1.10.5)
1. Field connections shall be accurately and securely fitted up before bolts are entered. Drifting shall be only such as to draw parts into position and not sufficient to enlarge holes or distort, kink or sharply bend the metal on any part. No reaming of holes will be permitted unless approved by the Departmental Representative.
 2. Employ pneumatic wrenches and high tensile alloy steel bolts (A325) where required to secure the necessary tight fit of parts to be bolted.
 3. Assembly bolts should be painted red and removed prior to completion of connection. Assembly bolts should not be part of final connection as they are tensioned and loosened repeatedly and thus fall under the "Reuse of bolts" clause of this specification.
 4. Excessive hammering which will distort the members will not be permitted.
 5. Surfaces in permanent contact shall be power tool cleaned and primed as specified in 09 97 19 - Painting Exterior Metal Surfaces just prior to assembly.
 6. Correct minor misfits, using reaming as specified, cutting, clipping and shimming. Any error in shop fabrication, or any deformation resulting from handling or transportation, which prevents the proper assembly and fitting of parts, especially connections to main member materials shall be reported to the Departmental Representative for approval of the method of correction. No correction of misfits of any character shall be made prior to obtaining the approval of the Departmental Representative.
5. New Steelwork Attached to Existing Steelwork
1. A drift pin should fill every open hole when replacing existing fasteners with required bolts in connecting required material to existing. One existing fastener shall be removed and the hole filled with a drift pin before a second fastener is removed.
 2. Once all existing fasteners are removed and replaced with drift pins, the required material shall be put into place. The drift pins shall be removed and replaced one by one with required bolts. Bolts should only be snug tight until all drift pins are removed and replaced with bolts. Only then should the bolts be fully tightened.
 3. Temporary bracing shall be used as required. All temporary bracing methods shall be analyzed and approved by a Professional Engineer licensed to practice in the Province of Ontario.

4. The shop drawings shall show the size and location of connection areas (faying surfaces) and rivet replacement on existing members so they can be laid out on the existing bridge by the Contractor.
6. Temporary Bracing for Existing Steelwork
 1. Temporary bracing shall be used as required by the Contractor's methods to adequately support and stabilize existing steelwork during strengthening and where connections are strengthened or replaced.
 2. Welding to existing steelwork is not permitted.
 3. Any bolting to existing steelwork shall not reduce the existing net area unless noted otherwise in the contract documents.
 4. Temporary bracing method calculations and drawings shall be stamped by a Professional Engineer licensed to practice in the Province of Ontario. Drawings and calculations shall be submitted to the Departmental Representative prior to the work being performed.
 5. Do not use any of the material intended for use in the finished structure for erection or temporary purposes unless such use is provided for on the plans or authorized by the Departmental Representative.
 6. Upon completion of the steelwork, when bracing is no longer required to provide structural stability, all temporary braces shall be removed.
7. Removal of Existing Bolts and Rivets
 1. Rivet removal will be required to complete both the designated repairs and additional repairs identified on site.
 2. Submit to the Departmental Representative the proposed method of 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 cannot be used.
 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 remain. In the event that the Departmental Representative determines that rivet removal work is resulting in damage to the structure, cease rivet removal operations until 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 shear off with a rivet buster and the shank driven, drilled, cored or jacked out as required by mechanical means. 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 between the concrete deck and the main plate girders. 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 2 mm and only after the proposed enlargement is reviewed and approved by the Departmental Representative. Holes shall be enlarged by reaming.
9. At locations where surrounding material is gouged or damaged as a result of the Contractor's operations, the surrounding material shall be repaired, replaced or restored to the Departmental Representative's satisfaction.
10. When a damaged hole is smoothed by light reaming to dress the hole, the cost of light reaming of existing holes shall be incidental to structural steelwork.
11. At locations where rivet holes contain cracked, torn, or otherwise damaged material due to condition other than the Contractor's operations, immediately contact the Departmental Representative for review before rivet removal. It is likely, where the defect is minor, that the hole shall be reamed to remove the defect and that an oversized bolt shall be used.
12. It is likely that lead based paint is present at all metalwork connections between plies and under rivet heads on all portions of the bridge. Therefore, take all necessary precautions to minimize worker lead exposure as required by Health and Safety Regulations Section 02 83 12 – Lead-Base Paint Abatement – Maximum Protection.
13. Paint damaged surfaces in accordance with the requirements of Section 09 97 19 – Painting Exterior Metal Surfaces.
14. Existing bolts cannot be reused.
15. There should never be more than one open hole at any given time in a connection when replacing fasteners unless approved by the Departmental Representative, proper temporary bracing has been provided and an engineer has reviewed the procedure, or described elsewhere in these Specifications. Where the plan details show existing fasteners to be replaced with high strength bolts, the existing fastener, rivet or bolt, shall be removed one at a time and replaced with the size and type of bolt shown in the plans. To facilitate replacement of members, temporary bolts may be used to carry out Work.
16. Holes left as a result of existing steelwork removal shall be filled with ASTM A325 bolts.

8. Removing Existing Steelwork

1. Demolition and salvaging: This work consists of the removal of existing bridge steelwork as shown on the contract plans and provides for the mandatory scrapping and recycling of the removed steelwork by a facility approved by the Departmental Representative in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal. The facility shall be advised in writing (with copies to the Departmental Representative) about the possible presence of lead in existing coating at faying surfaces and possibly other hazardous substances.

2. Ensure that all necessary safety precautions are taken to minimize workers lead exposure levels when performing demolition work, as required by all applicable regulatory authorities, and as indicated in Section 02 83 12 – Lead-Base Paint Abatement – Maximum Precautions.

9. Field Drilling of Required Holes

1. Drilling of required holes in the field shall be by approved methods. The following method is approved:
 - .1 All new holes to be made in the field shall only be drilled full size. Sub- drilling and reaming will not be accepted for new holes. Reaming may be used in the case of existing rivet holes when approved by the Departmental Representative. Whenever possible, reamers shall be directed by mechanical means. Reamed or drilled holes shall be cylindrical and perpendicular to the face of the member.
 - .2 Any burrs created during removal of existing fasteners, or during drilling or reaming shall be removed.
 - .3 Drilling full size holes shall be done using an existing member or a steel template with the utmost care as to position and angle.
 - .4 When holes are reamed or drilled, 85% of the holes in any group shall, after reaming or drilling, show no offset greater than 1 mm between adjacent thickness of metal.
 - .5 Heating to improve the alignment of holes shall not be allowed.
 - .6 Tack welds for the purpose of holding steel parts together while bolting takes place shall not be permitted under any circumstances whatsoever.
 - .7 All existing steel shall be cleaned prior to commencing of any drilling operations.
 - .8 No flame cutting of any holes will be permitted.
2. Mis-drilled members and any error that prevents the proper assembly and fitting of parts shall be reported and the proposed method of correction shall be submitted to the Departmental Representative for review. Corrective measures shall not commence until the submitted proposal is accepted by the Departmental Representative.

10. Additional Repairs

- .1 It is anticipated, and shall be assumed by the Contractor that additional deterioration of the structural steel will be discovered and the number of locations requiring repair shall be increased.

11. Handling of Existing Material

- .1 Perform all work with care so that any existing materials which are to remain in place or be reused, will not be damaged.

- .2 Should the Contractor damage any existing materials which are to remain in place or to be reused, the damaged material shall be repaired or replaced in a manner satisfactory to the Departmental Representative at own cost.
- .3 During removal, take all necessary actions to ensure that none of these removed materials are permitted to fall into the Canal, or onto roadways, pathways, sidewalks, staging areas, etc.

12. Coatings

- .1 Coating of all new steel components and existing structural steel components shall be in accordance with the requirements of Section 09 97 19 – Painting Exterior Metal Surfaces.

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 crane rail will require adjustment to suit the travelled wheel path of the wheels. The alignment and elevation of the rail is critical to the eventual function of the bridge. The rail must be adjusted accurately. The tolerance for vertical placement shall be +/- 0.5 mm. The rail must be level and flat. Verify the level and demonstrate to the Departmental Representative that the rail is in fact within tolerance prior to adjustment or assembly of the bridge over the rail.
3. It is the Contractor's responsibility to adjust the rail both vertically and horizontally such that the central balance 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.
4. Anchor bolts to secure the rail shall be installed by diamond core drilling in the concrete pier and installing the anchor bolts (as called for on the mechanical drawings) using approved grout, installed in strict conformance with the manufacturer's recommendations.

3.8 Nosing Angles

1. Fabricate new nosing angles complete with stud connections, as per the Contract Drawings, for the south abutment. Sufficient field measurements of length and curvature shall be taken to ensure that nosing angle is centered on the abutment, ensuring that required clearances are maintained throughout the swing of the bridge. Distortion shall be corrected prior to setting in concrete.
2. Install angle at required location and cast new concrete only after approval is given by the Departmental Representative. Concrete shall be properly vibrated to ensure that no air voids develop under the angles. Sequence of casting of concrete at nosing angle location shall be that of commission/balancing the bridge followed by the abutment cap.

3. Finish concrete to ensure a smooth transition between angles, nosing and adjoining deck end and abutment top. The tolerance for vertical alignment across all end and intermediate joints shall be 2 mm. No part of the joint assembly will be allowed to be more than 2 mm vertically from a straight edge placed parallel to the travelled lanes, across the joint.

3.9 Counterbalancing Weights

1. With the un-symmetric nature of the bridge, it is necessary to install counterbalancing weights to balance the bridge as part of the Commissioning process. This shall be primarily achieved by installing steel plates at the location as detailed on the drawings. Individual steel counterweights are to be fabricated as detailed. Any blocks left over following the Commissioning phase shall be turned over to Parks Canada for their future use.
2. As part of the shop drawing process, submit details of the counterbalancing weights and steel straps.

3.10 Field Quality Control

1. Manufacturer's Field Services:
 - 1) Obtain written report from manufacturer verifying compliance of work, in handling, installing, protecting and cleaning of steel.
 - 2) Submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - 3) Ensure manufacturer's representative is present before installation, during critical periods of installation and during construction of field joints and testing.
 - 4) Schedule site visits:
 1. After delivery and storage of products, and when preparatory work, or other work, on which the work of this section depends, is complete but before installation begins.
 2. Twice during progress of work at 25% and 60% complete.
 3. Upon completion of the work, after cleaning is carried out.

3.11 Cleaning

1. Progress Cleaning: clean in accordance with Section 01 74 11.
2. Leave work area clean at end of each day.
3. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

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

PART 1 - GENERAL

1.1 Treatment Availability

1. Chromated Copper Arsenate (CCA) preservative treatment is specified and it is increasingly difficult to acquire wood treated with this preservative. The Contractor must pre-arrange and allow long lead times to ensure supply.
2. All wood will have to meet the provisions of this Specification.

1.2 Related Sections

1. Section 01 33 00 - Submittal Procedures.
2. Section 01 35 43 – Archaeological, Cultural and Environmental Procedures
3. Section 06 10 11 - Rough Carpentry.

1.3 References

1. American Wood-Preservers' Association (AWPA).
 1. AWPA M2-01, Standard for Inspection of Treated Wood Products.
 2. AWPA M4-06, Standard for the Care of Preservative-Treated Wood Products.
2. Canada Green Building Council (CaGBC).
 1. LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations
3. Canadian Standards Association (CSA International)
 1. CSA O80 Series-97(R2002) - O80S2-05, Wood Preservation.
 2. CSA O80.20-1.1-M97(R2002), This Standard applies to the fire-retardant treatment of lumber by pressure processes.
 3. 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. CSA O80.201-M89, This Standard covers hydrocarbon solvents for preparing solutions of preservatives.
 5. CSA O322-02, Procedure for Certification of Pressure-Treated Wood Materials for Use in Preserved Wood Foundations.
4. South Coast Air Quality Management District (SCAQMD), California State (SCAQMD).
 1. SCAQMD Rule 1113-04, Architectural Coatings

1.4 Submittals

1. Submit submissions: 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 following information certified by authorized signing officer of treatment plant:
 1. Information listed in AWPA M2 and revisions specified in CSA O80 Series, Supplementary Requirement to AWPA M2 applicable to specified treatment.
 2. Moisture content after drying following treatment with water-borne preservative.
3. Early in the project submit samples and documentation illustrating the quality of the wood and that the correct preservative will be delivered.

1.5 Quality Assurance

1. Plant inspection of products treated with preservative by pressure impregnation will be carried out by designated testing laboratory to AWPA M2, and revisions specified in CSA O80 Series, Supplementary Requirements to AWPA M2.
2. Inspection and testing 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 AWPA Standard P5 Type C. All wood with preservative treatment shall be marked using a certification mark authorized by the Canadian Wood Preservers Bureau. 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.

2. Note: Suppliers of CCA treated wood are becoming less common. Confirm source during tendering.
3. Waterproofing shall be a self-adhering composite membrane as outlined in Section 06 10 11 - Rough Carpentry.
4. Hold down clips to be fabricated with steel conforming to the provisions of the steel specification and galvanized after fabrication.

PART 3 - EXECUTION

3.1 Application: Preservative

1. Treat all wood to CSA O80 Series using CCA preservative for use Category UC4.1 except as follows:
 1. Cut and drill wood to shape, length and size.
 2. Incise the wood on all faces to a depth of incision of 10 mm and to an incision density of 4500 per square meter.
 3. Ensure wood is dried as required for average moisture content of between 23% to 30%.
 4. Heat wood to 56°C for 30 minutes.
 5. Utilize CCA solution of between 2% to 2.5% concentration with temperature between 20°C to 25°C.
 6. Provide for minimum vacuum time of 30 minutes after reaching a full vacuum as per CSA O80.
 7. Pressure treat for a minimum of 6 hours at treatment pressure between 150 psi to 180 psi.
 8. Provided that the above is satisfied no retention and penetration certificates for the pressure treatment will be required.
2. The plant shall use the quality control procedures according to CSA O80 Series.
3. Following water-borne preservative treatment, dry material to maximum moisture content not exceeding 25% at a depth of 25mm prior to preservative treatment.

3.2 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. Treat all end cuts, defects and drilled holes in wood. Take care not to release end cut materials into waterways.

***** 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 decking, pressure treated (PT) plywood, waterproofing membrane, wearing boards, PVC deck drains, drain covers and curbing. All fasteners necessary to complete the work including hold down clips, nails, spikes, screws, bolts, rods and plate washers are included.

1.2 Related Sections

1. Section 02 41 23 - Demolition and Removal.
2. Section 05 12 33 - Structural Steel for Bridge.
3. Section 06 05 73 - Wood Treatment.

1.3 References

1. American Wood Preservers Association (AWPA).
 1. AWPA M2-00, Standard Inspection of Treated Wood Products.
 2. AWPA M4-01, Standard for the Care of Preventive Treated Wood Products.
2. Canadian Standards Association (CSA).
 1. CSA 080 Series-97, Wood Preservation.
 2. CSA B111-1974, Wire Nails, Spikes and Staples.
 3. CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
 4. CAN/CSA-O121-17, Douglas Fir Plywood.
 5. CAN/CSA-0141-91, Softwood Lumber.
 6. CAN/CSA-O86-14, Engineering Design in Wood.
 7. CAN/CSA-G40.21-M92, Structural Quality Steel.
3. National Lumber Grades Authority (NLGA)
 1. Standard Grading Rules for Canadian Lumber 1991.
4. Canadian Wood Preserves Bureau (CWPB).
5. ASTM.
 1. A446/A446M-91 Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process, Structural (Physical) Quality.

2. A307-91, Carbon Steel Bolts and Studs. 6000 psi Tensile Strength.

1.4 Quality Assurance

1. Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

1.5 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 up metal banding, flatten, and place in designated area for recycling.

1.6 Measurement and Payment

1. No measurement for payment will be made for the supply, fabrication and installation of the laminated timber deck, PT plywood, waterproofing membrane, wearing boards, wood curbs, PVC deck drains, drain covers and all specified fasteners (hold down clips, nails, spikes, bolts, screws, rods and plate washers). Installation of the timber curbs on the concrete deck is to be included under this item. Payment shall be made under the lump sum price item "Install New Laminated Timber Deck and Curbs" and shall include all costs for labour, materials and equipment necessary to do the work of this item.
2. Measurement and payment for the supply, fabrication and installation of the nosing angle at the end of the laminated timber deck is covered under Section 05 12 33 - "Structural Steel for Bridge".
3. No measurement for payment will be made for the supply, fabrication and installation of timber sidewalk deck and all specified fasteners (spikes and bolts). Payment shall be made under the lump sum price item "Install Sidewalk Timber Decking" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

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 Coastal Douglas Fir No. 1, incised, preservative treated and graded in accordance with the NLGA Standard Grading rules. All sizes of sawn wood are dressed sizes.
 1. Wood for the laminated portion of the deck shall be Coastal Douglas Fir No. 1 or better, incised, preservative treated and graded in accordance with NGLA standard grading rules.
 2. Care shall be exercised to ensure that, for laminates that are close to the limits of the criteria for Knots, Splits, Shakes and Wanes (of the grading rules), the defects are not placed directly beside each other and within 3 adjacent laminations of each other.
 3. All wood shall be marked using a grading stamp of an association or independent grading agency conforming to CSA 0141. 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
 4. The following tolerances shall apply:
 1. Dressed dimensions (x-section) (\pm) 2mm
 2. Length (\pm) 10mm 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 6 mm or the grading requirements if more stringent.
 2. Splits shall not exceed a length equal to the lesser of twice the member thickness, one and a half times the member width or the applicable limitations of the grading rules
2. Preservatives: preservatives shall be Chromated Copper Arsenate (CCA) conforming to AWWPA Standard P5 Type C. All wood with preservative treatment shall be marked using a certification mark authorized by the Canadian Wood Preservers Bureau. 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.
3. Pressure Treated Plywood: plywood shall conform to CSA-O121-2017 Douglas Fir Plywood (DFP) Grade A Good One Side (G1S) and pressure treated to CSA 080 Series – 97 (R2007).
4. Waterproofing Membrane: waterproofing membrane shall be a self-adhered membrane which consists of an SBS rubberized asphalt compound integrally laminated to a high density cross-laminated polyurethane film. Membrane must

adhere well to the plywood deck and seal around the nails between the wearing boards and laminated deck. An acceptable product is Blueskin or MEL-ROL. The waterproofing membrane shall be applied to the good side of the plywood.

5. PVC pipe deck drains shall conform to CSA B182.2-11.
6. Deck drain to be hot-dipped galvanized in accordance with Section 09 97 19 – Painting Exterior Metal Surfaces. Pipe to ASTM A53 Grade B. Flange plate to CSA G40.21 300W or ASTM A36.

2.2 Accessories

1. Fasteners: all fasteners called for shall conform to the applicable referenced standard and shall be galvanized except for screws to secure PVC drains to the laminated deck which shall be stainless steel.
2. Nail hold down clips (connectors between laminated deck and top flange of steel beams) shall be fabricated from 2 mm thick steel sheet, grade 300W conforming to CAN/CSA G40.21-M and shall be galvanized after fabrication.
3. Nails, spikes and staples: to CSA B111.
4. Bolts: 15.9 mm (5/8") diameter unless indicated otherwise, complete with nuts and washers to ASTM 307.
5. Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, recommended for purpose by manufacturer.

2.3 Finishes

1. Galvanizing: to CAN/CSA-G164, use galvanized fasteners for all work unless noted otherwise.

PART 3 - EXECUTION

3.1 Handling, Storage and Care of Wood

1. Handling and storage of wood shall conform to CAN/CSA 080. 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 can not dry readily.
2. Repair of cuts, abrasions and holes in material treated with waterborne preservatives shall conform to CAN/CSA 080.

3.2 Laminated Deck, Waterproofing, Drains and Wearing Boards

1. Complete repairs to painted 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. Install nail hold down clips as called for on the 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 beam.
4. Holes bored in the curb timbers and deck, shall be liberally treated with repair preservative prior to installation of curb and bolt assemblies and PVC drains.
5. All decking and wood members adjacent to steel members shall be fabricated to allow a 50 mm gap to allow steel to dry unless noted otherwise.
6. All defects in any piece of wood have to be placed such that no similar or other defect is present in the next adjacent two boards in either direction.
7. Nail placement and angle is critical - spacing can be controlled and completed with a story board (board painted or maker lines at the spacing used to keep spacing even). Each layer 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. The angle of insertion should be checked such that it is slightly (4 degrees) toward the center of the wood 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 of 250 mm or 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 in this manner to get an evenly spaced nailed deck. Note that the nailing pattern for the splicing of laminations, at the crown of the deck, shall be as detailed on the drawings.
8. Layout locations for PVC drains and core holes through deck at locations detailed on the drawings. Hole size to be such that PVC drain pipes fit "snug" in the holes. Cut lengths of PVC pipe to provide drainage from deck level to underside of bridge, as indicated on the drawings and to ensure deck run-off is directed away from underside bridge components (pipe elbows will be required). Fit pipe to hole and secure with minimum of four stainless steel screws to laminated deck.
9. Drain covers to be fabricated to secure waterproofing membrane inside of deck drain as per the Contract Drawings. The drain cover shall be flush with the top of the plywood. Drain cover assembly shall be hot-dipped galvanized. Waterproofing membrane to run continuous below top flange plate of drain cover and turned

down the PVC pipe. Ensure that the heads of the screws holding the PVC drain to the laminated deck are not in the way of the drain cover sides.

3.3 Plywood and Waterproofing Membrane

1. When laminated deck has been installed and approval has been given by the Departmental Representative, install plywood on deck surface to the limits indicated on the drawings and using galvanized spiral ardox nails at 300 mm centers. Edges of adjoining plywood sheets to be separated by a 1 to 2 mm gap to allow for expansion. Install wearing board and blocking strip on outside edge of gutter.
2. When approval is given by Departmental Representative, apply waterproofing membrane to plywood deck surface starting at deck edges and working towards center of deck. First membrane strip is to cover gutter area and turn up inside face of outer wearing board and blocking and turn down into PVC drains a minimum of 50 mm. Overlap adjoining membrane sheets minimum of 150 mm and to ensure drainage to gutters at deck edge. Apply one membrane sheet centered over the crown and lapping equally with the membrane sheets on either side of the crown but, no less than 150 mm.
3. Install wearing boards on waterproofed deck, after approval has been given by Departmental Representative, and with nailing as called for on the drawings. Care to be taken in the installation of the wearing boards so as to not damage the waterproofing membrane. Any damage to the membrane as a result of not using proper care, shall be repaired to the satisfaction of the Departmental Representative at no additional cost to the Contract.

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

PART 1 - GENERAL

1.1 Description of Work

1. The supply and installation of new stainless steel flashings between the main girders and curbs on the bridge deck.

1.2 Related Sections

1. Section 03 30 00 - Cast-in-Place Concrete.
2. Section 06 10 11 - Rough Carpentry.

1.3 Qualification

1. The sheet metal fabricator and applicator shall be of recognized standing with a proven record of satisfactory installations using traditional materials and installation techniques.

1.4 Workmanship

1. All workmanship shall be of the highest quality conforming to the best traditional practice and be to the approval of the Departmental Representative.

1.5 Shop Drawings, Samples and Mock-ups

1. Submit to the Departmental Representative for approval samples of all materials specified, prior to fabrication or commencement of work on site.
2. Submit Shop Drawings as per Section 01 33 00. Shop Drawings to show all details for the slope flashing including profiles and methods of attachment.
3. Provide job site or shop mock-ups of typical sections of the work as directed by the Departmental Representative.

1.6 Measurement and Payment

1. No measurement for payment will be made for the supply, fabrication and installation of new stainless steel flashing between the main girder and timber curbs. The support angles, continuous stainless steel bar strip and fasteners are to be under this item. Payment shall be made under the lump sum price item "Install New Stainless Steel Flashings" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Stainless Steel Sheets and Shapes

1. ASTM, A316 stainless steel thicknesses and sizes as called for on the drawings.

2.2 Fasteners

1. Fasteners: Stainless steel pan-head screws and washers sized as appropriate.

PART 3 - EXECUTION

3.1 Edge Strips

1. Install edge/bar strips in continuous butted lengths on main girders to allow metalwork to be attached.

3.2 Forming

1. All new sheet metal is to be formed on a bending-brake. Shaping and trimming are to be done on the bench as far as possible with the proper sheet metal-working tools.
2. The angle of bends shall be made with full regard for expansion and contraction to avoid buckling of fullness in the metal after it is in service.
3. Hem all exposed edges 20mm unless otherwise approved by Departmental Representative. Raw edges are not permitted.

3.3 Installation Standards

1. Install sheet metalwork, true to line and square, as per the Drawings. All work is to fit the deck edges exactly and collect and direct water away from the structure below.

3.4 Gutters

1. Form gutters to the shape/profile as indicated on the Drawings.
2. Install gutters through attachment to bars and timber curb as per approved Shop Drawings.

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

PART 1 - GENERAL

1.1 Description of Work

1. This section covers the requirements for the painting of all new and salvaged steelwork on the bridge.
2. All metal will be painted in accordance with this specification. This includes all new structural steel and metals of any kind. This does not include armouring angle on the south abutment, nosing angle at end of laminated timber deck or the stainless steel flashing at the deck edges.
3. This section covers the application of a soluble salt remover to the superstructure following abrasive blast cleaning of the structure.
4. This section covers the application of a sulphonate sealer penetrant between the main girders and the bottom cover plate.
5. This section also includes a description of the Contractor's requirement for quality control and verification procedures
6. NOTE: Specifically that, all steel must be blasted and prepared to meet the preparation requirements of this section.

1.2 Related Sections

1. Section 01 33 00 - Submittal Procedures
2. Section 01 35 43 - Archaeological, Cultural and 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. OPSS - Ontario Provincial Standard - 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 D 610-08 (2012), Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces.

2. ASTM D 2369-10 (2015)e1, Standard Test Method for Volatile Content of Coatings.
3. ASTM D 2832-92(2016), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
4. Canadian General Standards Board (CGSB)
 1. CAN/CGSB-1.181-99, Organic Zinc-Rich Coating.
 2. CAN/CGSB-1.207-98, Low Temperature Curing Epoxy Coating.
 3. CAN/CGSB-1.212-2004, Heavy Duty Free Marine Primer for Steel and Light Alloy Surfaces.
5. Federal Standard (FS)
 1. FS-595B-98, Paint Colours.
6. Society for Protective Coatings (Formerly known as the Steel Structures Painting Council abbreviated SSPC)
 1. SSPC-SP-1-04, Solvent Cleaning.
 2. SSPC-SP-3, Power Tool Cleaning.
 3. SSPC-SP-6/NACE No 3-07 Commercial Blast Cleaning.
 4. SSPC-SP-7/NACE No 4-07, Brush-off Blast Cleaning.
 5. SSPC-SP-10/NACE No 2-07 Near White Blast Cleaning
 6. SSPC-Vis-1-89, Abrasive Cleaning.
7. 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.

1.4 Definitions

1. CAEAL: Canadian Association for Environmental Analytical Laboratories.
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, mid-coat and top coats applied on a fully prepared and blast cleaned surface to SSPC-SP10 Near White Metal Standards. This treatment is to be applied to all surfaces of the bridge and all metal on site.

1.5 Submittals

1. Contractor shall review the Contract provisions and develop a written an all encompassing procedure for all coating operations including any and all issues of modifications to the design.

2. Submit painting plan to Section 01 33 00. 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.
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.
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 sample to Departmental Representative at least 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 manufacturer's 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 painters' pot. If test fails, provide additional samples to allow further testing to verify rejection of the paint.
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 specification.
 2. Paint colour chips.
 3. Copies of manufacturer's instructions for mixing, straining, thinning, and applying coatings.
 4. Manufacturer's recommendations for tip size, air pressure, paint guns and air supply.
 5. Include worker protection measures for cleaning and painting in the Site Specific Safety Plan. See Section 01 35 30 - Health and Safety Requirements.
 6. Copies of all leachate test reports from CAEAL-Accredited laboratory.
 7. 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 Transportation accepting the product as suitable for use on bridges and equivalent to the systems specified based on designated sources criteria. The Ministry of

Transportation Ontario recommendations will be considered. No requests for approval of alternatives will be considered during the tender period.

1.6 Measurement and Payment

1. No measurement for payment will be made for the item "Abrasive Blast Clean and Coat Structural Steel". All costs for the work of this item shall be included in the lump sum price bid for this item. Unless noted otherwise, 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. To ensure the continuity and quality of the coating system, all areas will be painted. This work shall include reblasting of any flash rust following application of the soluble salt remover and sulphonate sealer penetrant as detailed below.
2. The work includes testing for and application of a commercial liquid soluble salt remover on all surfaces of structural steel following abrasive blast cleaning in concentration as required to remove chlorides, sulphates, nitrates and other potentially present soluble salts, as well as to prevent flash rusting. No measurement for payment will be made for this item. Payment shall be made under the lump sum price item "Soluble Salt Remover to Superstructure" and shall include all costs for labour, materials and equipment necessary to do the work of this item.
3. The work includes application of a sulphonate sealer penetrant between the crevices of the bottom cover/reinforcing plate and girder flanges (East and West Girders). Apply sealer in all crevices and locations where rust pack/corrosion jacking is evident on the bottom flanges of both girders. This work shall be carried after abrasive blast cleaning for coating. No measurement for payment will be made for this item. Payment shall be made under the lump sum price item "Sulphonate Sealer Application to Main Girders" and shall include all costs for labour, materials and equipment necessary to do the work of this item.
4. 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 Full negative pressure enclosures to be designed by a Professional Engineer licensed in Ontario and the design submitted to the Departmental Representative in conformance with Section 01 33 00.

2.2 Paint Materials

1. Meet or exceed specified provincial standards using only materials that are approved for use in the Ministry of Transportation of Ontario (MTO) construction projects and meet the requirements of this specification. Coating system shall be supplied from a Manufacturer listed in DSM 9.20.39. Demonstrate in writing that each product meets or exceeds provincial requirements and the requirements of this specification.
2. Coating System for Structural Steel: Low VOC Epoxy-Zinc / Epoxy/ Polyurethane Coating System.

1.1. Base coat: Low VOC Epoxy-Zinc Primer

1.2. Mid coat: Epoxy

1.3. Top coat: Polyurethane

3. Colour: Match existing blue of the bridge to Fed Standard 15052 Blue. Note, the colour blue varies from manufacturer to manufacturer, submit samples for review and approval by Departmental Representative. Successive coats shall be formulated to show distinct colour difference.
4. Penetrating Sealer: Suitable for and compatible with paint system and is to be applied to all joints and connections throughout the bridge. Acceptable Products: Carboline Rustbond or Amerlock Sealer.
5. Sealant: Paintable Silicone Sealant, UV resistant compatible with paint system and recommended and having been successfully used for this application with the paint system.
6. Soluble Salt Remover/Cleaner: "Chlor Rid" as per Chlor Rid International or equivalent.
7. Test Kit such as "Chlor Test Rid" (as per Chlor Rid International to test for presence of chlorides, sulphates and nitrates.
8. All components of the paint system must be from one manufacturer, be compatible and recommended for use together to form one paint system by the manufacturer.
9. The Primer should have a minimum of 85% minimum zinc content in the dry film and conform to all other requirements of CGSB-1.181. Product as 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 temperature requirements of this specification are more

stringent than some manufacturers require and shall be adhered to unless it would cause an adverse effect 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 coatings and primer must be exposed on all faying surfaces to be bolted with no mid or top coat on the faying surface.
12. Cold galvanizing: Meet or exceed specified provincial standards using only materials that are approved for use in the Ministry of Transportation of Ontario (MTO) construction projects and meet the requirements of this specification. Coating system shall be supplied from a Manufacturer listed in DSM 9.20.90. Demonstrate in writing that each product meets or exceeds provincial requirements and the requirements of this specification.

2.3 Alternatives

1. Primer, intermediate, 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 2010, as well as meeting all requirements of this specification.
2. Alternatives will not be considered during the tender period.

PART 3 - EXECUTION

3.1 Full Negative Pressure Enclosure

1. Install and maintain a full environmental enclosure with a negative pressure around all surface preparation and painting activities. Ensure that the negative pressure system evacuates air from the enclosure to a dust collector and operates during all abrasive blasting and cleanup activities, including surface blow down prior to coating. Prevent random escapes from operations.
2. Cover the work platform, or the ground surface, if work is being conducted from the ground with tarps with overlapping edges or otherwise covered. Ensure that there are no escapes while dismantling or moving the full enclosures.
3. Prior to dismantling or moving the enclosure, clean the walls, floor and joints of the enclosure by vacuuming. Immediately vacuum all dust and debris not previously accessible and found in cracks and joints during dismantling of the enclosure.

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 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-1-04, Solvent Cleaning. Solvent clean to SSPC-SP1.
3. SSPC-SP-10/NACE No 2-07, Near-White Blast Cleaning. Blast Cleaning to SSPC-SP10
4. All surfaces are to be cleaned with abrasive blast cleaning; 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 blast cleaning.
6. Very lightly hand-sand the surface to roughen in readiness for the new coatings. 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 the rest of the surfaces.
7. All surfaces are to be abrasive blast cleaned to SSPC-SP10 to create surface profile and to reach an acceptable level of cleaning for paint adhesion.
8. Preparation for coating of existing structural steel:

1. Clean surfaces by removing loose, cracked, brittle or non-adherent paint, rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances.
2. Faying surfaces of existing steelwork shall be as a minimum blast cleaned in accordance with SSPC-SP6, Commercial Blast Cleaning, and cold galvanized with two coats by brush or spray. Aerosol application is permitted.

3.5 Soluble Salt Remover

1. Carry out this work following abrasive blast cleaning.
2. Test surface to verify cleanliness and to establish the speed of travel of application, distance of nozzle, pressure of application and concentration of the solution
3. As a minimum apply commercial liquid soluble salt remover in a dilution concentration of 1:50 with a commercial pressure washer of 3000 psi.
4. Apply in full conformance with manufacturer's recommendations at the rate that suits the condition of steel and in particular slow the wash on flanges, crevices and all areas that have prolonged exposure to potential of chlorides accumulation.

3.6 Calcium Sulphonate Penetrant / Sealer

1. Carry out this work following application of soluble salt remover.
2. Remove all corrosion pack/jacking rust accumulation. Use angle grinders and steel blades penetrating tools, other mechanical means, hand tools, chemical rust removers all as necessary to carry out the work. Do not damage structural steel.
3. Pressure wash (5000 psi) the void from which the pack rust was removed per location for 5 minutes.
4. Follow with minimum 100 psi high pressure air blast for 1 minute per location to help in cleaning and drying off.
5. Allow cleaned surfaces to dry.
6. Apply by hand two generous coats of Calcium Sulphonate Penetrant/Sealer to work into the voids, crevices and joints with brushes to allow soaking of the primer into voids, crevices and joints. Minimize overcoating outside of the voids, crevices and joints. Follow manufacturer's instructions.

3.7 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. Fully clean surfaces again to conform to preparation standards if flash rust or rusting, or, other degradation occurs after completion of surface preparation.
3. Prevent contamination of cleaned surfaces before prime coat is applied and between applications of remaining coats of paint.

3.8 Coating Systems

9. Each surface shall receive an appropriate thickness of coating as per manufacturers 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:
 3. Primer 1: one coat, 4 to 5 mils on product sheet dry film thickness.
 4. Intermediate 2: one coat, 5 to 6 mils dry film thickness.
 5. Topcoat 3: one coat, 4 to 5 mils dry film thickness.

For the paint system submitted, the optimum dry film thickness and the manufacturers 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 manufacturers products and to require the Contractor to come closer to the optimum thickness.

3.9 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 paint for brush application: use as received from manufacturer without written permission from Departmental Representative.
 2. Do not mix or keep paint in suspension by means of air bubbling through paint.
 3. Record all additives and the amount of any thinning products. All additives and thinning products to be confirmed for use in writing by the manufacturer.

3.10 Quality Control

1. The Contractor's personnel and the Departmental Representative will check the degree of cleanliness of surfaces. Do not apply paint until prepared surfaces have been accepted by Departmental Representative.
2. 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 check results by the Contractor and the

Departmental Representative agree with and continue to agree with previous thickness measurements.

3. The Contractor shall record the thicknesses of coating of each layer for each member and provide a written record of all measurements taken.
4. 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. 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 top coat.
5. 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.
6. 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.
7. 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.
8. 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 is applied, as they see fit.
9. At the time of inspection, the Departmental Representative will also check for gross defects such as (but not limited to) mudcracking 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.

3.11 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 unless paint is specifically formulated for application at low temperatures.
 2. Ensure metal surface temperature is between 10°C and 35°C at time of coating application unless paint is specifically formulated for application at high temperatures.
 3. Ensure metal surface temperature during application should be at least 5°C above dew point.
 4. 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.

3.12 Protection of Coated 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 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 and all other contaminants 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.

3.13 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.
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 5°C before paint has dried, unless paint is specifically formulated for application at low temperature.
 2. Temperature of surface is over 35°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.
 6. When ambient temperature is not higher by a least 5°C over dew point.

Note that these provisions set the minimum standards for extreme temperature and humidity regardless if manufacturer's documentation allows application under more extreme conditions. Where the provisions of SSPC-SP10, Near White Blast cleaning, or the Contract Documents are more stringent, then in all cases, the more stringent requirement shall apply.

8. Remove paint from areas which have been exposed to low temperatures, 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 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 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 of new structural steel components is to be completed in the shop. Complete all painting possible in the shop.
 2. On new pieces, do shop 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, friction type 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 sealer to all connections as per manufacturer's instructions.
 5. 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.
 6. 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 additional cost to the Contract.

7. 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 before painting to the full requirements of the surface preparation section.
 8. Remove weld spatter before painting. Remove weld slag and flux.
 9. 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.
 10. 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 striping, in addition to the spray application. When inorganic zinc primer is specified, the brush application shall be carried out with an epoxy-zinc primer from the same manufacturer, after the spray application of the prime coat. The mid coat and finish coat shall be brush applied prior to spray application of each coat.

3.14 Joints in Painting Systems

1. At joints where the system must be left incomplete, an exposed section of primer and each coat must be left to allow the primer and 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.

3.15 Difficult to Access

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. These areas include the between the concrete deck to remain and steel girders and the south pivot girder at Floor Beam 6.

3.16 Limits of Painting

1. Painting shall include all steel surfaces, with a few exceptions. The exceptions shall be:
 1. The stainless steel flashings at the edges of the deck.
 2. Armouring angle (at south abutment).
 3. Nosing angle and assembly (end of laminated timber deck).
 4. Any other components designated to be galvanized as specified on the Contract Drawings.
2. All connections in the steel and points of attachment will be cleaned and the faying surfaces primed prior to reconnecting or attaching joints and then the area shall be re-cleaned 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.

3.17 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 prior to field assembly on the 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 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 DFT.
8. Spray apply one coat of Mid-coat to a 5 to 7 mils DFT.
9. Spray apply one coat of Top Coat to a 3 to 5 mils DFT. Match topcoat colour to selected top coat colour.
10. All dry film thickness measurements to be adjusted as per manufacturers recommendations and Departmental Representatives approval.

3.18 Painting of Bolts

1. All oils must be removed.
2. Coat all bolts in the field after the connection has been fully assembled with bolts correctly installed (splines sheared off for Tension Control Bolts). Recoat and repair areas where bolts are installed after coating.

3.19 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, and then the remainder of the coating system will be applied.

3.20 Disposal of Existing Coating and Spent Blast Medium

1. The Contractor is fully responsible for proper disposal of removed coating and spent blast medium in the compliance with all applicable environmental regulations. The Contractor shall assume that the removed coating material and spent blasting medium will be classified as Class 146 Leachate toxic solid waste or more hazardous.
2. Significant concentration of lead, arsenic, barium, boron, cadmium, chromium, mercury, selenium, silver and any other parameter specified by Ontario Regulation 347 is expected to be contained in the spent blasting medium.

3. Allow for all appropriate provisions of protection of workers and environment, sampling, collecting, storing, disposing and any other provisions as required for the Class 146 Leachate toxic solid waste that will be produced.

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

PART 1 - GENERAL

1.1 General Description

1. The mechanical equipment on the Bobcaygeon Swing Bridge requires replacement and refurbishment. The hydraulic power unit (HPU), hydraulic rotating cylinders, centre pivot bearing, balance wheel assemblies, balance rails, locking pin and levelling jacks are to be replaced as detailed in the Contract Drawings.
2. As part of the project, it will be the Contractor's responsibility, as part of their Scope of Work, to remove and dispose of in a proper manner the existing end support wheels, balance wheels, balance rail and anchor concrete pads, locking pin and associated components.
3. The followings components are to be retained and turned over to the Departmental Representative: HPU in the center pier vault; HPU in the lock house, hydraulic rotating cylinders, centre pivot bearing and levelling jacks.

1.2 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 price. All costs for labour, materials and equipment necessary to complete the work of this Section, shall be included in the lump sum price under the following suggested cost breakdown.
 - .1 Mechanical Removals
 - .2 Install New Hydraulic Power Unit
 - .3 Install New Hydraulic Bridge Control Manifold
 - .4 Install New Bridge Rotation Hydraulic Cylinders, Hoses, Lines
 - .5 Install New Hydraulic Hoses and Lines from Lock House
 - .6 Install and Adjust New Centre Pivot Bearing
 - .7 Install and Adjust New Live Load Wheels and Ramps
 - .8 Install and Adjust New End Support Wheels and Ramps
 - .9 Install and Adjust New Center Pier Balance Wheel Rail
 - .10 Install and Adjust New Balance Wheels
 - .11 Install New Locking Pin Assembly
 - .12 Refurbish Existing End Stop

PART 2 - PRODUCTS

2.1 Centre Pivot Bearing Arrangement

1. The existing bearing arrangement will be replaced with a new assembly manufactured and supplied as specified in the Contract Drawings.
2. Steel for bearing fabrication to be to ASTM A36. Mill specification sheets are to be provided for all A36 used in the manufacture of the bearing.
3. Welding shall be made with E480xx electrodes in accordance with CSA W59 and shall be performed by a welder qualified under CSA W47.1. Surfaces to be welded shall be cleaned of all foreign material.
4. Steel for top and bottom discs of the bearing, to be AISI 1045, Hardened (Flame or Induction) to HRC 58 and Tempered at 150°C to 200°C to remove stresses.
5. Material for the Bearing Plate is to be CA932 Bronze.
6. Material for the Pivot Assembly to be AISI 1045 in the Hot Rolled and machined condition.
7. All bolts shall conform to the ASTM Standard A325 or A325M.
8. Anchor bolts to be ASTM A193 Grade B7 Threaded Rod with, ASTM A194 2H Heavy Hex Nuts and F436 Washers.
9. Anchors shall be set in place using a grout with a minimum compressive resistance of 50MPa.

2.2 Hydraulic Cylinders

1. Refer to Section 13 99 08 - Hydraulic Cylinders.

2.3 Hydraulic Skid and Components

1. Refer to Section 13 99 07 - Hydraulic Skid and Components.

2.4 Rail Assembly

1. The existing rail, upon which the bridge rotates, is to be removed and replaced with a new 60lb rail to ASTM A759.
2. Rail to be manufactured in three (3) sections and joined together on site using rail clips.

2.5 Live Load Wheels, End Wheels, Balance Wheels, Ramps

1. The existing four balance wheels will be replaced with two new live load wheels and six new balance wheels.
2. The assemblies are to be fabricated from ASTM A36 plate. Mill specification sheets are to be provided for all A36 used in the manufacture of the balance wheel brackets and mounting brackets.
3. All live load, balance and end wheel shafts are to be made from hardened and tempered AISI 1045 Steel.
4. Wheel bushings and thrust washers to be made from C932 Cast Bronze.
5. The abutment and live load ramp assemblies are to be made from AISI 1045 Steel.

2.6 Hydraulic Hose, Tubing and Fittings

1. Refer to Section 13 99 03 - Fasteners and Hardware; Section 13 99 04 - Cable and Tube Supports; 13 99 05 - Lines, Fitting and Hoses.
2. All hydraulic fittings, for tubing and hose, shall be manufactured from Stainless Steel to minimize corrosion.

2.7 Hydraulic Lubrication Oils

1. Refer to Section 13 99 06 - Hydraulic Oil.

2.8 Shop Drawings

1. All Shop Drawings shall be submitted to the Departmental Representative for approval before procurement and manufacturing.

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. These work specifications do not include workplace safety procedures, and other regulations covered by the O H & S Act and Regulations. The Contractor is expected to perform the necessary risk assessments on site, and take measures to complete the work safely.

3.2 Centre Pivot Bearing Assembly Overview

1. As part of this project, a new centre bearing assembly is being installed. This section of the scope covers the replacement of the centre pivot assembly.

3.3 Centre Pivot Bearing Assembly Removal

1. Refer to Section 01 91 37 - Decommissioning / Commissioning.

3.4 Centre Pivot Bearing Assembly Installation

1. Assemble the new bearing as specified in the Contract Drawings. Remove the old pivot bearing and turn over to Departmental Representative. Protect the new bearing and keep it separate until it is ready for assembly with the bridge.
2. Position the bottom of the bearing assembly on the anchor studs on the center pier.
3. Level the assembly to within .001 inch measured across the top surface of the assembly. Use shims as required.
4. Remove the protective covering and add lubrication oil as specified in Section 2.7 directly to the cavity.
5. Remove the packing seal from the assembly and insert the pin inside the assembly and mate with the bearing disc.
6. Install the packing seal back and block the bearing from tilting.
7. Cover the bearing assembly from dirt until it is ready to be connected to the bridge.
8. Tighten the anchor bolts as specified in the Contract Drawings.
9. Grout anchorages for bearing only when bridge is in its proper confirmed and final re-aligned and balanced position.

3.5 Balance Wheel Track Overview

1. As part of this project, all balance wheels and the track are being replaced. This section of the scope covers the replacement of the balance wheel track.

3.6 Balance Wheel Track Removal

1. Refer to Section 01 91 37 - Decommissioning / Commissioning.

3.7 Balance Wheel Track

1. Position the balance wheel track sections concentric to the center pivot assembly taking care of the segment splits as specified in Contract Drawings. These segment splits are located based on where the wheels will be positioned when the bridge is closed. The wheels must not be directly above the splits when there is traffic loading.

2. Level the individual track by adding shims. Ensure that the top surface of the track at the split is smooth. Adjust for the height without altering the level of the track.
3. Drill for the anchor studs on concrete, using the track mounting holes as template. Install the anchor rods as specified in Section 03 20 00 "Concrete Reinforcing".
4. Tighten the anchor bolts with seating torques as specified by the Engineer.

3.8 Balance and Live Load Wheel Assembly Overview

1. As part of this project, all balance wheels are being replaced. This section of the scope covers the replacement of the balance wheels and their Mounting Brackets.
2. There are six (6) balance wheel and mounting bracket assemblies and two (2) live load wheels and mounting bracket assemblies.
3. These assemblies can be mounted to the bridge before the bridge is set on top of the bearing and balance wheel tracks.
4. For the installation, it is assumed that the bridge is assembled to the center bearing, balance wheel tracks are installed and the bridge is leveled and blocked.

3.9 Balance Wheel Removal

1. Refer to Section 01 91 37 - Decommissioning / Commissioning.

3.10 Balance and Live Load Wheel Installation

1. Install the new balance wheel assemblies onto the four new balance wheel beams and two existing HSS struts as detailed in the Contract Drawings.
2. Correct the south HSS strut out-of-plane alignment to suit installation of new balance wheel.
3. Install two new live load wheels below the main girders. Bolt the new live load wheel assemblies to the transverse built-up beam assemblies as detailed in the Contract Drawings.
4. Use shim packs to close the gap between the balance wheel tracks and the balance wheels.
5. Hand tighten all the bolts. The final tightening of the bolts will take place after the Abutment Ramp Assemblies are installed.

3.11 Bridge End Support Wheel Assembly Overview

1. As part of this project, bridge end support wheels are being replaced. This section of the scope covers four (4) bridge end support wheel assemblies.
2. These assemblies can be mounted to the bridge before the bridge is set on top of the bearing and balance wheel tracks.
3. For the installation, it is assumed that the bridge is assembled to the center bearing.

3.12 Bridge End Support Wheel Removal

1. Refer to Section 01 91 37 - Decommissioning / Commissioning.

3.13 Bridge End Support Wheel Installation

1. Install the new support wheel assemblies onto The bridge girders as detailed in the Contract Drawings.
2. Use shim packs to close the gap between the balance wheel tracks and the balance wheels.

3.14 Swing System Overview

1. This section of the scope covers the replacement of the two (2) Bridge Swing Cylinders.
2. For purposes of this section, it is assumed that the new pier hydraulic distribution system has been installed, bridge structure has been successfully positioned on the new bearing assembly, the balance and live load wheel assemblies have been connected to the bridge structure and the bridge is balanced as in Section 01 91 37 - Decommissioning / Commissioning.

3.15 Swing System Installation

1. Assemble the cylinder, pivot and rod end brackets as specified in the Contract Drawings.
2. On the central pier, after the new bridge has been located on the new bearing assembly, and balance wheels assemblies, position the new swing cylinder assemblies as shown in the Contract Drawings.
3. The pivot bracket and the rod end brackets are shimmed so that the hydraulic cylinders are leveled to within .001 inch/foot as measured by a precision level.
4. Ensure the cylinder ports are well protected from dirt, and winch the bridge through it range of motion. Ensure that there are no interferences between any of the moving components, or between the moving components and other parts of the bridge structure. If there are any interferences, inform the Departmental Representative immediately and wait for instructions.
5. Tighten the bolts of the two brackets with bolts seating torques as specified by the Departmental Representative.
6. Apply grease to all moving components.

3.16 Abutment Ramp Overview

1. The Bobcaygeon Swing Bridge has ramps at the North abutment and levelling jacks on the South abutment.
2. The rehabilitation work includes the following:

- .1 Removal of the existing ramps and levelling jacks.
- .2 Repairs to the abutments (by others).
- .3 Fabrication and installation of the new ramp supports at both ends.

3.17 Abutment Ramp Removal

1. Refer to Section 01 91 37 - Decommissioning / Commissioning.
2. Remove ramps and anchors from North abutment.
3. Remove levelling jacks at South abutment and turn over to Departmental Representative.

3.18 Abutment Ramp Installation

1. Install new ramps at location and orientation as specified in the Contract Drawings.
2. Use stainless steel shims between the fabrication and the abutment.
3. Apply lubrication to the top surface of the skid plate to ensure smooth gliding of the bridge.
4. Manually winch the bridge and ensure there is clearance for the bridge to swing into its "driven", closed, position and ensure that the bridge is well supported. Shims may have to be added in between the Ramps and the abutment to ensure proper support of the ends of the span.

3.19 Locking Pin Replacement

1. Remove existing locking pin assembly at the South abutment.
2. Install new locking pin assembly at the North end of the bridge as specified in the Contract Drawings.

3.20 End Stop Refurbishment

1. Existing end stop embedded at South abutment to be reused. Clean and apply zinc-rich primer to end stop.
2. Install new bumper pads onto the existing steel end stop such that pads are in uniform contact with girder bottom flanges.

3.21 Replacement of Hydraulic Power Unit (HPU) Overview

1. The Bobcaygeon Swing Bridge currently has a Hydraulic Power Unit (HPU) located at the cubicle or vault at the pivot pier. This HPU must be removed and turned over to the Departmental Representative. A new HPU must be manufactured and installed at the existing lock house.
2. The scope of work includes the following:
 - .1 Removal of the existing HPU, hoses and connections.

- .2 Manufacture of the new HPU as specified in Section 11 99 07 - Hydraulic Skid and Components.
- .3 Installation of the new HPU at the lock house.
- .4 Installation of a new bridge manifold system at the pier vault.
- .5 Installation of protective covering for manifold system and hydraulic lines.

3.22 HPU Removal

1. Refer to Section 01 91 37 - Decommissioning / Commissioning.
2. Drain the hydraulic tank in its entirety. Ensure that all tubes, hoses and actuation cylinders are drained to avoid spillage.
3. Ensure there is no spillage of hydraulic fluid into the waterway.
4. Disconnect and remove the power unit, motors, and swing cylinders.
5. It may be necessary to flame cut the bolts due to excessive rusting.

3.23 Manufacture of New HPU and Installation

1. Install the new Hydraulic Power Unit in the lock house.
2. Install new hydraulic lines from lock house to pier vault.
2. Install hydraulic lines connecting the manifold system to the various actuation cylinders. Use stainless steel tube, hydraulic hoses and fittings.
3. Fill the hydraulic tank with fluid.

3.24 Hydraulic System Startup Overview

1. The Bobcaygeon Swing Bridge is equipped with a new hydraulic power unit, which is connected to new span drive cylinders.
2. The hydraulic system start-up assumes the following:
 - .1 The assembly of all mechanical components to the swing bridge is complete.
 - .2 The bridge structure is free of debris, construction equipment, tools etc.
 - .3 The protective covering of center assembly is removed and the assembly is lubricated with oil.
 - .4 All mechanical joints and connections with grease fittings are greased.
 - .5 Electrical connections to the hydraulic power unit are complete.

3.25 Hydraulic System Startup

1. Check all hosing has been connected as described above and that brackets and supports have been fabricated and installed to support the hydraulic lines.
2. Fill the hydraulic power unit and span drive cylinders with the fluid specified and verify hydraulic circuit matches the schematic. Confirm reservoir fluid level is above the minimum.

3. Check that all pipe and hose connections are tight and confirm all controls are in neutral to ensure the system will start unloaded.
4. Ensure the complete hydraulic system is full of fluid and has been primed.
5. Momentarily start and then stop the electric motor to visually confirm the direction of motor rotation is correct for the pump.
6. Start the motor and run at the lowest possible pressure. Check pressure gauges to verify low pressure build up and the reading is constant without spikes.
7. Allow the system to run at idle and unloaded for 1 hour for the oil to be cleaned out by the filter.
8. Operate swing cylinders by manually operating the directional control valve. It may take a few seconds for the operation, as the power unit fills the hydraulic lines with oil. Operate the cylinders back and forth to remove any trapped air. Bleeding have to be open to release any trapped air.
9. Stop the swing of the bridge several times to make sure that there are no interferences of the moving parts of the bridge with that of the span drive systems. Ensure that the hydraulic hoses are clear of the swing bridge components. Ensure that the span drive cylinders are stroked to the end of their stroke to remove any trapped air.
10. Swing the bridge the opposite way and stroke the cylinder to completely retracted position.
11. Check the fluid level of the HPU, and refill the oil if required.
12. The hydraulic system is now ready for commissioning.

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

PART 1 - GENERAL

1.1 Description

1. The work outlined in this section describes the new grease system for all bushings and bearings.
2. Refer to the drawings for details.

1.2 Related Work

1. Section 01 91 37 – Decommissioning / Commissioning.

1.3 Measurement and Payment

1. No measurement for payment will be made this section. Payment shall be made under lump sum price and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Grease Lines & Fittings

1. Materials: Stainless Steel (316SS)
2. Working pressure: Up to 5,000 psi
3. Service:
 1. Biodegradable grease (id), submerged in fresh water (od).
 2. Refer to grease specification. Ensure all tubing and fittings are compatible with selected grease.
2. Working temperature: -10 deg-C to +40 deg-C.
3. Tube Fittings:
 1. Use compression style fittings for all tubing connections.
 2. The tube fitting assembly must not gall during assembly.
 3. The fitting style must allow for disassembly and re-assembly, while maintaining a leak-tight seal.

4. Tube fitting and components will be stamped to identify manufacturer and material, and must be certified to produce fittings under an N-Stamp program accredited by ASME.
 5. The fitting manufacturer must have a statistical quality control program in place.
 6. No component of any other tube fitting manufacturer will be interchanged or intermixed.
4. Grease Nipple:
1. 1/4" NPT – Button head
 2. Refer to drawings for grease fitting locations and general arrangement.
5. Material Handling: Tubes must be free of damages upon commissioning.
6. Cleaning: Tube and components must be free of oils, debris, cutting fluids, etc., before grease is applied to line.
7. Testing:
1. Contractor must visually inspect all fitting for leaks while greasing system during dry-lock installation.
 2. Contractor to produce a visual test report.

2.2 Grease

1. Operating Temperature: -10 deg-C to +40 deg-C
2. Cold Storage Temperature: -40 deg-C. System is static during winter months.
3. Service:
 1. Bearing and grease submersed in fresh water.
 2. Grease must resist water washout.
4. Type: Readily biodegradable marine grease, > 85%) per CEC-L-A-94, ASTM D-5864.
5. Toxicity:
 1. Non- toxic, aquatic ecotoxicity classification WGK 1 (or equivalent).
 2. Departmental Representative to approve grease toxicity characteristics before commissioning.
6. Application: Plain bearing (pintle).
7. Operating Speed: Very slow (near static).
8. Duty Cycle: <10,000 cycles per year.

9. Material Compatibility: Hardened steel race and bronze bearing.
10. Delivery:
 1. Through standard zerk + 6 m long 5/16" (8 mm) grease tube.
 2. Grease must be able to be delivered under specified conditions with standard grease gun.

2.3 Grease Gun

1. Type: button head (1/4") – battery operated- hand held.
2. Barrel: Standard (i.e. 420 ml nominal cartridge), black powder coated or zinc plated.
3. Grease Delivery: Maximum pressure: 5000 psi.
4. Nozzle: 12" flex hose extension. Hose can be reinforced neoprene or polypropylene.
5. Connection: Standard zerk (grease nipple). To mate with pintle line zerks.

PART 3 - EXECUTION

3.1 Fabrication and Installation

1. Refer to the drawings.

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

PART 1 - GENERAL

1.1 Description

1. This section outlines the work associated with removing hydraulic oil from the existing system before the equipment is decommissioned, and cleaning the existing trenches, pits, and tunnel, before the new equipment is installed. Refer to the drawings and specification provided.

1.2 Related Work

1. Section 01 35 43 – Archaeological, Cultural and Environmental Procedures
2. Section 01 91 37 – Decommissioning / Commissioning.

1.3 Measurement and Payment

1. No measurement for payment will be made this section. Payment shall be made under the lump sum price and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Not Used

1. Not Used

PART 3 - EXECUTION

3.1 Hydraulic Oil Removal

1. Drain all existing hydraulic oil from cylinders, lines and reservoirs.
2. Remove oil from site.
3. Ensure no oil drains into waterway. The contractor must have a spill plan in place that is accepted by the client.

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

PART 1 - GENERAL

1.1 Description

1. The work outlined in this section describes the fasteners and hardware to be used for the installation of all new mechanical and structural equipment associated with the hydraulic system(s). The contractor shall conform to this specification unless other specific fasteners are prescribed by equipment vendors; however, the material prescribed in this specification must be followed.

1.2 Related Work

1. Section 01 91 37 – Decommissioning / Commissioning.

1.3 Measurement and Payment

1. No measurement for payment will be made this section. Payment shall be made under the lump sum price and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Machine Screw, Cap Screws, Bolts and Associated Nuts

1. Must be stainless steel, unless stated otherwise.
2. Must have a minimum tensile strength of 480 MPa (70,000 psi).

2.2 Wedge Anchors (and Associated Nuts/Washers)

1. Use sizes as specified.
2. Must be stainless steel.
3. Install per manufacturer's specifications.

2.3 Other

1. All components must be suitable for their intended purpose.

2. Where no specification exists, components must be reviewed and approved by public works (or designated technical firm).

PART 3 - EXECUTION

3.1 Installation

1. All fasteners to be installed using torque as recommended by manufacturer and/or by current machinery handbook (or other qualified reference).
2. All fasteners accessible by public must be secured using a suitable non-permanent thread locking adhesive.
3. Follow manufacturer's specification.

3.2 Fabrication and Installation

1. Refer to the drawings.

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

PART 1 - GENERAL

1.1 Description

1. The work outlined in this section describes the supports and fasteners to be used to support the electrical cables and hydraulic tubing throughout the trenches, pits, and tunnels and at other specific locations.

1.2 Related Work

1. Section 01 91 37 – Decommissioning / Commissioning.

1.3 Measurement and Payment

1. No measurement for payment will be made this section. Payment shall be made under the lump sum price and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Struts

1. Must be hot dipped galvanized (ASTM A123, or A153).
2. Must have suitable load rating for the application and be spaced per vendor information for the application.
3. Mount to concrete using wedge anchors (size and spacing per strut manufacturer specification).
4. Other mounting to follow industrial best practices.
5. Remove sharp edges from cut ends.

2.2 Clips and Other Hardware

1. Clips and mounting hardware must work properly with selected strut.
2. Must be stainless steel.
3. Must have integrated rubber or polymer liner to prevent galvanic corrosion and wear on tubing and electrical conduits.

4. Electrical Tech Cable to be held with P-Clamps.
5. Must allow axial movement of mounted components (tubes, etc.) to allow for thermal expansion / contraction.
6. Supports must be spaced and mounted such that vibration on tubing or components is addressed.

PART 3 - EXECUTION

3.1 Fabrication and Installation

1. Refer to the drawings.

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

PART 1 - GENERAL

1.1 Description

1. The work outlined in this section describes the complete specification regarding the hydraulic lines, hoses, and fittings. This includes all pressure and return lines that are used to operate the hydraulic cylinders in the field. Note: there is a separate specification provided for the grease lines and fittings (refer to the grease specification, Section 13 99 01).

1.2 Related Work

1. Section 01 91 37 - Decommissioning / Commissioning.
2. Section 13 99 01 - Grease System

1.3 Measurement and Payment

1. No measurement for payment will be made this section. Payment shall be made under the lump sum price and shall include all costs for labour, materials and equipment necessary to do the work of this item.

1.4 Design

1. Discharge line flow area shall be at least ¾" Tubing with 0.095" wall thickness
2. Suction line flow area shall be at least 1½" Tubing with 0.134" wall thickness
3. Return line flow area shall be at least 1" Tubing with 0.095" wall thickness

PART 2 - PRODUCTS

2.1 Pressure

1. Design pressure: Up to 3000 psi.
2. Operating pressure: Max 2500 psi.

2.2 Service

1. Biodegradable hydraulic oil (ID), submerged in fresh water (OD)

2. Refer to hydraulic oil specification. Ensure all tubing and fittings are compatible with selected oil.

2.3 Temperatures

1. Cold operating temperature: -10 deg C.
2. Cold storage temperature: -40 deg C.
3. Design temperature: +80 deg C.
 1. System will alarm and shut off if reservoir temperature meets or exceeds high temperature setting.

2.4 Tubing

1. Requirements:
 1. Material 316 ss.
 2. Various sizes.
 3. ASTM A269 or equivalent.
 4. Per SAE J1065, tube wall thickness must meet pressure requirements.
 5. Tube fitting manufacturer must specify the allowable ranges of tube wall thickness, diameter, and material hardness.
 6. High quality, fully annealed, seamless or drawn type (316) austenitic stainless steel.
 7. Tubing to be free of scratches, suitable for bending, and must properly adapt to a compression fitting.
 8. Hardness not to exceed 80 hrb.
 9. Contractor must ensure OD tolerance is suitable for connection.
 10. Pipe, tubing, and fittings shall be designed for the overload limit state such that the allowable working stresses established in ASME B31.1 shall not exceed the maximum working pressure, per CSA S6-14 section 13.8.5.3
 11. All hydraulic components shall be provided with a rated burst pressure greater than the maximum working pressure, with a minimum safety factor of 4 per CSA S6-14 section 13.8.5.2
 12. Pressure rating of tubing for hydraulic systems shall be greater than or equal to the maximum working pressure in the piping. Minimum safety factors shall be as specified in ASME B31.1.
 13. All hydraulic tubing material shall be specified as seamless, annealed, low carbon stainless steel conforming to ASTM A269, TP316, ISO 10763, and ANSI B31.1. Maximum tubing shall be specified as not larger than 38 mm (1.5 in) nominal. For conductor requirements greater than 38 mm (1.5 in), tubing shall not be considered.

2.5 Tube Fittings

1. Use compression style fittings for all tubing connections.
2. Block connections to be SAE J514 O-ring boss.
3. Where required, adapt to adjacent equipment with proper connection type.
4. The tube fitting assembly must not gall during assembly.
5. The fitting style must allow for disassembly and re-assembly, while maintaining a leak-tight seal.
6. Tube fitting and components will be stamped to identify manufacturer and material, and must be certified to produce fittings under a program accredited by ASME.
7. The fitting manufacturer must have a statistical quality control program in place. No component of any other tube fitting manufacturer will be interchanged or intermixed.
8. If NPTF fittings have to be used (i.e. existing hydraulic cylinders), high density gray stainless steel PTFE thread seal tape must be used (MIL specification T-22730A)
9. Hydraulic components shall be specified with certified manufacturer's pressure ratings, i.e., rated pressure, which meet or exceed the maximum working pressure.
10. Custom components shall be tested to establish certification criteria and acceptance.
11. Component ratings might require testing and documentation in accordance with industry standards based on the type of component and intended use. As a minimum, components shall be certified for RFP and RBP, in accordance with NFPA/T2.6.1.per CSA section 13.8.3.4.
12. All hydraulic components shall be provided with a rated burst pressure greater than the maximum working pressure, with a minimum safety factor of 4 per CSA S6-14 section 13.8.5.2
13. Pressure rating and safety factors for tube fittings shall be consistent with ratings for associated tubing.
14. Dimensions shall conform to SAE J514 for 37° flare connections and SAE J1453 for O-ring connections.
15. Tube connections shall be accomplished with 37° tube end flares and flare nuts. Mating 37° surface shall only be specified as Type 316 stainless steel and shall have an O-ring and O-ring boss to provide a leak-free connection.
16. Specifications for flange dimensions shall conform to SAE J518.

17. Specifications for all tube connections shall allow for unlimited break and remake of connections without cutting or creating loss of sealing integrity.
18. Material for all associated hardware required for fittings shall be specified as similar to fitting material.
19. Flange bolts shall be provided with locking washers if utilized.

2.6 Hose and Flex Lines

1. SAE 100R2AT standard per SAE J517
2. Flexible hydraulic hose assemblies shall be specified for the interconnection of moving or vibrating components to reduce stresses caused by vibration.
3. Hose lengths shall not exceed minimum requirements for the application.
4. Pressure rating and safety factors for hose end connections shall be consistent with ratings for associated hose.
5. Hose material shall be specified as hydraulic duty rated for maximum operating pressure consistent with pressures specified for components in which the hose is connected.
6. Hoses shall be specified such that the maximum working pressure in the hose does not exceed the recommended maximum operating pressure for that hose as defined in SAE J517.
7. Hose end connections shall be specified as Type 316 stainless steel for 37° female JIC swivel connections.
8. Hose assemblies shall be shop assembled by the hose supplier. Dimensional standards shall conform to SAE J516.
9. Hydraulic components shall be specified with certified manufacturer's pressure ratings, i.e., rated pressure, which meet or exceed the maximum working pressure.
10. Custom components shall be tested to establish certification criteria and acceptance.
11. Component ratings might require testing and documentation in accordance with industry standards based on the type of component and intended use. As a minimum, components shall be certified for RFP and RBP, in accordance with NFPA/T2.6.1.per CSA section 13.8.3.4.
12. All hydraulic components shall be provided with a rated burst pressure greater than the maximum working pressure, with a minimum safety factor of 4 per CSA S6-14 section 13.8.5.2

2.7 Hose Fittings

1. 316 ss crimp fittings. Fittings to adapt to equipment as required.
2. Material for all associated hose fitting hardware shall be specified as similar to fitting material.
3. Flange bolts shall be provided with locking washers.
4. Quick disconnect type fittings shall be attached to pipe fittings through SAE standard straight threads with an O-ring boss and machined wrench flats for installation. Both male and female couplings shall be provided with an internal checking valve to prevent fluid loss when not coupled.
5. Coupling material shall be specified as Type 316 stainless steel.
6. All hydraulic components shall be provided with a rated burst pressure greater than the maximum working pressure, with a minimum safety factor of 4 per CSA S6-14 section 13.8.5.2
7. Flexible hydraulic hose assemblies shall be specified for the interconnection of moving or vibrating components to reduce stresses caused by vibration. Hose lengths shall not exceed minimum requirements for the application.
8. Pressure rating and safety factors for hose end connections shall be consistent with ratings for associated hose. Assembly pressure testing shall be in accordance with SAE J343 for testing SAE 100R series hose.
9. Quick disconnect-type connectors shall not be permitted for permanent connections. Specified uses for these connectors shall be limited to temporary hydraulic connections or where emergency fluid power may be provided by connecting an auxiliary power unit.

2.8 Fasteners/Supports

1. Refer to drawings for typicals.
2. Tube support brackets must not prevent axial movement from thermal contraction and expansion. 5 ft. spacing maximum for all tubing.
3. Contractor must ensure best practices are followed for tube installation for the temperature ranges stated.

2.9 Adapters

1. All adaptors to be stainless steel
2. Use Standard S.A.E. dash sizes

3. Where possible, use 37° JIC to connect to flex lines
4. If connecting to NPT, use a high density grey stainless steel PTFE thread seal tape. (MIL Specification T-227730A)
5. Use best "Industry Accepted" installation, assembly and routing methods

2.10 Suction Lines

1. Sizes and requirements:
 1. From oil reservoir to pumps: hose: size to be determined by contractor.
 2. Must meet requirements listed in SAE J1065.

2.11 Pressure Lines

1. Sizes and requirements:
 1. From pump outlet to valve manifold: Hose: Size to be determined by contractor.
 2. From valve manifold to and from cylinders: 0.049 wall tubing, hose (at cylinders and at pintle centres for gate rotation): Size to be determined by contractor.
 3. From manifold to tank: tubing: size to be determined by contractor.

PART 3 - EXECUTION

3.1 Tube Installation

1. All tube and fitting installation must follow current standard best practices, and tube and fitting vendor specifications. The manufacturer will provide clear instructions for proper tube fitting installation. Tube fitting will not require disassembly for inspection after assembly.
2. Maximum bending radius and bends near fittings and fasteners: per vendor specifications. All fittings and valve stems must be placed where easily accessible. Contractor must provide shop drawings for review before installation.
3. Line preparation: per vendor specifications.

3.2 Hose Installation

1. Current best practices must be followed.

2. Hoses must not kink or twist throughout the movement of operating ranges. Routing must be per layout drawings.

3.3 Material Handling

1. Tubes, hoses, pipes and fittings must be free of damages upon commissioning.

3.4 Cleaning

1. Tubing and all hydraulic components to be cleaned of debris, oils, etc. Before installation following applicable standards. After installation complete, use pumps to cycle hydraulic oil through system (1 hr per channel). Before - turnover, contractor to supply oil sample report; oil must meet ISO 17/11 as a minimum. Contractor to make record of cleaning.
2. Note: temporary plumbing arrangements may be required to cycle oil through system. Contractor to ensure oil cleanliness meets or exceeds all specifications required for all wetted hydraulic components in the system.

3.5 Static Testing

1. Disconnect all cylinders (do not apply pressure to cylinders during testing), dead end system and test to maximum working pressure.
2. Attach pressure gauge and hold pressure for 4 hours. Inspect all connection joints for leaks during test.
3. All tube and hose connections must provide a leak-tight seal during the pressure test.
4. Contractor to make record of testing inspection.
5. Contractor can provide test plan that differs from this, but all test plans must be accepted by the owner.

3.6 Fabrication and Installation

1. Refer to the drawings.

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

PART 1 - GENERAL

1.1 Description

1. This section describes the hydraulic oil to be used in the new hydraulic system.

1.2 Related Work

1. Section 01 35 43 – Archaeological, Cultural and Environmental Procedures
2. Section 01 91 37 – Decommissioning / Commissioning.

1.3 Measurement and Payment

1. No measurement for payment will be made this section. Payment shall be made under the lump sum price and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Type

1. Readily biodegradable hydraulic oil (> 85%) per CEC-L-A-94, ASTM D-5864.
2. Hydraulic fluids should be specified as nonharmful to the environment and readily biodegradable, and conform to ISO 9439 and ASTM D5864.
3. Acceptable Products (or equivalent) that can be used provided all specification provisions are satisfied:
 - .1 Greenplus
 - .2 Chevron Clarity AW
 - .3 Petro Canada - Environ hydraulic fluid
4. Note: Vegetable based products are NOT acceptable.

2.2 Toxicity

1. Non-toxic per OECD 209, OECD 202, OECD 203.
2. Must pass acute aquatic toxicity on daphnia and trout.

3. Parks Canada to approve oil toxicity characteristics before commissioning.

2.3 Temperatures

1. Cold operating temperature: -10 deg C.
2. Cold storage temperature: -40 deg C.

2.4 Rust

1. Must pass distilled water test.
2. Anti rust per ASTM D-665.
3. Must meet or exceed all vendor requirements for all wetted hydraulic equipment / components / specifications.

2.5 Copper Corrosion

1. Value = 1A: copper corrosion test per ASTM D-130 (3 hrs at 100 deg C).
2. Must meet or exceed all vendor requirements for all wetted hydraulic equipment / components / specifications.

2.6 Foaming

1. Anti-foaming per ASTM D-892 sequence I, sequence II, sequence III.
2. Must meet or exceed all vendor requirements for all wetted hydraulic equipment / components / specifications.

2.7 Wear

1. Must meet or exceed all vendor requirements for all wetted hydraulic equipment / components / specifications, i.e. per ASTM D-4172, or Vickers 35VQ25 vane pump test, Denison vane pump T5D test, etc.

2.8 SAE Grade

1. Per equipment specifications, and operating temperature.
2. Must meet or exceed all vendor requirements for all wetted hydraulic equipment/components / specifications.

2.9 Viscosity

1. Per equipment specifications, and operating temperature.
2. Must meet or exceed all vendor requirements for all wetted hydraulic equipment / components / specifications.
3. As a minimum, hydraulic fluids shall have a viscosity index of 100 with an ISO Viscosity Grade of 15 to 46 at a temperature of 38 °C (100°F).

2.10 Cleanliness

1. Per ISO 4406, must meet or exceed all vendor requirements for all wetted hydraulic equipment / components / specifications.

2.11 Other

1. All other characteristics must meet or exceed all vendor requirements for all wetted hydraulic equipment / components / specifications, including seals.

PART 3 - EXECUTION

3.1 Not Used

1. Not Used

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

PART 1 - GENERAL

1.1 Description

1. This section describes the hydraulic components that make up the oil reservoir and associated equipment, pump/motor mounts, oil flow and pressure control devices.
2. This specification shall be read in conjunction with, but not only limited to, electrical drawing E3.10.

1.2 Related Work

1. Section 01 91 37 – Decommissioning / Commissioning.
2. Qualifications: The hydraulic vendor must have the following qualifications:
 1. One Tech on staff that is a Fluid Power Specialist
 2. Be Qualified with International Fluid Power Society.

1.3 Measurement and Payment

1. No measurement for payment will be made in this section. Payment shall be made under the lump sum price and shall include all costs for labour, materials and equipment necessary to do the work of this item.

1.4 Design

1. Hydraulic System Detailing:
 1. Assembly - As a minimum, power units for bridge operation shall be specified with maximum permissible envelope dimensions. Details of fabricated assembly showing pumps, motors, valve manifolds, and reservoirs shall be provided as necessary to aid in locating equipment within specified areas.
 2. Plumbing - Plumbing between hydraulic power units and actuators shall be detailed to clearly indicate location, routing, and method of attachment of pipe and tube for the transmission of hydraulic fluid. These details shall provide clear identification of special fittings such as quick disconnects. Additional details shall be provided as necessary for protective line covers, guards, and similar appurtenances.
 3. Serviceability - Hydraulic power units shall be designed to provide serviceability at a common area of the unit. Service related items to be located in this area shall include pressure gauges, additional gauge ports,

pressure filter(s), and valve manifold with adjustable valves. Pumps containing flow or pressure limiting valves shall be oriented and located in open areas for clear access. Other items that cannot be conveniently located in a common area (e.g., return filters, breathers) shall have unhindered accessibility for service and maintenance.

4. Identification and Accessibility - Hydraulic power units shall be fabricated and installed in order to provide maintenance access to all areas of the unit containing components requiring adjustment, replacement, monitoring, or similar servicing. Each component of any hydraulic system shall contain permanently attached labels identifying the component, manufacturer, and part number. This tag shall also display a call-out number that can be referenced to the hydraulic schematic located in maintenance manuals. These labels shall be specified as stainless steel with permanent markings appropriate for a corrosive environment.

2. Fabrication and Construction:

1. Flushing and Filling - Before charging hydraulic units, reservoir covers or inspection covers shall be removed and a complete inspection of the interior of the reservoir shall be performed. This inspection shall be specified regardless of any prior inspections that may have occurred during or after fabrication and regardless of integrity of unit protection from contamination during shipping or storage.
Fluid for flushing shall be the same as specified for final use. Flushing shall be performed with the fluid flow path in a "loop" configuration including the hydraulic power unit manifolds and field piping with bridge actuators bypassed from the circuit. This technique shall be applicable for both open and closed loop designs. The HPU Designer shall specify maximum fluid flow and duration of flushing. Observation of filter contamination and final degree of cleanliness shall be in accordance NFPA T2.24.1. This cleanliness level shall be verified by a qualified fluid testing facility and a copy of the results shall be forwarded to the Owner for use as baseline data. Standards for measuring levels of filtration shall be specified based on ISO 4406.
Newly installed hydraulic power units shall exhibit proper levels of fluid cleanliness before acceptance.
Minimum levels of cleanliness shall be ISO 18/16/13 to ISO 20/18/15 of ISO 4406.
All motor and pump case drains shall be filled in accordance with the manufacturer's instructions, and air from hydraulic cylinders and motors shall be purged prior to operation.
2. Painting - Paint systems shall be specified for all non-corrosion resistant materials used in hydraulic systems.

3. Testing

1. Hydraulic power unit testing shall include pressure testing at 1.5 times the maximum working pressure, verification of flow and pressure control, and verification of power output. Temperature control, offline filtration systems, and all diagnostic control systems of the unit design shall also be tested by

- the hydraulic equipment manufacturer and in conjunction with the hydraulic power unit control panel.
2. The Contractor shall submit the complete test procedure for approval prior to testing. Upon successful completion of the test, the results shall be compiled and a copy delivered to the Owner for their records.

PART 2 - PRODUCTS

2.1 Oil Reservoir

1. Operating Pressure: Atmosphere.
2. ReservoirMaterial: 10 gauge 316 stainless – conforming to ASTM A276, Type 316
3. Capacity:To be determined by contractor, minimum of 1.5 to 2.5 times the system flowrate per CSA S6-14 Section 13.8.13
4. Reservoir Style: Above Motors. Heavy-duty construction
5. Cleaning Access: Removable cover with gaskets, tee handle fasteners.
6. Baffle: Required, to allow for sufficient heat exchange between heated hydraulic oil and reservoir tank and to dissipate air entrainment.
7. Magnet: yes. Top accessible, removable without draining tank.
8. Drain: Yes. SAE.
9. Heater: Not required due to room heat.
10. Ports: The tank will include sufficient number of ports, plus spare suction and return ports (plugged) to connect all necessary equipment. Fluid sampling, drain, and breather ports shall be incorporated in the design.
11. Lifting: Skid must come with suitable lifting holes.
12. Finishes:
 1. Exterior: unfinished stainless steel.
 2. Interior: unfinished stainless steel.
13. Motor Mounting Plate: 3/8" steel.
14. Drip tray: 10-gauge steel minimum - sized to hold 110% or reservoir capacity. Must be hot dipped galvanized, or painted with high quality epoxy, or be stainless steel.
15. Component Configuration:

1. Refer to hydraulic schematic.
2. Contractor to follow current best practices and standards as outlined in NFPA T2.24.1.
3. Contractor to produce shop drawings for review before fabrication.

2.2 Temperature Gauge: Span to meet temperature switch and operational limitations.Oil Reservoir Sight Gas

1. Operating Pressure: < 2 psig.
2. Maximum Pressure: 30 psig.
3. Operating Temperature: -10 degC to +80 degC.
4. Type:
 1. Reservoir side mount fluid level site glass.
 2. Site glass bolts into side of reservoir.
 3. c/w thermometer (°C)
5. Height: 10"
 1. Must be easily readable in working range of hydraulic fluid near top of reservoir.
6. Body: to suit application.
7. Background: Clear background.
8. Transparent Window:
 1. Material to suit application.
 2. Must be transparent.
9. Seals: BUNA-N/nitrile.
10. Connections: Bolted.

2.3 Unload Valve

1. Operating Pressure: 2500 psi.
2. Maximum Pressure: 3000 psi.
3. Operating Temperature: -10 degC to 80 degC.

4. Type / Style: Solenoid, 2 position, spring return control valve. (Northman SWH-G03 Series or equivalent).
5. Flow Rate: Sized based on pump selection to ensure full pressure relief.
6. Mounting Pattern / size: NFPA DO5 - standard.
7. Solenoid Voltage: 120 VAC / 60 Hz.
8. Spool Configuration: According to schematic.
9. Leakage Rate: < 40 cm³/min/gland @ 3000 psi (maximum), @ 50 degC.
10. Approvals: CSA.
11. Indicator Lights: Yes.
12. Actuator Type: Wet armature solenoid.
13. Seals: Nitrile.
14. Electrical Connection: DIN 43650A.
15. Solenoid valves shall be specified as 120 VAC, 24 VDC or variable current loop signal when proportional, variable shifting is required. Electrical requirements of solenoid valves shall be in accordance with NFPA/T2.24.1.

2.4 Oil Reservoir Temperature Switch

1. Operating Temperature: -10 degC to 80 degC.
2. Operating Pressure: < 2 psig.
3. Maximum Pressure: 30 psig.
4. Type:
 1. Threaded mount temperature alarm switch.
 2. Threads into side of oil reservoir.
5. Diaphragm: Nitrile.
6. Body Material: To suit application.
7. Switch Type / Circuit: SPST / NO
8. Electrical Switching Capacity: 1A, 110 VAC.
9. Electrical Connection: DIN 43650A, IP65.

10. Mechanical Connection: Male 1/2" NPT.
11. Temperature Setting: 140degF (66 degC) rising.
12. Setting Tolerance: +/- 4 degC.
13. Differential: <10 degC deadband.
14. Mechanical Life: > 1 million cycles.
15. Approvals: CSA.

2.5 Oil Reservoir Level Switch

1. Operating Temperature: 0 degC to 80 degC.
2. Operating Pressure: < 2 psig.
3. Maximum Pressure: 30 psig.
4. Type: Non-magnetic.
5. Float Configuration: Double float, vertical rod.
6. Mounting: Male 1-1/4" NPT.
7. Rod Length and Float Locations:
 1. To suit reservoir oil levels.
 2. Refer to reservoir specification.
8. Rod Material: To suit application.
9. Rod Size / Reinforcement: To suit application
10. Switch Location: In head.
11. Electrical Connection: DIN 43650A.
12. Electrical Switching Capacity: 1A, 110VAC.
13. Electrical Switch Type: SPST / NO (for each float).
14. Body Material: To suit application.
15. Approvals: CSA.

2.6 Return Line Hydraulic Oil Filter

1. Operating Temperature: -10 degC to +80 degC.
2. Operating Pressure: 15 psig.
3. Type: Assembly: spin on oil filter with bypass check valve.
4. Differential Gauge:
 1. 0-25 psig safe operating range.
 2. Required for monitoring filter condition.
5. Bypass Valve Setting: 25 psig.
6. Flow Rate: Minimum 30 USGPM nominal rating.
7. Filter Canister Size: Size to suit.
 1. Pressure drop during clean filter operation not to exceed 1 psig.
 2. Note: This is intentionally oversized for improved performance and extended life.
8. Canister Style: Disposable, spin on.
9. Filter Media: Microglass.
10. Particle Size: 10 Microns, minimum rating
11. Filter Rating: Absolute with a beta ratio ≥ 200 , i.e. 99.5% efficient for any micron rating.
12. Canister and Head Material: All materials to suit application.
13. Port Sizes: SAE-ORB, to suit filter head.
14. Mounting: Head must be suitable for mounting.
15. Filtration specifications shall conform to NFPA T2.24.1 to determine fluid cleanliness levels
16. Electrical switch for clogged filter or active bypass check valve shall be included.

2.7 Pump Line Hydraulic Oil Filter

1. Operating Temperature: -10 degC to +80 degC.
2. Operating Pressure: 3000 psig.

3. Type: Assembly: spin on oil filter with bypass check valve.
4. Differential Gauge:
 1. 0-25 psig safe operating range.
 2. Required for monitoring filter condition.
5. Bypass Valve Setting: 25 psig.
6. Flow Rate: Minimum 30 USGPM nominal rating.
7. Filter Canister Size: Size to suit.
 3. Pressure drop during clean filter operation not to exceed 1 psig.
 4. Note: This is intentionally oversized for improved performance and extended life.
8. Canister Style: Disposable, spin on.
9. Filter Media: Microglass.
10. Particle Size: 10-20 microns/
11. Filter Rating: Absolute with a beta ratio ≥ 200 , i.e. 99.5% efficient for any micron rating.
12. Canister and Head Material: All materials to suit application.
13. Port Sizes: SAE-ORB, to suit filter head.
14. Mounting: Head must be suitable for mounting.
15. Filtration specifications shall conform to NFPA T2.24.1 to determine fluid cleanliness levels
16. Electrical switch for clogged filter or active bypass check valve shall be included.

2.8 Oil Reservoir Suction Strainer – NOT ALLOWED PER CSA S6-14 SECTION 13.8.15

1. Operating Temperature: -10 degC to +80 degC.
2. Operating Pressure: Not to exceed 0.2 psi differential.
3. Maximum Pressure (Negative): -5 psig.
4. Type: Submerged pump suction strainers.
5. Bypass Valve Setting: 3-5 psi (differential).

6. Maximum Flow Rate: 36 USGPM nominal capacity.
7. Filter Element: Stainless Steel.
8. Particle Size: 75-90 micron.
9. Dirt Holding Capacity: ISO 4572.
10. Filter Canister Size: Size to suit.
 1. Pressure drop during clean filter operation not to exceed 0.2 psi differential.
11. Canister and Head Material: Materials to suit application.
12. Port Sizes: Single port 3/4" NPT (minimum).

2.9 Pump Skid Test Ports

1. Operating Pressure: 2500 psi.
2. Maximum Working Pressure: 3000 psi.
3. Operating Temperature: -10 degC to +80 degC.
4. Type:
 1. DIN 2353 with dust cap.
 2. Test probes may be connected and disconnected at full system pressure without fluid loss or ingress of dirt.
5. Threaded Connection: - 6 SAE.
6. Body Material: To suit application.
7. Seals: To suit application.

2.10 Oil Reservoir Breather

1. Filtration Element:
 1. Indicating silica gel desiccant.
 2. Element must change colour to indicate when filter requires replacement.
2. Operating Temperature: -10 to +80 degC.
3. Threaded Connection: Male 1" NPT.

4. Type: Desiccant style.
5. Body Material: To suit application.
6. Maximum Operating Pressure (Differential): 5 psig.
7. Filter Element Size: 10 micron.
8. Particle Removal Efficiency: Beta 75.
9. Reservoir Fluid Exchange Rate: 12 GPM.

2.11 Directional Control Valves

1. Operating Pressure: 2500 psi.
2. Maximum Pressure: 3000 psi.
3. Operating Temperature: -10 degC to 80 degC.
4. Type / Style: Double solenoid, 3 position, spring centered directional control valve. (Northman SWH-G03 Series or equivalent). Electric requirements shall be in accordance with NFPA/T2.24.1
5. Flow Rate: Max 12 GPM, nominal 6.4 GPM.
6. Mounting Pattern / Size: NFPA DO5 - standard.
7. Solenoid Voltage: 120 VAC / 60 Hz.
8. Spool Configuration: According to schematic.
9. Leakage Rate: < 40 cm³/min/gland @ 3000 psi (maximum) @ 50 degC.
10. Approvals: CSA.
11. Indicator Lights: Yes.
12. Actuator Type: Wet armature solenoid.
13. Seals: Nitrile.
14. Electrical Connection: DIN 43650A.
15. Directional and speed control valving shall be specified based on system requirements with control and power valves sized according to anticipated flow and pressure requirements. All valve pressure ratings shall be specified to meet the maximum working pressure.

16. Whenever possible, valves shall be specified as manifold mounted with a subplate-type interfacing.
17. Unless an alternative mode of manual operation is provided, or the Owner waives the requirements for manual operation, any valve required for span movement shall be specified with a manual override system. Design and valve configuration shall be such that one operator could manually shift the necessary valves in order to direct the system to move the associated span without the use of the electrical control system.
18. Solenoid valves shall be specified as 120 VAC, 24 VDC or variable current loop signal when proportional, variable shifting is required. Electrical requirements of solenoid valves shall be in accordance with NFPA/T2.24.1.

2.12 Control Valve Manifold

1. Manifolds: two
2. Operating Pressure: 2500 psi.
3. Maximum Pressure: 3000 psi.
4. Type: Bar manifold.
5. Threaded Ports: SAE-ORB
6. Valve Mounting Pattern: NFPA T3.5.1-D05.
7. Valve Spacing: 3.25" / standard spacing.
8. Material: Aluminum.
9. Number of Stations: 3 stations for first manifold, 8 stations for second manifold.
10. Circuit Type: Parallel
11. Relief Cavity: Yes.
12. Connections/Supports: Foot mount bracket.
13. Shall have capability for internal and/or external draining of valve chambers per CSA S6-14 Section 13.8.11.1.
14. Manifolds shall be pressure tested to three times the maximum working pressure.
15. Manifold material for hydraulic valving shall be specified as steel or aluminum alloy possessing the necessary strength for the system pressure including safety factors. Carbon steel and aluminum manifolds shall be painted for protection per the requirements of structural steel.

2.13 Primary Hydraulic Piston Pump(s) & Motor(s)

1. Working Pressure: 3000 psi.
2. Operating Pressure: 2500 psi
3. Type: High pressure hydraulic variable volume piston pump
 1. specified for open loop circuit applications.
 2. Specified as positive displacement type with pressure and flow compensation per CSA S6-14 Section 13.8.10.
4. Mechanical Efficiency: > 81%.
5. Volumetric Efficiency: > 8190%.
6. Threaded Connections: SAE-ORB
7. Volume Flow Rate (based on 1725 rpm motor):
 1. Pump must provide: minimum 12 GPM (6 GPM x 2 pumps), 2500 psi maximum operating pressure, 20 HP motor.
8. Mounting:
 1. Include adapter and coupling to directly mount to motor c-face.
 2. Front face with SAE (or ISO) standard dimensions. Orientation for drain ports shall be specified as not to allow the pump chamber to drain during periods of inactivity.
9. Bushings: Teflon lined.
10. Seals: Buna-N.
11. All specified motors shall comply with NEMA dimensional standards, NEMA Design B motor guidelines, and ANSI/NEMA MG 1 for motors and generators.
12. Electrical motors equal to or greater than 0.746 kW (1 hp) used for driving hydraulic pumping equipment shall be specified as chemical duty rated, 1800 nominal rpm, three phase, 575 VAC, TEFC, squirrel cage induction motors. Per CSA S6-14 Section 13.8.7.1
13. Per CSA S6-14 Section 13.8.9, Flexible couplings for electric motor and hydraulic pump shafts shall be specified to assist in the assembly process of the hydraulic power unit. Couplings shall be specified based on available power and shall contain flexible inserts designed to accommodate shaft misalignment without inducing additional axial thrust into shafts.
14. Provision shall be made in the design and detailing of hydraulic systems for span operation such that the pumps are started under no-load conditions.

15. Switch Location: Pump Outlet
16. Electrical Switching Capacity: 1A, 110VAC.
17. Electrical Switch Type: SPST / NO

2.14 Check Valve

1. Operating Pressure: 2500 psi.
2. Maximum Pressure: 3000 psi.
3. Type: Metal poppet check valve.
4. Cracking Pressure: Between 5 and 15 psi differential.
5. Threaded Port: SAE.
 1. Primary Pumps (SAE-10).
 2. Emergency Pump (SAE-6).
6. Operating Temperature: -10 degC to +80 degC.
7. Body Material: Stainless Steel.
8. Seals: Buna-N/Nitrile.

2.15 Ball Valve

1. Operating Pressure: < 4 psig.
2. Class: ANSI Class 150 (or better).
3. Max Pressure: 150 psig (minimum).
 1. Ball valves only to be used on low pressure side of pumps.
 2. Refer to hydraulic schematic.
4. Operating Temperature: -10 degC to +80 degC.
5. Type: Full bore 90 degree ball valve.
6. Seals: Must be compatible with selected hydraulic fluid.
7. Body / Stem Material: Stainless Steel.
 1. No metal to metal moving parts.

8. Ball Material: Chrome plated or stainless steel.
9. Connections: SAE O-ring boss.
10. Handle:
 1. Locking style, with flow direction arrow.
 2. One hand operation.

2.16 Pressure Relief Cartridge Valve

1. Operating Pressure: 2500 psi.
2. Maximum Pressure: 3000 psi.
3. Type: Pilot operated, cartridge style, balanced spool relief valve. (
4. Flow Rate: 6.4 gpm (minimum).
5. Operating Temperature: -10 degC to +80 degC.
6. Adjustment Range: 100 - 2500 psig minimum range.
7. Adjustment: Sealed screw type, 4-6 turns through adjustment range.
8. Configuration: Per hydraulic schematic.
9. Connection: Must connect to control valve manifold relief cavity port.
10. Seals: Buna-N.

2.17 Sampling Port

1. Operating Pressure: Atmospheric.
2. Operating Temperature: -10 degC to 80 degC.
3. Mounting: 1/4" NPT.
4. Threaded Port: DIN 2353 with dust cap.
5. Tube: 1/4" stainless steel tubing.
6. Tube Length: To reach mid-level of fluid in reservoir.

2.18 Sandwich Body Flow Control Valve

1. Operating Pressure: 2500 psi.
2. Max Pressure: 3000 psi.
3. Type: Sandwich body/cartridge style needle valve flow control. (Northman MT-03 Series or equivalent)
4. Mounting Pattern: NFPA DO5 - Standard.
5. Flow Rate:
 1. At full open, valve must pass 6.4 gpm (minimum).
 2. Valve will control flow from 0 gpm to 6.4 gpm during operation.
6. Operating Temperature: -10 degC to +80 degC.
7. Body Material: Aluminum.
8. Adjustment: Sealed screw type, adjustment range 4 turns minimum.
9. Leakage: No leakage at shutoff.
10. Seals: Buna-N.
11. Configuration: Per schematic.
12. Directional and speed control valving shall be specified based on system requirements with control and power valves sized according to anticipated flow and pressure requirements. All valve pressure ratings shall be specified to meet the maximum working pressure.
13. Whenever possible, valves shall be specified as manifold mounted with a subplate-type interfacing.
14. Unless an alternative mode of manual operation is provided, or the Owner waives the requirements for manual operation, any valve required for span movement shall be specified with a manual override system. Design and valve configuration shall be such that one operator could manually shift the necessary valves in order to direct the system to move the associated span without the use of the electrical control system.

2.19 Sandwich Body PSI. Pressure Reducing Valve

1. Operating Pressure: 2500 psig
2. Max Pressure: 3000 psi.

3. Type: Pilot operated, sandwich body/cartridge style pressure reducing valve. (Northman MPR-03 Series or equivalent)
4. Mounting Pattern: NFPA DO5 - Standard.
5. Pressure Adjustment:
 1. 100-2500 psig minimum range.
 2. Valve will control pressure between 100 and 2500 psi during operation.
6. Operating Temperature: -10 degC to +80 degC.
7. Body Material: Aluminum.
8. Adjustment: Sealed screw type, adjustment range 4 turns minimum.
9. Seals: Buna-N.
10. Configuration: Per schematic.
11. Flow Rate: Valve must pass 6.4 gpm (minimum) throughout operating pressure range.

2.20 Sandwich Body Dual PO Check Valve

1. Operating Pressure: 2500 psi.
2. Max Pressure: 3000 psi.
3. Type: Pilot operated, sandwich body/cartridge style, check valve. (Northman MPC-03 Series or equivalent)
4. Mounting Pattern: NFPA DO5 - Standard.
5. Operating Temperature: -10 degC to +80 degC.
6. Nominal Flow Rate: 6.4 gpm (minimum).
7. Body Material: Aluminum.
8. Manual Load Release: Yes: sealed screw type.
9. Seals: Buna-N.
10. Configuration: Per schematic.

2.21 Regenerative Balance Valve Assembly

1. Operating Pressure: 2500 psi.
2. Max Pressure: 3000 psi.
3. Type: Cartridge style components. Regenerative balance valve with Counter Balance Valve. (Sun hydraulics model YDCD Series)
4. Flow Rate: 6.4 gpm (minimum) at inlet.
5. Operating Temperature: -10 degC to +80 degC.
6. Body Material: Aluminum.
7. Adjustment: Sealed screw type, easily accessible.
8. Seals: Buna-N.
9. Configuration: Per schematic.
 1. Several cartridges might be required to complete this assembly.
10. Ports: SAE O-ring boss.
11. Mounting: Foot bracket(s) or Side mount.
12. Port Locations: TBD
13. Adjustment Range: 500 - 2500 psi (minimum range).

2.22 Sandwich Body Dual Flow Control

1. Operating Pressure: 2500 psi.
2. Max Pressure: 3000 psi.
3. Type: Sandwich body/cartridge style (Northman MT03 Series or equivalent).
4. Operating Temperature: -10 degC to +80 degC.
5. Body Material: Aluminum.
6. Adjustment: Sealed screw type, 4 turns minimum.
7. Seals: Buna-N.
8. Configuration: Per schematic.

2.23 Pressure Indicators

1. At a minimum, permanently mounted hydraulic pressure gauges shall be required for measuring fluid pressures at the main system pumps and manifold pressures at the field piping connections.
2. Additional quick disconnect type ports with “no mess” check valves and protective caps, secured by chains, shall be specified at pertinent locations within the hydraulic system. Connections shall also be specified at the cylinder manifolds to measure cylinder rod and blind end pressures.
3. Gauges shall be located to avoid contact during maintenance of the hydraulic unit. Mounting shall be rigid and capable of accommodating vibrations during operation. Housing shall be stainless steel with the internal area being glycerin filled for component protection and dampening. Gauge working design pressure shall be specified for 150% of the maximum working pressure at the port location.

PART 3 - EXECUTION

3.1 Not Used

1. Not Used.

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

PART 1 - GENERAL

1.1 Description

1. This section describes the hydraulic cylinders and associated equipment that will be used to rotate the bridge.

1.2 Related Work

1. Section 01 91 37 – Decommissioning / Commissioning.

1.3 Measurement and Payment

1. No measurement for payment will be made this section. Payment shall be made under the lump sum price and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Bridge Rotation Cylinders

1. Operating Pressure: 2500 psi.
2. Maximum Pressure: 3000 psi.
3. Type: Push/pull mill duty hydraulic cylinder with bolted heads and rod seals serviceable without cylinder removal.
4. Cylinder Heads: Cylinder heads shall contain an appropriate rod scraper to limit intrusion of foreign materials into the hydraulic oil and a collar reservoir system to contain small rod seal leaks.
5. Cylinder design shall conform to NFPA/T2.24.1, except that cylinder dimensions and mounting shall be as required to meet the strength and serviceability criteria indicated in this specification and applicable WSP drawings.
6. Cylinder Strength: Strength of hydraulic cylinders for span operation shall be in accordance with ASME B31.3, and bear the required markings/documentation to indicate code compliance.
7. Flow Rate: ~ 6 gpm per cylinder
8. Operating Temperature: -10°C to +80°C.

9. Body Material: Washdown rated.
10. Rod Material: Stainless steel, chrome plated.
11. Seal Material: Compatible with oil.
12. Configuration: As shown on layouts.
13. Bore size: Per Drawing
14. Rod size: Per Drawing.
15. Stroke: Per Drawing.
16. Shell thickness: shall be at least 12mm (0.47in) thick
17. Shell length: shall be no greater than 1625mm (63.9in)
18. Accessories: Replace existing cylinder accessories.
19. Ports: SAE O-ring boss.
20. Cylinder must have magnetic band on piston for use with reed switches. Each cylinder to come equipped with two movable body switches (one for each end of stroke)
21. Cylinders shells must be designed for the overlimit state such that the allowable working stresses established in ASME B31.1 are not exceeded at the maximum working pressure, per CSA S6-14 Section 13.8.5.4
22. Pressure Test Ports: pressure test ports shall be specified at cylinder ports. Test ports may be provided in the cylinder manifold for improved access.
23. Air Bleed Ports: Air bleed ports shall be provided at practical locations for bleeding trapped air during installation and servicing.
24. Other Features: As noted on layouts.
25. Hydraulic cylinders for span operation shall be 7.8 pressure tested extended and retracted at 1.5 times the maximum working pressure with no visible evidence of external leakage. Testing shall be performed on the assembled cylinder, which shall include the cylinder, and any cylinder manifolds, piping between the cylinder ports and the manifold, and the cylinder manifold mounted valves. Cylinder cushion performance at design rod speeds shall be tested and verified.
26. Cylinders for span operation shall be mounted such that bending is not introduced into the cylinder due to the restraint of the supports and/or connections. If design geometry dictates that cylinder mounting will require positioning other than vertical, consideration shall be given to the added effects of cylinder dead loads in the

specification of cylinder rod bearings and analysis of cylinder buckling. As cylinder mounting approaches the horizontal position, provisions for a rod protection guard for normally extended cylinders should be considered.

27. Cylinder tubes shall have a permanently attached stainless steel information placard providing cylinder model number, manufacturer, pressure rating, bore and rod diameter, stroke length, cushion information, test pressure, and details of any nonstandard features.
28. Cylinder manifold shall include pilot operated check valves or similar means to hold fluid in the cylinder when the cylinder is not intended to be in motion. Manifolds shall also contain cylinder relief valves for limiting the pressure in both ends (i.e., rod and blind) of the cylinder. The manifold shall be hard piped to the cylinder ports
29. Cylinder manifolds for span drive cylinders shall be equipped with manual release needle valves to allow for maintenance or emergency operation of the cylinder. Manual release valves shall allow for variable flow adjustment, which facilitates controlled release of fluid from the cylinder under pressure.

2.2 Span Lock Cylinder

1. Operating Pressure: 2500 psi.
2. Maximum Pressure: 3000 psi.
3. Type: Push/pull tie rod hydraulic cylinder
4. Flow Rate: ~ 6 gpm
5. Operating Temperature: -10°C to +80°C.
6. Body Material: Washdown rated.
7. Rod Material: Stainless steel, chrome plated.
8. Seal Material: Compatible with oil.
9. Configuration: As shown on layouts.
10. Bore size: Per Drawing
11. Rod size: Per Drawing.
12. Stroke: Per Drawing.
13. Shell thickness and shell length shall be reviewed by the Engineer of Record.
14. Accessories: Replace existing cylinder accessories.

15. Ports: SAE O-ring boss.
16. Cylinder must have magnetic band on piston for use with reed switches. Each cylinder to come equipped with two movable body switches (one for each end of stroke)
17. Cylinders shells must be designed for the overlimit state such that the allowable working stresses established in ASME B31.1 are not exceeded at the maximum working pressure, per CSA S6-14 Section 13.8.5.4
18. Other Features: As noted on layouts.
19. Flexible boot for rod protection shall be provided.

2.3 Cylinder Bleed Valves

1. Operating Pressure: 2500 psi.
2. Max Pressure: 3000 psi.
3. Type: Needle style flow control valve.
4. Threaded Port: -4 SAE.
5. Operating Temperature: -10 degC to +80 degC.
6. Turns to full open: 5 minimum.
7. Valve Materials: Stainless steel.
8. Seals: Buna-n/nitrile.
9. Max flow rate: < 5 gpm.

2.4 Cylinder Brackets

1. To be CS and painted following Parks Canada paint specification.
2. Refer to drawings for fabrication details, dimensions, installation requirements.
3. Clevis pins to include provisions from supplier for lubrication of interface between the following two locations; rod-eye and clevis bracket, and cylinder bore end mounting bracket and pier clevis brackets.
4. Sizing of pins and brackets shall be in accordance with CSA-S6-14.

2.5 Rod Eyes (Cylinder Ends)

1. Refer to drawings for all thread on female spherical rod eyes.
2. Pin sizes: as per manufacture recommendations in accordance with CSA S6-14 to be verified by engineer of record

PART 3 - EXECUTION

3.1 Fabrication and Installation

1. Refer to the drawings.

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

PART 1 - GENERAL

1.1 Electrical Work Description

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of electrical equipment, apparatus, appliances, materials, and accessories necessary to complete the work under the scope of the contract.
2. The prime mover of the bridge span shall be by a packaged hydraulic power unit that will be located in the lock station. The control system shall consist of a relay based control panel, a bridge operator control console, field instruments and control devices, traffic control interface equipment, warning indication, circuit wiring, and miscellaneous electrical devices integrated to form a functional and operational system. Specifically, the system will include the following:
 - .1 One (1) hydraulic power unit (one serving both the bridge and locks)
 - .1 Two (2), 3-phase, 600V, 15HP motors and hydraulic pumps.
 - .2 Integrated valves, filters, and instruments terminating in a junction box.
 - .3 Reservoir and mounting structure.
 - .2 Bridge Operator Console and control panel.
 - .3 Lock Gate Control panel.
 - .4 75kVA transformer (600V/208/120V).
 - .5 Lock Station Distribution panel – 200A, 208/120V, 60 circuits.
 - .6 Lock Gate Controls Distribution panel – 100A, 208/120V, 24 circuits
 - .7 Bridge Distribution panel – 100A, 208/120V panel, 24 circuits.
 - .8 600V underground cabling from the Hydro One service pole to the lock station service entrance disconnect.
 - .9 Main distribution equipment including:
 - .1 Fused, 200A, service entrance rated disconnect switch with viewing window.
 - .2 200A, 7-Jaw meter base.
 - .3 200A Manual Transfer Switch.
 - .4 100A Generator, fused disconnect switch with Arktite connector.
 - .5 225A 3 phase, 3-wire, 600V splitter.
 - .6 60A, and 100A enclosed breaker disconnect switches.
 - .10 Hydraulic pump motor, size 2, combination starters (with 30A breaker).
 - .11 Bridge position limit or reed switches (BNC, BFC, BNO, BFO).
 - .12 Locking pin cylinder reed switches indicating driven and retracted positions.
 - .13 Two (2) traffic control gate units.
 - .14 Underground trench for control, power and hydraulic lines.
 - .15 Cabling/wiring.
 - .16 Submerged TECK cabling along the bottom of the canal.
 - .17 Replaced PA system components at bridge operator console.
3. As part of this project, the existing 600V service and distribution will be upgraded from a 100A service to a 200A service. The Contractor will be responsible for

coordinating work related to the service upgrades with the utility, Hydro One. The existing MCC will be replaced with a separate meter base, manual transfer switch (for generator connection), splitter, and disconnects to serve several loads.

4. A new 75kVA transformer will be added to supply a 120/208V distribution panel. This will replace the 120/240V lock station distribution panel located inside of the MCC. All circuits of the existing distribution panel will be transferred to the new 120/208V panel. The intent is to keep existing branch feeder wiring.
5. Lock Gates controls that presently reside in the MCC will be consolidated into a new Lock Gate Control cabinet. These controls will incorporate functionality that will allow the HPU to be shared between the Lock Gates and the Bridge. Existing cabling for field devices and Lock Gate operator stations will remain and be re-used.

1.2 Related Requirements

1. All Section 26 specifications defined for the electrical work.

1.3 References

1. Canadian Standards Association (CSA International)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No. 0 through 10 as applicable.
 - .3 CAN3-C235-83, Preferred Voltage Levels for AC Systems, 0 to 50,000V.
 - .4 Do underground systems in accordance with CSA C22.3 No.7-06, Underground Systems, except where otherwise specified.
 - .5 CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .6 CAN/CSA-S6.1-14, Commentary on CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .7 CAN/CSA-Z462-18, Workplace Electrical Safety.
2. Institute of Electrical and Electronics (IEEE)/National Electrical Code Safety Code product line(NESC)
 - .1 IEEE SP1122, The Authoritative Dictionary of IEEE Standard Terms (latest edition).
3. Electrical and Electronics Manufacturer's Association of Canada (EEMAC)
 - .1 EEMAC 2y-11958 and amendment thereto.
4. Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).
5. National Electrical Contractors Association (NECA)

- .1 NECA 1 (latest) – Standard Practice of Good Workmanship in Electrical Contracting.
6. National Fire Protection Agency (NFPA)
 - .1 NFPA 79 (latest) – Electrical Standard for Industrial Machinery.
7. The Ontario Electrical Safety Code 2018, and all bulletins (Ontario).
8. Utility requirements and local applicable codes and regulations.
9. Ontario Provincial Standard Specifications
 - .1 OPSS 106 – General Specification for Electrical Work.
 - .2 OPSS 604 – Construction Specification for Installation of Cable.
 - .3 OPSS 609 – Construction Specification for Grounding.
 - .4 OPSS 610 – Removal of Electrical Equipment.
 - .5 OPSS 614 – Construction Specification for Installation of Power Supply Equipment.
 - .6 OPSS 616 – Construction Specification for Footings and Pads for Electrical Equipment.
 - .7 OPSS 620 – Construction Specification for Traffic Signal Interconnection Equipment.
 - .8 OPSS 621 – Construction Specification for Electrical Traffic Control Devices.

1.4 Definitions

1. Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.
2. Electrical systems shall be engineered, manufactured and installed in accordance with the Canadian and Ontario Electrical Codes. The design and engineering of the electrical installation shall satisfy all statutory requirements of the national and/or local authorities in the region in which the electrical installation will be located. The electrical installation shall be suitable for the site conditions as specified. Where necessary, special attention shall be paid to the selection and installation of electrical equipment suitable for seismic conditions.
3. The reference standards outlined in section 1.3 form part of the specification to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the work.

1.5 Design Requirements

1. Operating voltages: to CAN3-C235.
2. Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
3. Language operating requirements: provide identification nameplates and labels for control items in English.

1.6 Action and Informational Submittals

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. Quality Control: in accordance with Section 01 45 00 - Quality Control.
 - .1 Provide CSA certified (or other recognized Canadian certification) equipment and material.
 - .2 Where CSA certified equipment (or other recognized Canadian certification) and material is not available, submit such equipment and material to Departmental Representative for approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

1.7 Quality Assurance

1. Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
2. Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Territorial Act respecting manpower vocational training and qualification.
 - .1 Employees registered in provincial apprentice's program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
 - .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
3. Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.8 Delivery, Storage and Handling

1. Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract.
2. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.9 System Startup

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

1.10 Operating

1. Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
2. Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system of item of equipment.
3. Print or engrave operating instructions and frame under glass or in approved laminated plastic.
4. Post instructions where directed.
5. For operating instructions exposed to weather, provide weather-resistant materials (cont'd) or weatherproof enclosures.
6. Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removals or peeling.

PART 2 - PRODUCTS

2.1 Materials and Equipment

1. Material and equipment to be CSA certified (or other recognized Canadian certification). Where CSA certified material and equipment is not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
2. Factory assemble control panels and component assemblies.

2.2 Wiring Terminations

1. Ensure lugs, terminals, screws used for termination of wiring are suitable for copper conductors.
2. Termination for power wiring shall be rated for a minimum of 60 degrees C for all conductors #2 AWG and smaller, and 75 degrees C for all conductors #1 AWG and larger.

2.3 Equipment Identification

1. Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, black face, white core, lettering accurately aligned and engraved into core.
 - .2 Sizes as follows:

Size	1	10 x	50 mm	1 line	3 mm high letters
Size	2	12 x	70 mm	1 line	5 mm high letters
Size	3	12 x	70 mm	2 lines	3 mm high letters
Size	4	20 x	90 mm	1 line	8 mm high letters
Size	5	20 x	90 mm	2 lines	5 mm high letters
Size	6	25 x	100 mm	1 line	12 mm high letters
Size	7	25 x	100 mm	2 lines	6 mm high letters
2. Labels: embossed plastic labels with 6mm high letters unless specified otherwise.
3. Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.

4. Allow for minimum of twenty-five (25) letters per nameplate and label.
5. Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
6. Identify equipment with Size 3 labels engraved as directed by Departmental Representative.
7. Disconnects, starters and contactors: indicate equipment being controlled and voltage.
8. Terminal cabinets and pull boxes: indicate system and voltage.
9. Transformers: indicate capacity, primary and secondary voltages.

2.4 Wiring Identification

1. Identify wiring with permanent indelible identifying markings, numbered on both ends of phase conductors of feeders and branch circuit wiring.
2. Maintain phase sequence and colour coding throughout.
3. Colour coding: to CSA C22.1.
4. Use colour coded wires in communication cables, matched throughout system.

2.5 Conduit and Cable Identification

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

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

PART 3 - EXECUTION

3.1 Demolition and Removals

1. Contractor to review existing electrical drawings and compare to the contract drawings and scope of work. Confirm with the Departmental Representative what equipment needs to be removed and what will be kept prior to demolition.
2. Cables and wiring to existing Lock Station loads are to be marked and tagged for reconnection to a new 120/208VAC distribution panel. Ensure this is completed prior to MCC removal.
3. Mark and record the cabling, including the individual wires, interconnecting the Lock Gate field operator stations, existing hydraulic unit, and lock gate limit switches/sensors. Wires shall be marked according to the terminal number they are presently connected to and in accordance with existing control drawings. Ensure this is completed prior to MCC and HPU removal.
4. Mark and record the cabling, including the individual wires, interconnecting the existing navigation lights and receptacles for the North end (East and West) of the bridge. These cables and equipment may be reused depending on condition and the approval of the Departmental Representative. Mark and record cabling and wires for any other bridge loads not specified on drawings or documents for removal.
5. After cables have been marked, remove the Lock Station Motor Control Center and dispose of the unit in accordance with Section 01 74 21 – Construction Demolition Waste Management and Disposal. Confirm with Departmental Representative if any MCC components can be salvaged for re-use at other sites.
6. Remove the bridge electrical equipment, sensors/limit switches and the operator console. Dispose of the material in accordance with Section 01 74 21 – Construction Demolition Waste Management and Disposal. Confirm with Departmental Representative if any components can be salvaged for re-use at other sites.
7. Examine the junction boxes and conduit pertaining to the bridge receptacles on the North-West and North-East sides. These may be re-used if in excellent condition. Examine and confirm with the Department Representative whether the conduit and junction boxes running through the South abutment can be re-used for the South traffic gate unit (control and power).

3.2 Installation

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

2. Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.
3. Proceed with installation according to Section 26 electrical specifications and associated contract drawings.

3.3 Nameplates and Labels

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

3.4 Field Quality Control

1. Conduct the following tests in accordance with Section 01 45 00 Quality Control.
2. Carry out tests in presence of Departmental Representative.
3. Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

3.5 Cleaning

1. Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original
2. Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

3.6 Location of Outlets

1. Locate outlets (if applicable) in accordance with the drawings.
2. Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
3. Change locations of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

3.7 Field Quality

1. Conduct the following tests in accordance with Section 01 45 00 Quality Control.
2. Carry out tests in presence of Departmental Representative.

3. Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

3.8 Mounting Heights

1. Mounting height of equipment is from finished floor to centerline of equipment unless specified or indicated otherwise.
2. If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
3. Install electrical equipment at following heights unless indicated otherwise:
 - .1 Local switches: 1400 mm.
 - .2 Wall receptacles:
 - .1 General: 300mm.
 - .2 Above top of continuous baseboard heater: 200 mm
 - .3 Above top of counters or counter splash backs: 175 mm
 - .4 In mechanical rooms: 1400 mm.
 - .3 Panel Boards: As required by CEC/OESC or as indicated on contract drawings.

3.9 Co-Ordination of Protective Devices

1. Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

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

PART 1 - GENERAL

1.1 Related Requirements

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of wires and cables.
2. Provide supervision, labor, and assistance for installation as part of this Contract.
3. The requirements of other related specification sections shall also apply for installation and coordination of work.

1.2 References

1. Canadian Standards Association (CSA International)
 1. CSA C22.1-12, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 2. CSA C22.2 No. 131 Type TECK 90 Cables.
 3. CSA C22.2 No. 38 Thermoset Insulated Wires and Cables.
 4. CSA C68.3 Power Cables with Thermoset Insulation.
 5. CSA C21.1 600 V Control Cable.
 6. CSA C21.2 300 V Control Cable
 7. CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 8. CAN/CSA-S6.1-14, Commentary on CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 9. CAN/CSA-Z462-18, Workplace Electrical Safety
 10. CAN/CSA-Q9000-92 Quality Management Quality Assurance Standards for select.
2. The Ontario Electrical Safety Code 2018, and all bulletins (Ontario).
3. Ontario Provincial Standard Specifications
 1. OPSS 106 – General Specification for Electrical Work.
 2. OPSS 604 – Construction Specification for Installation of Cable.

1.3 Action and Informational Submittals

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. The Contractor shall submit copies of vendor, producer or manufacturer data for cable and wiring. These shall include design and installation shop drawings,

catalog cuts, specifications, data sheets, physical dimensioned drawings, testing requirements, and installation instructions.

1.4 Quality Assurance

1. Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
2. Regulatory requirements: Perform electrical construction in accordance with industry acceptable practice and complies with applicable country, region and local codes.
3. Products shall be tested, approved and labeled/listed by CSA, or by a nationally recognized testing laboratory (NRTL).
4. Electrical equipment and materials shall be new and within one year of manufacture date.
5. Electrical work shall comply with the requirements of the CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations and CAN/CSA-Z462-18, Workplace Electrical Safety.
6. Material and workmanship shall conform to the requirements of the specifications. Contractor shall ensure material and workmanship quality and provide Certificates of Conformance per the requirement of Specification Section 01 45 00 Quality Control.

1.5 Delivery, Storage and Handling

1. Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and 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 wire and cables off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 2. Store and protect goods from damage.
 3. Replace defective or damaged materials with new.
4. Develop Construction Waste Management Plan related to Work of this Section.
5. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste

Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

6. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Install New Wire and Cables" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Low Voltage Unarmoured Wire and Cable (1000v and Below)

1. Construction: Stranded, annealed copper conductors, 1000 V, rating RWU90 cross-linked polyethylene (XLPE) insulation for all cables outside of buildings and RW90 cross-linked polyethylene (XLPE) insulation for cables within the building unless noted otherwise.
2. Direct buried installations or installation in direct buried polyethylene pipe: Cross-linked polyethylene (XLPE), RWU90 insulation, 1000 V minimum rating.
3. Standard: CSA C22.2 No. 38.
4. Minimum conductor sizes: Unless otherwise indicated, #12 AWG for power and current transformer circuits.
5. Multi-conductor cables: PVC flame retardant jacket overall, flame test rated.

2.2 Low Voltage Unarmoured Power Wire and Cable (300v and Below)

1. Construction: Stranded, annealed copper conductors, 300 V rating, 90°C (or greater) PVC insulation for indoor applications.
2. Standard: CSA.
3. Minimum conductor sizes: Unless otherwise indicated, #12 AWG for power and current transformer circuit.
4. Multi-conductor cables: PVC flame retardant jacket overall, flame test rated.

2.3 Low Voltage Armoured Wire and Cable (1000v and Below)

1. Construction: Stranded, annealed copper conductors, 1000 V rating, RW90 cross-linked polyethylene (XLPE) insulation.
2. Power cabling: TECK construction.
3. Control cabling: TECK construction.
4. Minimum conductor size: Unless otherwise indicated, #12 AWG for power and current transformer circuits and #14 AWG for control circuits.
5. Grounding conductor: Stranded, soft, bare copper conductor in multiconductor cables, concentric copper wires over insulation in single conductor cable.
6. Multi-conductor cables: With inner PVC jacket.
7. Interlocking armour: Flexible, galvanized steel or aluminum for multi-conductor cables and aluminum for single conductors, spirally wound over inner jacket.
8. Outer jacket: PVC, flame-retardant, FT4 flame test rated, low acid gas evolution, outer jacket extruded over the armour.
9. Fastenings:
 1. One-hole malleable iron clips to secure surface cables 50 mm and smaller. Two-hole steel clips for cables larger than 50 mm.
 2. Channel type supports for two or more cables at 500 mm centers.
10. Connectors: Watertight approved for TECK cable.

2.4 Control Cables

1. Voltage Rating: 600V.
2. Construction: TECK/Aluminum Interlocking Armour.
3. Standard: CSA.
4. Temperature rating: 90 Degrees C.
5. Minimum conductor sizes: Unless otherwise indicated, #14 AWG.
6. Multi-conductor cables: PVC flame retardant jacket overall, flame test rated.

2.5 Wiring Accessories

1. Wire Markers: Identify all wiring with heat shrinkable slip-on markers c/w type written tag numbers, black letters on white background.
2. Cable markers: For cables or conductors greater than 13 mm diameter, strap-on type, semi-rigid PVC carrier strip.
3. Terminal blocks: 600 V, 10 A minimum rating, modular, 35 mm DIN rail mounted, provision for circuit number labelling, individually removable, sized to accommodate conductor size and circuit current.
4. Fused Terminal Blocks: 300 V, 10 A minimum rating, modular, 35 mm DIN rail mounted, provision for circuit number labelling, individually removable, sized to accommodate conductor size and circuit current., 5x20mm fuse, 100-250V AC/DC with Blown Fuse Indication.
5. Field wiring terminations: Where screw-type terminal blocks are provided, supply insulated fork tongue terminals.
6. Splice connectors for equipment pig-tail, lighting and receptacle circuits: For wire sizes #12 and #10 AWG inclusive, twist-on compression spring type.
7. Moisture and waterproofing: In wet locations, with Liquid Tape.
8. Equipment pig-tail power circuit connections: For wire sizes #8 AWG minimum, split-bolt type, sized to suit number and size of conductors.
9. Low voltage (1000 V and lower) motor terminations: Heat shrinkable connection kit, including sleeves, caps and sealant.
10. Cables ties: Nylon, one-piece, self-locking type, UV resistant.
11. TECK cable connectors in wet or outdoor areas: Watertight type.
12. Cable grips (if required): To accommodate type and geometry of cable supported, single weave, variable mesh design.
13. Cable pulling lubricant: Compatible with cable covering and not to cause damage or corrosion to conduits or ducts.

2.6 Factory Custom Panel and/or Control Cabinet Wiring

1. Relay panel and/or control cabinet wiring shall use flame retardant cross-linked polyethylene (XLP) or flame-retardant ethylene-propylene rubber (EPR) insulation that meet or exceed requirements of UL 44 for Types SIS, and XHHW. Minimum size: No. 14 AWG (1.5 mm²).

2. Conductor terminal connectors shall be insulated, compression type connectors properly sized for conductor and terminal. Connectors shall be constructed of copper and shall be tin-plated.
3. Current transformers (if required) shall terminate on shorting type terminal blocks. Ship with shorting jumpers installed.
4. Prior to shipment of equipment, remove temporary wiring installed in factory for equipment testing.
5. Identification and labeling:
 1. Provide conductor identification sleeve on each end of each internal conductor. Mark each sleeve with opposite end destination identification with permanent black ink. Sleeves shall be UV-resistant self-adhesive type or PVC, not less than 13mm long.
 2. Permanently label each terminal block, terminal, conductor, relay, breaker, fuse block, and other auxiliary devices to coincide with identification indicated on manufacturer's drawings.

PART 3 - EXECUTION

3.1 Installation

1. Cables shall be installed per manufacturer recommendations and instructions, and comply with the applicable codes and standards.
2. Conductor length for parallel feeders to be identical.
3. Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
4. Wiring in walls (if required): typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
5. Provide numbered wire collars for control wiring. Numbers to correspond to control drawings. Obtain wiring diagram for control wiring.
6. Limit pulling tension and minimum bending radii to those recommended by manufacturer.
7. Pull cable into ducts, conduits and cable trays in accordance with cable manufacturer's instructions.
8. Prevent damage to cable jackets by utilizing adequate lubricant when pulling cables through ducts and conduits.

9. Support cables in manholes and utility tunnels on cable trays or cable racks.
10. Connect cables to electrical boxes and equipment enclosures located in wet or sprinkled areas with watertight cable connectors. Contractor to ensure that CSA/NEMA rating of enclosures are maintained.
11. Provide cable grips for vertical, horizontal and catenary cable suspension installations to reduce cable tension at connectors and at cable bends.
12. Install through wiring in junctions and pull boxes having no connection within the box. Leave 150 mm minimum of slack inside box.
13. Facilitate making of joints and connections by leaving sufficient slack in each conductor at panelboards, outlet boxes and other devices.
14. Identify each cable by attaching a cable marker at each end, in all intermediate manholes, junction boxes and pull boxes.
15. Install cables to conserve headroom in exposed locations and to cause minimum interference in spaces through which they pass.
16. Do not install horizontal runs in hollow masonry walls. Passage through any structural member or precast slab must be approved by the Departmental Representative.
17. Where exposed, install raceways and cables parallel with building lines and group neatly.
18. Maintain the integrity of all fire separations by sealing around all cables where they pass through any fire barriers. Generally, this includes all floors ceilings and concrete and masonry walls.
19. As far as is practicable, all feeder wiring shall be continuous from origin to panel termination without running splices in intermediate pull boxes or splicing chambers. Sufficient slack shall be left at the termination point to make proper connections to the equipment.
20. Circuit Cable Installation Around Structure Movable Joints:
 1. Contractor shall utilize droop or flexible cables around structural movable joints. Install cables so tension, including that from the weight of the cables, won't be transmitted to the conductor terminals. Strain-relief fittings shall be utilized.
 2. Liquid-tight flexible metal conduit or liquid-tight flexible non-metallic conduit may be used, as long as the length is limited to 2m.
 3. Provide bushings or fittings to protect cords where they pass through holes in covers, outlet boxes, or similar enclosures.
 4. Transition from rigid conduit to liquid-tight conduit or flexible cable shall be made through a NEMA 4X termination junction boxes.

5. The circuit cables shall securely be kept away from any pinch points.

3.2 Wiring Identification

1. Identify wiring with wire markers.
2. Colour code power, feeder and branch conductors at both ends with coloured plastic tapes. Tapes are not required where conductors are identified by jacket colour. Maintain phase and colour sequence throughout.
3. Identify each conductor, including spares, with a unique designation to facilitate troubleshooting and maintenance. Multiconductor cables may have conductor designations printed on them. Use wire markers in addition to these conductor designations and ensure they match. Contractor shall use the designations on the contract drawings where possible.
4. Identify PLC wiring at terminal blocks and connection points with tagging as identified on the contract drawings.

3.3 Field Quality Control

1. Conduct the following tests in accordance with Section 01 45 00 Quality Control.
2. Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
3. Perform tests before energizing electrical system.

3.4 Cleaning

1. Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
3. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

PART 1 - GENERAL

1.1 Related Requirements

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of the grounding system, and accessories necessary to complete the work under the scope of the contract.
2. Provide supervision, labor, and assistance for installation as part of this Contract. Follow specified procedures and instruction provided by the vendors and/or manufacturers of electrical equipment.
3. The requirements of other related specification sections shall also apply for installation and coordination of work.

1.2 References

1. Canadian Standards Association (CSA International)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CAN/CSA-C22.2 No.41-13, Grounding and Bonding Equipment
 - .3 CAN/CSA-C22.2 No.04-04, Bonding Electrical Equipment (Protective Grounding.
 - .4 CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .5 CAN/CSA-S6.1-14, Commentary on CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .6 CAN/CSA-Z462-18, Workplace Electrical Safety
 - .7 CAN/CSA-Q9000-92 Quality Management Quality Assurance Standards for select.
2. The Ontario Electrical Safety Code 2018, and all bulletins (Ontario).

1.3 Action and Informational Submittals

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. The Contractor shall submit copies of vendor, producer or manufacturer data for grounding connection devices and apparatus. These shall include product characteristics, performance criteria, catalog cuts, specifications, data sheets, physical dimensioned drawings, testing requirements, and installation instructions.

1.4 Quality Assurance

1. Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
2. Regulatory requirements: Perform electrical construction in accordance with industry acceptable practice and complies with applicable country, region and local codes.
3. Products shall be tested, approved and labeled/listed by CSA, or by a nationally recognized testing laboratory (NRTL).
4. Electrical equipment and materials shall be new and within one year of manufacture date.
5. Electrical work shall comply with the requirements of the CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations and CAN/CSA-Z462-18, Workplace Electrical Safety.
6. Material and workmanship shall conform to the requirements of the specifications. Contractor shall ensure material and workmanship quality and provide Certificates of Conformance per the requirement of Specification Section 01 45 00 Quality Control.

1.5 Delivery, Storage and Handling

1. Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
2. Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
3. Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect grounding equipment from damages.
 - .3 Replace defective or damaged materials with new.
4. Develop Construction Waste Management Plan related to Work of this Section.
5. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
6. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Install New Ground and Bonding" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Grounding and Bonding Conductors

1. Equipment grounding conductors shall be insulated stranded copper, except that sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be identified per CSA C22.1, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.
2. Bonding conductors shall be bare stranded copper, except that sizes No. 10 AWG and smaller shall be bare solid copper. Bonding conductors shall be stranded for final connection to motors, transformers, and vibrating equipment.
3. Grounding conductor sizes shall not be less than shown on the drawings, and not be less than grounding conductors sizing requirements in accordance with CAN/CSA-C22.2 No. 0., whichever is greater.
4. Insulation: XLPE shall be used for isolated power systems.

2.2 Grounding Electrode

1. Steel or copper clad steel, 19 mm (0.75 mm) diameter by 3 M (10 feet) long.
2. Quantity of rods shall be as shown on the drawings, and as required to obtain the specified ground resistance.

2.3 Equipment Rack and Control Cabinet Ground Bars

1. Provide solid copper ground bars designed for mounting on the framework of open equipment racks or enclosed cabinets.
2. Ground bars shall have minimum dimensions of 6.3mm (0.25") thick x 19mm (0.75") wide, with length as required or as shown on the drawings.
3. Provide insulators and mounting brackets.

2.4 Ground Connections

1. Below grade and Inaccessible Locations: Exothermic-welded type connectors. Compression (crimp) type connections may be used if all components are suitably designed for below grade applications.
2. Above Grade:
 - .1 Bonding Jumps: Listed for use with aluminum and copper conductors
 - .2 For wire size smaller than No. 8 AWG, use mechanical type lugs. For wire sizes No. 8 AWG and larger, use compression- type connectors. Connectors or lugs shall use zinc-plated or cadmium-plated, steel bolts, nuts, and washers as appropriate for the application.
 - .3 Connection to Building Steel (if required): Exothermic-welded type connectors.
 - .4 Connection to Equipment Rack and Cabinet Ground Bars: Listed for use with aluminum and copper conductors. Use mechanical type lugs, with zinc-plated or cadmium-plated, steel bolts, nuts, and washers as appropriate for the application.
 - .5 Bolts shall be torqued to the values recommended by the manufacturer.

PART 3 - EXECUTION

3.1 Installation

1. Install complete permanent, continuous grounding and bonding system including, electrodes, conductors, connectors, accessories.
2. Install connectors and equipment in accordance with manufacturer's instructions and in accordance with the CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations, corresponding Ontario Electrical Safety Code (OESC), and applicable bulletins.

3.2 System Grounding

1. Electrical system grounding type (i.e. solidly grounded) shall be as indicated on the design drawings.
2. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and/or at the respective service transformer.

3.3 Bridge Structure Grounding

1. The bridge structure steel and attached electrical equipment shall be grounded by a direct connection to a suitable grounding electrode as shown on the drawings.

2. Each bridge end wheel plates shall have a metal tab suitable for attaching grounding wires by means of an exothermic weld. The Contractor is to ensure a reliable long-lasting connection to the satisfaction of the Department Representative or their designate. The welded joints shall be coated with a suitable coating to prevent corrosion.
3. The center pier steel structure shall be bonded in at least two locations (diametrically opposite) to ensure adequate bridge grounding. Braided stainless steel jumpers may be used to account for bridge rotation. If appropriate and accessible, the immobile steel portion of the center pivot may be grounded. The Contractor is to ensure a reliable long-lasting connection to the satisfaction of the Department Representative or their designate. Coat joints with a suitable coating to prevent corrosion.
4. Copper ground rods shall be 3m x 19mm, driven into ground and buried 600mm below the surface, immediately adjacent to pier or substructure as shown on the drawings.
5. Concrete or masonry substructures and piers shall not be considered adequately grounded. Reinforcing steel in concrete shall not be used in lieu of copper electrical cables for grounding.
6. Copper cable, size AWG 4/0 or larger, shall be used to connect the bridge structure to the grounding electrode.
7. Mechanical protection shall be provided where grounding wires are exposed above ground.

3.4 Equipment Grounding

1. Metallic piping, building structural steel, electrical enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits, shall be bonded and grounded.
2. Grounding for all equipment, cabinets, and enclosures containing electric equipment shall be by dedicated grounding conductors run in each conduit and raceway from each piece of equipment, cabinet, and enclosure back to the system ground bus.
3. Conduit and raceways shall not be utilized as the sole grounding means for electric equipment.
4. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders, and power and lighting branch circuits.
5. Boxes, Cabinets, Enclosures, and Panelboards:

- .1 Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes.
 - .2 Provide lugs in each box and enclosure for equipment grounding conductor termination.
6. Receptacles shall not be grounded through their mounting screws. Ground receptacles with a jumper from the receptacle green ground terminal to the device box ground screw and a jumper to the branch circuit equipment grounding conductor.
7. Ground lighting fixtures to the equipment grounding conductor of the wiring system. Fixtures connected with flexible conduit shall have a green ground wire included with the power wires from the fixture through the flexible conduit to the first outlet box.
8. Fixed electrical appliances and equipment shall be provided with a ground lug for termination of the equipment grounding conductor.

3.5 Raceways and Conduit

1. Conduit:
 - .1 Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor.
 - .2 Non-metallic conduit systems, except non-metallic feeder conduits that carry a grounded conductor from exterior transformers to interior or building-mounted service entrance equipment, shall contain an equipment grounding conductor.
 - .3 Metallic conduit that only contains a grounding conductor, and is provided for its mechanical protection, shall be bonded to that conductor at the entrance and exit from the conduit.
 - .4 Metallic conduits which terminate without mechanical connection to an electrical equipment housing by means of locknut and bushings or adapters, shall be provided with grounding bushings. Connect bushings with an equipment grounding conductor to the equipment ground bus.
2. Wireway Systems:
 - .1 Bond the metallic structures of wireway to provide electrical continuity throughout the wireway system, by connecting a #6AWG bonding jumper (or sized as required by CEC) at all intermediate metallic enclosures and across all section junctions.
 - .2 Install insulated # 6 AWG bonding jumpers (or sized as required by CEC) between the wireway system, bonded as required above, and the closest building ground at each end and approximately every 16 m (50 feet).

- .3 Use insulated #6 AWG bonding jumpers (or sized as required by CEC) to ground or bond metallic wireway at each end for all intermediate metallic enclosures and across all section junctions.
- .4 Use insulated #6 AWG wire (or sized as required by CEC) to ground cable tray or alternate wireway in the trench from the lock station to the bridge pier.

3.6 Ground Resistance

1. Grounding system resistance to ground shall not exceed 5 ohms. Make any modifications or additions to the grounding electrode system necessary for compliance without additional cost to the Department. Final tests shall ensure that this requirement is met.
2. Grounding system resistance shall comply with the electric utility company ground resistance requirements, the Canadian Electrical Code (CEC – latest edition), and any additional requirements of the Ontario Electrical Safety Code (OESC – Latest Edition) or applicable bulletins.

3.7 Inaccessible Grounding Connections

1. Make grounding connections, which are normally buried or otherwise inaccessible, by exothermic weld, or by compression type (crimp) connections when using materials appropriated designed for this purpose. The Contractor is to ensure a reliable long-lasting connection to the satisfaction of the Department Representative or their designate.

3.8 Low-Voltage Equipment and Circuits

1. Main Bonding Jumper: Bond the secondary service neutral to the ground bus in the service equipment.
2. Provide a grounding electrode conductor sized per CSA C22.1, Canadian Electrical Code between the service equipment ground bus and all metallic water pipe systems, building structural steel, and supplemental electrodes.
3. Add a second ground electrode as shown on the drawings, connect with the existing ground electrode, and bond to the service entrance equipment, and electric equipment ground bus in the lock station.
4. Transformers downstream from service equipment: Ground the secondary neutral at the transformer. Provide a 4/0 AWG grounding conductor from the transformer to the nearest component of the grounding electrode system or the ground bar at the service equipment.

3.9 Control and Instrument Grounding System

1. At least Two ground bars shall be provided for each cabinet (one on each side). The ground bars shall be arranged at the bottom of the cabinet, and all the equipment instrument cases, metallic structures and cable armors shall be connected to it.
2. The ground bar shall be suitable to connect #6 or #2 AWG copper wires to the main Grounding systems.

3.10 Electrode Installation

1. For outdoor installations, drive each rod vertically in the earth, until top of rod is 610 mm (24") below final grade.
2. Bond separate, multiple electrodes together.
3. Where buried or permanently concealed ground connections are required, make the connections by the exothermic process, to form solid metal joints. Compression (crimp) type connections are also acceptable if components are designed for underground applications. The Contractor is to ensure a reliable long-lasting connection to the satisfaction of the Department Representative or their designate.
4. Make accessible ground connections with mechanical compression (crimp) type ground connectors.
5. Where rock or impenetrable soil prevents the driving of vertical ground rods, install angled ground rods or grounding plates to achieve the specified ground resistance.

3.11 Corrosion Inhibitors

1. When making grounding and bonding connections, apply a corrosion inhibitor to all contact surfaces. Use a corrosion inhibitor appropriate for protecting a connection between the metals used.

3.12 Utility Pole and Traffic Warning Gate

1. Provide materials for grounding and bonding utility pole equipment as directed by the utility, and as required by CEC/OESC.
2. Ground and bond traffic warning gates as instructed by the manufacturer and as per CEC/OESC requirements.

3.13 Acceptance Tests

1. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of-potential method as defined in IEEE 81. Ground resistance measurements shall be made before the electrical distribution system is energized or connected to the electric utility company ground system, and shall be made in normally dry conditions not fewer than 48 hours after the last rainfall.
2. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.
3. Below-grade connections shall be visually inspected by the on-site Departmental Representative (or their designate) prior to backfilling. The Contractor shall notify the Departmental Representative three (3) days before the connections are ready for inspection.

3.14 Field Quality Control

1. Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
2. Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
3. Perform tests before energizing electrical system.

3.15 Cleaning

1. Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
3. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

PART 1 - GENERAL

1.1 Related Requirements

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of the main distribution splitter, and accessories necessary to complete the work under the scope of the contract.
2. Provide supervision, labor, and assistance for installation as part of this Contract. Follow specified procedures and instruction provided by the vendors and/or manufacturers of the splitter.
3. The requirements of other related specification sections shall also apply for installation and coordination of work.

1.2 References

1. Canadian Standards Association (CSA International)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CAN/CSA-Z462-18, Workplace Electrical Safety
 - .3 CAN/CSA-Q9000-92 Quality Management Quality Assurance Standards for select.
2. The Ontario Electrical Safety Code 2018, and all bulletins (Ontario).
3. Ontario Provincial Standard Specifications
 - .1 OPSS 106 – General Specification for Electrical Work.

1.3 Action and Informational Submittals

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. The Contractor shall submit copies of vendor, producer or manufacturer data for the splitter. These shall include design and installation shop drawings, catalog cuts, specifications, data sheets, physical dimensioned drawings, testing and calibration requirements, and installation instructions.

1.4 Quality Assurance

1. Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

2. Regulatory requirements: Perform electrical construction in accordance with industry acceptable practice and complies with applicable country, region and local codes.
3. Products shall be tested, approved and labeled/listed by CSA, or by a nationally recognized testing laboratory (NRTL).
4. Electrical equipment and materials shall be new and within one year of manufacture date.
5. Electrical work shall comply with the requirements of the CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations and CAN/CSA-Z462-18, Workplace Electrical Safety.
6. Material and workmanship shall conform to the requirements of the specifications. Contractor shall ensure material and workmanship quality and provide Certificates of Conformance per the requirement of Specification Section 01 45 00 Quality Control.

1.5 Delivery, Storage and Handling

1. Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
2. Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
3. Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect grounding equipment from damages.
 - .3 Replace defective or damaged materials with new.
4. Develop Construction Waste Management Plan related to Work of this Section.
5. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
6. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Install New Splitters" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Main Distribution Splitter

1. Voltage: 600VAC.
2. Phases: 3, no neutral.
3. Size: 225A.
4. Main terminal Size: Accepts 250MCM copper or aluminum.
5. Branch terminal Sizes: To match size and number of conductors as indicated on contract drawings/single line diagram.
6. Ground Terminal: Accepts 4/0 AWG copper.
7. Enclosure: CSA/NEMA Type 12
8. Sheet metal enclosure, welded corners, and formed hinged cover suitable for locking in closed position.
9. Provide at least two (2) spare terminals for each phase that can accommodate #2 AWG Copper wire.
10. CSA approved.

PART 3 - EXECUTION

3.1 Installation

1. Install splitter in accordance with manufacturer's recommendations and the approved shop and working drawings.
2. Install and mount plumb, true and square to the building lines.
3. Refer to contract drawings for mounting location and arrangement.

3.2 Nameplates and Labels

1. Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.
2. Provide equipment identification in accordance with Section 26 05 00 – Common Work Results for Electrical.
3. Install identification labels indicating system, name, voltage, and phase.

3.3 Field Quality Control

1. Verifications of Conditions: Verify that existing conditions are acceptable for splitter installation in accordance with manufacturer's instructions, as well as ESA directives.
 - .1 Inform Departmental Representative and/or their designate of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
2. Conduct the tests in accordance with Section 01 45 00 Quality Control.

3.4 Cleaning

1. Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
3. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

PART 1 - GENERAL

1.1 Description

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of dry type transformers, and accessories necessary to complete the work under the scope of the contract.
2. Provide supervision, labor, and assistance for installation as part of this Contract. Follow specified procedures and instruction provided by the vendors and/or manufacturers of the dry type transformers.
3. The requirements of other related specification sections shall also apply for installation and coordination of work.

1.2 References

1. Canadian Standard Association (CSA)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CAN/CSA-C22.2 No.47, Air-cooled Transformer (Dry Type).
 - .3 CAN/CSA-C9, Dry Type Transformers.
 - .4 CAN/CSA-Z462-18, Workplace Electrical Safety
 - .5 CAN/CSA-Q9000-92, Quality Management Quality Assurance Standards for select.
2. The Ontario Electrical Safety Code 2018, and all bulletins (Ontario).
3. Ontario Provincial Standard Specifications
 - .1 OPSS 106 – General Specification for Electrical Work.

1.3 Action and Informational Submittals

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. The Contractor shall submit copies of vendor, producer or manufacturer data for the dry type transformers and apparatus. These shall include design and installation shop drawings, catalog cuts, specifications, data sheets, physical dimensioned drawings, testing and calibration requirements, and installation instructions for the following items, but not excluding other items or materials not specifically mentioned herein.

3. Product Data

- .1 Physical: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features.
- .2 Product warranty.
- .3 Energy Efficiency
 - a. No load and full load losses per NEMA TP-1.
 - b. Linear load efficiency data @ 1/6, 1/4, 1/2, 3/4, and full load.
 - c. Linear load efficiency @ 35% loading tested per NEMA TP-2.
- .4 Shop drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- .5 Qualification Data.
- .6 Source quality-control test reports.
- .7 Operation and Maintenance manuals.

1.4 Quality Assurance

- 1. Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- 2. Regulatory requirements: Perform electrical construction in accordance with industry acceptable practice and complies with applicable country, region and local codes.
- 3. Products shall be tested, approved and labeled/listed by CSA, or by a nationally recognized testing laboratory (NRTL).
- 4. Electrical Components, Devices, and Accessories: Listed and labelled as defined in NFPA 70, article 100, and to CEC, by a testing agency acceptable to authorities having jurisdiction (ESA), and marked for intended use.
- 5. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."
- 6. Comply with IEEE C57.110, "IEEE recommended practise for establishing transformer capability when feeding non-sinusoidal load currents.
- 7. Electrical equipment and materials shall be new and within one year of manufacture date.
- 8. Electrical work shall comply with the requirements of the CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations and CAN/CSA-Z462-18, Workplace Electrical Safety.
- 9. Material and workmanship shall conform to the requirements of the specifications. Contractor shall ensure material and workmanship quality and provide Certificates of Conformance per the requirement of Specification Section 01 45 00 Quality Control.

1.5 Delivery, Storage and Handling

1. Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
2. Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
3. Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, heated, well-ventilated area.
 - .2 Store and protect transformers from damages.
 - .3 Replace defective or damaged materials with new.
4. Develop Construction Waste Management Plan related to Work of this Section.
5. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
6. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Install New Dry-Type Transformers" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 General Transformer Requirements

1. Factory-assembled and tested, air-cooled unit for 60Hz service.
2. Type: Dry.
3. Phases: 3.
4. Size: 75kVA
5. Primary Material: Copper or Aluminum.
6. Primary Voltage: 600VAC.
7. Primary Configuration: Delta.
8. Secondary material: Matching primary material.

9. Secondary Voltage: 120/208VAC.
10. Secondary Configuration: Wye.
11. Taps: 2 x 2.5 % above nominal, 2 x 2.5% below nominal.
12. Insulation class: 220 Degrees C.
13. Temperature rise: 115 Degrees C at 40 Degrees C ambient.
14. X0 terminal: Sized to allow for bonding to ground as per CEC requirements.
15. Enclosure: CSA/NEMA Type 2
16. Mounting: Floor mounted.
17. Efficiency: As per present CSA standards.
18. Low-Sound-Level Requirements: NEMA ST 20 standard sound levels when factory tested to IEEE C57.12.91.
19. CSA approved.

PART 3 - EXECUTION

3.1 Examination

1. Examine conditions for compliance with enclosure and ambient temperature.
2. Verify that working clearances required by CEC and the manufacturer's instructions can be met.
3. Verify that the floor where the transformer is to be mounted is suitable.
4. Verify that ground connections are in place. The maximum ground resistance shall be 5 ohms at the location of the transformer.

3.2 Installation

1. Install the dry type transformer in accordance with manufacturer's recommendations and the approved shop and working drawings.
2. Refer to contract drawings for general mounting location.
3. Anchor to floor according to manufacturer's written instructions.
4. Ground and connect wiring in accordance with Section 26 05 26 – Grounding and Bonding, and Section 26 05 21 - Wiring and Cables.

3.3 Nameplates and Labels

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

2. Provide equipment identification in accordance with Section 26 05 00 – Common Work Results for Electrical.

3.4 Field Quality Control

1. Verifications of Conditions: Verify that existing conditions are acceptable for transformer installation in accordance with manufacturer's instructions, as well as CEC/ESA directives.
 - .1 Inform Departmental Representative and/or their designate of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
2. Conduct the tests in accordance with Section 01 45 00 Quality Control.

3.5 Cleaning

1. Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
3. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

PART 1 - GENERAL

1.1 Related Requirements

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of service entrance equipment. This includes the underground cable from the utility transformer to the lock station and the utility meter base located inside the lock station. The service entrance safety disconnect switch, grounding and bonding are dealt with in other specifications.
2. Provide supervision, labor, and assistance for installation as part of this Contract.
3. The requirements of other related specification sections shall also apply for installation and coordination of work.

1.2 References

1. Canadian Standards Association (CSA International)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No. 131 Type TECK 90 Cables.
 - .3 CSA C22.2 No. 38 Thermoset Insulated Wires and Cables.
 - .4 CSA C68.3 Power Cables with Thermoset Insulation.
 - .5 CAN/CSA-Z462-18, Workplace Electrical Safety
 - .6 CAN/CSA-Q9000-92 Quality Management Quality Assurance Standards for select.
2. The Ontario Electrical Safety Code 2018, and all bulletins (Ontario).
3. Ontario Provincial Standard Specifications
 - .1 OPSS 106 – General Specification for Electrical Work.
 - .2 OPSS 604 – Construction Specification for Installation of Cable.

1.3 Action and Informational Submittals

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. The Contractor shall submit copies of vendor, producer or manufacturer data for the panel boards. These shall include design and installation shop drawings, catalog cuts, specifications, data sheets, physical dimensioned drawings, testing and installation instructions.

1.4 Quality Assurance

1. Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
2. Regulatory requirements: Perform electrical construction in accordance with industry acceptable practice and complies with applicable federal, provincial and local codes.
3. Products shall be tested, approved and labeled/listed by CSA, or by a nationally recognized testing laboratory (NRTL).
4. Electrical equipment and materials shall be new and within one year of manufacture date.
5. Electrical work shall comply with the requirements of the CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations and CAN/CSA-Z462-18, Workplace Electrical Safety.
6. Material and workmanship shall conform to the requirements of the specifications. Contractor shall ensure material and workmanship quality and provide Certificates of Conformance per the requirement of Specification Section 01 45 00 Quality Control.

1.5 Delivery, Storage and Handling

1. Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
2. Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
3. Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect goods from damage.
 - .3 Replace defective or damaged materials with new.
4. Develop Construction Waste Management Plan related to Work of this Section.
5. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
6. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Install New Service Entrance Equipment" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Low Voltage Unarmoured Wire and Cable (1000v and Below)

1. Construction: Stranded, annealed copper conductors, 1000 V, rating RWU90 cross-linked polyethylene (XLPE) insulation for all cables outside of buildings and RW90 cross-linked polyethylene (XLPE) insulation for cables within the building unless noted otherwise.
2. Direct buried installations or installation in direct buried PVC pipe: Cross-linked polyethylene (XLPE), RWU90 insulation, 1000 V minimum rating.
3. Standard: CSA C22.2 No. 38.
4. Conductor sizes: Unless otherwise indicated, as per Canadian Electrical Code and Utility (Hydro One) requirements for service entrance.
5. Contractor to supply appropriate connectors/termination at the utility pole and lock station.

2.2 Utility Meter Base

1. Type: 7-Jaw.
2. Rating: 200A, 600V.
3. Location: Indoor.
4. Approval: CSA or approved equivalent.
5. Hydrel Part No. STC703RK or Microelectric Part No. PL27-IN-TCV or as directed by Hydro One.

2.3 Conduit

1. Size: 3".
2. Type: Schedule 40.

3. Material: PVC.
4. Fittings: Similar in size, type and material.

PART 3 - EXECUTION

3.1 Installation

1. Equipment shall be installed per manufacturer recommendations and instructions, and comply with the applicable codes and standards.
2. The Contractor is to review and understand the responsibilities of all parties as indicated on the Hydro One layout.
3. Contractor to locate all underground utilities around the electric utility pole, along the path of the existing cable to the lock station, and around the lock station.
4. Contractor to re-use the existing 3" PVC buried conduit (running from utility pole pull-pit to lock station pull-pit) unless it is not suitable to do.
5. Replace the metal conduit running from the pull-pit up the utility pole.
6. Contractor to verify that RWU90 (copper) is acceptable to Hydro One for connecting at the utility transformer.
7. The Contractor is responsible for all conduit and fittings for running to the top of the utility pole (transformers), as well as any grounding requirements and materials specified by Hydro One or Canadian Electrical Code.
8. Core drill through the pull pit at the lock station and run 3" PVC schedule 40 conduit to the north wall of the lock station mechanical/electrical room as shown on the contract drawings. Allow for frost movement/expansion as the conduit transitions out of the ground.
9. Run 4 x 1C#250MCM RWU90 from the pole to the lock station pull pit and on to the service entrance disconnect located inside the lock station. Follow the supply and installation requirements of Section 26 28 23 - Safety Disconnect Switches for the service entrance disconnect.
10. Continue with a run of 4 x 1C#250MCM RW90 in metal conduit or use 4C#250MCM TECK90, 1000V from the service entrance disconnect to the meter base.
11. Follow the grounding and bonding requirements as specified in Section 26 05 26 - Grounding and Bonding and any additional requirements indicated by Hydro One or the Canadian Electrical Code.

3.2 Wiring Identification

1. Identify wiring with wire markers.
2. Colour code power, feeder and branch conductors at both ends with coloured plastic tapes. Tapes are not required where conductors are identified by jacket colour. Maintain phase and colour sequence throughout.
3. Identify each conductor, including spares, with a unique designation to facilitate troubleshooting and maintenance. Multiconductor cables may have conductor designations printed on them. Use wire markers in addition to these conductor designations and ensure they match. Contractor shall use the designations on the contract drawings where possible.

3.3 Field Quality Control

1. Conduct the following tests in accordance with Section 01 45 00 Quality Control.
2. Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
3. Perform tests before energizing electrical system.

3.4 Cleaning

1. Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
3. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

PART 1 - GENERAL

1.1 General Description

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of electrical panelboards, and accessories necessary to complete the work under the scope of the contract.
2. Provide the following Panelboards:
 - .1 Lock Station Distribution Panel.
 - .2 Lock Gate Control Distribution Panel.
 - .3 Bridge Distribution Panel.
3. Provide supervision, labor, and assistance for installation as part of this Contract. Follow specified procedures and instruction provided by the vendors and/or manufacturers of the panel boards.
4. The requirements of other related specification sections shall also apply for installation and coordination of work.

1.2 References

1. Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.
2. Electrical systems shall be engineered, manufactured and installed in accordance with Canadian Electrical Codes and Standards. The design and engineering of the electrical installation shall satisfy all statutory requirements of federal, provincial and/or local authorities. The electrical installation shall be suitable for the site conditions as specified. Where necessary, special attention shall be paid to the selection and installation of electrical equipment suitable for seismic conditions. Where relevant, the specific publications are referenced herein.
3. The following reference standards documents form part of the specification to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the work.
4. Canadian Standards Association (CSA International)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No. 0 Through 10 as Applicable.

- .3 CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .4 CAN/CSA-S6.1-14, Commentary on CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .5 CAN/CSA-Z462-18, Workplace Electrical Safety
 - .6 CAN/CSA-Q9000-92 Quality Management Quality Assurance Standards for select.
5. National Fire Protection Association – NFPA
- .1 ANSI/NFPA 70 - National Electrical Code.
 - .2 ANSI/NFPA 70B - Recommended Practice for Electrical Equipment Maintenance.
 - .3 ANSI/NFPA 70E - Standard for Electrical Safety in the Workplace.
6. International Electrical Testing Association - NETA
- .1 ANSI/NETA ETT - Standard for Certification of Electrical Testing Technicians.
 - .2 ANSI/NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems.
7. National Electrical Manufacturers Association – NEMA
- .1 ANSI/NEMA C84.1 - Electrical Power Systems and Equipment Voltage Ratings (60 Hz)
 - .2 NEMA AB 1 Molded Case Circuit Breakers.
 - .3 NEMA PB 1 Panelboards.
 - .4 NEMA PB 1.1 Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
 - .5 NEMA PB 1.2 Application Guide for Ground-fault Protective Devices for Equipment.
 - .6 NEMA AB4 - Guidelines for Inspection and Preventive Maintenance of Molded-Case Circuit Breakers Used in Commercial and Industrial Applications
8. UL . Underwriters' Laboratories:
- .1 UL 67 Panelboards
 - .2 UL 50 Enclosures for Electrical Equipment
 - .3 UL489 Molded Case Circuit breakers and Circuit Breaker Enclosures
9. The Ontario Electrical Safety Code 2018, and all bulletins (Ontario).
10. Ontario Provincial Standard Specifications
- .1 OPSS 106 – General Specification for Electrical Work.
 - .2 OPSS 604 – Construction Specification for Installation of Cable.

1.3 Action and Informational Submittals

1. Submittals: in accordance with Section 01 33 00- Submittal Procedures.
2. The Contractor shall submit copies of vendor, producer or manufacturer data for the panel boards. These shall include design and installation shop drawings, catalog cuts, specifications, data sheets, physical dimensioned drawings, testing and calibration requirements, and installation instructions for the following items, but not excluding other items or materials not specifically mentioned herein.
3. Submit for review single line electrical diagrams under plexiglass and locate as indicated.
4. Electrical distribution system in the electrical equipment room of the lock station.
5. Shop drawings:
 - .1 The Contractor shall submit copies of vendor, producer or manufacturer product data. These shall include design and installation shop drawings, catalog cuts, specifications, testing requirements, and installation instructions.
 - .2 Outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker arrangement, sizes and numbering system.
6. Certificates:
 - .1 Provide CSA certified equipment and material.
7. Startup and Commissioning Plan and Report:
 - .1 Provide Startup and Commissioning Plan.
 - .2 Startup and Commissioning Report.
8. Test Reports:
 - .1 Provide Factory Acceptance Test.
 - .2 Provide Electrical Construction Field Testing and Commissioning Report.
9. Manufacturer's Field Reports:
 - .1 Submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and electrical power and control testing, as described in PART 3 – FIELD

1.4 Closeout Submittals

1. Submit in accordance with Section 01 78 00 - Closeout Submittals.

2. Operation and Maintenance Data: submit operation and maintenance data for electrical equipment and installations for incorporation into manual.
 - .1 The Contractor shall provide Operation and Maintenance Manuals to be contained in one or more volumes for all electrical power and control systems and sub systems and interfaces with the communications network provided under this contract. The Departmental Representative will review preliminary copies of the O&M Manuals and the Contractor will incorporate the changes made into the final manual. Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
 - .2 Operating instructions to include following:
 - a. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - b. Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - c. Safety precautions.
 - d. Procedures to be followed in event of equipment failure.
 - e. Warranty information.
 - f. Other items of instruction as recommended by manufacturer of each system or item of equipment.
3. Final "As-Built" markups shall be submitted for review and approval at the completion of the project. Any field modification during construction and/or deviations from the approved Shop Drawings shall be clearly indicated.

1.5 Quality Assurance

1. Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
2. Regulatory requirements: Perform electrical construction in accordance with industry acceptable practice and complies with applicable federal, provincial and local codes.
3. Products shall be tested, approved and labeled/listed by CSA, or by a nationally recognized testing laboratory (NRTL).
4. Electrical equipment and materials shall be new and within one year of manufacture date.
5. Electrical work shall comply with the requirements of the CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations and CAN/CSA-Z462-18, Workplace Electrical Safety.
6. Material and workmanship shall conform to the requirements of the specifications. Contractor shall ensure material and workmanship quality and provide Certificates of Conformance per the requirement of Specification Section 01 45 00 Quality Control.

1.6 Delivery, Storage and Handling

1. Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and 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 panel boards off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect panel boards from damage.
 - .3 Replace defective or damaged materials with new.
4. Develop Construction Waste Management Plan related to Work of this Section.
5. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
6. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.7 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Install New Panel Boards" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Bus and Hardware

1. Panelboards shall be completely factory assembled and equipped with a main circuit breaker and the type, size and number of branch circuit breakers, arranged and numbered as indicated on the panel schedule(s) or as further directed by the Departmental Representative.
2. Bus bars shall be copper and plated per CSA requirements. Bus bars shall be supported by glass-filled polyester-type insulators. Bus sequence shall be ABC top to bottom, left to right for both top and bottom fed panels. Neutral bus shall be copper, 200 percent rated and insulated from the cabinet and other parts.

3. A copper equipment ground bus, of sufficient width and length, shall be solidly bolted and grounded to the enclosure at the bottom and shall leave clear space for the bottom cable entries.
4. Bus bars shall be factory drilled and tapped with spacing arranged to permit breaker interchange, from the front, while the panel is energized.
5. Current ratings, and minimum short circuit interrupting capability of the panel shall be as shown on the panel schedule. Panelboards shall be fully rated. Series rated panelboards are not acceptable.
6. All multi-pole breakers shall be common trip. Branch circuits shall be arranged using double row construction.
7. A minimum of 20 percent spare pole spaces, grouped in multiples of three, shall be provided in each panelboard, for future installation, unless physical space is limited. Provide single pole filler plates in the spaces, as required. Provisions or space for future breakers shall be located at the bottom of the panel and be fully bussed, complete with the necessary mounting hardware.
8. A nameplate shall be provided and located near the top of the front trim on the exterior surface, listing panel type and ratings, as required by CSA.
9. Each circuit shall be permanently numbered to agree with the panel schedule, using plastic or metal buttons mounted adjacent to the breaker and secured by rivets or grommets with an engraved or depressed number. Adhesive numbering tape, painted numbers, or use of more than one number per breaker is not acceptable.
10. Pre-installed locking devices shall be provided for locking the main circuit breaker and each branch circuit breaker in the OPEN position, by means of a padlock. Locking devices shall not be removable from the front of the panel with the trim in place. Attachment of the locking device to the panel with adhesives is a not acceptable.

2.2 Circuit Breakers

1. Molded Case Circuit Breakers: NEMA AB 1, FS W-C-375.
2. Provide bolt-on type circuit breakers with integral thermal and instantaneous magnetic trip in each pole (common trip type).
3. Provide circuit breakers, CSA approved, that meet the requirements for their intended use as identified on the panelboard schedule(s).
4. Provide CSA approved ground fault interrupter circuit breakers where specified on panelboard schedule(s) and/or the Drawings.

5. Breakers shall be bolt on type, rigidly mounted, separately removable and independent of trim plates for their support. Breakers shall be industrial grade. Miniature circuit breakers are not acceptable.
6. The minimum symmetrical interrupting rating for molded-case circuit breakers shall be as specified on the panelboard schedule and/or Drawings. Series rated breakers are not acceptable.

2.3 Cabinet(Enclosure)

1. The panelboard enclosure shall be fabricated from corrosion resistance, code-gauge galvanized or galvanized-annealed steel without knockouts and with full front flange. All details of construction and methods of assembly shall meet the requirements of the "Enclosures for Electrical Equipment" of the Underwriters' Laboratories. The panel front shall be either surface or flush mounted as indicated on the drawings.
2. Surface mounted panel boxes shall be finished with corrosion resistance treatment. Color shall be ANSI-49 grey or similar.
3. The panelboard enclosure ingress protection or NEMA rating shall be suitable for the install environment. Panelboards installed inside the lock station may be NEMA 1. The Panel board for the bridge distribution should be NEMA 3 or better when installed inside a NEMA 4/4X enclosure.
4. The front trim shall have full-length hinged outer door designed to expose the wiring raceways and breakers, when open. Another, inner hinged door shall expose breakers only, when open, making this a door-in-door construction. Both doors shall open to the right.
5. Panelboards/enclosures shall bear the CSA label.

PART 3 - EXECUTION

3.1 Installation

1. Verification of Conditions: verify that existing conditions are acceptable for panelboards installation in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

2. Install surface mounted panelboards on 19 mm [$\frac{3}{4}$ "] plywood backing. If mounted on a concrete wall, install with 13 mm [$\frac{1}{2}$ "] steel spacers behind the panel. Mounting attachments and connections shall be designed in conformance with the minimum lateral seismic force of 0.5W per Canadian Building Code.
3. Install bridge distribution panelboard inside a NEMA 4/4X enclosure mounted on the back side of the bridge operator console. This enclosure should suitably sized to allow for adequate cable bending. Fabricate a mounting structure for the enclosure and affix to the concrete pad used by the bridge operator console. Do not affix the panelboard enclosure by drilling and fastening directly to the back side of the operator console. Cables shall be bottom entry and may be routed through the plinth.

3.2 Nameplates and Labels

1. Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.
2. Provide typed or printed circuit directory (panel schedule) for each panelboard to reflect the final as-built condition. Mount a directory card on the inside of hinged front door metal frame. The directory card shall be plastic 0.76mm thick minimum indicating circuit numbers, load controlled, and location. The directory card identifies each branch circuit breaker number with its respective connected load.
3. Provide panel identification, warning and arc flash hazard labels per the requirements of relevant codes and standards.

3.3 Field Quality Control

1. Conduct the following tests in accordance with Section 01 45 00 Quality Control.

3.4 Cleaning

1. Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
3. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

PART 1 - GENERAL

1.1 Related Requirements

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of the grounding system, and accessories necessary to complete the work under the scope of the contract.
2. Provide supervision, labor, and assistance for installation as part of this Contract. Follow specified procedures and instruction provided by the vendors and/or manufacturers of the field instrumentation devices.
3. The requirements of other related specification sections shall also apply for installation and coordination of work.

1.2 References

1. Canadian Standards Association (CSA International)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .3 CAN/CSA-S6.1-14, Commentary on CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .4 CAN/CSA-Z462-18, Workplace Electrical Safety
 - .5 CAN/CSA-Q9000-92 Quality Management Quality Assurance Standards for select.
2. The Ontario Electrical Safety Code 2018, and all bulletins (Ontario).
3. Ontario Provincial Standard Specifications
 - .1 OPSS 106 – General Specification for Electrical Work.
 - .2 OPSS 604 – Construction Specification for Installation of Cable.

1.3 Action and Informational Submittals

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. The Contractor shall submit copies of vendor, producer or manufacturer data for instrumentation devices and apparatus. These shall include design and installation shop drawings, catalog cuts, specifications, data sheets, physical dimensioned drawings, testing and calibration requirements, and installation instructions for the

following items, but not excluding other items or materials not specifically mentioned herein.

3. Product Data:
 - .1 Mechanical Limit Switch
 - .2 Magnetic (Reed) Limit Switch

1.4 Quality Assurance

1. Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
2. Regulatory requirements: Perform electrical construction in accordance with industry acceptable practice and complies with applicable country, region and local codes.
3. Products shall be tested, approved and labeled/listed by CSA, or by a nationally recognized testing laboratory (NRTL).
4. Electrical equipment and materials shall be new and within one year of manufacture date.
5. Electrical work shall comply with the requirements of the CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations and CAN/CSA-Z462-18, Workplace Electrical Safety.
6. Material and workmanship shall conform to the requirements of the specifications. Contractor shall ensure material and workmanship quality and provide Certificates of Conformance per the requirement of Specification Section 01 45 00 Quality Control.

1.5 Delivery, Storage and Handling

1. Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
2. Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
3. Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect grounding equipment from damages.
 - .3 Replace defective or damaged materials with new.
4. Develop Construction Waste Management Plan related to Work of this Section.

5. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
6. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Install New Field Instrumentation Devices" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 General Description

1. The contractor shall furnish all limit switches defined herein.
2. Mechanical limit switches (if used) shall consist of lever arm and plunger type limit switches as herein specified and described on the Contract Drawings.
3. All limit switches shall be manufactured in accordance with the requirements of NEMA A600 and be U.L. Listed, CSA certified and marked (or equivalent acceptable marking by an ESA recognized approval agency).

2.2 Mechanical Limit Switches

1. Function: Mechanical switches may be used to monitor position of bridge in the "Nearly Open", "Fully Open", "Nearly Closed" and "Fully Closed" states.
2. Construction:
 - .1 Metallic, industrial heavy-duty design.
 - .2 Suitable for application in harsh or corrosive environments.
 - .3 Electrically isolated bodies for industrial/corrosive environments.
 - .4 Zinc casings sealed w/ epoxy resin.
 - .5 Shock and vibration resistant.
 - .6 Stainless steel operating rod or lever arm.
 - .7 Stainless steel cable gland.
 - .8 Limit switch operating heads are as indicated in the Limit Switch Application Table.

3. Operating Temperature: -40 °C to 85 °C.
4. Enclosure Rating / Degree of Protection: NEMA 4X / IP67.
5. Ratings:
 - .1 Rated operational voltage: 130 V
 - .2 Rated Thermal Current: 10A min
 - .3 Rated Insulation Voltage: 300V minimum
6. Certifications / Approvals: UL & CSA.
7. Features and auxiliaries:
 - .1 The switches shall be provided with 2 NO and 2 NC contacts.
 - .2 Rated Thermal Current: 10A min. The Contractor shall furnish formed galvanized steel supporting brackets and associated stainless steel hardware.
 - .3 Manufacturer pre-wired connection.
 - .4 The joint of the mechanism between the spring buffer and the plunger rod shall be covered with a watertight, neoprene bellows-type boot.
8. The Contractor shall submit outline drawings, dimensioned layout, switch contact configuration diagram and specification data sheet of the limit switches to the Departmental Representative for approval prior to procurement.
9. Provide two (2) spare mechanical limit switches.

2.3 Magnetic Limit Switches

1. Function: Monitor position of bridge locking pin; protecting equipment and personnel from dangerous contacts and/or conditions. They are acceptable method to monitor position of bridge in the "Nearly Open", "Fully Open", "Nearly Closed" and "Fully Closed" states.
2. Construction:
 - .1 Proximity triggering with ferrous metal and magnetic targets - no exposed moving parts.
 - .2 Metallic, industrial heavy-duty design.
 - .3 Suitable for application in harsh industrial or corrosive environments.
 - .4 Electrically isolated bodies for industrial/corrosive environments.
 - .5 Shock and vibration resistant.
 - .6 Stainless steel sensing face and housing.
 - .7 Stainless steel cable gland.
 - .8 3/8" (10mm) sensing distance (ferrous metal).
 - .9 Provide target magnet to extended sensing as required (with resin cover or stainless cover).

- .10 AC/DC, NO/NC Wiring Flexibility.
- 3. Operating Temperature -58°F to 221°F (-50°C to 105°C).
- 4. Enclosure Rating / Degree of Protection: NEMA 4X / IP67.
- 5. Contact Ratings: Dry Contact, Single Pole Double Throw (SPDT); 5A/240VAC, 10A/120VAC, 3A/24VDC.
- 6. Certifications / Approvals: UL & CSA.
- 7. The Contractor shall submit outline drawings, dimensioned layout, switch contact configuration diagram and specification data sheet of the limit switches to the Departmental Representative for approval prior to procurement.
- 8. Provide two (2) spare magnetic limit switches if used only for the locking pin. Provide four (4) spare magnetic limit switches if used for both the locking pin and bridge position.

PART 3 - EXECUTION

3.1 Installation

- 1. Install the limit switches and field sensor device in accordance with manufacturer's recommendations and the approved shop and working drawings.
- 2. Each limit switch and field device shall be tested for correct operational functionality and repeatability.

3.2 Nameplates and Labels

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

3.3 Field Quality Control

- 1. Conduct the following tests in accordance with Section 01 45 00 Quality Control.

3.4 Cleaning

- 1. Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- 2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

PART 1 - GENERAL

1.1 Related Requirements

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of the grounding system, and accessories necessary to complete the work under the scope of the contract.
2. Provide supervision, labor, and assistance for installation as part of this Contract. Follow specified procedures and instruction provided by the vendors and/or manufacturers of the disconnect switches.
3. The requirements of other related specification sections shall also apply for installation and coordination of work.

1.2 References

1. Canadian Standards Association (CSA International)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CAN/CSA-C22.2 No.4-04, Enclosed and Dead-front Switches.
 - .3 CAN/CSA-C22.2 No.39-13, Fuseholder Assemblies.
 - .4 CAN/CSA-Z462-18, Workplace Electrical Safety
 - .5 CAN/CSA-Q9000-92 Quality Management Quality Assurance Standards for select.
2. The Ontario Electrical Safety Code 2018, and all bulletins (Ontario).
3. Ontario Provincial Standard Specifications
 - .1 OPSS 106 – General Specification for Electrical Work.

1.3 Action and Informational Submittals

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. The Contractor shall submit copies of vendor, producer or manufacturer data for the safety disconnect switches and apparatus. These shall include design and installation shop drawings, catalog cuts, specifications, data sheets, physical dimensioned drawings, testing and calibration requirements, and installation instructions.
3. Product Data:

- .1 200A, Fusible, Service Entrance, Safety Disconnect
- .2 200A, Non-fusible, 3-Pole, Double Throw, Safety Disconnect used as a Manual Transfer Switch.
- .3 100A, Fusible, Safety Disconnect Switch with integrated generator connector.
- .4 60A, and 100A, Breaker, Safety Disconnect Switches.

1.4 Quality Assurance

1. Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
2. Regulatory requirements: Perform electrical construction in accordance with industry acceptable practice and complies with applicable country, region and local codes.
3. Products shall be tested, approved and labeled/listed by CSA, or by a nationally recognized testing laboratory (NRTL).
4. Electrical equipment and materials shall be new and within one year of manufacture date.
5. Electrical work shall comply with the requirements of the CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations and CAN/CSA-Z462-18, Workplace Electrical Safety.
6. Material and workmanship shall conform to the requirements of the specifications. Contractor shall ensure material and workmanship quality and provide Certificates of Conformance per the requirement of Specification Section 01 45 00 Quality Control.

1.5 Delivery, Storage and Handling

1. Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and 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 safety disconnect switches off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect disconnect switches from damages.
 - .3 Replace defective or damaged materials with new.
4. Develop Construction Waste Management Plan related to Work of this Section.

5. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
6. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Install New Safety Disconnection Devices" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Service Entrance Disconnect Switch

1. Voltage: 600VAC.
2. Poles: 3.
3. Size: 200A.
4. Fusible: Yes, J-Class fuses.
5. Viewing Window: Yes.
6. Isolated Neutral Kit. Yes. Groundable.
7. Phase and Neutral Terminal Size: Accepts 250MCM copper or aluminum.
8. Ground Terminal: Accepts 4/0 AWG copper.
9. Enclosure: CSA/NEMA Type 12
10. Provision for padlocking in ON-OFF switch positions by three (3) locks.
11. Quick-make, quick-break action at 100% rated load.
12. Mechanically interlocked door to prevent opening when handle is in ON position
13. ON-OFF switch position indication on switch enclosure cover.
14. CSA approved for service entrance.

2.2 Manual Transfer Disconnect Switch

1. Voltage: 600VAC.
2. Poles: 3, Double-Throw
3. Size: 200A.
4. Fusible: No.
5. Viewing Window: Yes, preferred.
6. Terminal Size: Accepts 250MCM copper or aluminum.
7. Ground Terminal: Accepts 4/0 AWG copper.
8. Load rating: 100%.
9. Enclosure: CSA/NEMA Type 12
10. Provision for padlocking in NORMAL-OFF-EMERGENCY switch positions by three (3) locks.
11. All switch positions are indicated on switch enclosure cover.
12. CSA approved.
13. Eaton Part# DT364UDKW or similar.

2.3 Generator Disconnect Switch

1. Voltage: 600VAC.
2. Poles: 3.
3. Size: 100A.
4. Fusible: Yes, J-Class fuses.
5. Viewing Window: Not necessary, but can be included.
6. Terminal Size: Accepts #2 AWG copper or aluminum.
7. Ground Terminal: Accepts #2 AWG copper.
8. Enclosure: CSA/NEMA 3R minimum, 4/4X preferred.
9. Provision for padlocking in ON-OFF switch positions by three (3) locks.

10. Quick-make, quick-break action at 100% rated load.
11. ON-OFF switch position indication on switch enclosure cover.
12. Includes Crouse-Hinds Arktite 3-wire, 4-pin Receptacle to mate with generator connection.
13. Mechanically interlocked operation with generator connector.
14. CSA approved.
15. Square D part number H363DSWC (NEMA 4/4X) or H363AWC (NEMA 3R).

2.4 Safety Disconnect Switch – Enclosed Breaker

1. Voltage: 600VAC.
2. Poles: 3.
3. Size: 60A, 100A.
4. Breakers: Yes, sized per single line diagram and/or Canadian Electrical Code.
5. Terminal Size: In accordance with contract drawings and cable sizes.
6. Ground Terminal: In accordance with cabling and ground conductor requirements.
7. Enclosure: CSA/NEMA Type 12
8. Provision for padlocking in ON-OFF switch positions by three (3) locks.
9. Quick-make, quick-break action at 100% rated load.
10. Mechanically interlocked door to prevent opening when handle is in ON position
11. ON-OFF switch position indication on switch enclosure cover.
12. CSA approved.

PART 3 - EXECUTION

3.1 Installation

1. Install the safety disconnect switches in accordance with manufacturer's recommendations and the approved shop and working drawings.
2. Refer to contract drawings for mounting location and arrangement.

3.2 Nameplates and Labels

1. Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.
2. Provide equipment identification in accordance with Section 26 05 00 – Common Work Results for Electrical.

3.3 Field Quality Control

1. Verifications of Conditions: Verify that existing conditions are acceptable for disconnect switch installation in accordance with manufacturer's instructions, as well as utility/ESA directives.
 - .1 Inform Departmental Representative and/or their designate of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
2. Conduct the tests in accordance with Section 01 45 00 Quality Control.

3.4 Cleaning

1. Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
3. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

PART 1 - GENERAL

1.1 Related Requirements

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of the 600V motor starters, and accessories necessary to complete the work under the scope of the contract.
2. Provide supervision, labor, and assistance for installation as part of this Contract. Follow specified procedures and instruction provided by the vendors and/or manufacturers of the motor starters.
3. The requirements of other related specification sections shall also apply for installation and coordination of work.

1.2 References

1. Canadian Standards Association (CSA International)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CAN/CSA-Z462-18, Workplace Electrical Safety
 - .3 CAN/CSA-Q9000-92 Quality Management Quality Assurance Standards for select.
2. The Ontario Electrical Safety Code 2018, and all bulletins (Ontario).
3. Ontario Provincial Standard Specifications
 - .1 OPSS 106 – General Specification for Electrical Work.

1.3 Action and Informational Submittals

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. The Contractor shall submit copies of vendor, producer or manufacturer data for the motor starter. These shall include product characteristics, performance criteria, catalog cuts, specifications, data sheets, physical dimensioned drawings, testing and calibration requirements, and installation instructions.
3. Include operation and maintenance manuals for the starter as part of closeout submittals.
4. Contractor to provide spare parts for the starter as recommended by the starter manufacturer.

1.4 Quality Assurance

1. Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
2. Regulatory requirements: Perform electrical construction in accordance with industry acceptable practice and complies with applicable country, region and local codes.
3. Products shall be tested, approved and labeled/listed by CSA, or by a nationally recognized testing laboratory (NRTL).
4. Electrical equipment and materials shall be new and within one year of manufacture date.
5. Electrical work shall comply with the requirements of the CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations and CAN/CSA-Z462-18, Workplace Electrical Safety.
6. Material and workmanship shall conform to the requirements of the specifications. Contractor shall ensure material and workmanship quality and provide Certificates of Conformance per the requirement of Specification Section 01 45 00 Quality Control.

1.5 Delivery, Storage and Handling

1. Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
2. Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
3. Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect the motor starters from damages.
 - .3 Replace defective or damaged materials with new.
4. Develop Construction Waste Management Plan related to Work of this Section.
5. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
6. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Install New Motor Starters" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Full Voltage Non-Reversing Magnetic Starter

1. Voltage: 600VAC.
2. Phases: 3.
3. Size: 15HP.
4. Combination: Yes, breaker/disconnect.
5. Manufacturer: Siemens.
6. Enclosure: CSA/NEMA Type 5/12
7. Contactor: Rated for 15HP
8. Auxiliary contacts: 2 N.O., 2 N.C.
9. Overload: Class 20, 14-20A
10. Overload contacts: 1 N.O., 1 N.C.
11. Control transformer: Yes. 120VAC, 50VA minimum, 2 primary fuses, 1 secondary fuse.
12. Selector switch: Yes. HAND-OFF-AUTO, maintained.
13. Indicator: LED - Running Status.
14. Lockable enclosure: Yes.
15. CSA approved.
16. Include a wiring and schematic diagram inside starter enclosure in visible location.
17. Identify each wire and terminal for external connection, within starter, with permanent number marking identical to diagram.

PART 3 - EXECUTION

3.1 Installation

1. Install motor starter in accordance with manufacturer's recommendations and the approved shop and working drawings.
2. Starter wiring should be as indicated on contract drawings. Pre-packaged starter schematics may be different than shown on contract drawings. Contractor to re-wire pre-packaged systems as required.
3. Install and mount plumb, true and square to the building lines.
4. Refer to contract drawings for mounting location and arrangement.
5. Ensure correctly sized upstream protective device(s), and correctly sized motor starter overloads.
6. Confirm motor nameplate and adjust overload device to suit prior to energization.

3.2 Nameplates and Labels

1. Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.
2. Provide equipment identification in accordance with Section 26 05 00 – Common Work Results for Electrical.
3. Install identification labels indicating system name, voltage, and phase.

3.3 Field Quality Control

1. Verifications of Conditions: Verify that existing conditions are acceptable for motor starter installation in accordance with manufacturer's instructions, as well as ESA directives.
 - .1 Inform Departmental Representative and/or their designate of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
2. Conduct the tests in accordance with Section 01 45 00 Quality Control.

3.4 Cleaning

1. Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
3. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

PART 1 - GENERAL

1.1 Related Requirements

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of bridge navigation lights, and accessories necessary to complete the work under the scope of the contract.
2. Provide supervision, labor, and assistance for installation as part of this Contract. Follow specified procedures and instruction provided by the vendors and/or manufacturers of the navigation lights.
3. The requirements of other related specification sections shall also apply for installation and coordination of work.

1.2 References

1. Canadian Standards Association (CSA International)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .3 CAN/CSA-S6.1-14, Commentary on CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .4 CAN/CSA-Z462-18, Workplace Electrical Safety
 - .5 CAN/CSA-Q9000-92 Quality Management Quality Assurance Standards for select.
2. The Ontario Electrical Safety Code 2018, and all bulletins (Ontario).
3. Ontario Provincial Standard Specifications
 - .1 OPSS 106 – General Specification for Electrical Work.

1.3 Action and Informational Submittals

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. The Contractor shall submit copies of vendor, producer or manufacturer data for the navigation lights and apparatus. These shall include product characteristics, performance criteria, catalog cuts, specifications, data sheets, physical dimensioned drawings, testing and calibration requirements, and installation instructions.

1.4 Quality Assurance

1. Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
2. Regulatory requirements: Perform electrical construction in accordance with industry acceptable practice and complies with applicable country, region and local codes.
3. Products shall be tested, approved and labeled/listed by CSA, or by a nationally recognized testing laboratory (NRTL).
4. Electrical equipment and materials shall be new and within one year of manufacture date.
5. Electrical work shall comply with the requirements of the CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations and CAN/CSA-Z462-18, Workplace Electrical Safety.
6. Material and workmanship shall conform to the requirements of the specifications. Contractor shall ensure material and workmanship quality and provide Certificates of Conformance per the requirement of Specification Section 01 45 00 Quality Control.

1.5 Delivery, Storage and Handling

1. Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
2. Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
3. Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect the navigation lights from damages.
 - .3 Replace defective or damaged materials with new.
4. Develop Construction Waste Management Plan related to Work of this Section.
5. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
6. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Install New Bridge Navigation Lights" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 General Description

1. Navigation lights shall be furnished and installed as indicated on the contract drawings, and as per manufacturer's instructions.
2. The navigation lights shall conform to the requirements and be in accordance with the rule and regulations of the Canadian Coast Guard.
3. The navigation lights shall be swing span type lights, B&B Roadway, model# SS-4.

2.2 Navigation Bridge Swing Span Light

1. Swing span type light shall consist of single height alternating greenish blue, and red lights. The lens sections shall consist of 90 degrees Green/Blue, 90 degrees Red, 90 degrees Green/Blue, and 90 degrees Red.
2. The light shall be mounted from the underside of the bridge in the approximate locations noted on the contract drawings. The contractor is to ensure the appropriate kit is ordered for mounting/suspending from the underside of the bridge.
3. The housing shall be of cast silicon bronze. The casting alloy used shall be suitable for marine environments. Construction shall be rain-tight and fully gasketed. The light assembly shall be designed for heavy-duty, long service life. Design shall provide ready access for lamp service.
4. The lens shall be tempered fresnel glass. Lens colours shall meet Canadian Coast Guard Standards. The inside diameter of the lens shall be approximately 175mm. The outside diameter shall be approximately 205mm.
5. Lamp, dual lamps per section, shall be medium base, 120V, 100,000 hour LED lamps provided in a colour suitably matched to the lens. Medium base receptacles shall be rated for 250V, 660W and shall be porcelain with a nickel-plated brass shell to resist lamp freezing.
6. The dual lamp arrangement shall be provided with an automatic transfer relay that will switch power to the backup lamp upon failure of the primary lamp. The relay

shall provide a second independent contact for remote signaling of “primary lamp failure” status. Transfer relay components shall be contained in a cast box of the same material as the fixture head.

7. Lamp fixture head and base shall be mounted on a 51mm schedule 40 pipe, 60mm O.D. Pipe material shall be stainless pipe used with bronze castings. Standard dimensions from the light base to the focal plane of the lens shall be 356mm.
8. The fixture will be mounted from the bottom of the swing bridge. All junction boxes, housings and mounting devices must be suitable for this orientation.
9. Power shall be switched between RED (bridge closed to maritime traffic) and GREEN (Bridge open) sections remotely from the bridge control system.
10. An indicator light to signal “primary lamp failure” status shall be included, for remote installation. The indicator light shall have a 360-degree blue Fresnel lens. A 27W lamp shall be included.
11. Each light shall be securely bolted in place with bronze or stainless-steel lag screw or bolts of not less than 9.5mm in diameter. The connections to the lights shall be made with #10AWG conductors. The feeding conduits for the lights shall be securely clamped with stainless steel hardware.
12. The Contractor shall submit outline-dimensioned drawings of their proposed bridge swing span navigation lighting unit, mounting details, and specification for approval by the Departmental Representative.

PART 3 - EXECUTION

3.1 Installation

1. Navigation bridge swing span light layouts shall be approved by the Departmental Representative prior to the installation work.
2. Install the navigation bridge swing span lights in accordance with manufacturer’s recommendations and the approved shop and working drawings.
3. Each bridge swing span light shall be tested for correct operational functionality and repeatability.
4. The existing lock navigation lights that are presently mounted on the bridge shall be retained and re-used.

3.2 Field Quality Control

1. Verifications of Conditions: Verify that existing conditions are acceptable for navigation light installation in accordance with manufacturer's instructions.
 - .1 Inform Departmental Representative and/or their designate of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
2. Conduct the tests in accordance with Section 26 05 00 Common Work Results for Electrical.

3.3 Cleaning

1. Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
3. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

PART 1 - GENERAL

1.1 Description

1. This section describes the traffic warning equipment used for traffic control at the bridge.

1.2 General Requirements

1. Section 26 05 00 – Common Work Results for Electrical.

1.3 Related Requirements

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of vehicle traffic warning gates under the scope of the contract.
2. The requirements contained in other sections of project specification shall also apply for installation and coordination of work.

1.4 References

1. Canadian Standard Association (CSA)
 - .1 CAN/CSA-Q9000 – Quality Management Quality Assurance Standards for selection and use.
 - .2 TAC – Manual of Uniform Traffic Control Devices.
 - .3 OTM – Ontario Traffic Manual.
 - .4 CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
2. American National Standards Institute (ANSI)
 - .1 ANSI/NEMA MG 1-2011, Motors and Generators.

1.5 Delivery, Storage and Handling

1. Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
2. Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
3. Storage and Handling Requirements:

- .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect warning gates from damages.
 - .3 Replace defective or damaged materials with new.
4. Develop Construction Waste Management Plan related to Work of this Section.
 5. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 6. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 Quality Assurance

1. Regulatory requirements: Perform electrical construction in accordance with industry acceptable practice and complies with applicable country, region and local codes.
2. Products shall be tested, approved and labeled/listed by CSA or by a nationally recognized testing laboratory (NRTL).
3. Electrical equipment and materials shall be new and within one year of manufacture date.
4. Electrical work shall comply with the requirements of the CSA C22.1, Canadian Electrical Code, Part 1, (Latest Edition), Safety Standard for Electrical Installations and CAN/CSA-Z462-2018, Workplace Electrical Safety.
5. Material and workmanship shall conform to the requirements of the specifications. Contractor shall ensure material and workmanship quality and provide Certificates of Conformance per the requirement of Specification Section 01 45 00 – Quality Control.

1.7 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Install New Traffic Warning Gates" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 General Description

1. Pre-wired, drop arm vehicle warning gates, including all selected attachments and accessory equipment as indicated on drawings. Complete with all motors and electrical devices to move barrier arm and limit its travel in both directions.
2. The gates shall be controlled from the bridge operators control station.
3. The traffic warning gate shall be B&B Roadway model VW-4.

2.2 Warning Gates and Operators

1. Operation shall be by means of a mechanical 4-bar linkage. The linkage shall be driven by a fully enclosed, double reduction, worm gear speed reducer. The velocity of the arm shall follow a sinusoidal pattern to provide smooth operation. The arm shall begin and end its full motion path with zero velocity and accelerate smoothly to a maximum velocity at mid-travel.
2. Travel time is to be between five seconds and eleven seconds from fully closed to fully open position.
3. Gate arm shall be of tubular fiberglass design with arm length for full coverage of roadway width not to exceed the maximum length of 28' (8.53m).
4. Standard components shall include as a minimum:
 - .1 Housing: shall be constructed of 4.8mm (0.188") carbon steel, hot dipped galvanized after fabrication. All fasteners shall be corrosion resistant. Arm shaft openings shall incorporate O-ring seals.
 - .2 Doors: Front and rear doors shall have slip-off type hinges with stainless steel pins. Door latches (two per door) shall compress a neoprene bulb-type gasket to seal the door openings.
 - .3 Arm shaft: the main arm shaft shall be 51mm (2") diameter with a minimum tensile strength of 140,000 psi. The shaft shall be mounted in a heavy duty lubricable bearings.
 - .4 Arm: the gate arm shall be 102mm (4") square, 6005-T5 aluminum extruded tubing. Front and rear arm surfaces shall be covered with alternating red and white high intensity reflective sheeting.
 - .5 Counter weights: Hot-dipped galvanized counter weights shall be mounted to balance the arm. Counter weights shall be sectional and permit at least 10% adjustment.
 - .6 Arm base: the arm base shall be designed with a shear pin mechanism to minimize damage to the gate and vehicle in the event of a collision. At the full-open position, a spring-loaded latch shall engage, preventing the arm from swinging back into traffic. The arm shall be easily reset by manually

- releasing the latch, rotating the arm back into position and replacing the shear pin.
- .7 Electric motor: shall be 208VAC, three-phase. The minimum size shall be 1/2HP, except when a greater rating is recommended by the gate manufacturer. The motor shall be mounted directly to the transmission.
 - .8 Braking mechanism: The motor shall be equipped with a solenoid-release, automatic brake. The brake shall have a manual release to permit manual operation of the gate during emergencies or startup.
 - .9 Handcrank: A handcrank shall be provided to facilitate manual operation.
 - .10 Limit switches: multiple limit switches shall be used and shall be adjustable to control maximum travel (i.e. fully up and down positions).
 - .11 Safety switches: A manual disconnect switch shall be pre-wired and provided to break the main motor leads, to protect personnel during service. A safety switch shall be provided to prevent powered activation of the gate during manual operation. Door safety switches shall be installed to break the control circuit when either access door is opened.
 - .12 Gate Operator shall have the following input and output control interface with the bridge control system:
 - a. Emergency stop command
 - b. Raise command
 - c. Lower command
 - d. Raised position indication (dry contacts – NC & NO from limit switch)
 - e. Lowered position indication (dry contacts – NC & NO from limit switch)
 - f. Operator door open indication (dry contacts – NC & NO from both doors)
 - .13 Barrier Lights: Low voltage LED lights for barrier arm and flasher.
 - .14 Heater: sufficiently sized heater with thermostat for cold/damp climates.

2.3 Factory Tests

1. Fully assemble and test, at the factory, each gate operator to assure smooth operation, sequencing and electrical connection integrity. Apply physical loads to the operator to simulate field conditions.
2. Tests shall simulate physical and electrical loads equal to the fully rated capacity of the operator components.
3. Check all mechanical connections for tightness and alignment. Check all welds for completeness and continuity. Check welded corners and edges to assure they are square and straight.
4. Inspect painted finish for completeness and gloss. Touch up imperfections prior to shipment.
5. Check all hydraulic hoses and electrical wires to assure that chafing cannot occur during shipping or operation.

2.4 Warning Gate Concrete Bases

1. Re-use the existing concrete base for the north warning gate, if possible. It is likely that the existing anchor bolt pattern will not be the same for the new unit.
2. If the existing base is not suitable, the warning gate concrete base shall be in accordance with Section 03 20 00 Concrete Reinforcing and 03 30 00 Cast-in-Place Concrete, as well as the manufacturer's requirements.
3. Anchor bolts: shall be in accordance with the gate manufacturer's requirements.
4. The south warning gate unit is presently mounted on a steel structure affixed to the west side of the south abutment. Re-use this steel structure if feasible. Otherwise fabricate a new steel support structure and anchor into the abutment.

PART 3 - EXECUTION

3.1 Examination

1. Verification of Conditions: verify that existing conditions are acceptable for warning gate installations in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Departmental Representative.

3.2 Installation

1. Install the warning gates in accordance with the manufacturer's printed instructions, current at the time of installation. Coordinate locations of operators with contract drawings, other trades and shop drawings.
2. Each gate shall be tested for correct operational functionality and repeatability.
3. Ensure existing traffic warning gate units are removed prior to installation of new.
4. Install North warning gate on the existing concrete pad. Modify the existing pad, as necessary, if the new warning gate unit dimensions are considerably different than the existing units.
5. Install the South warning gate in the same location as the existing unit. Modify the mounting bracket as necessary if the dimensions of the new warning gate unit are significantly different.

6. Provide grounding and bonding in accordance with manufacturer's instructions and the requirements of Canadian Electrical Code.

3.3 Field Quality Control

1. Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
2. Test gate operator through ten full cycles and adjust for operation without binding, scraping or uneven motion. Test limit switches for proper "at rest" gate position.
3. All anchor bolts shall be fully concealed and fully tightened in the finished installation.
4. Department, or Departmental Representative, shall complete "punch list" with installing contractor prior to final acceptance of the installation and submit completed warranty documentation to manufacturer.
5. Ensure moving and working part are lubricated where required.

3.4 Continued Service and Documentation

1. Train Department's personnel on how to safely shut off electrical power, release, and manually operate barrier arm. Additionally, demonstrate the general maintenance of the gate operator and accessories and provide one copy of "Installation and Reference" manual for the Department's use (a second manual is available upon request). Manuals will identify parts of the equipment for future procurement.

3.5 Cleaning

1. Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave work area clean at end of each day.
 - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.
 - .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

- .2 Do not dispose of unused preservative material into sewer system, into streams, lakes, onto ground or in any other location where they will pose health or environmental hazards.
- .3 Divert unused concrete materials from landfill to local facility approved by Departmental Representative.

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

PART 1 - GENERAL

1.1 Description

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of bridge operator control console, and accessories necessary to complete the work under the scope of the contract.
2. Provide supervision, labor, and assistance for installation as part of this Contract. Follow specified procedures and instruction provided by the vendors and/or manufacturers of the field instrumentation devices.
3. The requirements of other related specification sections shall also apply for installation and coordination of work.

1.2 References

1. Canadian Standard Association (CSA)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .3 CAN/CSA-S6.1-14, Commentary on CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .4 CAN/CSA-Z462-18, Workplace Electrical Safety
 - .5 CAN/CSA-Q9000-92, Quality Management Quality Assurance Standards for select.
2. The Ontario Electrical Safety Code 2018, and all bulletins (Ontario).
3. Ontario Provincial Standard Specifications
 - .1 OPSS 106 – General Specification for Electrical Work.
 - .2 OPSS 604 – Construction Specification for Installation of Cable.

1.3 Action and Informational Submittals

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. The Contractor shall submit copies of vendor, producer or manufacturer data for instrumentation devices and apparatus. These shall include design and installation shop drawings, catalog cuts, specifications, data sheets, physical dimensioned drawings, testing and calibration requirements, and installation instructions for the

following items, but not excluding other items or materials not specifically mentioned herein.

1.4 Related Work

1. Section 01 91 37 – Decommissioning / Commissioning
2. Section 26 05 00 – Electrical Common Work Results
3. Section 26 05 21 – Wiring and Cables
4. Section 26 05 26 – Grounding and Bonding

1.5 Quality Assurance

1. Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
2. Regulatory requirements: Perform electrical construction in accordance with industry acceptable practice and complies with applicable country, region and local codes.
3. Products shall be tested, approved and labeled/listed by CSA, or by a nationally recognized testing laboratory (NRTL).
4. Electrical equipment and materials shall be new and within one year of manufacture date.
5. Electrical work shall comply with the requirements of the CSA C22.1, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations and CAN/CSA-Z462-11, Workplace Electrical Safety.
6. Material and workmanship shall conform to the requirements of the specifications. Contractor shall ensure material and workmanship quality and provide Certificates of Conformance per the requirement of Specification Section 01 45 00 Quality Control.

1.6 Storage and Handling

1. Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
2. Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
3. Storage and Handling Requirements:

- .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect materials from damages.
- .3 Replace defective or damaged materials with new.
4. Develop Construction Waste Management Plan related to Work of this Section.
5. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
6. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.7 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Install New Bridge Operators Control Console" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Bridge Operator Control Console

1. Manufacturer: Hammond Manufacturing (others may be considered upon Departmental Representative approval).
2. Type: Sloped console with hinged top and lower panel door(s).
3. Rating: CSA Type 4X.
4. Size: 510 mm x 914 mm [20" x 36"].
5. Model Number: 2CSC2036.
6. Backplane: Yes. Part# 2CWCP36.
7. Provision for Padlocking: Yes.
8. Plinth: Yes. Part# 2CSP83618 or use other design approved by Departmental Representative.
9. Hinged Cover: Yes. Consult with Departmental Representative for custom design of this cover.

2.2 Relays

1. Manufacturer: Allen Bradley
2. Model: 700-CFM Series Relay
3. Ampere rating: 10A minimum.

4. Coil Voltage: 120VAC.
5. Contact Voltage: 240 VAC or greater.
6. Approvals: CSA Approved.
7. Contact Configuration: As shown on drawings.
8. Mounting: DIN rail.

2.3 Time Delay Relays

1. Manufacturer: Allen Bradley
2. Model: 700-CFM Series Relay
3. Ampere rating: 10A minimum.
4. Delay Unit: Either 100-FPTA30 or 100-ETA30
5. Coil Voltage: 120VAC.
6. Contact Voltage: 240 VAC or greater.
7. Approvals: CSA Approved.
8. Contact Configuration: As shown on drawings.
9. Mounting: DIN rail.

2.4 Flasher Relays

1. Manufacturer: Allen Bradley
2. Model: 700-HV Series Relay
3. Part Number: 700-HV32AAU120
4. Ampere rating: 10A minimum.
5. Coil Voltage: 120VAC.
6. Contact Voltage: 240 VAC or greater.
7. Approvals: CSA Approved.
8. Contact Configuration: As shown on drawings.
9. Mounting: Using DIN mounting plate.

2.5 Power Terminal Block

1. Manufacturer: Allen Bradley (or other manufacturer approved by Department Representative)
2. Part Number: 1492-PDM3141 (or similar)
3. Voltage: 240 VAC minimum.
4. Number of poles: 3.
5. Current Rating: 30A minimum
6. Withstand Rating: 10 kA.
7. Approvals: CSA approved.

2.6 DC 24V Power Supply

1. Manufacturer: Allen Bradley (or other manufacturer approved by Department Representative)

2. Part Number: 1606-XLS240EA (or similar)
3. Input Voltage: 120 VAC minimum.
4. Output Voltage: 24VDC nominal.
5. Output Current Rating: 10A minimum
6. Mounting: DIN.
7. Approvals: CSA approved.

2.7 2-Position Selector Switch

1. Manufacturer: Allen Bradley
2. Model: 800TC-HG11B
3. Type: Heavy duty.
4. No. of positions: 2, maintained.
5. Contact Details: Refer to drawings. For additional contacts use stackable switch blocks.
6. Ratings: CSA Type 4X, oil tight, water tight.
7. Size: 30 mm.
8. Contact Continuous Current Rating: 10 A.
9. Contact Voltage Rating: 120 VAC minimum.

2.8 3-Position Selector Switch

1. Manufacturer: Allen Bradley
2. Model: 800TC-JG11B
3. Type: Heavy duty.
4. No. of positions: 3, maintained.
5. Contact Details: Refer to drawings. For additional contacts use stackable switch blocks.
6. Ratings: CSA Type 4X, oil tight, water tight.
7. Size: 30 mm.
8. Contact Continuous Current Rating: 10 A.
9. Contact Voltage Rating: 120 VAC minimum.

2.9 4-Position Selector Switch

1. Manufacturer: Allen Bradley
2. Model: 800TC-NG11KF4B
3. Type: Heavy duty.
4. No. of positions: 4, maintained.
5. Contact Details: Refer to drawings. For additional contacts use stackable switch blocks.
6. Ratings: CSA Type 4X, oil tight, water tight.
7. Size: 30 mm.
8. Contact Continuous Current Rating: 10 A.
9. Contact Voltage Rating: 120 VAC minimum.

2.10 2-Position Keyed Selector Switch

1. Manufacturer: Allen Bradley
2. Model: 800TC-H31B
3. Type: Heavy duty.
4. No. of positions: 2, Maintained.
5. Contact Details: Refer to drawings. For additional contacts use stackable switch blocks.
6. Ratings: CSA Type 4X, oil tight, water tight.
7. Size: 30 mm.
8. Contact Continuous Current Rating: 10 A.
9. Contact Voltage Rating: 120 VAC minimum.

2.11 3-Position Keyed Selector Switch

1. Manufacturer: Allen Bradley
2. Model: 800TC-J42B
3. Type: Heavy duty.
4. No. of positions: 3, Maintained.
5. Contact Details: Refer to drawings. For additional contacts use stackable switch blocks.
6. Ratings: CSA Type 4X, oil tight, water tight.
7. Size: 30 mm.
8. Contact Continuous Current Rating: 10 A.
9. Contact Voltage Rating: 120 VAC minimum.

2.12 Cluster Pilot Light

1. Manufacturer: Allen Bradley
2. Model: 800TC-PCL416-RAGB, GGGG, or RRRR (refer to drawings for colour requirements).
3. Type: LED.
4. No. of Indicators: 4.
5. Ratings: CSA Type 4X, oil tight, water tight.
6. Size: 30 mm.
7. Voltage Rating: 120 VAC.

2.13 Pilot Light

1. Manufacturer: Allen Bradley
2. Model: 800TC-QTH2G– Green. Use equivalent part numbers for other colours.
3. Type: LED.
4. No. of Indicators: 1.
5. Ratings: CSA Type 4X, oil tight, water tight.
6. Size: 30 mm.
7. Voltage Rating: 120 VAC.

2.14 Push Button

1. Manufacturer: Allen Bradley
2. Model: 800TC-A6B.
3. Colour: Red.
4. Type: Momentary, spring return.
5. Ratings: CSA Type 4X, oil tight, water tight.
6. Size: 30 mm.
7. Voltage Rating: 120 VAC.

2.15 Push Button

1. Manufacturer: Allen Bradley
2. Model: 800TC-A2B.
3. Colour: Black.
4. Type: Momentary, spring return.
5. Ratings: CSA Type 4X, oil tight, water tight.
6. Size: 30 mm.
7. Voltage Rating: 120 VAC.

2.16 E-STOP

1. Manufacturer: Allen Bradley
2. Model: 800TC-TFXJET6A4.
3. Type: Giant Mushroom.
4. Channels: Dual, 2 N.C. contacts.
5. Ratings: CSA Type 4X, oil tight, water tight.
6. Size: 30 mm.
7. Voltage Rating: 120 VAC.

2.17 Reset Button

1. Manufacturer: Allen Bradley
2. Model: 800TC-A207WB.
3. Colour: Black with white "RESET".
4. Type: Momentary, spring return.
5. Ratings: CSA Type 4X, oil tight, water tight.
6. Size: 30 mm.
7. Voltage Rating: 120 VAC.

2.18 Fuse - 2 AMP

1. Ampere Rating: 2A.
2. Type: 5 x 20 mm.
3. Voltage: 250 VAC/DC.

4. Approvals: CSA approved.

2.19 Fuse - 5 AMP

1. Ampere Rating: 5A.
2. Type: 5 x 20 mm.
3. Voltage: 250 VAC/DC.
4. Approvals: CSA approved.

2.20 Fuse Holder Terminal Block

1. Type: Finger safe.
2. Mounting: DIN rail.
3. Voltage: 250 VAC/DC minimum.
4. Ampere Rating: 10A minimum.
5. Approvals: CSA approved.

2.21 Through-Terminal Blocks

1. Type: DIN mounted.
2. Voltage Rating: 300VAC, 250VDC.
3. Ampere Rating: 20A minimum.
4. Terminal Type: Screw.
5. Colour: Grey.
6. End plates: Yes. Use at end of row/grouping.
7. End brackets: Yes. Use at both ends of terminal row/grouping.

2.22 DIN Rail

1. Size: 7.5mm x 35mm.
2. Material: Stainless Steel.
3. Hardware: As required, including standoffs.

2.23 Wiring Duct

1. Manufacturer: Panduit (or as approved by the Department Representative).
2. Model: F2X3LG6 or F3X3LG6
3. Size: 51mm or 76mm (W) x 76mm (D) (as best suited).
4. Material: PVC.
5. Colour: Light Grey
6. Slots: Narrow.
7. Covers: Yes, C2LG6 or C3LG6.

PART 3 - EXECUTION

3.1 Installation

1. Install plinth on existing bridge operator station pad. Arrange plinth so that it completely covers the pad opening. The plinth is intended to keep leaves, dust and foreign material from falling into the opening of the pad.
2. Install Bridge Operator Console on top of plinth as per manufacturer's instructions.
3. Wire and interconnect as per contract drawings (series E2.x).
4. Console to be in conformance with UL508.
5. Contractor to ensure control panel has appropriate CSA approval and labeling.
6. Implement additional changes to console for Public Address (PA) system as directed by the Departmental Representative. Place holders for the volume adjust, speaker selector and speaker on/off are shown on drawings. Use existing PA system drawings for guidance to replicate PA functionality.

3.2 Field Quality Control

1. Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
2. Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and check out operation of section.
3. Upon completion of sectional test, undertake group testing.
4. Check out complete system for operational sequencing.

3.3 Identification

1. Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

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

PART 1 - GENERAL

1.1 Description

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of lock gate control cabinet, and accessories necessary to complete the work under the scope of the contract.
2. Provide supervision, labor, and assistance for installation as part of this Contract. Follow specified procedures and instruction provided by the vendors and/or manufacturers of the field instrumentation devices.
3. The requirements of other related specification sections shall also apply for installation and coordination of work.

1.2 References

1. Canadian Standard Association (CSA)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .3 CAN/CSA-S6.1-14, Commentary on CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .4 CAN/CSA-Z462-18, Workplace Electrical Safety
 - .5 CAN/CSA-Q9000-92, Quality Management Quality Assurance Standards for select.
2. The Ontario Electrical Safety Code 2018, and all bulletins (Ontario).
3. Ontario Provincial Standard Specifications
 - .1 OPSS 106 – General Specification for Electrical Work.
 - .2 OPSS 604 – Construction Specification for Installation of Cable.

1.3 Action and Informational Submittals

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. The Contractor shall submit copies of vendor, producer or manufacturer data for instrumentation devices and apparatus. These shall include design and installation shop drawings, catalog cuts, specifications, data sheets, physical dimensioned drawings, testing and calibration requirements, and installation instructions for the

following items, but not excluding other items or materials not specifically mentioned herein.

1.4 Related Work

1. Section 01 91 37 – Decommissioning/Commissioning
2. Section 26 05 00 – Electrical Common Work Results
3. Section 26 05 21 – Wiring and Cables
4. Section 26 05 26 – Grounding and Bonding

1.5 Quality Assurance

1. Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
2. Regulatory requirements: Perform electrical construction in accordance with industry acceptable practice and complies with applicable country, region and local codes.
3. Products shall be tested, approved and labeled/listed by CSA, or by a nationally recognized testing laboratory (NRTL).
4. Electrical equipment and materials shall be new and within one year of manufacture date.
5. Electrical work shall comply with the requirements of the CSA C22.1, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations and CAN/CSA-Z462-11, Workplace Electrical Safety.
6. Material and workmanship shall conform to the requirements of the specifications. Contractor shall ensure material and workmanship quality and provide Certificates of Conformance per the requirement of Specification Section 01 45 00 Quality Control.

1.6 Storage and Handling

1. Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
2. Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
3. Storage and Handling Requirements:

- .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect materials from damages.
- .3 Replace defective or damaged materials with new.
4. Develop Construction Waste Management Plan related to Work of this Section.
5. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
6. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.7 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Install New Lock Gate Control Cabinet" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Lock Gate Control Cabinet

1. Manufacturer: Hoffman-nVent (others may be considered upon Departmental Representative approval).
2. Type: Wall mounted.
3. Rating: NEMA Type 12.
4. Size: 1219 mm x 914 mm x 406 mm [48" H x 36" W x 16" D].
5. Model Number: A483616LP.
6. Backplane: Yes, part number A48P36.
7. Provision for Padlocking: Yes.
8. Door hinge: On left side.

2.2 Relays

1. Manufacturer: Allen Bradley
2. Model: 700-CF Series Relay
3. Ampere rating: 10A minimum.
4. Coil Voltage: 120VAC.
5. Contact Voltage: 240 VAC or greater.
6. Approvals: CSA Approved.

7. Contact Configuration: As shown on drawings.
8. Mounting: DIN rail.

2.3 Time Delay Relays

1. Manufacturer: Allen Bradley
2. Model: 700-CF Series Relay
3. Ampere rating: 10A minimum.
4. Delay Unit: Either 100-FPTA30 or 100-ETA30
5. Coil Voltage: 120VAC.
6. Contact Voltage: 240 VAC or greater.
7. Approvals: CSA Approved.
8. Contact Configuration: As shown on drawings.
9. Mounting: DIN rail.

2.4 Flasher Relays

1. Manufacturer: Allen Bradley
2. Model: 700-HV Series Relay
3. Part Number: 700-HV32AAU120
4. Ampere rating: 10A minimum.
5. Coil Voltage: 120VAC.
6. Contact Voltage: 240 VAC or greater.
7. Approvals: CSA Approved.
8. Contact Configuration: As shown on drawings.
9. Mounting: Using DIN mounting plate.

2.5 Power Terminal Block

1. Manufacturer: Allen Bradley (or other manufacturer approved by Department Representative)
2. Part Number: 1492-PDL3161 (or similar)
3. Voltage: 240 VAC minimum.
4. Number of poles: 3.
5. Current Rating: 60A minimum
6. Withstand Rating: 10 kA.
7. Approvals: CSA approved.

2.6 DC 24V Power Supply

1. Manufacturer: Allen Bradley (or other manufacturer approved by Department Representative)
2. Part Number: 1606-XLS240EA (or similar)
3. Input Voltage: 120 VAC minimum.
4. Output Voltage: 24VDC nominal.

5. Output Current Rating: 10A minimum
6. Mounting: DIN.
7. Approvals: CSA approved.

2.7 2-Position Selector Switch

1. Manufacturer: Allen Bradley
2. Model: 800TC-HG11B
3. Type: Heavy duty.
4. No. of positions: 2, maintained.
5. Contact Details: Refer to drawings. For additional contacts use stackable switch blocks.
6. Ratings: CSA Type 4X, oil tight, water tight.
7. Size: 30 mm.
8. Contact Continuous Current Rating: 10 A.
9. Contact Voltage Rating: 120 VAC minimum.

2.8 3-Position Selector Switch

1. Manufacturer: Allen Bradley
2. Model: 800TC-JG11B
3. Type: Heavy duty.
4. No. of positions: 3, maintained.
5. Contact Details: Refer to drawings. For additional contacts use stackable switch blocks.
6. Ratings: CSA Type 4X, oil tight, water tight.
7. Size: 30 mm.
8. Contact Continuous Current Rating: 10 A.
9. Contact Voltage Rating: 120 VAC minimum.

2.9 2-Position Keyed Selector Switch

1. Manufacturer: Allen Bradley
2. Model: 800TC-H31B
3. Type: Heavy duty.
4. No. of positions: 2, Maintained.
5. Contact Details: Refer to drawings. For additional contacts use stackable switch blocks.
6. Ratings: CSA Type, oil tight, water tight.
7. Size: 30 mm.
8. Contact Continuous Current Rating: 10 A.
9. Contact Voltage Rating: 120 VAC minimum.

2.10 Cluster Pilot Light

1. Manufacturer: Allen Bradley
2. Model: 800TC-PCL416- GGGG, or RRRR (refer to drawings for colour requirements).
3. Type: LED.
4. No. of Indicators: 4.
5. Ratings: CSA Type 4X, oil tight, water tight.
6. Size: 30 mm.
7. Voltage Rating: 120 VAC.

2.11 Pilot Light - Green

1. Manufacturer: Allen Bradley
2. Model: 800TC-QTH2G.
3. Type: LED.
4. No. of Indicators: 1.
5. Ratings: CSA Type 4X, oil tight, water tight.
6. Size: 30 mm.
7. Voltage Rating: 120 VAC.

2.12 Push Button - Red

1. Manufacturer: Allen Bradley
2. Model: 800TC- QTH2R.
3. Type: LED.
4. No. of Indicators: 1
5. Ratings: CSA Type 4X, oil tight, water tight.
6. Size: 30 mm.
7. Voltage Rating: 120 VAC.

2.13 Push Button - Amber

1. Manufacturer: Allen Bradley
2. Model: 800TC-QTH2A.
3. Type: LED.
4. No. of Indicators: 1
5. Ratings: CSA Type 4X, oil tight, water tight.
6. Size: 30 mm.
7. Voltage Rating: 120 VAC.

2.14 Push Button

1. Manufacturer: Allen Bradley
2. Model: 800TC-A2B.

3. Colour: Black.
4. Type: Momentary, spring return.
5. Ratings: CSA Type 4X, oil tight, water tight.
6. Size: 30 mm.
7. Voltage Rating: 120 VAC.

2.15 E-Stop

1. Manufacturer: Allen Bradley
2. Model: 800TC-TFXJET6A4.
3. Type: Giant Mushroom.
4. Channels: Dual, 2 N.C. contacts.
5. Ratings: CSA Type 4X, oil tight, water tight.

6. Size: 30 mm.
7. Voltage Rating: 120 VAC.

2.16 Reset Button

1. Manufacturer: Allen Bradley
2. Model: 800TC-A207WB.
3. Colour: Black with white "RESET".
4. Type: Momentary, spring return.
5. Ratings: CSA Type 4X, oil tight, water tight.
6. Size: 30 mm.
7. Voltage Rating: 120 VAC.

2.17 Fuse - 5 AMP

1. Ampere Rating: 5A.
2. Type: 5 x 20 mm.
3. Voltage: 250 VAC/DC.
4. Approvals: CSA approved.

2.18 Fuse - 2 AMP

1. Ampere Rating: 2A.
2. Type: 5 x 20 mm.
3. Voltage: 250 VAC/DC.
4. Approvals: CSA approved.

2.19 Fuse Holder Terminal Block

1. Type: Finger safe.

2. Mounting: DIN rail.
3. Voltage: 250 VAC/DC minimum.
4. Ampere Rating: 10A minimum.
5. Approvals: CSA approved.

2.20 Through-Terminal Blocks

1. Type: DIN mounted.
2. Voltage Rating: 600VAC, 250VDC.
3. Ampere Rating: 10A minimum.
4. Terminal Type: Screw.
5. Colour: Grey.
6. End plates: Yes. Use at end of row/grouping.
7. End brackets: Yes. Use at both ends of terminal row/grouping.

2.21 DIN Rail

1. Size: 7.5mm x 35mm.
2. Material: Stainless Steel.
3. Hardware: As required, including standoffs.

2.22 Wiring Duct

1. Manufacturer: Panduit (or as approved by the Department Representative).
2. Model: F2X3LG6 or F3X3LG6
3. Size: 51mm or 76mm (W) x 76mm (D) (as best suited).
4. Material: PVC.
5. Colour: Light Grey
6. Slots: Narrow.
7. Covers: Yes, C2LG6 or C3LG6.

PART 3 - EXECUTION

3.1 Installation

1. Construct and install Lock Gate Control Cabinet, wire and interconnect per drawings (series E3.x).
2. Console to be in conformance with UL508.
3. Contractor to ensure control panel has appropriate CSA approvals and labeling.

4. Reconnect and terminal Lock gate cables that were identified and marked during decommissioning of the MCC. Terminal numbers from the original lock gate controls have been retained.

3.2 Field Quality Control

1. Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
2. Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and check out operation of section.
3. Upon completion of sectional test, undertake group testing.
4. Check out complete system for operational sequencing.

3.3 Identification

1. Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

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

PART 1 - GENERAL

1.1 Description

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of the proportional driver and junction box (es), and accessories necessary to complete the work under the scope of the contract.
2. Provide supervision, labor, and assistance for installation as part of this Contract. Follow specified procedures and instruction provided by the vendors and/or manufacturers of the field instrumentation devices.
3. The requirements of other related specification sections shall also apply for installation and coordination of work.

1.2 References

1. Canadian Standard Association (CSA)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .3 CAN/CSA-S6.1-14, Commentary on CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .4 CAN/CSA-Z462-18, Workplace Electrical Safety
 - .5 CAN/CSA-Q9000-92, Quality Management Quality Assurance Standards for select.
2. The Ontario Electrical Safety Code 2018, and all bulletins (Ontario).
3. Ontario Provincial Standard Specifications
 - .1 OPSS 106 – General Specification for Electrical Work.
 - .2 OPSS 604 – Construction Specification for Installation of Cable.

1.3 Action and Informational Submittals

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. The Contractor shall submit copies of vendor, producer or manufacturer data for instrumentation devices and apparatus. These shall include design and installation shop drawings, catalog cuts, specifications, data sheets, physical dimensioned drawings, testing and calibration requirements, and installation instructions for the

following items, but not excluding other items or materials not specifically mentioned herein.

1.4 Quality Assurance

1. Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
2. Regulatory requirements: Perform electrical construction in accordance with industry acceptable practice and complies with applicable country, region and local codes.
3. Products shall be tested, approved and labeled/listed by CSA, or by a nationally recognized testing laboratory (NRTL).
4. Electrical equipment and materials shall be new and within one year of manufacture date.
5. Electrical work shall comply with the requirements of the CSA C22.1, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations and CAN/CSA-Z462-11, Workplace Electrical Safety.
6. Material and workmanship shall conform to the requirements of the specifications. Contractor shall ensure material and workmanship quality and provide Certificates of Conformance per the requirement of Specification Section 01 45 00 Quality Control.

1.5 Storage and Handling

1. Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and 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 the proportional driver and junction box (es) off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect proportional driver junction box (es) from damages.
 - .3 Replace defective or damaged materials with new.
4. Develop Construction Waste Management Plan related to Work of this Section.
5. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste

Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

6. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Install New Proportional Driver Junction Box" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Proportional Driver

1. Manufacturer: Lynch Electronics.
2. Type: Direct DIN Solenoid Mount.
3. Operating Voltage: 9 – 36VDC.
4. Maximum Output: 3A.
5. Input Signal: 5V, 10V, 4-20mA
6. Maximum Ramp Time: 99.5 Sec.
7. PWM / Dither Frequency: 40-450Hz
8. Linearity: 1%
9. Temperature Range: -40 Deg C to 75 Deg C
10. Model Number: LE PG X.
11. Protection Grade: IP65.
12. Irrespective of the above specifications, the proportional valve driver shall ensure that smooth controlled deceleration occurs under normal conditions and in the event of inadvertent change in speed and direction.

2.2 Junction Box (Enclosure)

1. Manufacturer: Hammond Manufacturing (others may be considered upon Departmental Representative approval).
2. Type: Wall mounted.
3. Rating: CSA Type 4X.
4. Material: 316 Stainless Steel.
5. Size: 305 mm x 254 mm x 152 mm [12" x 10" x 6"].
6. Model Number: EJ12106S16.
7. Backplane: Yes, included.

2.3 Potentiometer Operator

1. Manufacturer: Allen Bradley
2. Model: 800H-UR29
3. Type: Heavy duty.
4. Resistive Element: 10k ohms.
5. Ratings: CSA Type 4X, oil tight, water tight.
6. Size: 30 mm.
7. Voltage Rating: 30VDC minimum

2.4 Through-Terminal Blocks

1. Type: DIN mounted.
2. Voltage Rating: 600VAC, 250VDC.
3. Ampere Rating: 10A minimum.
4. Terminal Type: Screw.
5. Colour: Grey.
6. End plates: Yes. Use at end of row/grouping.
7. End brackets: Yes. Use at both ends of terminal row/grouping.

2.5 DIN Rail

1. Size: 7.5mm x 35mm.
2. Material: Stainless Steel.
3. Hardware: As required, including standoffs.

2.6 Cubicle LED Light

1. Size: 610 mm [24"]
2. Wattage: Minimum 25W.
3. Rating: NEMA 4X.
4. Mounting Hardware: Suitable to mount to top of cubicle.

2.7 GFI Receptacle

1. Size: 20A
2. Voltage: 125 VAC.
3. Rating: NEMA 4X.
4. Mounting Hardware: Suitable to mount to side of cubicle.

PART 3 - EXECUTION

3.1 Installation

1. The proportional driver and junction boxes will be located inside the cubicle at the center pier of the bridge where the hydraulic manifold will also be located.
2. Install proportional drivers as per manufacturers instructions.
3. Install junction box(es) and interconnect per drawings.
4. Contractor to ensure junction box has appropriate CSA approval and labeling.
5. Install NEMA 4X LED light along with switch (integrated or separate) in pier cubicle to ensure adequate visibility for troubleshooting and maintenance
6. Install a NEMA 4X, 20A, GFI, receptacle inside the pier cubicle.

3.2 Field Quality Control

1. Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
2. Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and check out operation of section.
3. Upon completion of sectional test, undertake group testing.
4. Check out complete system for operational sequencing.

3.3 Identification

1. Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

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

PART 1 - GENERAL

1.1 Description

1. This section includes general requirements for supply, service, delivery, storage, installation, testing, and commissioning of the safety circuit devices, and accessories necessary to complete the work under the scope of the contract.
2. Provide supervision, labor, and assistance for installation as part of this Contract. Follow specified procedures and instruction provided by the vendors and/or manufacturers of the safety circuit devices.
3. The requirements of other related specification sections shall also apply for installation and coordination of work.

1.2 References

1. Canadian Standard Association (CSA)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
 - .2 CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .3 CAN/CSA-S6.1-14, Commentary on CAN/CSA-S6-14, Canadian Highway Bridge Design Code.
 - .4 CAN/CSA-Z462-18, Workplace Electrical Safety
 - .5 CAN/CSA-Z432-16; Safeguarding of Machinery
 - .6 CAN/CSA-Q9000-92, Quality Management Quality Assurance Standards for select.
2. The Ontario Electrical Safety Code 2018, and all bulletins (Ontario).
3. Ontario Provincial Standard Specifications
 - .1 OPSS 106 – General Specification for Electrical Work.

1.3 Action and Informational Submittals

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. The Contractor shall submit copies of vendor, producer or manufacturer data for instrumentation devices and apparatus. These shall include design and installation shop drawings, catalog cuts, specifications, data sheets, physical dimensioned drawings, testing and calibration requirements, and installation instructions for the

following items, but not excluding other items or materials not specifically mentioned herein.

3. Product Data

- .1 Dual Input, Dual Channel programmable safety relay.
- .2 Expansion safety relay module.
- .3 E-Stop button.
- .4 Safety Rated Contactors.

1.4 Quality Assurance

- 1. Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- 2. Regulatory requirements: Perform electrical construction in accordance with industry acceptable practice and complies with applicable country, region and local codes.
- 3. Products shall be tested, approved and labeled/listed by CSA, or by a nationally recognized testing laboratory (NRTL).
- 4. Electrical equipment and materials shall be new and within one year of manufacture date.
- 5. Electrical work shall comply with the requirements of the CSA C22.1, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations and CAN/CSA-Z462-11, Workplace Electrical Safety.
- 6. Material and workmanship shall conform to the requirements of the specifications. Contractor shall ensure material and workmanship quality and provide Certificates of Conformance per the requirement of Specification Section 01 45 00 Quality Control.

1.5 Storage and Handling

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

4. Develop Construction Waste Management Plan related to Work of this Section.
5. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
6. Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "Install New Safety Circuits" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 General Description

1. The contractor shall furnish all devices defined herein.
2. All safety devices defined within this specification must CSA approved and rated as a safety device.
3. All safety devices defined within this specification must combine to form a CSA Category 3 safety circuit (dual channel inputs, dual channel outputs, with monitoring).

2.2 Programmable Safety Relay

1. Manufacturer: Allen Bradley.
2. Part Number: 440R-D22R2 GuardMaster Programmable Safety Relay
3. Supply Voltage: 24VDC
4. Inputs: Dual Input – Lock station and Bridge.
5. Input Channels: Dual with monitoring.
6. Relay Outputs: Two and expandable with expansion modules.
7. Relay Contact Rating: 1.5A @ 240VAC
8. Reset: Automatic – by pressing a reset button.
9. Reset monitoring: Yes.
10. Programming Modes: Multiple modes – Input 1 AND Input 2 required.
11. CSA approved.

2.3 Safety Relay Expansion Modules

1. Manufacturer: Allen Bradley.
2. Part Number: 440R-EM4R2 GuardMaster Safety Relay Expansion Module
3. Supply Voltage: 24VDC
4. Cascade Input: Yes, from 440R-D22R2.
5. Relay Outputs: Four (4)
6. Relay Contact Rating: 1.5A @ 240VAC
7. Cascade Output: Yes, to other 440R-EM4R2 Expansion modules
8. Contact Ratings: Dry Contact, Single Pole Double Throw (SPDT); 5A/240VAC, 10A/120VAC, 3A/24VDC.
9. CSA approved.
10. Expansion module shall maintain CSA Category 3 safety rating.

2.4 E-Stop Push Button

1. Manufacturer: Allen Bradley.
2. Part Number: 800TC-TFXJET6A4
3. Type: Giant Mushroom, twist release.
4. Voltage: 24VDC
5. Channels: Dual, Normally Closed Contacts.
6. Size: 30mm.
7. Ratings: CSA Type 4X, oil tight, water tight.
8. CSA approved.

2.5 Safety Contactor

1. Manufacturer: Allen Bradley.
2. Part Number: 100S-C23D14BC
3. Poles: 3.
4. Voltage: 600VAC.
5. HP Rating: 15HP.
6. Auxiliary Contacts: 1 N.O., 4 N.C.
7. Coil Voltage: 120VAC.
8. Bi-furcated contact.
9. CSA approved.

PART 3 - EXECUTION

3.1 Installation

1. Install the safety devices in accordance with manufacturer's recommendations and the approved shop and contract drawings.
2. The safety relay will be located within the lock gate control cabinet.

3. The safety contactors shall be mounted in an appropriate enclosure near to the combination motor starters. The contactors must be installed downstream of the starters.
4. E-Stops and E-Stop resets shall be installed at the lock gate control panel and the bridge operator console. Additional E-stops may be wired in series with the lock gate control panel. However, this is beyond the scope of this contract.
5. Each safety device shall be tested for correct operational functionality and repeatability.

3.2 Nameplates and Labels

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

3.3 Field Quality Control

1. Conduct the following tests in accordance with Section 01 45 00 Quality Control.

3.4 Cleaning

1. Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
3. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

PART 1 - GENERAL

1.1 Related Sections

1. Section 01 35 43 – Archaeological, Cultural and Environmental Procedures
2. Section 31 23 10 - Earth Excavation
3. Section 32 11 18 - Granular 'A'.

1.2 References

1. Ontario Provincial Standard Specification OPSS.MUNI 314.
2. Ontario Provincial Standard Specification OPSS.MUNI 206.

1.3 Samples

1. Submit test results for granular gradation in accordance with Section 01 33 00 Submittal Procedures.

1.4 Measurement and Payment

1. No measurement for payment will be made for Granular material or Rock Fill under this section.

PART 2 - PRODUCTS

2.1 Materials

1. Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
2. Use of recycled materials (RAP or RCM) on this project is not permitted.
3. Rock fill shall be in accordance with OPSS.MUNI 206.

2.2 Source Approval

1. Inform Departmental Representative of proposed source of aggregates and provide test results for sampling at least 4 weeks prior to commencing production.

2. If, in 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 2 weeks in advance of proposed change and provide documentation for testing.
4. Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, 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 obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified.
3. Wash aggregates, if required to meet specifications. Use only equipment approved by Departmental Representative.

3.2 Handling

1. Handle and transport aggregates 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 sediment fence barrier around perimeter of stockpile (considered incidental to work).

3.4 Aggregate Stockpile Cleanup

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 Related Sections

1. Section 01 35 43 – Archaeological, Cultural and Environmental Procedures
1. Section 31 05 17 - Aggregate Materials.
2. Section 33 99 01 - Utility Trenches.

1.2 Description

1. The work of this section covers the requirements for all earth excavation required on this project. This includes excavation in front of the north abutment wall to give access to reface the wall. Also, excavation will be required along the existing pathway stub retaining wall to install new trenches for electrical and hydraulic lines from the existing bridge cubicle to the existing trenches at the downstream lock gate.
2. 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.
3. Earth excavation shall include any required shoring, bracing, and dewatering of excavation.

1.3 References

1. ASTM C 117-13, Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
2. ASTM C 136-06, Method for Sieve Analysis of Fine and Coarse Aggregates.
3. ASTM D 422-63 (2007), Method for Particle-Size Analysis of Soils.
4. ASTM D 1557-12e1, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbs/ft²) (2,700 kN-m/m²).
5. ASTM D 4318-10e1, Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
6. CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
7. CSA A23.1-00/A23.2-14, Concrete Materials and Methods of Concrete Construction.

8. OPSS MUNI 401 – Trenching, Backfilling and Compacting.
9. OPSS 1003 Aggregates - Hot Mixed, Hot Laid, Asphaltic Concrete.
10. OPSS 1010 Aggregates - Granular A, B, M and select subgrading materials.

1.4 Definitions

1. Unclassified excavation: excavation of deposits of whatever character encountered in work.
2. Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
3. Waste material: excavated material unsuitable for use in work or surplus to requirements.
4. Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.
5. Unsuitable materials:
 1. Weak and compressible materials under excavated areas.
 2. Frost susceptible materials under excavated areas.
 3. Frost susceptible materials:
 1. Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318-10e1, and gradation within limits specified when tested to ASTM D 422-63(2007) and ASTM C 136-14: Sieve sizes to CAN/CGSB-8.1-88.

<u>Sieve Designation</u>	<u>% Passing</u>
2.000 mm	100
0.100 mm	45 - 100
0.020 mm	10 - 80
0.005 mm	0 - 45

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

1.5 Protection of Existing Features

1. Existing buried utilities and structures:
2. Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 1. Prior to commencing excavation work, arrange with the designated utility locator to stake existing Municipal, Parks Canada and private utility locations.

2. Existing utilities to be exposed in advance by hand excavation.
 3. Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 4. Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing.
 5. Record location of maintained, re-routed and abandoned underground lines.
3. 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.

1.6 Measurement and Payment

1. Measurement for payment for the unit price item shall be as indicated below. All costs for labour, materials and equipment necessary to do the work of the unit price items, in accordance with the drawings and these specifications, shall be included in the tendered Contract prices for these items.
 1. "Earth Excavation at North Abutment"m3
2. Measurement for payment for earth excavation to install new mechanical and electrical utility trenches are covered under Section 33 99 01 - Utility Trenches.

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.

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 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, 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 to extent and depth as directed by Departmental Representative.
8. Correct unauthorized over-excavation as follows:
 1. Fill with Granular to depths indicated on Contract Drawings, compacted to not less than 95% of Standard Proctor 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 MUNI 501.
2. Contractor shall proof roll excavated area prior to the placement of any granular material.

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

PART 1 - GENERAL

1.1 Related Sections

1. Section 01 35 43 – Archaeological, Cultural and Environmental Procedures
1. Section 31 23 10 - Earth Excavation.
2. Section 31 05 17 - Aggregate Materials.

1.2 References

1. OPSS 1010.

1.3 Delivery, Storage and Handling

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

1.4 Measurement and Payment

1. Payment for the work of supplying and placing Granular 'A' shall be made under the unit price item, "Granular A Backfill" (by the tonne) and shall include the costs for all labour, equipment and material necessary to complete the work of installing Granular 'A' in accordance with these Specifications and the Contract Drawings.

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 lifts, not to exceed 150 mm, 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 References

1. Agriculture and Agri-Food Canada
 1. The Canadian System of Soil Classification, Third Edition, 1998.
2. Canadian Council of Ministers of the Environment
 1. PN1340-2005, Guidelines for Compost Quality.
3. Canadian Green Building Council (CaGBC)
 1. LEED Canada-NC Version 1.0-December 2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System For New Construction and Major Renovations.
4. U.S. Environmental Protection Agency (EPA)/Office of Water
 1. EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.2 Related Sections

1. Section 01 35 43 – Archaeological, Cultural and Environmental Procedures
2. Section 01 74 11 - Cleaning.
3. Section 32 92 23 - Sodding.

1.3 Definitions

1. Compost:
 1. Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
 2. Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
 3. Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth C:N ratio below 25, and contain no toxic or growth inhibiting contaminants.
 4. Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).

1.4 Submittals

1. Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
2. Quality control submittals:
 1. Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in Part 2 - Source Quality Control.
 2. Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 Quality Assurance

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

1.6 Waste Management and Disposal

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

1.7 Measurement and Payment

1. No measurement for payment will be made for the supply and installation of topsoil for the restoration of the areas disturbed by construction. Payment shall be made under the lump sum price item "Sitework" and shall include all costs for labour, materials and equipment necessary to do the work of this item.
2. Preparation of sub-grade for placing of topsoil will not be measured for payment and shall be included in the supply of topsoil.
3. Topsoil stripping will not be measured.
4. Specified depth of topsoil: as shown on drawings and approved by Departmental Representative after settlement and consolidation.

PART 2 - PRODUCTS

2.1 General

1. Topsoil: mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.
 1. Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70% sand, minimum 7% clay, and contain 2 to 10% organic matter by weight.
 2. Contain no toxic elements or growth inhibiting materials.
 3. Finished surface free from:
 1. Debris and stones over 25 mm diameter.
 2. Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 1% of soil volume.
 4. Consistence: 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 N per gram of topsoil.
 3. Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
 4. Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
 5. Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
 6. Ph value: 6.5 to 8.0.
2. Peat moss:
 1. Derived from partially decomposed species of Sphagnum Mosses.
 2. Elastic and homogeneous, brown in colour.
 3. Free of wood and deleterious material which could prohibit growth.
 4. Shredded particle minimum size: 5 mm.
3. Sand: washed coarse silica sand, medium to course textured.
4. Organic matter: compost Category A in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
5. Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications.
6. Limestone:
 1. Ground agricultural limestone.

2. Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
7. Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

2.3 Source Quality Control

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

PART 3 - EXECUTION

3.1 Temporary Erosion and Sedimentation Control

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

3.5 Acceptance

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

3.6 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 – Archaeological, Cultural and Environmental Procedures
3. Section 01 74 11 - Cleaning.
4. Section 32 91 21 - Topsoil Placement and Grading.

1.2 Submittals

1. Samples.
 1. Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 2. Submit sod for each type specified. Install approved samples in one square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.
 3. Obtain approval of samples by Departmental Representative.

1.3 Quality Assurance

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

1.4 Scheduling

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

1.5 Measurement and Payment

1. No measurement for payment will be made for sodding required for the restoration of the construction areas. Payment shall be made under the lump sum price item

"Sitework" and shall include all costs for labour, materials and equipment necessary to do the work of this item.

2. Any Sodding required to repair damaged areas of the site shall be completed in accordance with this specification. Seeding will not be accepted as an alternative.

PART 2 - PRODUCTS

2.1 Materials

1. Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
 1. Turf Grass Nursery Sod types:
 1. Number One Kentucky Bluegrass Sod: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.
 2. Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.
 3. Number One Named Cultivars: Nursery Sod grown from certified seed.
 2. Turf Grass Nursery Sod quality:
 1. Not more than 2 broadleaf weeds or 10 other weeds per 40 square metres.
 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, 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; 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 degrees C.
2. Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
3. 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.
2. Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
3. Cut grass to 50 mm when or prior to it reaching height of 75 mm. Remove clippings which will smother grassed areas.
4. 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 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.

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 resod dead or bare spots to satisfaction of Departmental Representative.
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 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 Scope

1. This comprehensive specification covers all requirements associated with construction of the utility trench, associated grading and structures. The work include excavation, subgrade preparation, in-situ concrete trench base, procurement and installation of utility trench complete with steel framing and cover, waterproofing, backfilling, regrading, top soil placement and sodding. The work includes coring into the bridge centre pier and connecting to the existing trenches at the operator's control station. Specialized sections of trenches will be required where the terrain raises up towards the existing trenches at the operator's control station. The work includes cleaning the interior surfaces of the vault and replacing the vault door prior to installation of all new mechanical components.
2. The utility trench boxes will be supported on a new continuous concrete base which is in turn supported off the existing structure's base. The bottom of the precast trench boxes will be covered with welded wire reinforcement to seal the joints and to allow drainage towards new PVC wall drains that will be installed on waterside and grouted in place.
3. The required surveying to allow development of shop drawings by Contractor including necessary drainage provisions.

1.2 Related Sections

1. Section 01 33 00 - Submittal Procedures
2. Section 03 20 00 - Concrete Reinforcing
3. Section 03 30 00 - Cast-in-Place Concrete
4. Section 05 12 33 - Structural Steel for Bridges
5. Section 31 23 10 - Earth Excavation
6. Section 32 91 21 - Topsoil Placement and Grading
7. Section 32 92 23 - Sodding

1.3 Submittals

1. Provide a complete submission of all work components, product data, shop drawings, specifications, dimensions etc.

1.4 Measurement and Payment

1. No measurement for payment will be made for this section. Payment shall be made under the lump sum price item "New Utility Trenches and Pier Vault Rehabilitation" and shall include all costs for labour, materials and equipment necessary to do the work of this item. Submit the breakdown of lump sum to Departmental Representative for progress payment purposes.

PART 2 - PRODUCTS

2.1 Materials

1. Precast concrete and reinforcing steel for the utility trench as per pre-cast supplier including concrete of strength of air content in fresh mix of 5 to 8%. The minimum standard is Lafarge heavy duty precast trench, complete with hot dip galvanized frames and covers and Unistrut brackets as per precast supplier. The covers on the trench to be bolted down and easily removable with tools to allow maintenance but prevent vandalism. The precast trench to include the bend sections and special sections where terrain raises. Use of cast in place concrete will be allowed provided that the precast standards of construction are met.
2. Concrete: as per Section 03 30 00 - Cast-in-Place Concrete.
3. Joint filler: asphalt impregnated fibreboard.
4. Granular material for backfill: Ontario Provincial Standard Specifications OPSS.MUNI.1004. Size 19mm Type II.
5. Galvanized welded wire reinforcement as per Section 03 20 00 - Concrete Reinforcing with size as per Contract Drawings.
6. Waterproofing: minimum standard is Clay-Tite by W.R. Meadows. Alternate products will be allowed as approved by Departmental Representative.
7. PVC pipe drains shall conform to CSA B182.2-11.
8. Mechanical pier vault door and framing: 304 stainless steel.

PART 3 - EXECUTION

3.1 Execution for Utility Trench

1. Survey the area of installation as necessary to provide complete shop drawings of the installation. All dimensions, elevations, grades and existing conditions to be confirmed before commencement of work. Make submission of survey to Departmental Representative as per Section 01 33 00 - Submittal Procedures.

2. Carry out utility survey of the area and submit to Departmental Representative for record.
3. Prepare shop drawings of a complete installation and submit as per Section 01 33 00 - Submittal Procedures. The shop drawings to indicate:
 1. Details of trenches and manufacture data, including special sections for the vertical and horizontal bends
 2. Details of frames and covers
 3. Details of connections between precast units to assure water tightness
 4. Unistruts
 5. Waterproofing
 6. Subgrade preparation and backfill
 7. Grading details
 8. Reinstatement details
 9. Coring details for the drains and utilities
 10. Wall drains installation
4. Strip sod, top soil, excavate as per Section 32 91 21 - Topsoil Placement and Grading for the utility trench installation.
5. Install cast-in-place continuous concrete trench support. Level the top of the concrete support such that the top of the trench box matches the top of the existing retaining wall.
6. Prepare and compact subgrade including installation of clear stone granular as per OPSS.MUNI.1004. for trench construction.
7. Core walls of bridge pier and mechanical vault for utilities below grade. Apply water tight seal at all cable and pipe penetrations.
8. Remove and repair walkway in way of installation of new trench boxes at the Control station.
9. Install utility trenches c/w Unistrut brackets and covers.
10. Waterproof the utility trench including sealing the joints between the trench boxes with sealant.
11. Backfill utility trench.
12. Install cast-in place-floor slab in the utility trench complete with welded wire fabric.
13. Core the trench and existing concrete upstand/retaining wall and install drainage pipes and grout in place.
14. Backfill and grade.
15. Place top soil and sod to finish the installation.

3.2 Execution for Mechanical Pier Vault

1. Survey the area of installation as necessary to provide complete shop drawings of the installation. Make submission of survey to Departmental Representative as per Section 01 33 00 - Submittal Procedures.
2. Prepare shop drawings of a complete installation and submit as per Section 01 33 00 - Submittal Procedures. The shop drawings to indicate:
 1. Details of vault door including door framing and locking latch mechanism
 2. Details to seal the door and framing from water and debris infiltration
3. All interior surfaces of vault to be cleaned thoroughly by power washing with high pressure water (5000 psi minimum) and appropriate cleaners to ensure concrete surfaces are free of dust, surface dirt, oil and other contaminants. Water used in cleaning shall be from an approved source by the Departmental Representative prior to the start of cleaning work.

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

PART 1 - GENERAL

1.1 Description

1. Work includes local replacement of a deteriorated guide rail with a new steel beam guide rail located on the roadway at the North-West end of the bridge.

1.2 References

1. Ontario Provincial Standard Drawings (OPSD). OPSD 912.101, November 2016, Guide Rail System, Steel Beam Rail Component.
2. Ontario Provincial Standard Specifications (OPSS). OPSS 1504, November 2010, Material Specification for Steel Beam Guide Rail.

1.3 Measurement and Payment

1. No measurement for payment will be made for the supply and installation of the new steel guide rail. Payment shall be made under the lump sum price item "Replace Steel Beam Guide Rail " and shall include all costs for labour, materials and equipment necessary to do the work of this item.

PART 2 - PRODUCTS

2.1 Materials

1. Steel beam guide rail and hardware to OPSS 1504. Contractor to verify cross-section of existing guide rail. Cross-section is similar to that specified in OPSD 912.101. Colour of new guide rail to match existing.

PART 3 - EXECUTION

3.1 Installation

1. Install new section of guide rail in same location as existing deteriorated guardrail.

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