Public Services and Procurement Canada | Services publics et Approvisionnement Canada

SPECIFICATIONS FOR

Parks Canada Agency - Rideau Canal
Ottawa Walls
Clegg St. Repairs

Project No. R.079197.049
Tender Package
June 20, 2019

Prepared by:

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Drawing Number	Title
100	Cover Page and Location Plan
101	Plan and Sections
102	Wall Elevation and Storm Drain Detail
103	New Posts and Railing - Details

1.1 TIME OF COMPLETION

.1 Commence work in accordance with notification of acceptance of contract offer and complete the work within the dates outlined in the contract.

.2 Comply with the dewatering, drawdown schedule, and spring water levels as described in paragraph 1.10 of this section.

.3 Comply with the work schedule restriction imposed at Site, as described in paragraph 1.28 of this section.

1.2 ACCESS TO THE SITES

.1 The site is located in Ottawa, Ontario, along the Rideau Canal Waterway along Colonel By Drive between Mutchmor road and Herridge Street, adjacent to the Clegg Street Intersection, east embankment.

.2 Within the Canal and NCC lands, access to the work, limits of the work and staging areas to be as shown on the plans or as directed by the Departmental Representative. Limit of work within the Canal is limited to a maximum width of five meters (5m) from the existing vertical wall face for the full length of the site.

- .1 Extension of work limit beyond five meters (5m) from vertical face of existing retaining wall will be submitted to and reviewed for approval “as required” by the Departmental Representative.

.3 Prior to the contractor mobilizing on site, the contractor will be required to submit all pertinent information and documentation to PCA to obtain an authorization for construction Permit signed by PCA’s Ontario Waterways Director.

- .1 Documentation for review and approval;
  - .1 Environmental Management Plan (EMP) which outlines all measures to be implemented by the Contractor on the project site. The EMP to be submitted in writing, at least fifteen (15) working days prior to commencing work.
    - .1 EMP or its components plans to be prepared by qualified environmental professional(s). EMP to include but not limited to details on frequency of monitoring and list of high-risk construction activities where qualified environmental professional(s) are required on site.

.4 An access permit from the NCC will be required before using any NCC land.

- .1 Contractor to provide to NCC, prior to mobilization on site, approximate number of vehicles on site daily and associated license plate numbers for vehicle access pass validation.

.5 Remove any temporary access structures and restore the access and work areas to the original condition upon completion of the work, at the contractor's expense, except where noted otherwise.

.6 For the portion of the access by public roads, make all arrangements, obtain any required permits and confine activities to such routes and load limits as the authorities having jurisdiction may require.

- .1 Contractor to submit traffic Control Plan in accordance to Section 01-35-30 prior to mobilization on site.
- .2 Contractor to maintain and clean public roads and access routinely where sediment and debris from construction activities pose public safety

concerns.

.7 Secure the work areas in an approved manner. This includes using a minimum 1.8 m high welded-wire construction fence to prevent public access to any areas where construction activities occur and construction material is stored.

.1 For the winter period, when the Canal is used as a skating rink, a 1.8 m welded-wire construction fence on the ice surface will also be required to separate the work area from the skating public. Snow fence is to be located minimum of 1.5m from the cofferdam/dewatering/granular/work platform structure.

.8 Refer to Section 01 35 30 and Report No. 17M-02445-00 – “Rideau Canal Walls Rehabilitation Project, Transportation Management Plan”, for traffic control details, references and recommendations.

1.3 CANAL REGULATIONS AND PERMITS

.1 The "Historic Canal Regulations"(SOR/93-220) apply to and govern the work of this Contract. Copies may be obtained from the Justice laws Website:

.1 https://laws-lois.justice.gc.ca/eng/regulations/SOR-93-220/index.html.

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

.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

1.4 ARCHAEOLOGICAL, CULTURAL AND ENVIRONMENTAL PROTECTION

.1 The Rideau Canal is a National Heritage Site.

.2 Client Department, Parks Canada Agency, is main Environmental Authority for Rideau Canal Projects.

.3 Departmental Representative will seek and obtain acceptance of Client Department and 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 Contractor to comply with mitigation measures outlined in site-specific Basic Impact Assessment (BIA) and other federal, provincial, territorial or municipal act or regulation applying to the National Parks and Historic Sites of Canada.

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

.6 Site may contain cultural and archaeological resources.

.7 Employ minimal intervention approach for all work.

.8 Damage to heritage elements will not be tolerated

.9 All work to be in accordance with requirements of Section 01 35 46 ARCHAEOLOGICAL, CULTURAL AND ENVIRONMENTAL PROCEDURES.

1.5 RELICS AND ANTIQUITIES

.1 Corner stones and their contents, buried artifacts, the remains and evidence of ancient persons and peoples, commemorative plaques and other objects of historic value and worth remain the property of the Crown. Any and all such objects shall be protected and immediately brought to the attention of the Departmental Representative.

- .1 Should historic objects be uncovered during the work, stop work immediately and notify the Departmental Representative immediately. Work is to only resume after such time as directed by the Departmental Representative. If evidence of historic objects are validated;
  - .1 Contractor will allow time for Departmental Representative to conduct proper heritage recording of the work site asset prior to start of work. Additional recordings may be required after dewatering prior to demolition work.
  - .2 Century old timber cribbing has been found 2 to 3 meters back behind the canal wall in similar rehabilitation projects (2011 & 2015) just below the surface approximately 1 to 2 meters below grade. Also, there is evidence of remnants of original cribbing and wood facing boards approximately 1 to 2 meters in front of the Canal wall at other locations north of the current site. Contractor is to notify Departmental Representative if such a resource is found during work.
    - .1 For the location in question it is believed that the original canal timber cribbing is located within the canal bed approximately 1-2m in front of the existing concrete wall.
      - .1 This existing timber should have no impact on the work of this contract.
  - .3 Contractor to ensure float time within schedule for such occurrences.

1.6 MINIMUM STANDARD

.1 Materials shall be new and work shall conform to the most current minimum applicable standards of the Canadian General Standards Board, the Canadian Standards Association, the National Building Code of Canada 2015 (NBCC), ASTM, applicable Provincial and Municipal codes, and all other national and international standards.

.2 In the case of conflict or discrepancy, the most stringent requirement will apply.

1.7 ABBREVIATIONS

.1 Abbreviations used are:

- .1 ASTM - American Society for Testing and Materials.
- .2 ACI - American Concrete Institute.
- .3 ANSI - American National Standards Institute.
- .4 BIA - Basic Impact Assessment.
- .5 CSA - Canadian Standards Association.
- .6 CWB - Canadian Welding Bureau.
- .7 EMP – Environmental Management Plan.
- .8 NBCC - National Building Code of Canada.
- .9 CPM - Critical Path Method.
- .10 CGSB - Canadian General Standards Board.
- .11 CAN2, CAN3 - national standards of Canada published by CGSB.

.12 GC - General Conditions.
.13 MNR - Ministry of Natural Resources
.14 MOE - Ministry of the Environment
.15 NCC - National Capital Commission
.16 OPSS - Ontario Provincial Standard Specifications
.17 PSPC - Public Services and Procurement Canada.
.18 TMP – Traffic Management Plan.

1.8 DEFINITIONS

.1 Unless the context clearly indicates otherwise, the following definitions apply:
.1 Canal - the Rideau Canal.
.2 Wall – the existing mass gravity Concrete retaining wall.
.3 Plans and/or Specifications:
.1 Plans - the drawings listed in the "List of Drawings".
.2 Specification - the subject matter listed in the "List of Contents", addenda to the specification, and all relative written communications sent by the Departmental Representative to the Contractor in connection with the work.

1.9 BENCH MARK/DATUM

.1 Contractor shall complete a complete vertical and horizontal alignment survey of the existing wall in accordance to Natural Resources Canada, Geodetic Survey requirements prior to commencement of work.

.2 Refer to plans for available station marker information and location.

1.10 WATER LEVELS

.1 Information on the control of water levels and canal flows may be obtained from Departmental Representative.

.2 The contractor will be required to work in areas where water is present.
.1 Where repairs are required below water, the work is to be performed after a dewatering system is installed to facilitate wall repairs. Refer to Section 35 20 22 for dewatering.

.3 The normal water levels during the navigation period, which runs approximately from Victoria Day weekend in mid-May through to Thanksgiving weekend in October every year, ranges from 64.03 m to 64.08 m.

.4 The normal water level during the drawdown period is 61.92 m.
.1 Duration of the initial drawdown period is typically two (2) weeks.
.2 Water levels start to rise until a water level of 62.83 m is attained. This level is maintained until the end of the NCC skating season. Depending on weather conditions, skating season usually ends by mid-March.
.3 Spring drawdown water level of 61.92 m is typically achieved by the second week of April and is kept at that level for a period of usually two (2) weeks until the water level is raised to full navigation levels which typically starts on the Victoria Day long weekend in May of any year.
.4 Since weather conditions affect water levels in the canal during the month of April, the contractor is to assume that the duration of the drawdown level in April is ten (10) calendar days.

.5 Dates indicated in subsections 1.10.3 and 1.10.4 are not firm commitments and approximations only and are based on previous year operations. Exact dates for the 2019/2020 season and subsequent seasons will be provided to the Contractor, as soon as Rideau Canal Operations Manager establishes a schedule for the upcoming season.

.6 Winter Conditions:

.1 Ice Thickness: Rideau Canal skate way consists of at minimum 310mm of ice during the month of December and January and progressively thickens up to 560 to 610mm in the month of February. The values provided are averages.

.7 If the water level rises above or drop below these ranges because of precipitation, operating problems or any other cause, it shall be brought back within described range as soon as reasonably possible.

.8 The Departmental Representative and PCA endeavors to control the water level. However, the Departmental Representative cannot be held responsible for events, or the results of events that are not under its control.

1.11 REQUIREMENTS OF REGULATORY AGENCIES

.1 Adhere to City of Ottawa noise by-laws during all working periods.

.2 Dispose of all unwanted materials at a location off Canal lands approved by the Ontario Ministry of the Environment.

1.12 PROTECTION OF EXISTING UNDERGROUND FACILITIES

.1 Prior to excavating, locate and expose existing underground utilities. Shore and protect (including winter protection) exposed utilities until such time that these protective devices are ordered removed by the Departmental Representative.

.1 Contractor to coordinate disconnection/reinstatement and/or alternative bypass for mandatory continuous service delivery of utilities through work site.

.2 Repair, restore and/or replace to the Departmental Representative's approval any and all utilities damaged due to the work, or activities in connection with the work.

.3 Excavation within 1.5m of existing underground electrical high voltage (115KV) utility cable pipes shall be done by either hand digging or by an authorized hydro-excavator who is pre-qualified by Hydro One in accordance to the Hydro One standard *SP 0302 R1,* provided in the Contract documents. Refer to *“Construction Work Around Hydro One Cables and Temporary Support Requirements”* for additional information and specifics with respect to work around the 115KV cables.

.1 Prior to doing any work near the high voltage utility cable pipes, contact each utility at least 2 weeks before excavation work to schedule a meeting with the utility representative and to inform and coordinate with each respective utility the proposed scope of work around the cable pipes and cable trench;

.2 Do not excavate under the 115KV cables without following the guidelines set forth by Hydro One for setting up proper supports.

.3 Contractor to coordinate and follow rules and guidelines set forth by utility authorities for work within proximity to their assets.

.4 Notify Hydro One when excavation in proximity to the 115KV cables is finished.

1.13 DEPARTMENTAL REPRESENTATIVE SITE OFFICE

.1 Provide and maintain a secure construction office area for the shared use of the Departmental Representative and Contractor as follows:
- .1 Of sound, lockable, insulated, weather-proof construction.
- .2 Equipped with electric light, 4 electrical outlets, heat, desk, 900 mm x 1200 mm reference table, 4 chairs, 1 drafting stool, and 1 lockable 4-drawer filing cabinet; not less than 12 square meters in floor area.
- .3 Supply wireless data service for use by Contractor and Departmental Representative.

.2 Maintain a minimum temperature of 22 degrees C during hours of work.

.3 Pay all costs, including utilities connections, heating and lighting.

.4 Office is to remain the property of the Contractor.

.5 Contractor may provide office trailer with separate and individually lockable office segments to minimize space usage on site upon acceptance of Departmental Representative.

1.14 CONTRACTOR'S OFFICE

.1 Provide an office at the site location, open during regular working hours and large enough to accommodate site meetings for up to 10 people.

.2 Dedicated meeting room not to be used for Contractor materials and or equipment storage.

1.15 EXPLOSIVES

.1 Use of explosives is not permitted on this project.

1.16 EXAMINATIONS

.1 Examine site and conditions likely to affect work and be familiar and conversant with existing conditions.

.2 Provide photographs of surrounding properties, objects and structures liable to be damaged or be the subject of subsequent claims.

1.17 CLEAN-UP

.1 Clean and tidy the premises including the bed of the Canal on a daily basis. Do not permit the accumulation of debris, trash or garbage. At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.

.2 Rubbish, debris and garbage from all construction activities is to be removed off site on a weekly basis.

.3 At the completion of the work:
- .1 Remove all surplus materials, tools, plant, rubbish and debris, and dispose of them in an approved manner off Canal property.
- .2 Remove scaffolding, temporary protection and surplus materials.

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

.4 Make good defects noted at the substantial completion phase of the work.

1.18 TAXES

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

1.19 FEES, PERMITS, AND CERTIFICATES

.1 Pay all fees and obtain all permits as required to complete the work. Provide authorities with plans and information for acceptance certificates as required. Provide inspection certificates as evidence that work conforms to requirements of Authority having jurisdiction when requested.

.2 As per the Historic Canal Regulations (Applicable to lands administered by the Rideau Canal National Historic Site of Canada), Contractor is responsible to obtain a permit signed by Ontario Waterways Director to authorize the project work prior to mobilizing and commencement of any on site activities.

1.20 FIRE SAFETY REQUIREMENTS

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

1.21 FIELD QUALITY CONTROL

.1 Carry out Work using qualified licensed workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification.

.2 Permit employees registered in the Ontario apprenticeship program to perform specific tasks only if under direct supervision of qualified licensed workers.

.3 Determine permitted activities and tasks by apprentices, based on level of training attended and demonstration of ability to perform specific duties.

.4 Where work is to be done within 1.5m of the utility owned electrical cable pipes, work shall be performed by a competent, qualified civil contractor with experience working in and around areas of high voltage utilities.

1.22 HAZARDOUS MATERIALS

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

1.23 TEMPORARY UTILITIES

.1 Make all required arrangements with utility providers in order to provide temporary light, telephone, power and water to fulfill the operational requirements and demands of construction.

1.24 REMOVED MATERIALS

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

1.25 PROTECTION AND WARNING NOTICES

.1 Protect finished work against damage until take-over.

.2 Protect the work from damage by ice, flooding and/or other adverse climatic conditions.

.1 This includes protecting new work from differential temperature changes.

.3 Protect adjacent work/properties and infrastructure against the spread of dust and dirt beyond the work areas.

.4 Protect operatives and other users of site from all hazards.

.5 Monitor weather conditions (wet and heavy rain or snow fall) and schedule activities accordingly to minimize damage to site and or work.

1.26 CUT, PATCH AND MAKE GOOD

.1 Repair, replace and refinish, to the Departmental Representative's approval and photographic recorded condition, existing surfaces and items damaged in connection with the work, at the contractor's expense.

.2 The repaired, replaced and refinished items to be at least equal or better to those that existed immediately before damage occurred.

1.27 SIGNS AND SAFETY DEVICES

.1 Provide common-use signs and safety devices related to traffic control, information, instruction, use of equipment, public safety devices, etc., in both official languages or by the use of commonly-understood graphic symbols to the Departmental Representative's approval.

.2 Detour/warning signs and temporary fencing blocking existing bike path shall be illuminated for night time use.

.3 No advertising by the Contractor will be permitted on this project.

.4 Coordinate with Section 01 35 30 – SPECIAL PROCEDURES -TRAFFIC CONTROL.

1.28 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to the normal use of premises and traffic flow on Colonel By Drive. This includes vehicular, pedestrian and cyclist traffic. Make arrangements with Departmental Representative to facilitate work as stated.

.2 Existing access points to the Canal during the winter skating period located adjacent to the work areas must remain open with no interference from construction activities.

.1 Gate access near or adjacent to the work area must remain open with no interference from construction activities, unless otherwise directed

to provide alternative access approved by NCC and Department Representative.

.2 Contractor to coordinate construction work with NCC, and provide access for installation and removal of equipment and components and/or facilitate relocation of staircase and gate outside of work limits, where applicable.

.3 Within the work area, the existing pedestrian pathways will be closed to all users, but alternate pedestrian routes will be provided.

.4 City of Ottawa in conjunction with the NCC will provide snow removal for the pedestrian detour pathway, provided its surface is kept in fair condition and will not promote damage to their equipment or the pathway itself. Contractor will be responsible for any snow removal required in the area of work including snow removal against the base of the walls where required.

.1 Contractor is to maintain all temporary surfaces installed for pedestrian detour in good condition and maintain associated signage, lighting and barriers places for the duration of the project.

.2 Contractor will not be allowed to dump ground surface snow from the pathway and or roadway onto the ice surface or build snow banks against the canal walls.

.5 During snow clearing activities performed by the N.C.C., which fall outside the area of work, the N.C.C. will do their best not to push snow onto/into the work area, but it is possible that under large snowfall events that snow will be pushed into the Contractor's work area unintentionally. Under such events, the Contractor will be responsible to clear this additional snow.

.6 Where public safety and security is reduced by work, provide temporary means to maintain appropriate security.

1.29 TEMPORARY FACILITIES

.1 Provide and maintain suitable storage facilities, of type and location approved by the Departmental Representative.

.2 Observe and enforce all construction safety measures required by authorities having jurisdiction.

.3 Provide and maintain all necessary enclosures, guards, guardrails, hoardings, barricades, warning signs and similar items.

.4 Provide sufficient chemical toilet conveniences in a sanitary condition for use of all persons at the site.

.5 Enclose the work and storage area with secure fencing as directed by the Departmental Representative.

1.30 ACCESS AND EGRESS

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

1.31 SCAFFOLDS AND WORK PLATFORMS

.1 Design, install, and inspect scaffolds and work platforms as required for work in

accordance with relevant municipal, provincial and other regulations.

.2 Provide design drawings, signed and sealed by qualified Professional Engineer licensed in the province of Ontario, where prescribed.

.3 Additions or modifications to scaffolding must be approved by a licensed Professional Engineer in the province of Ontario in writing.

1.32 GUARANTEES AND WARRANTIES

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

1.33 PROJECT MEETINGS

.1 Contractor, Sub-contractor, and supplier Representatives to attend meetings will be qualified and authorized to act on behalf of the party each represents.

.2 Preconstruction meetings:
- .1 Within five (5) working days of award of contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Establish time and location of meeting and notify parties' concerned minimum of five (5) working days before meeting.
- .3 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.3 Progress Meetings:
- .1 During course of work and two (2) weeks prior to project completion, schedule progress meetings monthly.
- .2 Notify parties' minimum five (5) working days prior to meetings.
- .3 Contractor to record minutes of meetings, prepare and distribute minutes to attending parties and affected parties not in attendance within three (3) working days after meetings.

1.34 CONTRACT DOCUMENTS

.1 Drawings and specifications are complementary, and items shown or mentioned in one and not in the other are deemed to be included in the contract work.
- .1 If Drawings and Specification conflict with one another, immediately notify Departmental Representative for clarification.

.2 The Contractor will be responsible for printing/duplicating any required drawings or specifications for:
- .1 Suppliers;
- .2 Sub-contractors;
- .3 On-Site drawings & specifications;
- .4 Project Record drawings.

1.35 TESTING LABORATORY SERVICES

.1 Departmental Representative to appoint and pay for costs of inspection and testing services for quality control for, unless indicated otherwise.
- .1 Concrete Testing

.2 Backfill compaction
.3 Asphalt density compaction

.2 The Departmental Representative will appoint and pay for costs of inspection and testing services for quality assurance purposes, in addition to those listed in this section, 1.36.1, unless indicated otherwise.

.3 Provide safe working areas and assist with testing procedures, including provisions for materials or services and co-ordination, as required by testing agency and as authorized by Departmental Representative.

.4 Where Departmental Representative appointed testing indicates non-compliance with specifications, contractor to pay for initial test and all subsequent testing of work to verify acceptability of corrected work.

1.36 SCHEDULING

.1 Submit the construction progress schedule, (in CPM format) within ten (10) working days of award of contract. Progress schedule must include the quantity of work to be accomplished within each two (2) week time frame. No progress payments will be made until the construction progress schedule is approved. Submit together with the progress schedule a cost breakdown for each lump sum payment item.

.2 When requested by the Departmental Representative, resubmit the schedule with all revisions made to show the progress of the work and to show any changes which are required to meet the approved completion dates, within ten (10) working days.

.3 Take all necessary measures to complete the work within the schedule submitted and approved by the Departmental Representative.

.4 Do not make changes to the approved schedule, without the Departmental Representative's approval.

.5 The requirements of Section 01 33 00 - SUBMITTAL PROCEDURES, apply to the construction progress schedule.

.6 Carry out work during "regular hours" Monday to Friday from 07:00 to 18:00 hours.

.7 Notify and request from the Departmental Representative 48 hours in advance, for work to be carried out during "off hours". Off hours are defined as 18:00 to 7:00 Monday to Friday and anytime on Saturdays or Sundays.

.8 All work which is affected by the water level being raised to navigational level must be kept “in-the dry” until full completion of the project.

1.37 LAYOUT OF THE WORK

.1 The Departmental Representative will locate the project, establish a bench mark, and set the initial line. The Contractor will be responsible for all other layout and control survey work, and checking plan dimensions against field measurements.

.2 Lay out the work according to the elevations and dimensions shown on the plans and verified in the field, or determined in the field.

.3 Notify the Departmental Representative immediately of any discrepancies between field measurements and dimensions shown on the plans.

.4 Be responsible for rectification of errors resulting from failure to verify dimensions, elevations and other pertinent data shown on the plans.

1.38 COST BREAKDOWN

.1 Before submitting the first progress claim, Contractor is to submit a breakdown of Contract Amount in detail as directed by Departmental Representative and aggregating the Contract Amount. After approval by Departmental Representative, cost breakdown will be used as the basis for progress payments.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

1.2 APPLICATIONS FOR PROGRESS PAYMENT

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

.2 Date applications for payment last day of payment period and ensure amount claimed is for value, proportional to amount of Contract, of Work performed and products delivered to place of work at that date.

.3 Submit to Departmental Representative a Breakdown of unit price and lump sum items, at least two(2)weeks (14 Calendar days) before first application for payment. The proposed Schedule of values for parts of Work completed with respect to the aggregate total amount of the Contract, will be used to facilitate application evaluation of payments.

1.3 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.

1.4 PREPARING SCHEDULE OF UNIT PRICE TABLE ITEMS

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

.2 Make form of submittal parallel to Schedule of Values, with each line item identified same as line item in Schedule of Values. Include in unit prices only:
- .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 material cost of that item in Schedule of Values.

1.5 MEASUREMENT AND PAYMENT PROCEDURES

.1 Lump Sum Price - For the work which is not designated in the Unit Price Table there shall be no measurement and shall be paid at the contract Lump Sum Price. These items include all costs associated to perform the work including but not limited to material, equipment, personnel, overhead, etc. It is the Contractor's responsibility to ensure that all items of work not covered under the Unit Price Table are covered in the Contract Lump Sum Price. Items considered to be included in the Lump Sum Price are:
- .1 Mobilization.
- .2 Demobilization.
- .3 Connecting to existing services.
- .4 Site Access.
- .5 Design/supply/installation/removal of all temporary access routes and temporary ramps required to access the Work area.
  - .1 Public/Residential Access Areas - sidewalk approach protection on Colonel By Drive. Temporary Construction to be in accordance with municipal standards.
  - .2 Maintenance and repair as required due to heavy machinery use.
  - .3 Temporary relocation of ice skating access to canal, where existing access is affected by construction activities and work areas.
- .6 Design/installation/removal of all temporary work platforms required to complete construction work.
- .7 Construction Control - Condition surveys and monitoring of temporary works including temporary bench marks.
- .8 Electrical Work and safety procedures for excavation and work around 115kV Hydro One Trunk line.
  - .1 Design/implement/monitor as required by a Professional Electrical Engineering Consultant licensed in the province of Ontario. This includes but is not limited to such work as:
    - .1 Hydro-excavation and hand excavation around and below 115kV cables, if and where applicable and required.
- .9 Project Documentation Recording.
- .10 Construction fencing and perimeter security measures around work area.
- .11 Supplying, installing and maintaining illuminated detour/warning signs.
- .12 Maintaining the work/storage area for the duration of the work.
  - .1 Site security;
  - .2 Snow removal;
  - .3 Contractor's Site Office;
  - .4 Dust, privacy, and noise management;
  - .5 Protection, maintenance, relocation and reconnecting of existing services and utilities, as required;
  - .6 Preparation, clearing and grubbing, rough grading, geotextile and granular backfill, drainage of area etc. as required.
- .13 Traffic Control - Temporary measures for vehicle and navigation traffic control provisions and maintenance. This includes but is not limited to:
  - .1 Widening existing pathways to NCC 3m width requirement where applicable.
  - .2 Install/place temporary asphalt ramp access in areas where access is limited by stairs for pedestrian detour.

.3 Supply/install/maintain temporary pedestrian activated traffic control signals (TCS) for duration of the project period.
.4 Provide and maintain all signage and required markings for all temporary road crossings.
.14 Removal of the temporary access routes and temporary ramp.
.15 Environmental Procedures, including;
.1 Sediment, erosion and Turbidity control measures.
.2 Monitoring and Testing.
.16 Temporary Utilities.
.17 Construction Facilities.
.18 Other Removal, salvage and reinstallation of:
.1 All benches and existing signage as required to complete work. Work includes but is not limited to removal, salvaging, and reinstallation of all existing benches, garbage containers, signs and existing handrail access gates. This includes bench concrete bases.
.19 Concrete Reinforcement – Glass fibre Reinforcement Polymer (GFRP).
.20 Progressive and final Site cleaning.
.21 Design/Build/maintenance/deconstruction of Cofferdam/dewatering/ construction pad systems as required for the various work requirements of the site.
.22 Landscaping and reinstatement of site.

.2 The following Lump Sum Price Items shall be separated from the Lump Sum Price and identified with individual prices:
.1 Traffic Management and Control as described under 1.5.1.13.
.2 Environmental Procedures as described under 1.5.1.15.
.3 Concrete Reinforcement as described under 1.5.1.19.
.4 Cofferdam System as described under 1.5.1.21.
.5 Dewatering System as described under 1.5.1.21.

1.6 UNIT PRICE ITEM MEASUREMENT AND PAYMENT PROCEDURES

.1 Item No.1 - Post Removal.
.1 Item No.1 shall be paid at the contract unit price EACH for each post. This item shall include all the work described in Section 02 41 21 related to removal of line and expansion posts. All line and expansion posts are to be disposed of.

.2 Item No.2 - Pipe Railing Removal.
.1 Item No.2 shall be paid at the contract unit price by the unit LINEAR METER of pipe railing removed. This item shall include all the work described in Section 02 41 21 related to removal and disposal of existing pipe railings.

.3 Item No.3 - Concrete Excavation.
.1 Item No.3 shall be paid at the contract unit price by the unit CUBIC METER (Cu.M). This item shall include all the work described in Section 02 41 16 related to removal and disposal of material off site from existing concrete gravity retaining wall as indicated on drawings, including but not limited to, concrete sawcutting. This item will be measured in cubic meters calculated from neat dimensions indicated on the drawings or authorized in writing by Departmental Representative.

.4 Item No.4 – Class I Concrete:

.1 Item No.4 shall be paid at the contract unit price by the unit CUBIC METER (Cu.M). This item shall include all the work described in Section 03 30 00 related to concrete for use in the refacing portions of the Canal wall.

.5 Cast-in-place concrete: All classes of concrete shall be paid at the Contract unit price by the cubic metre calculated from neat dimensions indicated on Contract drawings or authorized in writing by Department Representative. Concrete placed beyond dimensions indicated will not be measured.
.1 No deductions will be made for volume of concrete displaced by reinforcement.
.2 Include in the prices of concrete the bonding agent.
.3 Include in the price of concrete the work described in Section 03 10 00.
.4 Include in the price of concrete the heating, cooling, hot and cold weather protection, curing, and finishing, including pre-heating of substrate.
.5 Include in the price of concrete the supply and installation of waterstops, where applicable.
.6 Include in the prices of concrete the supply and installation of joint filler, bond breaker and joint sealer.
.7 Include in the prices of concrete the supply and application of reinforcement fibers.

.6 Item No.5 - Line Posts.
.1 Item No.5 shall be paid at the contract unit price EACH for each line post. This item shall include all the work described in Section 05 52 20 related to supplying and installation of new line posts.

.7 Item No.6 - Expansion Posts.
.1 Item No. 6 shall be paid at the contract unit price EACH for each expansion post. This item shall include all the work described in Section 05 52 20 related to supplying and installation of new expansion posts.

.8 Item No.7 - Pipe Railing.
.1 Item No.7 shall be paid at the contract unit price by the unit LINEAR METER of pipe railing in place. This item shall include all the work described in Section 05 52 20 related to supplying, installation and coating system for new pipe railings.

.9 Item No.8 - Asphalt Excavation.
.1 Item No.8 shall be paid at the contract unit price by the unit CUBIC METER (Cu. M). This item shall include all the work described in Section 31 23 15 related to removal and disposal of existing asphalt pathway, including asphalt saw-cutting.

.10 Item No.9 - Common Excavation.
.1 Item No.9 shall be paid at the contract unit price by the unit CUBIC METER (Cu. M). This item shall include all the work described in Section 31 23 15 related to common excavation of existing native backfill.
.1 Excavation, removal, hauling and disposal of debris, and sediment in work area to complete repairs to concrete Canal walls and coping and to construct new wall segment. This includes watercourse sediment and debris removal from the Canal channel.
.2 Excavation of Granular native soil.

.11 Item No.10 – Hydro-Excavation
.1 Item No.10 shall be paid at the contract unit price by the unit CUBIC METER (Cu. M). This item shall include all the work described in Section 31 23 15 related to hydro-excavation of existing native backfill.
.1 Excavation, removal, hauling and disposal of debris, and sediment in work area to complete repairs to concrete Canal walls and coping and to construct new wall segment. This includes watercourse sediment and debris removal from the Canal channel.
.2 All Excavation to be completed by hand digging or Hydro-excavation for all excavations below asphalt course.

.12 Item No.11 - Backfilling.
.1 Item No.11 shall be paid at the contract unit price by the unit CUBIC METER (Cu. M). This item shall include all the work described in Section 31 23 15 related to backfilling, including but not limited to, surface preparation prior to general landscaping work.
.1 Quantities will be taken from cross section based on approved dimensions and actual grade lines set by Departmental Representative.
.2 Supplying, hauling, placement and compaction of site and imported materials within work area.

.13 Item No.12 - Asphalt HL3.
.1 Item No.12 shall be paid at the contract unit price by the unit square meter (Sq.M). This item shall include all the work described in Section 32 12 16, including but not limited to, line painting and supply/re-grading/leveling/compacting additional granular material for the bike/pedestrian pathway.

.14 Item No.13 – Catch Basin Repairs & Connection.
.1 Item No.13 shall be paid at the contract unit price for EACH (EA.) repair and extension. This item shall include all the work described in Section 31 23 15.

.15 Item No. 14 – Removal and disposal of Contaminated Material.
.1 Item No. 14 shall be paid at the contract unit price by the unit CUBIC METER (Cu.M. This item shall include all the work described in Section 31 23 15 related to removal and disposal of contaminated material.
.1 Excavation, removal, hauling and disposal of all material obtained from the Canal bed work area shall be considered for this item.

1.7 PROGRESS PAYMENT

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

1.8 SUBSTANTIAL PERFORMANCE OF WORK

.1 Prepare and submit to Departmental Representative a comprehensive list of items to be completed or corrected and apply for a review by Departmental

Representative to establish Substantial Performance of Work or Substantial Performance of designated portion of Work when Work is substantially performed if permitted by lien legislation applicable to Place of Work designated portion thereof which Departmental Representative agrees to accept separately is substantially performed. Failure to include an item on list does not alter responsibility to complete the Contract.

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

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

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 GENERAL

1.1 ADMINISTRATION

.1 This section specifies general requirements and procedures for Contractor’s submissions of shop drawings, product data and samples to Departmental Representative for review. Additional specific requirements for submissions are specified in individual sections of Divisions 01 to 35.

.2 Submit to Departmental Representative submittals listed for review.

.3 Submit promptly and in orderly sequence all submissions as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.4 Do not proceed with work affected by submittal until relevant submissions are approved by Departmental Representative.

.5 Present shop drawings, product data and samples in SI Metric units.

.6 Where items or information is not produced in SI Metric units converted values are acceptable.

.7 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submissions.
  .1 Contractor is responsible to review submittals, stamp, sign, and date submittals prior to submission to Departmental Representative.
  .2 Departmental Representative will not review and or accept submittals that have not been reviewed by Contractor and stamped, signed and dated.
    .1 No claim for time extension or delay of work shall be considered due to the Contractor’s failure to submit without the Contractor’s completed submittal review.

.8 Notify Departmental Representative, in writing, at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative's review of submission, unless Departmental Representative gives written acceptance of specific deviations.

.10 Make any and all changes in submissions which Departmental Representative may require consistent with Contract Documents and resubmit as directed by Departmental Representative.

.11 Notify Departmental Representative, in writing, when resubmitting, of any revisions other than those requested by Departmental Representative.

.12 Contractor to keep one reviewed copy of each submission on site.

.13 Submit in electronic format as PDF files. Forward PDF files through email or alternative electronic file sharing system or means as directed by

Departmental Representative.

1.2 SUBMISSION REQUIREMENTS

.1 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available.

.2 Allow five (5) working days for Departmental Representatives review of each submission.

.3 Accompany submissions with transmittal letter, in duplicate, containing:
- .1 Date,
- .2 Project title and number,
- .3 Contractor's name and address,
- .4 Identification and quality of each shop drawing, product data and sample,
- .5 Other pertinent data.

.4 Submissions shall include:
- .1 Date and revision dates,
- .2 Project title and number,
- .3 Name and address of:
  - .1 Subcontractor,
  - .2 Supplier,
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractors authorized Representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .1 All submissions submitted without Contractor's stamp will be returned without review. No delay of time will be contemplated or held against Canada for incomplete submissions.
- .5 Details of appropriate portions of work as applicable:
  - .1 Fabrication,
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances,
  - .3 Setting or erection details,
  - .4 Capacities,
  - .5 Performance characteristics,
  - .6 Standards,
  - .7 Operating weight,
  - .8 Relationship to adjacent work.

.5 After Departmental Representative's approval, distribute copies.

1.3 SHOP DRAWINGS

.1 The term "Shop drawing" refers to: original drawings, diagrams, illustrations, schedules, performance charts, brochures and or other modified data/documentation provided by Contractor, to illustrate details of portions of Work, which are specific to project requirements.

.2 Submit drawings stamped and signed by Professional Engineer registered or licensed in the Province of Ontario, Canada, as required.

.3 Maximum sheet size: 850 x 1050 mm.

.4 Submit shop drawings as follows:
.1 Electronic format - PDF, transmitted through shared Government FTP site (GeoPortal or similar) or by email.

.5 Indicate cross-references to design, shop drawings, specifications, and/or applicable portions of Contract Documents.

.6 All shop drawings to properly and clearly indicate: materials, methods of construction, and attachment or anchorage, erection diagrams, connections, explanatory notes, and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed.

.7 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of work, state such in writing to Departmental Representative for review, prior to proceeding with work.

.8 Co-ordinate, each submission, with requirements of work and Contract documents. Individual submissions will not be reviewed until all related and relevant information is available.

.9 Allow fifteen (15) working days for submittals related to Electrical Utilities, Archaeological, Cultural, or Environmental Procedures which require acceptance by the Client Department and or Authorities having jurisdiction and co-ordinated through Departmental Representative.

1.4 PRODUCT DATA

.1 Product data: manufacturers catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products.

.2 Submit two (2) copies of product data.

.3 Sheet size: 215 x 280 mm, maximum of three (3) modules.

.4 Delete information not applicable to project.

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

.6 Cross-reference product data information to applicable portions of Contract Documents.

.7 Submit electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product. Clearly identify selected product to be used.

.8 Submit 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.

.9 Submit 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 materials meet specification requirements.
.2 Certificates must be dated after award of Contract, complete with project name.

.10 Submit product data for but not limited to the following items:
.1 Concrete Mix.
.2 Epoxy adhesive system.
.3 Waterstops.
.4 Joint Sealant.
.5 Joint Filler.
.6 Concrete Fibre.
.7 Sheet piling (if applicable – cofferdam system).
.8 PVC drainage pipes and system.
.9 Pipe Railing Coating System.

1.5 SAMPLES

.1 Samples: examples of materials, equipment, quality, finishes, workmanship.

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

1.6 SHOP DRAWINGS REVIEW

.1 The review of shop drawings by Public Services and Procurement Canada (PSPC) is for the sole purpose of ascertaining conformance with the general concept.
.1 This review shall not mean that PWGSC approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and contract documents.
.2 Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to the confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of the work of all sub-trades.

.2 Submit shop drawings for but not limited to the following work:
.1 Reinforcement (GFRP).
.2 Metal Fabrication.
.3 Expansion and Line Post fabrication.
.4 Cofferdam/Dewatering System, if applicable.
.5 Construction access and work platform.
.6 Pedestrian Detour Pathway Construction.
.7 Traffic Control Plan and layout.

1.7 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers Safety and Insurance Board Experience report.

.2 Submit transcription of insurance immediately after award of Contract.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with Ontario Occupational Health and Safety Act, Canada Labour Code Part II, and Canada Occupational Safety and Health Regulations.

.2 Develop written Site-Specific Health and Safety Plan (HSSP) based on hazard assessment prior to commencing any site work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.3 Site-Specific Health and Safety Plan covers sub-trades utilized on the project.

.4 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 must be submitted to Departmental Representative in writing. Departmental Representative will respond in writing, either accepting or requesting improvements.

.5 Departmental Representative may respond in writing, where deficiencies or concerns are observed and may request re-submission of Site-Specific Health and Safety Plan with amended corrections addressing changes or improvements to plan.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 There shall be no separate measurement for payment for the work under this Section. Include cost in the Contract Lump Sum Price.

1.3 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

.2 Canadian Standards Association (CSA):
  .1 CSA S350-M1980 (R2003), Code of Practice for Safety in Demolition of Structures.

.3 National Building Code 2015 (NBCC):
  .1 NBC 2015, Division B, Part 8 Safety Measures at Construction and Demolition Sites.

.4 Province of Ontario:
  .1 Occupational Health and Safety Act, R.S.O. 1990 (Updated 2005) as amended and:
  .2 Regulations for Construction Projects, O.Reg. 213/91 as amended.
  .3 Ministry of Labour Publication "Silica on Construction Sites", 2004.
  .4 Workplace Safety and Insurance Act, 1997.
  .5 Municipal Statutes and Authorities.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS):
  .1 Material Safety Data Sheets (MSDS).

1.4 SUBMITTALS

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

.2 Submit site-specific Health and Safety Plan including but not limited to working in proximity to high voltage cable pipes:
- .1 Within seven (7) working days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
- .2 Results of site specific safety hazard assessment, including but not limited to:
  - .1 Mitigating measures and controls to address identified safety hazards and reduce anticipated risks.
  - .2 Results of Safety and health risk or hazard analysis for site tasks and operation found in work plan.
  - .3 Company Health and Safety Policy.
  - .4 Contractor's Safety Communication Plan, including contact information for key contacts.
  - .5 Contingency and Emergency Response Plan.

.3 Submit Construction Safety Checklists after completion.

.4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.

.5 Submit copies of incident and accident reports.

.6 Submit to Departmental Representative Material Safety Data Sheets (MSDS).

.7 Personnel training requirements including as follows:
- .1 Names of personnel and alternates responsible for site Safety and Health, hazards present on site, and use of personal protective equipment.

.8 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within five (5) working days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within five (5) working days after receipt of comments from Departmental Representatives.

.9 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.10 On-site Contingency and Emergency Response Plan: Address standard operating procedures to be implemented during emergency situations. Coordinate plan with existing Emergency Response requirements and procedures provided by Departmental Representative.

.11 Submit Workplace Safety and Insurance Board (WSIB) - Experience Rating Report.

1.5 FILING OF NOTICE

.1 File Notice of Project with Provincial and Federal authorities prior to commencement of Work.

.2 File other required notices in accordance with Acts and Regulations of the Province of Ontario as required.

.3 Keep copy of Notice of Project on site at all times.

1.6 SAFETY ASSESSMENT

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

1.7 MEETINGS

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

.2 Complete Parks Canada Attestation and Proof of Compliance with Occupational Health and Safety (OHS) Form.

1.8 REGULATORY REQUIREMENTS

.1 Comply with Acts and regulations of the Province of Ontario.

.2 Comply with specified Acts, Standards and Regulations to ensure safe operations at site.

1.9 PROJECT/SITE CONDITIONS

.1 Work at site will involve but not be limited to contact with:
- .1 Silica dust in concrete, from concrete demolition/excavation.
- .2 Corroded metals.
- .3 Benzene in fuel oil, paints and adhesives (new Materials).
- .4 Arsenic and acrylonitrile in adhesives.
- .5 Fresh concrete, concrete admixtures and bonding agents.

.2 Hazards on-site include but are not limited to:
- .1 Working around moving heavy equipment.
- .2 Working near vehicular traffic.
- .3 Work at or near water.
- .4 Falling Hazards.
- .5 Icy and slippery surfaces.
- .6 Working in adverse and cold weather conditions.
- .7 Working near high voltage underground power lines (115KV).

.3 Refer to 2016 EnGlobe report and 2017 Golder Associates Ltd. report for information on known contaminants. Contaminants on site include but are not limited to:
- .1 Metals – lead and mercury
- .2 Petroleum hydrocarbons including polycyclic aromatic hydrocarbons – beno(a)anthracene, pyrene, and 2-methylnaphthalene.

1.10 COMPLIANCE REQUIREMENTS

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

1.11 RESPONSIBILITY

.1 Be responsible for safety of persons and property on site and for protection of persons off site and environment to extent that they may be affected by

conduct of work.

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

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

1.12 COMMUNICATION REQUIREMENTS

.1 Comply with Ontario Health and Safety Act, Canada Labour Code Part II, and Canada Occupational Safety and Health Regulations.

1.13 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 Occupational Health and Safety Act for the Province of Ontario.

1.14 HEALTH AND SAFETY SUPERVISOR

.1 Employ and assign to Work, a competent and authorized Health and Safety Supervisor. Health and Safety Supervisor must:
- .1 Have site-related working experience specific to activities associated with nature of site work.
- .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 the site Supervisor.

1.15 POSTED DOCUMENTS

.1 Provide documents as follow and post on site at all time. 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 accordance with Departmental Representative;
- .1 Contractor's Health and Safety Policy.
- .2 Contractor's name.
- .3 Notice of Project.
- .4 Name, trade, and employer of Contractor's Health and Safety Representative (Safety Coordinator or Joint Health and Safety Committee member list, if applicable).
- .5 Workplace Safety and Insurance Board (WSIB) of Ontario - Poster 82C titled "In case of Injury".
- .6 Workplace Safety and Insurance Board for Ontario-Regulation 1101.
- .7 Ministry of Labour Regulations for the Province of Ontario.
- .8 Occupational Health and Safety Act for Province of Ontario.

.9 Material Safety Data Sheets.
.10 Written Emergency response plan and Site Specific Health and Safety Plan.

.2 Comply with Provincial general posting requirements.

1.16 CONSTRUCTION SAFETY CHECKLISTS

.1 Review and implement applicable health and safety checklists in collaboration with Departmental Representative.

1.17 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authorities having jurisdiction and/or by Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative may stop work if non-compliance of health and safety regulations is not corrected.

1.18 BLASTING

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

1.19 POWDER ACTUATED DEVICES

.1 Use powder actuated devices and fastening tools only after submittal of full justification for requirement of their use and receipt of written permission from Departmental Representative. Application and use of mentioned devices to be in conformance with Occupational Health and Safety Act and Regulations for Construction Projects, O.Reg. 145/00,S.30.

1.20 MECHANICAL EQUIPMENT

.1 Use of mechanical equipment within 1.5m of high voltage utility lines shall be coordinated and approved by Hydro Ottawa and Hydro One, prior to starting work.
.1 Verify with Hydro one prior to commencement of work for load restrictions in areas where work may be completed above buried powerlines.

1.21 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 a competent Health and Safety Officer to stop or start Work when, at the Health and Safety Officer's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative may also stop work for health and safety considerations.

1.22 EQUIPMENT LOCK-OUT/TAG-OUT

.1 The contractor shall coordinate and comply with Parks Canada (PCA)/National

Capital Commission (NCC) lock out procedures for equipment at site. The more stringent of Provincial Safety Regulations shall take precedence. PCA/PWGSC procedure involves multi-lock systems.

.2 Lock-out/Tag-out procedures are to be followed when working with PWGSC on existing or new electrical or mechanical system installations.

.3 Hydro One:

.1 Coordinate with Hydro One that step and touch potentials are controlled by the use of an equipotential work zone prior to operating hydrovac equipment within the 1.5m radius of high voltage power lines.

.2 Contractor to make sure that no personnel makes direct contact with the high voltage lines without wearing appropriately-rated personal protective equipment (PPE), because the lines may become energized during a power system fault. Accidental contact with the exposed line shall be avoided at all times.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Traffic Control and Management Plan (TCMP).

.2 Informational and Warning Devices.

.3 Protection and Control of Public Traffic.

.4 Operational Requirements.

.5 Pedestrian Pathway Detours.

.6 Temporary traffic signals.

.7 Road Closures.

1.2 REFERENCES

.1 Report No. 17M-02445-00 – “Rideau Canal Walls Rehabilitation Project – Transportation Management Plan”, prepared by WSP Canada Ltd.
  .1 The above referenced report provides guidance for the Contractor related to the traffic management, incident management and public information requirements needed prior to and during the construction process.
  .2 Contractor is solely responsible for the preparation of its own Traffic Control and Management Plan (TCMP).

.2 Ensure that all traffic control measures are in accordance with:
  .1 Manual of Uniform Traffic Control Devices (UTCD), Ministry of Transportation, Ontario and the Ontario Ministry of Labour.
  .2 Ontario Traffic Manual, Book 7: Temporary Conditions (2014).
  .3 Ontario Traffic Manual, Book 15: Pedestrian Crossing Facilities (2016).

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 There shall be no separate measurement for payment for the work under this section. Include cost in the Contract Lump Sum Price.

1.4 TRAFFIC PLAN

.1 Contractor to fill out and submit a Traffic Control and Management Plan to the City of Ottawa and Departmental Representative, which can be obtained at the following location:
  .1 Permit Issuing Counter, 560 Rochester St., 5th Floor Ottawa, Ontario
  .2 Telephone No. 613-580-2424 ext. 16000

.2 Indicate method and implementation schedule, include all signage, equipment and personnel to be used for the traffic control.

.3 Traffic Control and Management Plan must be submitted prior to commencing work. Provide adequate time to allow authority having jurisdiction to review plan and submit permit.

.4 Traffic Control and Management Plan required for:
  .1 Initial site mobilization and setup.
  .2 Temporary lane reductions for site delineation and TCP barrier installation.
  .3 Very short duration road or lane closures.
  .4 Short duration road or lane closures.
  .5 Changes as required for Work.

.5 Copies of plans & permits are to be submitted to the Departmental Representative and one (1) copy to be kept on-site at all time.

.6 Submit in accordance with Section 01 33 00.

1.5 PROTECTION OF PUBLIC TRAFFIC

.1 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out work or haul materials or equipment.

.2 When working on travelled way:
  .1 Place equipment in position to present minimum of interference and hazard to travelling public.
  .2 Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.
  .3 Do not leave equipment on travelled way overnight.

.3 Do not close any lanes of road without receipt of written approval from Departmental Representative and/or City of Ottawa. Before re-routing traffic erect suitable signs and devices in accordance with instructions contained in the UTCD manual and Ontario Traffic Manual, Book 7.
  .1 All lane and road closures to be coordinated with the Departmental Representative and the NCC. Departmental Representative to be notified a minimum of ten (10) working days in advance of the closure to allow for City of Ottawa and emergency services notification.
  .2 Very Short-term duration single-lane closure will be permitted between 9:30 hrs and 15:00 hrs during weekdays.
    .1 Maximum delay to public traffic: 10-15 minutes.
    .2 Signage to be posted at each approach notifying public of maximum delay time.
  .3 Lane closure at any other time, except as specified above in paragraph 1.4.4.2, must be approved by the Departmental Representative a minimum of 48 hours prior to any closure.
  .4 Provide specific schedule and traffic plan options prior to start of work for concrete deliveries within construction limits that parallel Colonel By Drive that requires long-term single lane closures and traffic detours.

.4 Provide and maintain road access and egress to property or adjacent residential roads fronting along Work site under Contract and in other areas as indicated, except where other means of road access exist that meet approval of Departmental Representative.

1.6 INFORMATIONAL AND WARNING DEVICES

.1 Provide and maintain signs, flashing warning lights and other devices required to indicate construction activities or other temporary and unusual conditions

resulting from project work which requires road user response.

.2 Provide adequate illumination to all detour/warning signs and temporary fencing blocking existing bike paths.

.3 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified in the UTCD and Ontario Traffic Manual Book 7.

.4 Place signs and other devices in locations recommended in UTCD and Ontario Traffic Manual Book 7.

.5 Meet with Departmental Representative prior to commencement of Work to prepare list of signs and other devices required for project. All traffic signs and devices must conform to the approved Traffic Control and Management Plan. If the situation on site changes, revise list to approval of Departmental Representative and City of Ottawa.

.6 Continually maintain traffic control devices in use:
- .1 Check signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.
- .2 Remove or cover signs which do not apply to conditions existing from day to day.

1.7 CONTROL OF PUBLIC TRAFFIC

.1 Provide competent flag persons, trained in accordance with Infrastructure Health & Safety Association (IHSA), and properly equipped as specified in, UTCD and Ontario Traffic Manual 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 it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.
- .3 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.
- .4 Where temporary protection is required while other traffic control devices are being erected or taken down.
- .5 Where transporting materials between staging areas or onto site using travelled roadway.
- .6 Where accepting deliveries in which public roadway traffic will be disrupted or delayed.
- .7 For emergency protection when other traffic control devices are not readily available.
- .8 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.

.2 Delays to public traffic due to contractor's operators: maximum 10 min.

1.8 OPERATIONAL REQUIREMENTS

.1 Maintain existing conditions for traffic throughout period of contract except that, when required for construction under contract and when measures have been taken as specified and approved by Departmental Representative to protect and control public traffic as stated in paragraph 1.4 and 1.7 of this section.

.2 The asphalt pathways located within the limits of work will be closed-off

fully to the public. Sufficient signage is to be provided at both ends informing all users of the pathway closure and to use alternate detour route/pathway provided. Signage indicating no pedestrian access within the limits of the work area are also to be provided at both ends of the work site.

.1 Additional signage is to be posted south of the work site, such that use of the asphalt pathway leading to the construction site from the South end is fully closed off and not in-use.

.3 A temporary 1.8m high construction fence is to be erected to separate all construction working areas from the public. Installation to minimize visual obstruction and allow for roadway snow plowing operations.

.4 Contractor to respect and conform to local agency spring load reductions/restrictions.

.5 Provide temporary orange centerline paint within Construction zone with well-defined transition zones from full lane to reduced lane corridor.

.6 Advisory speed limit and speed limit signs to be reduced to regulatory speed limit and signage with notification to the City of Ottawa and NCC. Maximum speed reduction for Colonel By drive is to 40Km/h.

.1 Any regulatory speed limit markings on roadway should be white in color to prevent confusion to motorists with advisory and regulatory signage.

.7 Contractor to provide offset of at least 0.5m between temporary Concrete Barriers (TCBs) and nearest travel lane while maintaining minimum lane widths of 3.5 meters each way.

.8 The Contractor to provide, install, and maintain temporary pedestrian activated traffic control signals for crossings where required for pedestrian and public detour access.

.1 All temporary control signals to be hard-wired units. The use of solar or diesel powered units will not be permitted.

.2 All temporary cross walks to be marked with white cross walk markings.

.9 TCMP to include Speed Display flashing sign alerting drivers to current speed located after the posted speed limit signs.

.10 The Contractor is responsible for supplying, installing and removing a granular bed plus asphalt cover along the pedestrian detour pathway over existing stairs and adjusting grades to meet multi-user requirements (Approximately 5% grades), where applicable for the contractors proposed TMP detours.

.1 Install a geotextile fabric over the grassed area, minimum 3.6 m wide.

.2 Supply and compact stone dust over geotextile, 150 mm thick, 2.5 m wide, with 2H: 1V side slopes.

.3 Supply, place and compact 50mm thick, HL3 asphalt within detour pathway for sections not already paved.

.4 Fabricate and install a pedestrian friendly ramp access to bypass local steps in the locations as indicated on the contract drawings.

.5 Maintain detour pathway adding granular fill to potholes and depressions and re-grading where and when required.

.6 Snow removal outside of Work area will be the responsibility of the NCC and or City of Ottawa.

.7 At the end of the Work, remove and dispose of all granular fill and geotextile, and re-sod/ vegetate areas in accordance with Section 32 94 00 - General Landscaping.

.11 Refer to the drawings showing alternate pedestrian detour access and layout detail, where applicable.

1.9 OPERATIONAL CONSIDERATIONS:

.1 Colonel By Drive events and approximate dates in 2019, which may require adjustments to TMP (event name, segment of roadway, date):

.1 RCS Chalet Removal, **Bronson to Hog's back Road (HBR),** *April 12, 13 or 19,20*.
.2 Our dreams matters, **Pathway Corktown bridge to Bank**, *April 26.*
.3 Alive to Strive, **Hawthorne to Hog's Back Road (HBR),** *April 28*.
.4 CN Cycle, **Daly to Hog's Back Road**, *May 5.*
.5 Steps for Life, **Pathway – Laurier to Pretoria,** *May 4.*
.6 Tulip festival – Fireworks, **Bronson to HBR**, *May 10- 20.*
.7 Sporting Life, **Pretoria to HBR**, *May 12*.
.8 Early Bird Triathlon, **Clegg to HBR**, *May 18.*
.9 Sunday Bike day, **Laurier to HBR**, *every Sunday May 19 to September 1.*
.10 Ottawa Race Weekend, **Daly to Pretoria**, *May 25, 26*.
.11 Ride for Dad, **Daly to HBR**, *June 1*.
.12 World Partnership Walk, **Pathway – Laurier to Daly**, *June 2*.
.13 National Capital Triathlon/Duathlon, **Clegg to HBR**, *July 27*.
.14 Canadian Triathlon/Duathlon, **Daly to HBR**, *August 31*.
.15 Terry Fox run, **Pretoria to HBR**, *September 23*.
.16 Army Run, **Rideau to Hawthorne**, *September 22*.
.17 Hike for CHEO, **Pathway – Bank to HBR**, *September 23*.
.18 Ottawa Fire Service relay, **Pathway- Fifth to Hawthorne**, *September 23*.
.19 Terry Fox-St. Pius, **Pathway – Heron to HBR**, *September 27*.
.20 National Peace Officer Memorial Run & Ride, **Pretoria to Bronson**, *September 21*.
.21 Harvest Run, **Pathway – Clegg to HBR**, *October 3*.
.22 RCS Chalet Installs, **Bronson to HBR & Concord/Daly/Hawthorne/NAC**, *November 1,2 or 8,9 (schedule dependent)*

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

1.0 GENERAL

1.1 DESCRIPTION

.1 This Section describes requirements for the protection of archaeological and cultural resources and the environment that apply to the Work. These requirements apply to all Sections of this Specification, without limiting the conditions and approvals imposed by statute.

.1 Reference Basic Impact Assessment (BIA) provided with Contract Documents. For the purpose of assisting the bidder in preparing their bids, the environmental mitigation measures, which were extracted from the BIA, are incorporated in this section of the specifications. This does not remove responsibilities of the Contractor to follow the BIA.

.2 Control Work to provide effective archaeological, cultural, environmental, water body, and fish habitat protection. Departmental Representative and Parks Canada Agency (PCA) Environmental Authority will monitor protection and mitigation measures and will identify whenever such protection is found to be ineffective. Change measures or work procedures as directed by Departmental Representative to ensure environmental, water body and fish habitat protection.

1.2 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 water body, could degrade water quality or impact fish, fish habitat and aquatic wildlife. This includes, but is not limited to:

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

.4 "Dripline" - means the location on the ground surface directly beneath a theoretical line described by the tips of the outermost branches of the trees.

.5 "Barrier" - means fence consisting of approved material, supported by steel posts and being a minimum of 1.8 m high, without breaks or unsupported sections.

1.3 HERITAGE PROTECTION

.1 The Rideau Canal is a National Historic Site.

.2 Preserve heritage elements of site by executing work without damage to site features or character-defining elements.

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

.4 Employ minimal intervention approach for all Work.

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

.6 Damage to heritage elements will not be tolerated.

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

.8 Notify Departmental Representative immediately where reasonable concern exists that damage may result from work.

.9 Contractor may propose alternative work methodologies to be accepted by Departmental Representative and PCA Environmental Authority.

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

1.4 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.

1.5 ARCHAEOLOGICAL AND CULTURAL REQUIREMENTS AND RESTRAINTS

.1 Site may contain possible cultural and archaeological resources.

.2 PCA may monitor and record some or all aspects of excavations, site access routes, and disturbances to soil overburden due to equipment and general work operations.

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

.4 Do not resume work until directed by Departmental Representative.

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

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

1.6 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00

.2 Before commencing construction activities or delivery of materials to site, submit Environmental Management Plan (EMP) to Departmental Representative, who will co-ordinate review and acceptance by PCA Environmental Authority.

- .1 Environment Management Plan to detail frequency of monitoring and high-risk construction activities requiring environmental professional onsite.
- .2 The environmental management plan to include a comprehensive overview of known or potential environmental issues to be addressed during construction.
  - .1 Include a list of key project activities and phases and identify actual and or potential environmental impacts associated with each activity.
  - .2 EMP must show considerations for navigational water levels. EMP must demonstrate that this condition is planned for and work activities will be revised accordingly.
  - .3 The potential environmental issues associated with the construction activities include, but are not limited to, the following:
    - .1 Introduction of fines or silt into waterways or water column – during placement of construction platform/dewatering structure; dewatering; construction of new retaining wall; excavation of existing retaining wall; Dewatering structure removals.
    - .2 Contamination of waterways due to disturbances of canal sediment due to the presence of pre-existing contaminants in the canal bed.
    - .3 Contamination of waterways due to spills – during refueling; hydraulic line rupture; accidental spill of lubricants or other manufactured product used during construction.
  - .4 Include measures to avoid causing harm to fish and fish habitat including aquatic species at risk in compliance with the Fisheries Act and Species at Risk Act in accordance with: http://laws-lois.justice.gc.ca/eng/acts/F-14/
  - .5 Include details of monitoring plan that will verify that environmental performance objectives are met and protective of water quality in the Rideau Canal.
  - .6 Environmental Management Plan to follow baseline water and streambed quality indicated in Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life: http://ceqg-rcqe.ccme.ca/en/index.html.
  - .7 Environmental Management Plan to be prepared in accordance with requirements of Federal, Provincial and Municipal laws and regulations.
  - .8 Environmental Management plan and its component plans to be prepared by qualified environmental professionals in accordance with Parks Canada Agency's Environmental Standards and Guidelines Document – Ontario Waterways (July 2017) and site-specific Basic Impact Assessment (BIA).
  - .9 PCA Environmental Authority will outline prescribed mitigation measures during construction start-up meeting.
  - .10 Notify Departmental Representative of proposed changes to project plans or schedules affecting Environmental Management Plan.
  - .11 Contractor to ensure on-site personnel are aware of and comply with prescribed mitigation measures in Environmental Management Plan.

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

.4 Environmental Management plan to include:
- .1 Names of persons responsible for ensuring adherence to Environmental Management Plan.
- .2 Names and qualifications of persons responsible for manifesting 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.
- .6 Provisions for protection of stockpile material.
  - .1 For stockpile material that shall be inactive for periods exceeding 30 days, are to form part of the erosion and sediment control plan.
  - .2 Protect inactive stockpile material from inclement weather in a timely manner.
- .7 Drawings showing locations of proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
- .8 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 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 or release of hydrocarbon sheens during the Work.
- .10 Spill Prevention Plan: including location/procedures for storage and refueling of all fuel and fuel operated equipment located near waterways. Fuel containers are to have secondary containment, overfill and spill protection. Fueling area is to be contained to address potential spillage.
  - .1 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 known contaminants onsite and potential for unknown contaminants; identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- .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, such as disturbed contaminated sediment, concrete curing water, concrete tremie displaced water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
- .14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.
- .15 Pesticide treatment plan: to be included and updated, as required.
- .16 Noise Control Plan: including notifying local residents in advance of potential disruption from noise inducing activities. Establish a communications protocol/plan acceptable to Departmental Representative.

.17 Dewatering structure and plan in accordance with Section 01 52 00, identifying measures for management of water levels on site during construction and the management and discharge of seepage and infiltration flows.

.18 Waste Disposal Plan identifying methods and procedures for management and disposal of materials directly derived from construction activities, such as disturbed contaminated sediment, concrete waste, construction materials and or hazardous materials.

.19 Water Quality Testing Reports: Test water quality prior to start of work for background levels and daily during work and immediately after a spill or change in water quality is observed.

.20 Plan for dewatering, including design, installation, operation and removal of dewatering systems, to be updated as required.

.5 Basic Impact Analysis is found in attached contract appendices. Contractor to comply and meet stated measures.

.6 If there any changes to project plans and/or scheduling or site conditions outside the assessed Basic Impact Analysis (BIA) reports, Contractor is to inform Departmental Representative.

.1 Changes not addressed by BIA will require additional mitigation measures to be approved by Departmental Representative.

.7 Meet or exceed the requirements of all environmental legislation and regulations, including all amendments up to the project date provided that in any case of conflict or discrepancy the more stringent requirements shall apply.

.8 Water Quality Testing Reports: to be submitted before start of work, daily during construction activities, and immediately after spills or when changes in water quality observed.

.9 Product Data: Submit manufacturer’s instructions, printed product literature, data sheets and WHMIS MSDS sheets.

1.7 REGULATORY REQUIREMENTS

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

.2 Client Department, Parks Canada Agency, is main Environmental Authority for Rideau Canal Projects.

.3 Client Department will not issue permit to authorize start of Work, under Historical Canal Regulations, before review and acceptance of Environmental Management Plan.

.4 Comply with and enforce compliance by employees of prescribed environmental mitigation measures outlined in Environmental Management Plan and Basic Impact Assessment (BIA).

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

.6 Comply with written orders and directions from PCA Environmental Authority to correct deficiencies or implement additional environmental mitigation measures.

.7 PCA Environmental Authority may issue written stop Work order if elevated turbidity or suspended sediment concentrations are observed.

.8 Submit copies of environmental orders and directions to Departmental Representative.

1.8 EXPLOSIVES

.1 The use of explosives in prohibited.

1.9 FIRES

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

1.10 DISPOSAL AND HANDLING OF WASTES

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

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

.3 Dispose of contaminated excavated materials in designated areas in accordance with Section 31 23 15.

.1 For disposal of soil, Contractor to hire third party to conduct TCLP analysis prior to removal from site to determine proper disposal methodology as required by results.

.4 Excavation, filling, pumping, towing, hauling, disposal and dumping operations for excavation will employ such methods and equipment to ensure no loss of materials into waterway.

1.11 CONTAMINATION

.1 Sediment within the canal bed and soil adjacent to canal walls (under NCC pathway) are contaminated with hazardous substances that are to be minimized from entering into the water column during the construction activity. Proper disposal off site to a licensed facility accepting contaminated waste is required for all excavated material. Refer to the following reports for contamination details:

.1 Report Number: 1776320-004-R-Rev0, Environmental Management Planning Considerations – Ottawa Wall Repairs Rideau Canal, Ottawa, Ontario by Golder Associates Ltd.

.2 Report Number: 10-1122-0214, Phase II Environmental Site Assessment Colonel By Drive from Laurier Avenue to Highway 417, Ottawa, Ontario National Capital Commission Property Asset 96747 by Golder Associates Ltd.

.2 Ensure worker use of personal protective equipment appropriate to minimize risk of exposure to sediment and water in Work Area. Personal protective equipment should include, as a minimum, gloves, long-sleeved shirts, long pants, waterproof/chemical-resistant footwear, and safety glasses.

.1 Provide appropriate hand wash stations and wash stations to remove adhered sediments from personal protective equipment. Wash water should not be allowed to enter the canal, but should be contained and disposed of off-site.

.3 Mitigation measures are to be provided to minimize disturbance of bedding material and protect the transportation or addition of canal bed sediment into the water column.

.4 Water may be discharged back into the Canal provided that it meets water quality discharge requirements identified in Sections 01 35 46 and 35 49 25 and the environmental reports referenced in 1.11.1. Water which is observed to be

contaminated with suspended sediment from the canal bed cannot be released back into the canal waterway and must be treated to meet discharge requirements and disposed of appropriately.

.5 Material removed from the canal bed during the Work cannot be reused as backfill material and is to be disposed of offsite. Material removed and temporarily stockpiled to be placed in a contained facility to prevent contamination release and be stored away from locations that could allow for contaminant release into the waterway.

.6 Contractor to return grade to pre-work elevation. Material imported for this purpose to be tested for potential contaminants of concern (e.g., metals, hydrocarbons) and confirmed to be "clean" (i.e., meets sediment quality guidelines).

.7 Prevent transfer of adhered material to sidewalks and streets during the transport of construction equipment and material (e.g. turbidity curtains) out of the project area. Where material is rinsed or otherwise cleaned at the work site, wash-off material must be contained and disposed of offsite. Wash water must not be allowed to enter the canal either directly or through a storm sewer.

.8 Contractor to retain a qualified environmental professional to inspect the work site, collect water quality measurements and samples, and notify the Contractor where modifications to the work may be necessary to meet environmental protection objectives. This work should include, but is not limited to:
- .1 Review health and safety plan and provide measures for workers encountering contaminated sediments and resulting vapours.
- .2 Testing for the presence of vapours and other hydrocarbon-related hazards and provision of measures to protect worker health and safety based on testing results.

.9 Samples to be collected for laboratory analysis once at each Work Area from the point of discharge during active dewatering and concurrently upstream and downstream of the Work Area to verify adherence to water quality guidelines.
- .1 In the event of accidental release of sediment-laden water with a TSS concentration exceeding 75 mg/L, the following samples are to be collected for testing:
- .2 Samples of discharge water to be submitted for chemical analysis of total and dissolved metals, polycyclic aromatic hydrocarbons (PAHs), pH, total organic carbon, TSS, and turbidity concurrently with toxicity testing following Environment Canada (1990, 2011) protocols for rainbow trout or fathead minnow.
- .3 Samples of Rideau Canal water from upstream and downstream of the Work Area to be submitted for chemical analysis of total and dissolved metals, polycyclic aromatic hydrocarbons (PAHs), pH, total organic carbon, TSS, and turbidity
- .4 Additional samples as required by PCA Environmental Authority.

1.12 TURBIDITY CONTROL AND DRAINAGE WATER

.1 Refer to Section 35 49 25 – TURBIDITY AND SILT CURTAIN.

.2 Control turbidity of all water released during the Work as developed in the Erosion and Sediment Control Plan (ESCP) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with ESCP, Federal, Provincial, and Municipal regulations.
- .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 without

releasing sediment or hazardous materials or causing additional erosion.
- .1 Pumped water must meet water quality requirements prior to return to waterway.
- .2 Water with harmful substances to be disposed in accordance with local authority, provincial and federal regulatory requirements.

.2 Where any in-water work is required and pre-approved by Departmental Representative, the work area shall be enclosed by a turbidity curtain (Silt curtain) to prevent sediment escape from enclosed work area.
- .1 Monitor water quality for suspended sediment levels exceeding identified requirements during in-water activities.

.3 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .1 Situate pump system such that it does not re-suspend sediment from the canal bed within the Work Area or otherwise pump water from which particulates have not been allowed to settle. Where necessary, implement a pre-filtration step to further minimize transfer of suspended sediments.

.3 Sediment water quality objectives and monitoring:

.1 Turbidity water quality objectives, measured at the point of discharge:
- .1 A maximum increase of 8 NTU, caused by suspended sediments, above background levels for a short-term exposure (< 24-h period), with an absolute maximum of 25 NTU, irrespective of the background levels;
- .2 A maximum increase of 2 NTU, caused by suspended sediments, above background levels for a long-term exposure (> 24-h to 30days).

.2 Total suspended solid (TSS) water quality objectives, measured at the point of discharge and in the receiving environment:
- .1 A maximum increase of 25 mg/l, caused by suspended sediments, above background levels for a short-term exposure (< 24-h period), with an absolute maximum of 75mg/l irrespective of the background levels;
- .2 A maximum increase of 5 mg/l, caused by suspended sediments, above background levels for a long-term exposure (> 24-h to 30days).

.3 Contractor shall provide protocol and methodologies for monitoring and recording the turbidity from any discharge point (treated or untreated) to the watercourse. Submit a monthly report of the monitoring program. Report to include dates, location, time of sampling, weather condition and test results, together with monthly volume of water discharge into the watercourse.
- .1 As a minimum the contractor monitoring program shall include daily measurements and recordings of the turbidity at the point of discharge, including background reading taken at a point upstream of the construction site.
- .2 Initial measurements are to be taken within 10 to 30min after initiating discharge. If measurements exceeds the quality objectives limits, take additional measurements on a 15min bases.
- .3 After the initial installation of or modification to a point of discharge additional turbidity readings shall be taken at a point near the discharge point at 300mm above the canal bed where the water depth greater than 600mm and at mid depth when the water depth is less than 600mm.

.4 In the event that maximum turbidity values are exceeded, inform the Departmental Representative with 2 hours of the event. Submit a written report within 48 hours of the event describing the reasons for water quality objectives exceedance, estimated quantity of water release under the exceedance and corrective work taken to prevent a recurrence.

.5 In the event that the turbidity **at the point of discharge** is lower than 25 NTU (TSS < 75 mg/L, irrespective of background, but more than 8 NTU (TSS

> 25 mg/L) above background for a period less than 24 hours, the work site and construction activities shall be reviewed to determine appropriate mitigations to reduce turbidity levels and TSS.

.6 In the event that the maximum turbidity value, **at the point of discharge,** of 25 NTU (or TSS of 75 mg/L) is exceeded, irrespective of background, or the turbidity is greater than 25 NTU (TSS<75 mg/L) but more than 8 NTU (TSS > 25 mg/L) above background for more than 24 hours, the work shall be stopped and the work site and methods reviewed to determine appropriate mitigations to reduce turbidity and TSS. Once the mitigations are implemented, work can resume.

.7 In the event that the TSS **in the receiving environment** is more than 25 mg/L above background, for a period less than 24 hours, the work site and construction activities shall be reviewed to determine appropriate mitigations to reduce turbidity levels and TSS.

.8 In the event that the TSS is greater than 25 mg/L above background, **in the receiving environment,** (but less than the absolute maximum of 75mg/l at the discharge point) for more than 24 hours, the work shall be stopped and the work site and methods reviewed to determine appropriate mitigations to reduce turbidity and TSS. Once the mitigations are implemented, work can resume.

.9 In the event that TSS **in the receiving environment** is on average greater than 5 mg/L above background for a period greater than 30 days, the contractor shall inspect the work site and review their work procedures to determine appropriate mitigation actions.

.10 The discharge point is defined as the interface work site and the waterbody.

.1 During the construction and deconstruction of the cofferdam/dewatering works or during none dewatering stages, the discharged point is considered as the outer perimeter work area enclosed by a turbidity curtain, in particular at location along the turbidity curtain where water from the contained area may escape or seep out .

.2 During the dewatering and dewatering maintenance stages of the work the discharge point is considered to be the end of the dewatering system pipe or hose where the discharge water enters the waterbody and also five (5) feet outside the turbidity curtain (where a curtain is applied).

.11 The receiving environment is defined as an area within the waterbody away from the work area/discharge point. Exact sampling point for the receiving environment will be determined prior to start of the work.

.12 Contractor to ensure that TSS levels at points of discharge and in the receiving environment never exceed an absolute value of 75 mg/L.

.13 Water discharged into surface water bodies should have turbidity <8 NTU above background levels during short term exposure not to exceed 24 hours and <2 NTU above background levels for long term exposure (>24-hr to 30d.

.4 Develop Erosion and Sediment Control Plan (ESCP) identifying type and location of erosion and sediment controls provided. Plan to 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.

.5 Provide marine grade turbidity curtain to enclose areas where sediments may enter waterway. Turbidity curtain to be anchored or weighted down along its length to form a continuous seal on the canal bed with adequate flotation at water surface to prevent over spills of turbid water.

.1 Mechanical filtration of turbid water is also acceptable.

.2 Maintain turbidity during project and adjust management measures or work practices as required to maintain acceptable levels.

.6 In the event of significant silting or debris caused by construction activities,

contractor must take appropriate measures to confine work and install additional turbidity curtains.

.7 Control disposal or runoff of water containing other harmful substances in accordance with local authority requirements.

.8 Sediment, debris and erosion control measures must be inspected daily to ensure that they are functioning properly and are maintained and upgraded as required.

.9 If the sediment, debris or erosion control measures are not functioning properly, no further work will be permitted until the sediment/erosion problem has been rectified.

.10 Sediment, debris and erosion control measures must be left in place until all disturbed areas within the work area has been stabilized and any sediments in the water have settled. Removal will be permitted only after written approval from the Departmental Representative.

.11 The following factors must be considered in determining the suitability of specific erosion control practices:
- .1 Run-off quantity and Velocity: dictates the suitability of products;
- .2 Soil characteristics: Soil texture and chemistry can affect the performance of many erosion control practices. Grain size characteristics of concrete sediment must be considered when selecting filter fabric material. Filter fabric material shall be designed around the principles of maintaining sufficient hydraulic flow and preventing particle movement through the material.
- .3 Topography: the selection and success of erosion control practices is dependent on the slope length and gradient of surrounding area. The ease or difficulty of diverting clean run-off around the site is dependent on the terrain and drainage patterns; Climate and season; Contingency measures for extreme water events including rainfall and flooding need to be considered in the plan.
- .4 Temporary vs. permanent Controls: Some erosion control practices are intended as permanent measures;
- .5 Accessibility: some practices require access for specialized equipment;
- .6 Erosion and sediment control requirements for different construction phases.

1.13 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees, shrubs and plants on site and adjacent properties where indicated on approved site plan.

.2 Limit clearing, grubbing, and tree-branch removals to areas of work or access indicated on approved shop drawings.

.3 Protect and wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 1.2m minimum.
- .1 Maintain Barriers in good repair throughout the duration Work. Remove these upon completion of Work.
- .2 Where restrictions impede barrier placement, seek approval of Departmental Representative for alternative solutions.

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

.5 Damage to trees as a result of Contractor's operations:
  .1 Broken branches 25 mm or greater in diameter: cut back cleanly at the break, or to within 10 mm of their base, if a substantial portion of the branch is damaged. Departmental Representative will direct.
  .2 Exposed roots 25 mm or larger: cut back cleanly to the 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.

.6 Minimize stripping of topsoil and vegetation.

.7 Reduce soil displacement and compaction by using heavy machinery in designated areas and on existing vehicle paths. Replace damaged lawn to pre-construction state with topsoil and sod.

.8 Avoid using heavy machinery on saturated ground.

.9 Use equipment of low bearing weight and low psi tires wherever possible.

.10 Migratory Birds: Vegetation removals.
  .1 No vegetation shall be removed during the period from April 1st, to August 28th of any year to protect nesting birds. If vegetation is to be removed during this period, an avian biologist is to be present to screen and clear the area of nests no more than two (2) days prior to clearing.
    .1 If active nests are present, contractor shall provide a buffer zone prescribed by avian biologist and clearing may not be completed until nest is no longer active.

1.14 IN_WATER WORK

.1 No in-water work is permitted between March 15th and June 30th of any year.

.2 In-water work includes the construction of temporary dewatering structures, cofferdams, and the removal of the existing structures.

.3 All work must comply with the Fisheries Act, as regulated by the Department of Fisheries and Oceans.

.4 In-water work must comply with the Ministry of Natural Resources and Forestry in-water timing windows.

.5 The Contractor shall make every effort to minimize time working in the waterway. Accordingly, all necessary materials and equipment should be on site before proceeding with removal such that delays waiting for materials or equipment do not occur once in-water activities have commenced.

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

.7 Work should occur in the dry using appropriate dewatering procedures for the site. Dewatering procedures and systems to be set out in EMP as applicable and approved by Departmental Representative.

.8 No acid-bearing (Containing sulphides) rock shall be used for in water works.

1.15 WILDLIFE PROTECTION

.1 Detail procedures for preventing turtle entry and nesting within disturbed project area in Environmental Management plan.

.2 Place temporary reptile exclusion fence around stockpiled material and construction areas that may attract turtle nesting activities.
- .1 Reptile exclusion fencing must follow the guidance in the document titled Species at Risk Branch, Best Practices Technical Note, Reptile and Amphibian Fencing, Ver. 1.1, developed by the Ontario Ministry of Natural Resources and Forestry: http://files.ontario.ca/environment-and-energy/species-at-risk/mnr_sar_tx_rptl_amp_fnc_en.pdf

.3 Do not use synthetic plastic erosion control mats or blankets to prevent entrapment hazard for turtles.

1.16 AQUATIC ANIMALS AND SPECIES AT RISK

.1 In water work to be completed before March 15, 2019 to protect fish populations. Restricted in-water activities between March 15 and June 30 are as such but not limited to; in-water excavation, in-filling, rock/rip-rap placement and transfer/movement of granular material or aggregates.

.2 Contractor to salvage and release outside of the work area any fish and/or amphibians observed within the work area. Moving of animals to be carried out as per the Ministry of Natural Resources and Forestry License to Collect Fish for scientific Purposes guidelines.
- .1 Notify Departmental Representative and PCA Environmental Authority 24hrs prior to fish rescue and the commencement of dewatering activities.
- .2 A qualified biologist should be on site during live transfer of fish and/or amphibians.
- .3 If unforeseen negative impacts to fish, wildlife or cultural resources are present, all work shall cease and the Contractor is to contact Departmental Representative immediately.

.3 All workers shall be made aware for the potential of species at risk (SAR) on site. Employees must be able to identify potential species at risk and follow prescribed procedures when species are encountered. The following are included but potentially not limited to:
- .1 Blanding's Turtle, Eastern Musk turtle and Snapping Turtle.

.4 Should any suspected species at risk be encountered within the project limits, Contractor is to contact Departmental Representative and PCA Environmental Authority immediately.

1.17 WORK ADJACENT TO WATERWAYS

.1 Do not release any Deleterious Material into waterway.

.2 Do not use salt as a deicer within 30m of the waterway or 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.
- .1 Alternatively, Contractor can use environmentally acceptable deicing or traction materials approved by Departmental Representative.

.3 Ensure all equipment and temporary access structures such as scaffolding placed

in water bodies is free of earth material, and excess, loose or leaking fuel, lubricants, coolant and other deleterious material that could enter the water body.

.1 Contractor to ensure appropriate use and disposal of all products (sealants, lubricants or other compounds) used on site in accordance to manufacturer's recommendations and products technical data sheets.

.4 Do not use waterway beds for borrow material.

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

.6 Stockpiles of excavated or fill materials to be stored no closer that 30m from waterway, unless otherwise noted.

1.18 SEDIMENT, DUST, AND EROSION PROTECTION

.1 Prior to commencement of work that will create dust or debris, (such as improvements to access, concrete sawing and removal, excavation, backfilling, etc.), install effective mitigation techniques for sediment, dust, debris and erosion control to the satisfaction of Departmental Representative. Maintain these protective measures at all times, including shut down periods.

.1 All areas of the work site prone to erosion which are disturbed by ongoing work shall be stabilized with erosion mitigation measures.

.1 Acceptable measures include erosion control blankets, mulch and/or pre-approved alternative methods to keep soil in place.

.2 Provide a one (1) metre high silt fence barrier in all areas where, due to construction activities, silt or debris may enter the canal or water. This includes, but is not limited to, a silt barrier installed around staging and work areas, and on the canal bed (or ice surface) parallel to the canal concrete retaining wall. Install silt curtain approximately 2 m to 3 m from wall for refacing work only.

.3 Maintain a standby supply of pre-fabricated silt fence barrier, or an equivalent ready-to-install sediment control device.

.4 Excavation to cease during periods of heavy rainfall, unless runoff is contained from entering waterway.

.5 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

.6 Implement erosion and sediment control measures prior to Work and maintain during Work phase. The following principles should be considered:

.1 Diversions to limit run-off water.
.2 Reduction of erosional forces by surface water velocity reduction.
.3 Reduction of sediment development through sediment collection or anchoring.
.4 Sedimentation of mobilized sediments.
.5 Filtration of sediment carrying flows.
.6 Collection of captured or contained sediments.
.7 Treatment of pH.

.7 Consider particle size present in the sediment and native soils to select appropriate control options.

.8 Environmental protection measures shall be checked after each extreme weather event. Avoid activities that could lead to erosion during excessively wet weather conditions; monitor forecasts for heavy rainfall watches and warnings.

.9 Sediment control measures and exclusion fencing must be removed in a way that prevents the escape or re-suspension of sediments.

.10 Stockpile excavated or fill materials must be stored and stabilized away from the water. Runoff from the excavated or fill material must be contained from entering the waterway.

1.19 OPERATION AND MAINTENANCE OF EQUIPMENT

.1 Do not operate heavy equipment in waterway, except when operated from a barge, during full drawdown or an approved , prepared working construction pad.

.2 Provide drip trays to prevent the discharge of oil, grease, antifreeze, or any other materials into the ground.
- .1 All lubricants, oils, fuels and other chemicals to be stored in secure and designated areas on impermeable pads.

.3 Equipment and heavy machinery used to meet or exceed all applicable emission requirements.

.4 All equipment to be thoroughly cleaned prior to coming on site, to reduce risk of invasive species introduction from outside sources.
- .1 Additional information and guidance on how to properly clean equipment can be found at:
  - .1 Clean Equipment Protocol for industry - Developed by the Ontario Invasive Plant Council;
    - .1 Can be found here: https://www.ontarioinvasiveplants.ca/resources/technical-documents/

.5 Leave machinery running only while in actual use, except where extreme temperatures prohibit shutting machinery down.

.6 All vehicle/equipment maintenance and refueling must be conducted in accordance to the environmental management plan and over impermeable/absorptive material situated at a designated site regardless of proximity to water body. Where space allows and can be designated, a minimum distance of at least 30 m away from the nearest water body is required for fueling stations. In the case of fuel heaters that will be located nearer than thirty (30) metres from the canal, a large drip pan to contain any leakage from heater or refueling operations. Absorptive material must also be placed at the bottom of drip pan for added measure.
- .1 Refueling areas will have a spill containment kit immediately accessible.

.7 There shall be no discharge of chemicals and cleaning agents in or near aquatic habitats; all such substances shall be disposed of at a facility licensed to receive them.

.8 Where generators/fuel heaters/fossil fuel operating equipment must be located closer than fifteen (15) metres from waterway/canal, use large drip pan to contain possible leakage from operations or refueling activities.
- .1 Absorptive material and clean up kits to be provided at all locations for added measures.

1.20 INVASIVE SPECIES

.1 Clean mud, dirt, and vegetation off machinery and equipment before entering work site and before leaving work site. Inspect and clean in accordance with Clean

Equipment Protocol for Industry:
.1 https://www.ontarioinvasiveplants.ca/resources/technical-documents/

.2 Equipment and vehicles to be used in water to be cleaned before and after use. This includes any visible mud, vegetation, mussels.
.1 Drain of standing water.
.2 Clean with hot water (> 50 degrees Celsius) at high pressure (> 250 psi).
.3 Allow to dry for 2-7 days in sunlight before transporting between waterbodies.
.4 Conduct cleaning minimum 30 m from edge of waterbody.

.3 Submit photo and report to Invading Species Hotline (1-800-563-7711) or online at EDD Maps Ontario, https://www.eddmaps.org/ontario/ and to Departmental Representative and PCA Environmental Authority if an invasive species is suspected.
.1 Known invasive species already existing in the Rideau Canal system at the specified location:
.1 Eurasion Milfoil (aquatic plant)
.2 Zebra Mussels (aquatic Invertebrate)

1.21 REMOVED MATERIALS

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

1.22 POLLUTION CONTROL

.1 Provide spill response materials including but not limited to, containers, absorbents, shovels, and personal protective equipment. Assure that Spill Response Equipment and materials are available at all times in which hazardous materials or wastes are being handled or transported and in which there is potential for release of hydrocarbon sheens as a result of the Work. Spill response materials to be compatible with the type and quantity of material being handled.

.2 Manage release of hydrocarbon sheens during the work in the same manner as spills, as per Spill Control Plan. Maintain a spill containment kit on site and train workers in use. Prepare and post in an accessible location a spill response plan that includes contact information for the Departmental Representative and applicable spill response agencies.

1.23 HAZARDOUS MATERIALS

.1 Place materials defined as hazardous or toxic waste in designated containers.
.1 Where applicable, store Hazardous Materials in secure areas on impermeable pads, provide berms if necessary.

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

1.24 CLEAN UP

.1 Clean up work area as work progresses. At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.
.1 Concrete debris to be placed into watertight container daily, and or more

frequently as directed.

.2 Permit no undue amounts of debris, trash or garbage to accumulate. Ensure public waterways and drainage courses remain free of waste and volatile materials disposal.

.3 Separate and recycle all materials that can be recycled.

.4 Dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner by taking them to a special designated waste facility. Do not dump these into waterways, storm or sanitary sewers.

.5 Ensure all emptied containers are sealed and stored safely for disposal away from children.

.6 Spills:
- .1 Report all spills or hydrocarbon sheens immediately to the Departmental Representative, PCA Environmental Authority, and to the Ontario Spills Action Centre (Telephone No. 1-800-268-6060).
- .2 Using appropriate safety precautions, collect liquid or solidify liquid with an inert, noncombustible material and remove for disposal as per 1.16.l.
- .3 Be responsible for all costs of cleaning up any spills to the satisfaction of the Departmental Representative.
- .4 Must have an environmental emergency response plan in place and a spill kit readily available.
- .5 Further information on dangerous goods, emergency clean-up and precautions including a list of companies performing this type of work can be obtained from Transport Canada's (TC) 24-hr collect phone number 613-996-6666.
- .6 Documentation, remediation, testing, and results as requested to be submitted to Departmental Representative.

.7 Remove all scaffolding, temporary protection and surplus materials, tools, plant, rubbish and debris and dispose of them in an approved manner off Crown property at the following times:
- .1 Before the water level is raised to navigation level for items in the Rideau Canal/River.
  - .1 At the completion date of the work for all other areas.

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

.9 Canal Bed to be cleaned of any unused construction materials/ debris and restored to original state and grade upon completion of work within canal area.

.10 All equipment, temporary structures, utilities, barriers or parts thereof, shall be removed from site after the completion of the work.

1.25 CONCRETE EQUIPMENT AND PLACEMENT

.1 The following clauses are applicable to all work under Section 03 30 00.

.2 Employ measures to prevent entry of concrete wash water or leachate from uncured concrete into the water.

.3 Use trigger operated spray nozzles for water hoses.

.4 Ensure proper use of concrete, sealants, and other compounds in accordance with appropriate product technical data sheets and manufacturer’s instructions.

.5 All debris including unused aggregate/concrete rubble shall be completely removed and area restored to original state upon completion of work.

.6 The Contractor to submit and obtain Departmental Representative approval for designated cleaning area and containment facilities on-site for equipment and tools to limit water use and runoff. The cleaning area will be sufficiently far away from the watercourse to prevent contamination. Where no safe cleaning area is available, contractor will be required to provide a settling pond to trap and contain all cementitious wash water from equipment can be cleaned and filtered. All alkali water is to be disposed of in accordance with federal, provincial, and local authority requirements.

.1 Water pH should be neutral before any clarified water is released to the drainage system or allowed to percolate back into the waterway via any filtration system.

.7 No cementitious or lime-containing material or cement by-products are to be deposited directly or non-directly into the watercourse.

.1 Contractor to ensure that Cast-in-place concrete materials shall remain contained in properly assembled seal tight formwork structures during curing phases.

.2 Cast-in-place concrete and other cementitious works are to be protected from exposure to fish-bearing waters for a minimum of 48 hours at ambient temperatures above 0 degrees Celsius and or minimum of 72 hours at ambient temperatures below 0 degrees Celsius.

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

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

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

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

.9 Contractor will measure and record baseline pH levels in the project area prior to commencement of work to set baseline (background) values.

.10 Prior to commencement of operations the Contractor is to demonstrate satisfactory knowledge and use of pH monitoring equipment to departmental Representative.

.11 Monitor the pH levels frequently in the waterway immediately outside the cofferdam and dewatering system during concrete placement activities. Emergency measures shall be taken if pH change is more than 1.0 pH unit, measured to an accuracy of 0.2 pH units from the background level or is recorded to be below 6.0 or above 9.0 pH units.

.1 Water with pH >9 cannot be released directly into waterway without treatment. Water with pH $\geq$ 12.5 is considered toxic and must be treated as a hazardous waste under Ontario Regulation 347 of the Environmental Protection Act and wastewater in this condition must be removed from site to an approved treatment facility.

.12 The pH levels are to be maintained within the range of 6.5 -8.5 as per Provincial Water Quality Objectives (PWQO).

.13 Contractor to keep a carbon dioxide (C02) tank with regulator hose and gas diffuser readily available during concrete work. Use it to release carbon dioxide gas into the affected area to neutralize pH levels should a spill occur. Train workers to

use tanks.

.14 Concrete Equipment cleaning: Direct concrete wash water to a collection site and treat effectively to remove all suspended solids, and dissipate flow to prevent deleterious substances from entering waterway.

1.26 TRANSPORTING WASTE MATERIALS

.1 All waste subject to Regulation 558 of the Ontario 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 Be responsible for obtaining all Waste Generator Numbers, permits, manifests, and all other paperwork necessary to comply.

1.27 AIR/NOISE CONTROL

.1 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, recreational users, and wildlife.

.1 Departmental representative or PCA Environmental Authority reserves the right to limit use or cease activity of mechanical equipment (vehicles, generators), if it is emitting excessive exhaust or suspect of faulty emission control equipment.

.2 Comply with the City of Ottawa's Noise By-Law No. 2004-253: By-law to Regulate Noise for residential areas.

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

1.28 HISTORICAL/ARCHAEOLOGICAL CONTROL

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

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

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

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

1.29 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or

regulations, permits, and other elements of Contractor's Environmental Management plan.

.2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
  .1 Take action only after receipt of written approval by Departmental representative.

.3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

PART 2 – PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 – EXECUTION

3.1 CORRECTIVE ACTIONS FOR WATER

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

.2 Cessation of in-water work:
  .1 In-water work will cease at the first indication of a significant oil sheen or distressed or dying fish in the vicinity of the work area.
  .2 Departmental Representative may direct Contractor to other areas of work within the project limits while issues are investigated.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

.1 Contractor is responsible for all Quality Control.

.2 Departmental Representative will carry out Quality Assurance inspections and testing for the purposes of verifying Contractor's Quality Control procedures and verifying that Work of Contractor, sub-contractors, and suppliers is executed in accordance with Contract Documents.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Departmental Representative may engage independent Quality Assurance Agencies for purpose of Quality Assurance.

.2 Employment of Quality Assurance Agencies by Departmental Representative does not relax Contractor's responsibility to carry out Quality Control inspection and testing to execute work in accordance with Contract Documents.

1.3 ACCESS TO WORK

.1 Allow Departmental Representative and Quality Assurance Agencies full access to work whenever and wherever it is in progress. If part of work is executed at other locations such as shops, allow access to such Work whenever it is in progress.

.2 Provide equipment required for access and execution of inspection and testing by Quality Assurance Agencies such as, but not limited to; scaffolding, ladders, heating, and lights.

.3 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

.1 Notify Departmental Representative 48 hours in advance of work requiring inspection or testing.

.2 Give timely notice requesting inspection, if Work is designated for special tests, inspections, or acceptance by Departmental Representative or Regulatory Agency.

.3 Provide submit samples and materials required for testing as listed in specifications. Submit with reasonable promptness, in orderly sequence and sufficiently in advance so as to not delay Work.

.4 Provide labour and facilities to obtain and handle samples and materials

on site. Provide sufficient space to store and cure test samples.

.5 If Contractor covers or permits to be covered Work that has been designated for inspections before these are made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

1.5 INSPECTION AND TESTING BY DEPARTMENTAL REPRESENTATIVE

.1 Departmental Representative and Quality Assurance Agencies will perform inspection and testing on a random basis for auditing purposes.

.2 Correct defects and irregularities as accepted or advised by Departmental Representative at no cost.

.3 Pay costs for retesting and re-inspection.

.4 Departmental Representative may order part of work to be re-examined if work is suspected to be not in accordance with Contract Documents.
- .1 If upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.
- .2 If such work is found in accordance with Contract Documents, Departmental Representative will authorize payment of the cost of examination and replacement due to quality assurance procedures.

1.6 NOTICE OF NONCOMPLIANCE

.1 Departmental Representative will notify the Contractor of any noncompliance with the foregoing requirements. After receipt of such notice, Contractor shall take corrective action immediately. Such notice, when delivered to the Contractor or its representative at the work site, shall be deemed sufficient for the purposes of notification.

.2 If Contractor fails or refuses to comply promptly, Departmental Representative may issue an order stopping all or any part of the Work until satisfactory corrective action has been taken.

.3 The Contractor shall make no part of the time lost due to any such Stop Work Order the subject of a claim for extension of time or for excess costs or damages.

1.7 REJECTED WORK

.1 Remove defective work whenever found, either through Contractor's Quality Control procedures or through Departmental Representative's Quality Assurance procedures.

.2 Notify Departmental Representative of proposed corrective action for acceptance prior to executing corrective action.

.3 Remove and replace or re-execute work in accordance with Contract Documents.

.4 If in opinion of Departmental Representative it is not expedient to correct

defective Work or Work not performed in accordance with Contract Documents, Departmental Representative will deduct from Contract Price, difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Temporary utilities.

.2 Temporary Heating for enclosures and offices.

.3 Temporary Power and Lighting.

.4 Temporary pumping for dewatering (where applicable).

1.2 RELATED SECTIONS

.1 Section 01 52 00 - Construction Facilities.

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

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 There shall be no separate measurement for payment for the work under this Section. Include costs in the Contract Lump Sum Price.

.2 Payment shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work.

1.4 SUBMITTALS

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

.2 Heating Plan including:
- .1 Heater numbers, types, locations and capacity.
- .2 Ventilation fans, numbers, location and capacities.
- .3 Emergency fire equipment type, numbers and location.

.3 Location, type and service provider for sanitation facilities.

.4 Connection and installation of site lighting for low light conditions and power supply to construction facilities.

1.5 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute work expeditiously.

.2 Remove temporary utilities and controls from site all such work after use.

1.6 DEWATERING

.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water as required. Refer to Section 35 20 22 - DEWATERING.

.2 Provide standby equipment (generators and pumps) to ensure continuous and safe operation of dewatering system.

1.7 WATER SUPPLY

.1 Contractor is responsible to arrange for supply of potable water for construction use and for potable water.

.2 Arrange for connection with appropriate utility company and pay all costs for installation, maintenance and removal.

1.8 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, fuel watch, maintenance and fuel.
- .1 Heating equipment type to be approved by Departmental Representative.

.2 Construction heaters used inside enclosures must be vented to outside or be flameless type. 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 surface.
- .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
- .5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Maintain minimum temperatures within enclosed areas as specified in individual Sections for the items of work.

.5 Ventilating:
- .1 Prevent accumulations of dust, fumes, mists, vapors or gases in areas occupied during construction.
- .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
- .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
- .4 Ventilate storage spaces containing hazardous or volatile materials.
- .5 Ventilate temporary sanitary facilities.
- .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.6 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
- .1 Conform to applicable codes and standards.
- .2 Enforce safe practices.
- .3 Prevent abuse of services.
- .4 Prevent damage to finishes.
- .5 Vent direct-fired combustion units to outside.

.7 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

.8 Provide heating adequate to meet temperature requirements listed in the following Sections:
- .1 For Concrete work: Section 03 30 00 - CAST-IN-PLACE CONCRETE.
- .2 For other Sections where heating is required for cold-weather

protection, heating requirements shall be in accordance to applicable codes, standards, regulations or manufacturer's recommendations related to Work completed.

1.9 TEMPORARY POWER AND LIGHT

.1 Provide and pay for temporary power during construction for temporary lighting and operation of power tools.

.2 Arrange for connection with appropriate utility company. Pay all costs for installation, maintenance and removal.
- .1 Provide meters and switching for connections to existing power supply.
- .2 Ensure level of illumination on all work areas is not less than the requirements stated in:
  - .1 Occupational Health and Safety regulations SOR/86-304 part VI.

1.10 TEMPORARY COMMUNICATION FACILITIES

.1 Provide and pay for temporary data hook up (Wireless internet access), and associated equipment necessary for own use and use by Departmental Representative on site.
- .1 Wireless data to be provided through secure, shared router.
- .2 Wireless data efficiency to be capable of video monitoring and software/hardware for video conferencing.

1.11 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.

1.12 CONSTRUCTION SITE STILL FRAME WEB CAMERA SYSTEM

.1 The Contractor shall provide and install one outdoor web cam (on-site live digital capture camera). The camera shall be positioned at the project site to capture an overview of construction activity. This digital camera shall be secured in a fixed position and shall remain stationary throughout the construction process, from site preparation through completion of landscaping. Camera location shall be approved by Departmental Representative. The Contractor is required to provide a suitable mounting base or pole to establish a useful vantage point from which to view the construction activities. Image capture shall occur at 10 (ten) minutes intervals during daylight and scheduled work hours on each construction work day. Images shall bear an imprinted identification strip which will include the date and time of the digital image capture. The Contractor shall provide an electrical power supply, and an appropriate wiring delivery system (routing/conduit) for a high speed internet connection including internet service cost. The images captured by the web camera on a regular schedule shall be sent by ftp (file transfer protocol) to an off-site web server for permanent archiving throughout the construction period. Images captured for ftp must be created in JPEG (.jpg) format with dimensions of at least 640x480 pixels; a minimal amount of compression shall be applied. This images files shall be identified by date and time of capture. Upon completion of the project,

the Contractor shall prepare and provide a time-lapse movie for the entire construction period to PSPC and PCA. Still frame file archives shall be produced as well.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Construction aids.

.2 Office and sheds.

.3 Parking.

.4 Project identification.

.5 Cofferdams/dewatering/scaffolding Facilities.

.6 Sediment and Erosion Control.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 There shall be no separate measurement for payment for the work under this Section. Include costs in the Contract Lump Sum Price.

.2 Payment shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work.

1.3 REFERENCES

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.

.2 Canadian Standards Association (CSA International)
- .1 CSA-A23.1-09/A23.2-09 (R2014), Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA/CAN -S269.3-M92 (2013), Concrete Formwork.
- .3 CSA-0121-M-08 (R2013), Douglas Fir Plywood.
- .4 CSA Z797-09 (R2014), Code of practice for Access Scaffold.
- .5 CAN/CSA-Z321-96(R2006), Signs and Symbols for the Occupational Environment, withdrawn but still available from CSA, CCOHS and Techstreet.
- .6 CAN/CSA-S269.2-M87(R2003), Access Scaffolding for Construction Purposes, withdrawn but still available from CSA, CCOHS and Techstreet.

1.4 SUBMITTALS

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

.2 Submit for review and approval by Departmental Representative, a cofferdam and dewatering plan , where applicable, which provides the following:
- .1 Layout of proposed dewatering structure area and turbidity curtain.
- .2 Layout of “in-the-dry” work area and construction platform.
- .3 Typical cross section of cofferdam/construction platform structure.
- .4 Turbidity Curtain details.
- .5 Details of connection/abutment with existing structure where applicable.

.6 Dewatering collection area.
.7 Dewatering pump and equipment layout, details, and specifications.
.8 Dewatering discharge layout and details including:
.1 Heat trace line and or heating/insulation for water lines to prevent freezing during operations, if applicable;
.2 Contractor to note that discharge areas for clean water to be located at ends of the work area and not directed towards the center of the canal.
.9 Dewatering structure/cofferdam and Dewatering plan shall be signed and sealed by a Professional Engineer registered in the Province of Ontario.

.3 Submit for review and approval by Departmental Representative, a Sediment and Erosion Control Plan (ECP) which provides the following:
.1 Limits of sediment control boundaries/perimeters and typical details and sections of sediment control structures/measures.
.2 Areas to be treated and maintained to prevent tracking of mud from site and into waterway area including methods of protection and maintenance.
.3 Areas of proposed stockpiling for native and/or imported fills, granular materials or waste materials on site and methodology for preventing erosion and sediment delivery from these areas.
.4 Management of drainage on site and at site perimeter as required to provide relief for flows and to prevent delivery of sediment off site.

1.5 INSTALLATION AND REMOVAL

.1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.

.2 Identify areas which have to be graveled to prevent tracking of mud.
.1 Includes layout, location of Pedestrian detour.

.3 Indicate use of supplemental or other staging area.

.4 Provide construction facilities in order to execute work expeditiously.

.5 Remove from site all such work after use.

1.6 SCAFFOLDING

.1 Scaffolding in accordance with CSA Z797.

.2 Provide and maintain scaffolding, ramps, ladders and temporary stairs.

1.7 HOISTING

.1 Provide, operate and maintain hoists/cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.

.2 Hoists/cranes shall be operated by qualified operator.

1.8 SITE STORAGE/LOADING

.1 Confine work and operations of employees to areas defined by Contract Documents. Do not unreasonably encumber premises with products.

.1 Any increase in required work area from that indicated on contract documents shall require prior approval of the Departmental Representative.

.2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.9 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of Work.
.1 Contractor to designate specified parking area on site plan for approval by Departmental Representative.

.2 Provide and maintain adequate access to project site.

.3 Build and maintain temporary roads where indicated or as required and provide snow removal during period of Work.

.4 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

.5 Clean construction runways and taxi areas where used by Contractor's equipment.

1.10 SECURITY

.1 Pay for responsible and suitable security measures and methods to guard site and contents of site after working hours and during holidays. To be submitted and approved by Department Representative.

.2 Contractor shall pay for monitoring of the site during periods of no construction activity and to maintain and service dewatering and heating systems.

1.11 OFFICES

.1 Provide office heated to 22°C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
.1 Provide Additional Lock and Key for Departmental Representative and Client/Owner (PCA).

.2 Provide a clearly marked and fully stocked first-aid case in a readily available location.

.3 Subcontractors may provide their own offices as necessary. Direct location of these offices.

.4 Departmental Representative's Site office.
.1 Inside dimensions minimum 3.6 m long x 3 m wide x 2.4 m high, with floor 0.3 m above grade, complete with 4 - 50% opening windows and one lockable door.
.2 Insulate building and provide heating system to maintain 22°C inside temperature at -20° C outside temperature.
.3 Finish inside walls and ceiling with plywood, hardboard or wallboard and paint in selected colours. Finish floor with 19 mm thick plywood.

.4 Install electrical lighting system to provide min 750 lx using surface mounted, shielded commercial fixtures with 10% upward light component.
.5 Provide private washroom facilities adjacent to office complete with flush or chemical type toilet, lavatory and mirror and maintain supply of paper towels and toilet tissue.
.6 Equip office with 1 x 2 m table, 4 chairs, 4 m of shelving 300 mm wide, one 3 drawer filing cabinet, one plan rack and one coat rack and shelf.
.7 Maintain in clean condition.

1.12 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.

1.13 SANITARY FACILITIES

.1 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.

1.14 CONSTRUCTION SIGNAGE

.1 Provide and erect, within three (3) weeks of signing Contract, a project sign in a location designated by Departmental Representative.

.2 Construction sign 1.2 x 2.4 m, of wood frame and plywood construction painted with exhibit lettering produced by a professional sign painter.

.3 Indicate on sign, name of Owner, Contractor and Subcontractor with logo, name of project, project identification reference, of a design style approved by Departmental Representative.

.4 No other signs or advertisements, other than warning signs, are permitted on site.

.5 Provide project identification site sign comprising foundation (as required), framing, and one 1200 x 2400 mm signboard as detailed and as described below.
.1 Foundations: 15 MPa concrete to CAN/CSA-A23.1/A23.2 minimum 200 mm x 900 mm deep.
.2 Framework and battens: SPF, pressure treated minimum 89 x 89 mm.
.3 Signboard: 19 mm Medium Density Overlaid Douglas Fir Plywood to CSA O121.
.4 Paint: alkyd enamel to CAN/CGSB-1.59 over exterior alkyd primer to CGSB 1-GP-189.
.5 Fasteners: hot-dip galvanized steel nails and carriage bolts.
.6 Vinyl sign face: printed project identification, self-adhesive, vinyl film overlay, supplied by Departmental Representative.

.6 Locate project identification sign as directed by Departmental Representative and construct as follows:
.1 Build concrete foundation, erect framework, and attach signboard to framing.

.2 Paint all surfaces of signboard and framing with one coat primer and two coats enamel. Colour white on signboard face, black on other surfaces.

.3 Apply vinyl sign face overlay to painted signboard face in accordance with installation instruction supplied.

.7 Signs and notices for safety and instruction shall be in both official languages. Graphic symbols shall conform to CAN/CSA-Z321.

.8 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.

1.15 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Provide access and temporary relocated roads as necessary to maintain traffic.

.1 Reference Section 01-35-30 Special Procedures: Traffic Control.

.2 Reference WSP Traffic Impact Study Report Rideau Canal Ottawa Walls 2018.

.2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.

.3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs

.4 Protect travelling public from damage to person and property.

.5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.

.6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.

.7 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.

.8 Dust control: adequate to ensure safe operation at all times.

.9 Provide snow removal during period of Work as required to facilitate access and continuous work progress.

1.16 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Clean dirt or mud tracked onto paved or surfaced roadways.

.3 Store materials resulting from demolition activities that are salvageable.

.4 Stack stored new or salvaged material.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 IMPLEMENTATION

.1 Cofferdams, Dewatering structures and construction platforms:
- .1 Construct temporary cofferdams and or platforms within defined work limits in accordance with approved cofferdam and dewatering plan and in conformance with relevant permitting conditions, to sufficient elevation and cross-section to permit dewatering of proposed work areas and provide a “in-the-dry” work area as required, and to provide for stability and protection against seepage under expected range of water levels during work period.
- .2 Cofferdams and or construction platforms shall be designed and constructed to support all anticipated loads and shall be located such that they do not hinder the operations required to construct the permanent works.
- .3 Design and construct cofferdams and or construction platforms to accommodate expected variations in water levels and ice conditions within the work area and over the construction period.
- .4 Cofferdams and or construction platforms should accommodate over topping without failure of the structures and in a manner that minimizes the risk of damage to work under construction within the dewatered work area.
- .5 Design cofferdams and or construction platforms to be placed and removed with as minimal risk to water quality and local aquatic and terrestrial habitat conditions.
- .6 Inspect cofferdams and or construction platforms on a regular basis and maintain as necessary to ensure structural reliability and performance throughout the duration of the project.
- .7 Cofferdams and or construction platforms shall not be removed until the permanent Works below design water levels have been inspected and approved by the Departmental Representative.

.2 Sediment and Erosion Control:
- .1 Provide temporary erosion and sediment control measures to prevent soil erosion and discharge of soil bearing water run-off or airborne dust to adjacent properties and walkways according to the approved Environmental Control Plan (ECP) and requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain ECP measures during construction.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removals.

.3 Granular Access Pad and Work Platforms:
- .1 Construct temporary access ramp and work platform within defined work

limits to provide for sufficient protection of canal bed during work and which provides stable support and dewatered area access under heavy construction traffic.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Barriers.

.2 Environmental Controls.

.3 Traffic Controls.

.4 Fire Routes.

1.2 DESCRIPTION

.1 This section relates to temporary construction measures to facilitate the work and specifies requirements for designing, supplying, installing, inspecting, maintaining, and removing:
  .1 Cold weather protection, consisting of temporary housing and supplementary heating and ventilation for the workspaces and the work, as described by the specifications. The requirements of this section apply to all sections of specifications that call for cold weather protection.
  .2 Lighting of workspaces.
  .3 Temporary barriers for security and work safety.
  .4 Housing and containment systems.

.2 Work not included in this Section:
  .1 Provision of separate air supply for workers which is part of Contractor's responsibility under Health & Safety regulations for construction.

.3 Intent: Housing; heating and ventilating must be sufficient to:
  .1 Ensure safe working environment.
  .2 Facilitate progress of work in an efficient manner during extreme temperature/weather conditions.
  .3 Protect areas adjacent to work during procedures which may damage surrounding areas.
  .4 Protect work and products against dampness and cold.
  .5 Provide suitable and ambient temperature conditions for storage, installation and curing of materials.

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 There shall be no separate measurement for payment for the work under this Section. Include costs in the Contract Lump Sum Price.

.2 Payment shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work.

1.4 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29 - Health and Safety Requirements.

.3 Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

.4 Section 01 51 00 - Temporary Utilities.

.5 Section 01 52 00 - Construction Facilities.

1.5 REFERENCES

.1 Canadian General Standards Board (CGSB):
  .1 CAN/CGSB-1.189-2000, Exterior Alkyd Primer for Wood.
  .2 CAN/CGSB-1.59-97, Alkyd Exterior Gloss Enamel.

.2 Canadian Standards Association (CSA):
  .1 CSA-O121-17, Douglas Fir Plywood.

.3 Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD).

.4 Ontario Ministry of Transportation, Book 7 of the Ontario Traffic Manual - Temporary Conditions.

.5 Province of Ontario
  .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990 as amended, O. Reg. 213/91 as amended.
  .2 Air Pollution - Local Air Quality (O. Reg. 419/05)

.6 Public Services and Procurement Canada (PSPC).
  .1 Standard Acquisition Clauses and Conditions (SACC)-ID: General Conditions (GC)

1.6 SUBMITTALS

.1 Shop Drawings showing:
  .1 Type and construction of housing and enclosures, connections with scaffolding, stability systems, and methods of sealing areas plus egress.
  .2 Ventilation fan locations and capacities for assurance of even and sufficient air flow movement to minimize localized cold zones during vital temperature sensitive work.
  .3 Heater numbers, type, location, and capacities. Drip trays to be included with all liquid fueled heaters.
  .4 Location and type of all fire extinguishers in association with heating equipment.
  .5 Temporary connections to existing structures are not allowed.
  .6 Staging plan and schedule.

1.7 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating and ventilation as set out in Section 01 51 00.

.2 Remove from site all such work after use.

1.8 WORK AREA DELINEATION

.1 Erect and maintain temporary site enclosure and barriers to delineate the work area as identified on the drawings and other measures as necessary to define the Work area and restrict access to the public.

.2 Provide and maintain temporary barriers to define the Work area within the Canal once the drawdown period is completed and the canal is frozen to restrict access to dewatering Works, as indicated on the drawings and as set in Section 35 20 22.

.3 Provide a construction Traffic Control and Management Plan for both work related and local vehicular traffic as set out in Section 01 35 30.

.4 Provide lockable truck entrance gates and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.

.5 Erect and maintain pedestrian walkways complete with signs and electrical lighting as required by law.

.6 Erect and maintain navigational signals/ markers and electrical lighting as per Transport Canada/Parks Canada guidelines for cofferdam demarcation during work that extends into navigational season.

1.9 INSTALLATION AND REMOVAL

.1 Provide temporary geodetic and survey controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.10 ACCESS TO SITE

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.11 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stairs, open edges of refacing walls, and top of wall, as required.

1.12 DUST SCREENS

.1 Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of Work and the Public.

1.13 WEATHER ENCLOSURES

.1 Design enclosures to withstand wind and snow loading.

1.14 PUBLIC TRAFFIC FLOW

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

1.15 FIRE ROUTES

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

1.16 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 GENERAL

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

3.2 ENCLOSURES

.1 Provide strong and durable housing and containment enclosures for portions of Work to be isolated, protected, heated, or ventilated during Work.
- .1 Housing to be strong enough to withstand rain, wind, and snow loads.
- .2 Tarps to be overlapped and sealed to prevent opening and to ensure waterproofing. Housing to be insulated against cold.
- .3 Electrical wiring, lights, and other equipment located inside enclosure: explosion-proof type. Illumination shall be sufficient for safe execution of Work.

.2 Design, install, maintain, and remove enclosures as required for containment of dust and debris during operations or to provide heated enclosures during cold weather work:
- .1 Enclosure will be constructed to withstand loading from wind, rain, ice, and snow.
- .2 Enclosures to be constructed with a minimum clearance of:
  - .1 2m height for work areas and walkways.
  - .2 1m width for work areas and walkways.
- .3 Routinely inspect, maintain and repair immediately enclosures if and

when required.

3.3 HEATING

.1 Provide temporary heating required during construction period, including watch person attendance, maintenance, and fuel.

.2 Be responsible for damage to work due to failure in providing adequate heating and hoarding during construction.

.3 Use only indirect (fired) heating equipment of types acceptable to Departmental Representative.

.4 Fuel Storage: to requirements of Fire Commissioner of Canada and Section 01 35 46.

.5 Ensure that heating requirements are met by providing, at optimum efficiency of equipment, a capacity of 125% of heat requirement, and sufficient number of standby heaters ready for use at site.
.1 Equipment that fails to perform efficiently or fails due to mechanical breakdown to be replaced immediately.

.6 Provide means of assuring proper heat circulation and even distribution of heat throughout enclosures. Do not direct heating onto curing concrete surfaces.

.7 Contractor to modify heating system as required if designated temperatures as per contract documents cannot be consistently met.

.8 Vent exhausts of heating equipment outside and away from enclosures, and clear of combustible materials and fresh air intakes.

3.4 LIGHTING

.1 Provide electric lighting within enclosure to provide adequate lighting for a safe work environment.
.1 High intensity LED lighting preferred for cold temperature performance.

3.5 QUALITY CONTROL AND WATCHKEEPING

.1 Provide and post at approved locations within housing, minimum two thermometers per 10 square meters of plan area or two per 50 square meters of wall elevation within housing. One thermometer to be at bottom and one at top of enclosure within this area. In areas of poor heat circulation, add extra thermometers as directed.

.2 Ensure continuity of protection and heating by providing watch keeper to make periodic checks at all times including when work is not in progress, nights, weekends, and holidays.

.3 Watch Keeper’s qualifications to be sufficient to perform such duties as:
.1 Maintain strict supervision of operation of temporary heating and ventilating equipment, and enclosures.
.2 Enforce safe practices.
.3 Prevent abuse of services.

.4 Prevent damage to finishes due to miss-use of heating and ventilation equipment.
.5 Undertake preventative maintenance and re-fueling procedures.
.6 Complete emergency repairs as required and when necessary.

.4 Contractor to record and provide logs of maximum and minimum temperatures on a daily basis, re-setting thermometers as needed during work stages where heating is required.
.1 Make temperature records available to Departmental Representative.
.2 Provide certified written records to Departmental Representative on weekly basis.
.3 Measure and record humidity and time of application of water, wetted burlap, misting or polyethylene sheeting for curing processes.

END OF SECTION

PART 1 - GENERAL

1.1 CONSTRUCTION & DEMOLITION WASTE

.1 Carefully deconstruct and source separate materials/equipment and divert, from waste destined for landfill to maximum extent possible. Target for this project is 60% diversion from landfill. Reuse, recycle, compost, anaerobic digest or sell material for reuse except where indicated otherwise. On site sales are not permitted.

.2 Contaminated material, including sediment or settled material from water treatment systems, to be disposed of based on the types of contamination found as per Federal guidelines with reference to the contamination report and EMP developed by environmental professional.

.3 Source separate waste and maintain waste audits in accordance with the Environmental Protection Act, Ontario Regulation 102/94 and Ontario Regulation 103/94.

- .1 Provide facilities for collection, handling and storage of source separated wastes.
- .2 Source separate the following waste:
  - .1 Portland cement concrete.
  - .2 Asphalt.
  - .3 Steel.
  - .4 Existing fill.
  - .5 Wood, not including painted, treated, or laminated wood.
- .3 Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by Construction, Renovation and/or demolition (CRD) activities.
- .4 Protect environment and prevent environmental pollution damage.

.4 Submit a Waste Reduction Work Plan (WRW) indicating the materials and quantities of material that will be recycled and diverted from landfill.

.5 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.

1.2 REFERENCES

.1 Reference Standards:

- .1 Ontario Ministry of Environment:
  - .1 Ontario 3 R’s Regulations (regulation 102/94) for waste management programs applicable to construction and demolition projects.
  - .2 Ontario Environmental Protection Act (EPA);
    - .1 Regulation 102/94, Waste Audits and Waste Reduction Workplans.
    - .2 Regulation 103/94, Source Separation Programs.

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Prepare and submit following prior to start-up:
- .1 Electronic copy of completed Waste Audit (WA).
- .2 Electronic copy of completed Waste reduction Workplan.

.3 Registration of activities on the Ontario Hazardous Waste Information Network (HWIN), if applicable.

1.4 WASTE AUDIT

.1 Source separate waste and maintain waste audits in accordance with the Environmental Protection Act, Ontario Regulation 102/94 and Ontario Regulation 103/94.
- .1 Provide facilities for collection, handling and storage of source separate wastes.
- .2 Source separate the following waste:
  - .1 Cement and concrete.
  - .2 Steel.
  - .3 Wood.
  - .4 Corrugated cardboard.

1.5 WASTE REDUCTION WORKPLAN (WRW)

.1 Prepare and submit WRW (Schedule B) at least ten (10) working days prior to commencement of project.

.2 WRW identifies strategies to optimize diversion through reduction, reuse, and recycling of materials and comply with applicable regulations.

.3 WRW should include but not be limited to:
- .1 Applicable regulations.
- .2 Specific goals for waste reduction, identify existing barriers and develop strategies to overcome them.
- .3 List of approved Disposal Facilities.
- .4 List of approved Haulers.
- .5 Destination of materials identified.
- .6 Deconstruction/disassembly techniques and schedules.
- .7 Protection of personnel, sub-contractors.
- .8 Clear labelling of storage areas and waste bins.
- .9 Details on material handling and removal procedures.
- .10 Recycler and reclaimer requirements.
- .11 Quantities of materials sent to landfill.
- .12 Requirements for monitoring on-site wastes management activities.

.4 Monitor and report on waste reduction by documenting total volume (in tonnes) and cost of actual waste removed from project.

1.6 WASTE SOURCE PREPARATION PROGRAM (WSSP)

.1 As part of WRW, prepare a WSSP prior to project start-up.

.2 WSSP will detail methodology and planned on-site activities for separation

of reusable and recyclable materials from waste intended for landfill.

.3 Provide sufficient on-site facilities and containers for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Locate containers to facilitate deposit of materials without hindering daily operations.

.5 Clearly and securely label containers to identify types/conditions of materials accepted and assist in separating materials accordingly.

.6 On-site sale of salvaged materials is not permitted.

1.7 WASTE PROCESSING SITES

.1 Province of: Ontario.
  .1 Ministry of Environment and Climate Change, 135 St. Clair Avenue West, Toronto, ON, M4V 1P5.
    .1 Telephone: 800-565-4923 or 416-323-4321.
    .2 Fax: 416-323-4682.
  .2 Recycling Council of Ontario: 215 Spadina Avenue, #407, Toronto, ON, M5T 2C7.
    .1 Telephone: 416-657-2797
    .2 Fax: 416-960-8053
    .3 Email: rco@rco.on.ca.
    .4 Internet: http://www.rco.on.ca/.

.2 Contractor responsible for accessing a licensed/approved landfill site for both hazardous and nonhazardous materials. Submit location of the licensed facility site to Departmental Representative for review.

1.8 DISPOSAL OF WASTE

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste volatile materials, mineral spirits, oil, paint thinner into waterways, storm, road, and /or sanitary sewers.

.3 Concrete waste water having a pH≥12.5 must be disposed of in accordance with Section 02 81 01.

.4 Remove materials on-site as Work progresses.

1.9 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 and WSSP.

.2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations.

3.2 CLEANING

.1 Leave work area clean at end of each day.

.2 Final Cleaning: upon completion of project:
- .1 Remove surplus materials, rubbish, tools, and equipment.
- .2 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.3 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Government Chief Responsibility for the Environment.

.2 Province of: Ontario

.3 Ministry of the Environment and Energy, 135 St. Clair Avenue West, Toronto, ON, M4V 1P5.

.4 General Inquires:
- .1 Telephone: 800-565-4923 or 416-323-4321 or 416-734-4494
- .2 Fax: 416-323-4682

END OF SECTION

PART 1 - GENERAL

1.1 RECORD DRAWINGS

.1 Maintain project record drawings and record accurately all deviations from the Contract documents. Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

.2 Record changes in legible red ink. Mark ongoing changes on one set of prints. Then, at the completion of the project and before final inspection, neatly transfer notations to the second set and into electronic copy. Submit all sets to the Departmental Representative.
- .1 If project is completed without significant deviations from Contract documents, submit to Departmental Representative one set of drawings and specifications marked “AS_BUILT”.

1.2 INFORMATION TO BE RECORDED

.1 Record the following information:
- .1 Measured depths of elements of foundation in relation to established bench mark.
- .2 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
- .3 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
- .4 Field changes of dimensions and details.
- .5 Changes made by Change Order (CO), Field Order (FO) or Site Instructions (SI).
- .6 Details not on original Contract Drawings.
- .7 References to related shop drawings and modifications.
- .8 Additional Requirements: as specified in individual specification sections.

.2 Maintain record documents in clean, dry, and legible condition. Do not use record documents for construction purposes.

.3 Specifications:
- .1 Legibly mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed.
  - .2 Changes made by Amendments and Change Orders.

.4 Other Documents:
- .1 Maintain inspection certifications, field test records, required by individual specification sections.
- .2 Provide digital photos, if required, for site records.

.5 At completion of work, submit to Departmental Representative, one paper and one electronic copy of “AS-BUILT” drawings and specifications.

1.3 REVIEW

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for mechanical demolition to complete work as indicated by drawings and specifications.

.2 Work includes but is not limited to:
- .1 All necessary labour, materials and equipment required for the excavation, removal, disposal, salvage, recycling and reinstallation for reuse of those items as specified and as identified on the drawings.
- .2 Removal and disposal off site of the existing gravity retaining canal wall concrete, to the extent as shown on the drawings.
  - .1 The concrete debris from the demolition of the existing concrete wall does not need to be considered to be contaminated, as long the concrete debris is free from any sediments or soil. The contractor should remove/scrape any sediment or soil that might be adhered to the concrete wall surface after excavation and ensure that concrete debris does not come in contact with any sediment or soil during the demolition and removal work. Any concrete debris that is not free of sediment or soil will need to be disposed as contaminated waste.
  - .2 Existing concrete is reinforced with steel in some locations, Contractor to price as if all concrete excavation is reinforced.
- .3 Saw-cuts required to remove the concrete as shown on the drawings.
- .4 Excavation/deconstruction shall include removal and disposal of debris from the canal bed and areas immediately adjacent to the concrete retaining wall to prepare for new works. General common excavation or surface clearing where required is not covered under this section.
- .5 Preparation of all concrete surfaces against which new concrete is to be cast.
- .6 Disposing off site of all concrete debris and removed steel reinforcement.
- .7 Disposing off site of all materials not designated for salvage or reuse by Departmental Representative.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01.

.2 Payment for these items shall be included in the Unit Price Table:
- .1 Item No.3 - Concrete Excavation: This item covers the work described in subsection 1.1.2.

.3 No payment will be made for concrete excavation beyond the limits shown on the drawings, which has not been authorized by the Departmental Representative; any over break beyond these limits shall be replaced by concrete at the Contractor's expense.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

.2 National Building Code of Canada (NBCC) including User's Guide, Part 8 - Safety Measures at Construction and Demolition Sites (2015).
.3 Ontario Occupational Health and Safety Act (OHSA).
.4 Ontario Building Code (OBC).
.5 Department of Justice Canada (Jus).
.1 Canadian Environmental Protection Act (CEAA), 1992, c.37.
.2 Canadian Environmental Protection Act (CEAA), 1999,c.33.
.1 SOR/2003-2, On-road Vehicle and Engine Emission Regulations.
.2 SOR/2006-268, Regulations Amending the On-road Vehicle and Engine Emission Regulations.

.3 Transportation of Dangerous Goods Act (TDGA), 1992, c.34

1.4 SUBMITTALS

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

.2 Prior to beginning of Work on site, submit detailed Waste Reduction Workplan in accordance with Section 01 74 20 and indicate:
.1 Descriptions and anticipated quantities of materials to be recycled and landfilled.
.2 Schedule of selective demolition.
.3 Number and location of dumpsters.
.4 Anticipated frequency of tippage.
.5 Name and address of haulers and waste facilities.
.6 Receiving facilities of materials containing potential hazardous materials. These materials are to be disposed in accordance with applicable regulations and not be designated for reuse.
.1 Some concrete material generated during its removal might be cross contaminated during excavation by canal bed sediment. Such material shall be disposed in accordance with Section 02 81 01 – HAZARDOUS MATERIALS.

.3 Shop Drawings:
.1 Provide shop drawings and product data in accordance with Section 01 33 00.
.2 Provide drawings stamped and signed by a Professional Engineer registered or licensed in the Province of Ontario, Canada.

.4 Prior to excavation of vertical surfaces, coping or existing structure, establish reference Bench marks (minimum of 3) that will allow the transference of the coordinates and elevations of the existing geodetic bench marks to the new geodetic bench mark on the new structure or such other approach as approved by the Departmental Representative.
.1 Provide all data regarding the reference points to the Departmental Representative.
.2 Survey work shall be undertaken by an Ontario Legal Surveyor.

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements:
.1 Ensure work is performed in compliance with CEPA, CEAA, TDGA, and Fisheries Act, Species at Risk Act, and applicable Provincial/Territorial and Municipal Regulations.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Perform Work in accordance with Section 01 35 46 – ARCHAEOLOGICAL, CULTURAL AND ENVIRONMENTAL PROCEDURES.
  .1 Ensure that selective demolition work does not adversely affect adjacent waterway, groundwater, and wildlife, or contribute to excess air and noise pollution.

.2 Waste Management and Disposal:
  .1 Separate waste materials for recycling in accordance with Section 01 74 20 – CONSTRUCTION/DEMOLITION WASTE MANAGEMENT AND DISPOSAL.

.3 Protect existing items/structures designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative.

.4 Remove and store materials to be salvaged, in manner to prevent damage, where applicable.

.5 Handle salvaged materials as new materials.

1.7 SITE CONDITIONS

.1 Review existing site conditions and take necessary precautions to protect environment in accordance to Section 01 35 46.

.2 Existing conditions:
  .1 Structures and concrete surfaces to be excavated are based on their condition, at time of examination prior to tendering.
  .2 The existing concrete retaining wall has significant horizontal meandering cracks full length of wall to be replaced and has rotated and been horizontally displaced towards the canal due to frost jacking and potential surcharge over loading.
  .3 The structure is considered a mass gravity retaining wall with minimal steel reinforcement. The structures concrete exhibits areas of concrete delamination, spalled and cracked concrete and areas of full depth structure cracking with the presence of voids near catch basin exit points.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Leave equipment and machinery running only while in use, except where extreme temperatures prohibit shutting down.

PART 3 – EXECUTION

3.1 GENERAL

.1 Carry out mechanical excavation in accordance with CSA S350.

3.2 PREPARATION

.1 Protection:
  .1 Prevent movement, settlement, or damage to remaining part of structure, adjacent road and utilities, to remain in place. Provide bracing and shoring, if required.
    .1 All Shoring to be designed, signed and stamped by a Professional Engineer licensed in the Province of Ontario.
    .2 If safety of structure being demolished or adjacent structures or services appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.
  .2 Keep noise, dust, and inconvenience to users to a minimum.
  .3 Provide temporary dust screens, covers, railings, supports and other protection as required.
  .4 Sawcut existing wall to depth indicated on drawings. Use small, hand operated chippers for demolition from approximately 1 m away from the sawcut. Retain structural integrity of the remaining portion of the wall intact.
    .1 Maximum equipment weight for small removals near sawcuts: 10kg

.2 Locate and protect utility lines. Do not disrupt active or energized utilities traversing premises.
  .1 Do not disrupt active or energized high voltage utilities traversing premises near Clegg and running parallel to wall as indicated on Contract documents.
    .1 13.5kV power lines – Hydro Ottawa.
    .2 115kV trunk lines – Hydro One.
  .2 Disconnect and or re-route electrical, and/or other utility service lines located within work area, where applicable. Post warning signs on electrical lines and equipment which must remain energized to serve other products during period of demolition.

3.3 DEMOLITION, SALVAGE AND DISPOSAL

.1 Protect structural integrity of existing walls and adjacent roadway to remain in place.

.2 Remove items to be reused, store as directed by Departmental Representative, and re-install after wall construction is completed.

.3 Dispose of removed materials, to appropriate recycling facilities except where specified otherwise, in accordance with authority having jurisdiction.

.4 Remove and excavate components of structure as shown on drawings and as specified in specifications.

.5 Crush concrete generated due to demolition of structure to size suitable for

recycling and to facilitate efficient hauling and transportation.

.6 Excavate in a manner to minimize dusting. Keep materials wetted as directed by Departmental representative.

.7 Prevent concrete fines or slurry from entering the watercourses.

.8 Neatly excavate concrete structure to lines and limits as indicated on drawings.

.1 Where poor quality concrete is discovered at the limits of the proposed excavation, advise Departmental Representative and confirm whether work limits will be maintained or expanded. Contractor to await written confirmation of work beyond initial proposed excavation limits.

3.4 STOCKPILING

.1 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

.2 Locate stockpiled materials convenient for use in new construction. Eliminate double handling wherever possible.

3.5 REMOVAL FROM SITE

.1 Transport material designated for alternate disposal to approved facilities listed in waste reduction workplan and in accordance with applicable regulations. Do not deviate from facilities listed in waste reduction workplan without prior written authorization from Departmental Representative.

.2 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.

.1 Disposal facilities must be approved of and listed in waste reduction workplan.

.2 Do not deviate from disposal facilities listed in waste reduction workplan without prior written authorization from Departmental Representative.

3.6 CLEANING AND RESTORATION

.1 Keep site clean and organized throughout demolition procedure.

Upon completion of project, reinstate grass areas, pathways, light standards, road ways, affected by Work to condition which existed prior to beginning of Work and match condition of adjacent, undisturbed areas.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section covers but is not limited to the removal and disposal of the following existing components and such other items as may be directed by the Department Representative to complete work as indicated:
  .1 Removal and disposal of line and expansion posts, as required. Prior to post removal, Departmental Representative and Contractor to review line and expansion posts for quality and salvage quantities. Estimate disposal of 100 percent of all line and expansion posts.
  .2 Removal and disposal of existing pipe railings.
  .3 Removal, salvaging and reinstallation of public benches within the work area, as required.
  .4 Removal, salvaging and reinstallation of garbage receptacles and signs within the work area, as required.
  .5 Removal, salvaging and reinstallation of ice skating access gates within the work area and granular base pads within canal bed, where applicable.

.2 This section includes the removal of all other items that must be removed to complete the work as described in the specification.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01.

.2 Work covered by this section will be paid for under payment items included in the Unit Price Table:
  .1 Item No.1 - Removal and disposal of expansion and line posts. All line posts and all expansion posts are to be disposed of. Departmental Representative will inform contractor if otherwise noted.
  .2 Item No.2 - Removal and disposal of existing pipe railings.

.3 All other work of this section, which is not identified as a unit price item, is to be included in the Lump Sum Price.

1.3 RELATED SECTIONS

.1 Handrail System: Section 05 52 20

.2 Excavating and Backfilling: Section 31 23 15

1.4 PROTECTION

.1 Protect existing structures or parts of structures designated to remain. In the event of damage, make repairs and replacements to the approval of, and at no additional cost, to the Departmental Representative.

.2 Protect all exposed electrical wiring and conduits during the concrete excavation, forming, heating and placement of concrete or backfilling work.

PART 2 - PRODUCTS

.1 Not applicable.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Inspect the site and verify with the Departmental Representative objects designated to be removed and objects to be preserved.

.2 Survey, record and tag all elements of existing lighting system to be salvaged for ease of future re-installation, including element location and orientations.

.3 Notify utility authorities before starting any excavation, clearing and grubbing.

.4 Contractor to coordinate with National Capital Commission (NCC) to verify continuity of lighting services at both adjacent areas outside the construction limits.

.5 Contractor to coordinate with City of Ottawa to verify continuity of traffic intersection lighting is not affected by work.

.6 Identify Contractor(s), if any, working in adjacent areas and coordinate construction traffic Control and management plan.

3.2 REMOVALS

.1 Do not disturb adjacent work designated to remain in place.

.2 Items not designated to be salvaged are to be disposed of in a manner approved by the Departmental Representative.

.3 Remove pipe railing at nearest pipe expansion joint or cut pipe at locations identified by the Departmental Representative.

3.3 SALVAGE

.1 Carefully dismantle materials designated to be salvaged and stockpile at locations designated by the Departmental Representative.

.2 Salvaged railing and lighting system items are to be delivered to the NCC warehouse located at 1740 Woodroffe Avenue. All items not to be salvaged are to be disposed of off-site.

.3 All items listed as per 1.1.1 of this section existing to be removed and salvaged with care and stored securely on site or coordinated and transported safely to the NCC warehouse.

3.4 REINSTALLATION

.1 None of the existing pipe railings will be reinstalled. Refer to Handrail

System - Section 05 52 20 for installation of new posts and pipe railing.

.1 Make all necessary adjustments to ensure proper fit, closure and operations of all gates affected by work, if required.

.2 Refer to Handrail System – Section 05 52 20 for installation of new and reinstallation of salvaged lamp standard components.

.3 Reinstall all other items which were removed as a result of construction activities to the Departmental Representative's approval.

3.5 DISPOSAL OF MATERIALS

.1 Dispose of materials not designated for salvage or reuse in work off the site.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 02 41 16 – STRUCTURE DEMOLITION.

.2 Section 31 23 15 – EXCAVATING AND BACKFILLING.

1.2 REFERENCE STANDARDS

.1 Canadian Environmental Protection Act,1999 (CEPA 1999)
  .1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).

.2 Department of Justice Canada (Jus)
  .1 Transportation of Dangerous Goods Act, 1992 (TDG Act) [1992], (c. 34).
  .2 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2001-286).

.3 Green Seal Environmental Standards (GS)
  .1 GS-11-[2008, 2nd Edition], Paints and Coatings.
  .2 GS-36-[00], Commercial Adhesives.

.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  .1 Material Safety Data Sheets (MSDS).

.5 National Research Council Canada (NRC)
  .1 National Fire Code of Canada [2015] (NFC).

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  .1 SCAQMD Rule 1113-[A2007], Architectural Coatings.
  .2 SCAQMD Rule 1168-[A2005], Adhesive and Sealant Applications.

1.3 DEFINITIONS

.1 Dangerous Goods: product, substance, or organism specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.

.2 Hazardous Material: product, substance, or organism used for its original purpose; and is either dangerous goods or material that will cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.

.3 Hazardous Waste: hazardous material no longer used for its original purpose and that is intended for recycling, treatment or disposal.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
  .1 Submit manufacturer's instructions, printed product literature and data sheets for hazardous materials and include product characteristics,

performance criteria, physical size, finish and limitations.

.2 Submit electronic copies of WHMIS MSDS in accordance with Section 01 35 46 - Environmental Procedures to Departmental Representative for each hazardous material required prior to bringing hazardous material on site.

.3 Submit hazardous materials management plan to Departmental Representative that identifies hazardous materials, usage, location, personal protective equipment requirements, and disposal arrangements.

1.5 CONTAMINATION

.1 Refer to the following reports for information on known contaminants:

.1 *Report Number: 1776320-004-R-Rev0, Environmental Management Planning Considerations – Ottawa Wall Repairs Rideau Canal, Ottawa, Ontario by Golder Associates Ltd.*

.2 *Report Number: 10-1122-0214, Phase II Environmental Site Assessment Colonel By Drive from Laurier Avenue to Highway 417, Ottawa, Ontario National Capital Commission Property Asset 96747 by Golder Associates Ltd.*

.2 Contaminants on site include but are not limited to:

.1 Heavy metals – lead and mercury;

.2 Petroleum hydrocarbons including polycyclic aromatic hydrocarbons (PAHs) – benzo (a) anthracene, pyrene, and 2-methylnaphthalene.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 35 46 - Environmental Procedures and with manufacturer's written instructions.

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

.3 Transport hazardous materials and wastes in accordance with Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.

.4 Storage and Handling Requirements:

.1 Co-ordinate storage of hazardous materials with Departmental Representative and abide by internal requirements for labelling and storage of materials and wastes.

.2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.

.3 Store and handle flammable and combustible materials in accordance with National Fire Code of Canada (NFC) requirements.

.4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.

.1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.

.2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Departmental Representative.

.5 Transfer flammable and combustible liquids away from open flames or heat-producing devices.

.6 Solvents or cleaning agents must be non-flammable or have flash point above 38 degrees C.

.7 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.

.8 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.

.9 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:

.1 Store hazardous materials and wastes in closed and sealed containers.

.2 Label containers of hazardous materials and wastes in accordance with WHMIS.

.3 Store hazardous materials and wastes in containers compatible with that material or waste.

.4 Segregate incompatible materials and wastes.

.5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.

.6 Store hazardous materials and wastes in secure storage area with controlled access.

.7 Maintain clear egress from storage area.

.8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.

.9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.

.10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.

.11 When hazardous waste is generated on site:

.1 Co-ordinate transportation and disposal with Departmental Representative.

.2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.

.3 Use licensed carrier authorized by provincial authorities to accept subject material.

.4 Before shipping material obtain written notice from intended hazardous waste treatment or disposal facility it will accept material and it is licensed to accept this material.

.5 Label container[s] with legible, visible safety marks as prescribed by federal and provincial regulations.

.6 Only trained personnel handle, offer for transport, or transport dangerous goods.

.7 Provide photocopy of shipping documents and waste manifests to Departmental Representative.

.8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide photocopy of completed manifest to Departmental Representative.

.9 Report discharge, emission, or escape of hazardous materials immediately to Departmental Representative and appropriate provincial authority. Take reasonable measures to control release.

.12 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.

.13 Report spills or accidents immediately to Departmental Representative. Submit a written spill report to Departmental Representative within 24 hours of incident.

.5 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 35 46.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Description:
  .1 Bring on site only quantities hazardous material required to perform Work.
  .2 Maintain MSDS in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

PART 3 EXECUTION

3.1 IMPLEMENTATION OF WORK

.1 Minimize disturbance and mixing of canal bed sediment into the water column during work operations.

.2 Provide physical, non-pervious separation between canal bed material and any construction material brought on site.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 35 46.
  .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 35 46.

.3 Waste Management: separate waste materials for disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
  .2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.
  .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
  .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
  .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
  .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
  .7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.
  .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:
    .1 Hazardous wastes recycled in manner constituting disposal.

.2 Hazardous waste burned for energy recovery.
.3 Lead-acid battery recycling.
.4 Hazardous wastes with economically recoverable precious metals.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 03 25 13 - GFRP REINFORCING.

.2 Section 03 20 00 - CONCRETE REINFORCING.

.3 Section 03 30 00 - CAST-IN-PLACE CONCRETE.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Include costs in concrete items of work for which concrete formwork, falsework and accessories are required.

.2 Payment shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)
- .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .2 CAN/CSA-O86-14, Engineering Design in Wood.
- .3 CSA O121-17, Douglas Fir Plywood.
- .4 CSA O151-17, Canadian Softwood Plywood.
- .5 CSA O153-13 (R2017), Poplar Plywood.
- .6 CSA O437 Series-93(R2011), Standards for OSB and Waferboard.
- .7 CSA S269.1-16, Falsework and formwork.
- .8 CSA S269.3-M92 (R2014), Concrete Formwork.

.2 Canadian General Standards Board (CGSB)
- .1 CGSB 71-GP-24M, Adhesive, flexible, for Bonding Cellular Polystyrene Insulation.

.3 Council of Forest Industries of British Columbia (COFI)
- .1 COFI Exterior Plywood for Concrete Formwork.

.4 Underwriters' Laboratories Of Canada (ULC)
- .1 CAN/ULC-S701-11, Standard for thermal Insulation Polystyrene, Boards, and Pipe Coverings.

1.4 SHOP DRAWINGS

.1 Submit shop drawings for formwork and falsework fourteen (14) Calendar days in advance of Work and in accordance with Section 01 33 00.

.2 Indicate method and schedule of construction, shoring, stripping, and arrangement of joints, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1/S269.3, for formwork and falsework drawings.

.3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.

.4 Indicate sequence of erection and removal of formwork/falsework to minimize exposure time to adverse weather conditions.

.5 Submit shop drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

.6 Contractor to review, sign and date shop drawing prior to submittal to Departmental Representative.

1.5 REQUIREMENTS OF REGULATORY AGENCIES

.1 Conform to municipal, provincial and national codes relating to design and construction of formwork and falsework.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 To Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

.2 Separate and recycle waste material in accordance with section 01 74 20 and Section 01 35 46.

.3 Use sealers, form release, and stripping agents that are non-toxic, biodegradable, and have zero or low VOC's.

.4 Divert wood materials and plastic from landfill to a recycling facility.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Formwork materials:
  .1 For concrete without special architectural features, use wood and wood product formwork materials to CAN/CSA-O86-14 & CSA-O153.

.2 Sheathing: use form facing material which will produce a smooth, hard, uniform texture on the concrete. In accordance with CSA A23.1-14, 7.7.2.6, this material may be:
  .1 Form Plywood,
  .2 tempered concrete-form-grade hardboard,
  .3 metal,
  .4 plastic,
  .5 Other material capable of producing a smooth finish.

.3 Form ties: use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.

.4 Form Release agent:
  .1 Maximum VOC level to be 250g/L based on EPA test method 24 and biodegradability as described by EPA as having a half-life of 28 days or less based on ASTM D5684/OECD 301B.

.5 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 15 sq.mm/s to 24 sq.mm/s at 40°C, flashpoint minimum 150°C, open cup.

.6 Falsework materials: to CSA S269.1.

2.2 SMOOTH-FORM FINISH

.1 The form facing material shall produce smooth, hard, uniform texture of concrete exposed to view.

.2 Materials with raised grains, torn surfaces, worn edges, patches, dents, or other defects that will impair the texture of the concrete surface shall not be used.

.3 Tie holes and defects beyond the acceptable level shall be patched. All fins shall be completely removed.

.4 Smooth-form finish shall be used for all formed surfaces.

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.

.2 Hand trim sides and bottoms and remove loose earth and/or rock from earth/bedrock forms before placing concrete (if applicable).

.3 Fabricate and erect falsework in accordance with CSA S269.1.

.4 Fabricate and erect formwork in accordance with CAN/CSA-S269.1 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1/A23.2.

.5 Do not place shores and mud sills on frozen ground. Provide site drainage to prevent washout of soil supporting mud sills and shores.

.6 Align form joints and make watertight.
.1 Keep form joints to minimum.

.7 Use 20 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless matching original profiles or specified otherwise.

.8 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.9 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

.10 Clean formwork in accordance with CAN/CSA-A23.1/A23.2, before placing concrete.

.11 Obtain Departmental Representative’s approval for use of earth form framing if applicable and not indicated on drawings.

3.2 FORM RELEASE AGENT

.1 Surface preparation:

.1 Protect adjacent surfaces not designated to receive concrete form release.
.2 Clean and prepare surfaces to receive form release in accordance with manufacturer's instructions.
.3 Clean form surfaces thoroughly prior to application.
.4 Remove all rust, scale and/or previously used form release agents from the forms in accordance with good concrete practices.
.5 When using new wooden forms, apply and re-apply form release until complete saturation has been accomplished prior to first use.

.2 Application:
.1 Apply concrete form release in accordance with manufacturer's instructions.
.2 Avoid accumulation of form release at base of forms.

3.3 REMOVAL AND RESHORING

.1 Leave formwork in place for seven (7) Calendar days after placing concrete or until 80% of design strength is reached.

.2 Provide all necessary re-shoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.3 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1/A23.2.

3.4 FORMWORK AT DRAIN OUTLETS

.1 Form circular openings where existing drain pipes are located within areas of concrete refacing.

.2 Sawcut, remove and replace existing pipe at line of excavation; alternatively, sound pipes may be conserved during concrete excavation and incorporated in new cast-in-place concrete.

3.5 FORMWORK AT FOUNDATION INTERFACES

.1 Scribe formwork and trim panels to prepare neat contact with foundation material.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for glass fibre reinforced polymer (GFRP) concrete reinforcement as described by the drawings and the specification.

1.2 RELATED WORK

.1 Section 01 33 00 - Submittal Procedures. Procedures.

.2 Section 03 10 00 - Concrete Forming and Accessories.

.3 Section 03 30 00 - Cast-in-Place Concrete.

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01.

.2 There shall be no separate measurement for payment for the work under this Section. Include costs in the Contract Lump Sum Price.

.3 Glass Fiber Reinforced Polymer (GFRP) Reinforcement:
  .1 For concrete work related to canal wall refacing as indicated on the drawings.

.4 Epoxy coated wire/plastic ties and spacers to be considered incidental to supply and placement of reinforcement.

1.4 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)
  .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  .2 CSA-A23.3-14, Design of Concrete Structures.
  .3 CAN/CSA-S806-12(R2017), Design and construction of building structures with fibre-reinforced polymers.
  .4 CAN/CSA-S6-14, Fibre Reinforced Structures, "Canadian Highway Bridge Design Code".
  .5 CSA-S807-10 (R2015) Specification for fibre-reinforced polymers.
  .6 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles, A National Standard of Canada.
  .7 CSA W186-M1990(R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.
  .8 CSA-G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement.
  .9 CSA G30.3-M1983(R1998), Cold Drawn Steel Wire for Concrete Reinforcement (withdrawn but still available).
  .10 CSA-G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  .11 CSA W186-M1990(R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.2 ASTM International

.1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
.2 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
.3 ASTM D7205 (2011), Standard test Method for Tensile Properties of Fiber Reinforced Polymer Matrix Composite Bars.
.4 ASTM D7337 (2012), Standard test Method for Tensile Creep Rupture of Fiber Reinforced Polymer Matrix Composite Bars.
.5 ASTM D7617 (2011), Standard test Method for Transverse Shear Strength of Fiber Reinforced Polymer Matrix Composite Bars.

.3 American Concrete Institute (ACI)
.1 SP-66-04, ACI Detailing Manual 2004.
.1 ACI 315-99, Details and Detailing of Concrete Reinforcement.
.2 ACI 315R-04, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.
.2 ACI 350-06 Code Requirements for Environmental Engineering Concrete Structures and ACI 350.1-10 Specification for tightness of Environmental Engineering Concrete Containment Structures & Commentary.
.3 ACI 440R-07 (2007), "Report on Fiber Reinforced Polymer (FRP) Reinforcement for Concrete structures"
.4 ACI 440.5-08(2008), Specification for Construction with Fiber-Reinforced Polymer Bar".

.4 Reinforcing Steel Institute of Canada (RSIC)
.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.5 SUBMITTALS

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

.2 Prepare reinforcement Shop drawings in accordance with RSIC Manual of Standard Practice.

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.1 Indicate placing of reinforcement and:
.1 Lists.
.2 Quantities of reinforcement.
.3 Sizes, spacings, locations of reinforcement and mechanical splices if accepted by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
.4 Indicate sizes, spacings and locations of chairs, spacers and hangers.

.4 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.
.1 Provide type 'B' tension lap splices unless otherwise indicated.

.5 Detail placement of reinforcing where special conditions occur.

.6 Quality Assurance: Upon Request, provide Departmental Representative with certified copy of test report of FRP reinforcing, minimum 3 weeks prior to beginning reinforcing work.

.1 Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.
.2 Substitute different size bars only if permitted in writing by Departmental Representative.

1.6 QUALITY CONTROL

.1 Manufacturing process to be in accordance with ISO 9001 Certified from delivery of raw materials to shipping of bars.

.2 A control plan for monitoring sampling procedures and testing of raw materials and final products along with production documentation shall be made readily available upon request from Departmental Representative.
.1 Manufacturer to keep records of :
.1 Raw materials and approvals,
.2 Polymer Mixture proportions,
.3 Inspection dates and findings,
.4 Certificates of Compliance.

.3 Each production lot shall be tested in accordance with but not limited to following standards:
.1 CSA S806 - Annex C,L & G,
.2 ASTM D7914,
.3 ASTM D2584,
.4 ASTM D3171 - procedure G,
.5 ASTM D570,
.6 ASTM D3418,
.7 ASTM E831.

.4 Manufacturer to confirm and provide upon request, all qualification test results and documents carried out by third party testing firm.
.1 Certificates of Compliance to be signed by manufacturer and include:
.1 Bar size,
.2 Grade,
.3 Type of Resin,
.4 Type of Fibre,
.5 Type of Manufacturing Process,
.6 Production Lot definition (Lot #),
.7 Linear Meter length produced per Lot,
.8 Start and End date of production run,
.9 Number of Samples Tested and results of each test including averages, Standard deviations, minimum tensile strengths, and modulus of elasticity,
.10 Deviations from standardized testing methods and explanations,
.11 Final statement of product acceptance based on design criteria,

1.7 TESTING

.1 Number of test samples to be in accordance to the requirements of each test methods listed in "QUALITY CONTROL" of this Section.

.2 Minimum Tensile Strength is defined as average minus three times standard deviation. Minimum Requirements:
.1 Straight Bars - 1000 MPa
.2 Bent Bars - 450 MPa (bent portions)

.3 Minimum Modulus of Elasticity to be defined as specified modulus of elasticity if coefficient of variation is smaller than 5%. If greater than 5%, then specified modulus of elasticity to be taken as average minus three times standard deviation. Minimum Requirements:
  .1 Straight Bars:
    .1 Low Modulus (LM): < 50GPa
    .2 Standard (std) Modulus: >50 GPa & <60GPa
    .3 High Modulus (HM): >60GPa
  .2 Bent Bars: >46 GPa (bent portions)

.4 Voids: No continuous voids as per ASTM D5117

1.8 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name, address and lot numbers on a durable label.

.3 Storage and Handling Requirements:
  .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
    .1 Prevent any coating or material build up on reinforcement bars that would adversely affect bond.
  .2 Replace defective or damaged materials with new.
  .3 GFRP is very flexible in comparison to steel bars; use appropriate equipment and support method when moving bundles of bars.

.4 At all times, protect bars from direct sunlight (or any other significant UV radiation source), and any other cause of damage.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Glass Fiber Reinforced Polymer (GFRP) Bars: Polymer Matrix reinforced by one type of reinforcement fibers - Glass.
  .1 Polymer: Vinyl ester resin and homogeneous throughout cross-section. Blended polymers of different resins are not permitted.
  .2 Reinforcement fibres: Fibres shall be supplied from continuous roving and be E-glass or ECR (Electrical/Chemical Resistance) glass fibres.
  .3 Surface Finish: GFRP reinforcement bars to have deformed surface (preferable) or sand coated finish.
  .4 Fillers: Use of inorganic fillers is not permitted.
  .5 Additives: May be used in manufacturing of the GFRP polymer and be appropriate to resin system used and specified application as indicated. Any additives used are to be submitted and accepted by Departmental Representative.
  .6 GFRP bars to be of standard or higher tensile and modulus mechanical properties as indicated, (Std or HM).

.2 Wire ties:

.1 Galvanized wire ties to ASTM A1060/A1060M-14 or ASTM A525.
.2 Epoxy Coated Wire Ties to ASTM A884.
.3 Nylon Ties.

.3 Form Ties: Use plastic or Nylon form ties.

.4 GFRP reinforcing bars to have equivalent or longer development length than standard black steel reinforcement.
.1 Minimum overlap length of 40 diameters of bar is required when overlapping bars to obtain longer lengths.

.5 Contractor to not substitute GFRP reinforcing bars for steel reinforcing bars on an equal area basis without consultation with manufacturer and Departmental Representative.

2.2 FABRICATION

.1 Fabricate GFRP reinforcing bars in accordance with CAN/CSA-S806-12(R2017), CAN/CSA-S6-14, CSA-S807-10(R2015) and reference Reinforcing Steel manual of Standard Practice by the Reinforcing Steel Institute of Ontario where applicable.

.2 Obtain Departmental Representative's approval for locations of reinforcement splices.

.3 Packaging and shipping:
.1 Identification:
.1 GFRP straight bars to be individually marked so that size, lot number and name of manufacturer are easily identified on bundles and bars.
.2 GFRP bent bars to be bundled by type and dimension and each bundle properly identified with durable labels. Bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

.4 Shop Bending:
.1 All GFRP Bars are made of thermo set resin.
.1 Bending must be carried out before full curing of uncured bars. Alterations after setting are not possible.
.2 Shape bent bars with gradual transitions and in accordance to allowable bend angles as per manufacturers’ requirements.

PART 3 - EXECUTION

3.1 FIELD BENDING

.1 Do not field bend GFRP reinforcement.

3.2 PLACING REINFORCEMENT

.1 Place GFRP reinforcing bars as indicated on reviewed placement drawings and in accordance with CSA-A23.1/A23.2 and RSIC, unless otherwise indicated.

.2 Field cutting: field cut GFRP bars with high speed grinding cutter or saw. Do not shear bars.

.3 Secure GFRP bars in formwork to prevent displacement by concrete placement or workers.

.4 Use plastic or non-corrosive chairs to place GFRP bars as indicated. Verify with manufacturer regarding support distance between chairs as GFRP is more flexible than standard steel reinforcement.

.5 Splicing:
.1 Use Lap splices, whenever continuity is required in reinforcement.
.2 All lap splices to be Class B, unless otherwise noted.

.6 Prior to placing concrete, obtain Departmental Representative's acceptance of reinforcement bars and position.

.7 Ensure concrete cover for reinforcement is maintained during concrete placement, as indicated on drawings.

.8 Protect GFRP portion of bars with covering during handling and placement.

.9 Do not exceed placing tolerances as specified in CSA A23.1/A23.2 and A23.3.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for Cast-in-Place concrete placed as described by the drawings and the specifications.

.2 Blended hydraulic cement type GU or GUb for cast-in-place concrete is specified for use at all non-mass concrete pours at all reinforced concrete structures.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01.

.2 Work covered by this section will be paid for under payment items included in the Unit Price Table:
- .1 Item No.4 – Class I Concrete:
  - .1 Concrete for use in the refacing portions of the Canal wall.

.3 All labour, equipment and materials for cast-in-place concrete including incidentals, complete as specified, shall be included in the applicable unit price for concrete work.

.4 Cast-in-place concrete will be measured in cubic metres calculated from neat dimensions indicated on drawings or authorized in writing by Departmental Representative. Concrete placed beyond dimensions indicated will not be measured.

.5 No deductions will be made for volume of concrete displaced by reinforcement.

.6 Include in the prices of concrete:
- .1 Bonding agent.
- .2 Installation of all items embedded therein.
- .3 Work described in Section 03 10 00.
- .4 Heating, cooling, hot and cold weather protection, curing, and finishing, including provision for pre-heating of existing substrate prior to casting.
- .5 Supply and installation of waterstops.
- .6 Supply and installation of joint filler, bond breaker/backer rod and joint sealer.
- .7 Reinforcing fibre content.

.7 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.

.8 Temporary enclosures and heating are included for payment under Section 01 56 00.

1.3 RELATED WORK

.1 Section 03 10 00 - Concrete Forming and Accessories.

.2 Section 03 25 13 – GFRP Concrete Reinforcement.

.3 Section 31 23 15 - Excavating and Backfilling.

1.4 REFERENCE STANDARDS

.1 Abbreviations and Acronyms:
- .1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.
  - .1 Type GU, GUb and GUL - General use cement.
  - .2 Type LH, LHb and LHL - Low heat of hydration cement.
- .2 Fly ash:
  - .1 Type F - with CaO content less than 15%.
  - .2 Type CI - with CaO content ranging 15 to 20%. from
  - .3 Type CH - with CaO greater than 20%.
- .3 GGBFS - Ground, granulated blast-furnace slag.
- .4 FRC - Fiber-Reinforced Concrete.
  - .1 GFRC - Glass Fiber-Reinforced Concrete.
- .5 PVAF - Polyvinyl Alcohol Fibers.

.2 Canadian Standards Association (CSA International)
- .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CAN/CSA-A3000-18, Cementitious Materials Compendium:
  - .1 CAN/CSA-A3001-13, Cementitious Materials for Use in Concrete.
  - .2 CAN/CSA A3002-13, Masonry and mortar cement.
  - .3 CAN/CSA A3003-13, Chemical test methods for cementitious materials for use in concrete and masonry.
  - .4 CAN/CSA A3004-13, Test methods and standard practices for cementitious materials for use in concrete and masonry.
  - .5 CAN/CSA A3005-13, Test equipment and materials for cementitious materials for use in concrete and masonry.
- .3 CAN/CSA-S806-12(R2017), Design and Construction of Building Structures with Fiber-Reinforced Polymers.
- .4 CAN/CSA-S807-10 (R2015), Specification for Fiber-Reinforced Polymers.
- .5 CAB/CSA G30.18, Billet Steel Bars for Concrete Reinforcement.
- .6 CAN/CSA A283-06 (R2016), Qualification Code for Concrete Testing Laboratories.

.3 American Society for Testing and Materials International (ASTM)
- .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
- .2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- .3 ASTM C494/C494M-11, Standard Specification for Chemical Admixtures for Concrete.
- .4 ASTM C1017/C1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- .5 ASTM C1059, Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
- .6 ASTM C1116/C1116M-10a (2015), Standard Specification for Fiber-reinforced Concrete.
- .7 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers- Tension.
- .8 ASTM D570-98(2005), Standard Test Method for Water Absorption of Plastics.
- .9 ASTM D624-00(2007), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
- .10 ASTM D638-08, Standard Test Method for Tensile Properties of Plastics.
- .11 ASTM D746-07, Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.

.12 ASTM D747-08, Standard Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam.
.13 ASTM D1752-04a (2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

1.5 SUBMITTALS

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

.2 Shop Drawings:
.1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and necessary details of reinforcing.
.2 Submit drawings showing formwork and falsework design to CSA A23.1/A23.2.
.3 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

.3 At least two (2) weeks prior to commencing the work, provide the Departmental Representative a concrete design mix that meets the specifications. Include submittals for:
.1 Curing compound;
.2 Joint Filler and Sealant;
.3 Fibers;
.4 Waterstops.

.4 At least three (3) weeks prior to commencing concrete work submit to the Departmental Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that the following materials will meet specified requirements and are compatible:
.1 Portland cement.
.2 Supplementary cementing materials.
.3 Shrinkage compensating grout for concrete repairs.
.4 Admixtures.
.5 Aggregates
.6 Water.

.5 At least two (2) weeks prior to beginning Work, provide Departmental Representative a cold weather protection plan for concrete.

.6 Concrete Pours: Provide accurate records and documentation of poured concrete items indicating date, location, quality, air temperature and test samples taken.

.7 Contractor to provide third party concrete testing through Quality Control Agency, upon delivery of concrete to site, for all pours greater than 10 cubic metres. Contractor to submit to Departmental Representative third party testing firm information for approval prior to any concrete placement.

.8 Provide testing inspection results and reports for review by Department Representative and do not proceed without written approval when deviations from mix design or parameters are found.

.9 Provide two (2) copies of WHMIS MSDS in accordance with Sections 01 35 29 - Health and Safety and 01 35 46 – Archaeological, Cultural and Environmental Procedures.

1.6 QUALITY CONTROL AND ASSURANCE

.1 Three (3) weeks prior to starting concrete work, provide valid and recognized

certificate from plant delivering concrete.

.2 Quality Control Plan: Provide written report, minimum 3 weeks prior to starting concrete work, to Departmental Representative verifying compliance that concrete in place meets performance requirements. Provide proposed quality control procedures for review by Departmental Representative on following items:
- .1 Falsework erection.
- .2 Hot weather concrete.
- .3 Cold weather concrete.
- .4 Concrete consolidation through vibration.
- .5 Curing.
- .6 Finishes.
- .7 Formwork removal.
- .8 Maintaining an environment for concrete curing.
- .9 Preparing works to receive concrete including achieving an acceptable environment and substrate temperature.

.3 Manufacturer's Qualifications:
- .1 Ready mix concrete supplier: member in Good standing of Ready Mix Concrete Association of Ontario (RMCAO). Batching plant facilities are required to maintain RMCAO special Seal of Quality.
- .2 Batching and delivery facilities: Facilities capable of producing minimum of 50m^3/h, conforming to requirements of CAN/CSA A23.1/A23.2.

.4 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1/A23.2,and that mix design is adjusted to prevent alkali aggregate reactivity problems.

.5 Defective concrete:
- .1 Strength acceptance criteria from cylinder tests will be in accordance with CAN/CSA A23.1/A23.2 except as follows:
  - .1 Concrete shall be considered defective for concrete placements less than 200 m^3 when a cylinder test fails to meet specified strength. In such cases, concrete in that section may be checked by Departmental Representative by core specimens drilled and tested in accordance with CAN/CSA A23.2. All concrete core extraction and testing shall be conducted by a third party inspection company with a CSA certified testing laboratory with Category I certification.
  - .2 Strength acceptance criteria from core specimens will be in accordance with CAN/CSA A23.1/A23.2.
  - .3 Consider concrete defective if it is structurally unsound, lacks moisture resistance, or is honeycombed or improperly finished, as determined by the Departmental Representative.
  - .4 The Departmental Representative has the right to require replacement, strengthening or correction of impacted portions of defective concrete structure to acceptance of the Departmental Representative.
    - .1 Contractor to bear all cost of rectifying defective concrete including inspections, design, coring, testing, strengthening, demolition, and replacement. Bear investigation and evaluation cost even if further evaluation of design allows unit to be classed as acceptable concrete.

.6 Records:
- .1 Before unloading at Site, have concrete producer submit to the Departmental Representative a delivery ticket (with each batch of concrete) on which is printed, stamped or written the following information:
  - .1 Name and location of batching plant.

.2 Date and serial number of ticket.
.3 Name of Contractor.
.4 Specific designation of job (name and location).
.5 Approved mix code, specified strength, and specific class or designation of concrete indicated in Concrete Mixes article specified.
.6 Amount of concrete in cubic meters.
.7 Truck number, cumulative total, and/or load number.
.8 Time loaded or time of first mixing of cement and water/aggregate.
.9 If water added on site, show amount and have this information initialed by the Departmental Representative.

.2 Include the following information, which is to be registered by producer's representative on at least two copies of the delivery ticket, after discharge has been completed:
.1 Time that load arrived on Site.
.2 Time that discharge of load was started.
.3 Time that discharge of load was completed.
.4 Type and amount of admixtures, if added on Site.
.5 Amount of water, if added on Site.
.6 Location of placed concrete and any issues encountered.
.7 Volume of concrete returned.

.3 Maintain accurate records of cast-in-place concrete elements. Include in records the following information:
.1 Date of placing concrete element.
.2 Location of concrete element.
.3 Specified strength of concrete.
.4 Air and form temperature when concrete was placed.
.5 Temperature of concrete when placed in the form.
.6 Test samples taken and results of test samples.

.7 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: Concrete hauling time: maximum allowable time limit for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.
.1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative, laboratory representative and concrete producer as described in CSA A23.1/A23.2.
.2 Deviations to be submitted for review by Department Representative.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

.3 Packaging Waste Management:
.1 Remove for return and reuse by manufacturer, pallets, crates, padding and packaging materials in accordance with Section 01 74 20.
.2 Provide an appropriate area on the job site where concrete trucks can be safely washed.
.3 Unused admixtures and additive materials must not be disposed of into sewer systems, onto ground or in other location where they will pose a health or environmental hazard.

.4 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid

with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.2 Ensure emptied containers are sealed and stored safely.

.3 Divert unused concrete materials from landfill to approved facility, as reviewed by Departmental Representative.

1.9 REQUIREMENTS OF REGULATORY AGENCIES

.1 Conform to municipal, provincial and national codes relating to design and construction of formwork.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

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

2.2 PERFORMANCE CRITERIA

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

.2 Shrinkage performance to comply with CSA A23.1/A23.2 requirements for low shrinkage concrete.
- .1 Concrete shall be prequalified by testing in accordance with CSA A23.2-21C - Test Method for length change of hardened concrete.
- .2 Linear shrinkage at 28 days must not exceed 0.04% if prisms with a cross-section of 75 x 75 mm are used, or 0.035% if prisms with a cross-section of 100 x 100 mm are used.
- .3 Contractor to submit results of prequalification test prior to first concrete placement. Submittal of previously completed laboratory testing done in the past for proposed or similar concrete mix will not be accepted by Departmental Representative.

2.3 APPROVALS

.1 All concrete mixes to be approved by the Departmental Representative.

2.4 MATERIALS

.1 General:
- .1 Do not use calcium chloride or compounds, or admixtures containing calcium chloride.
- .2 Use consistent concrete ingredients, uniformly proportioned from batch to batch.

.2 General Use hydraulic Cement: to CAN/CSA-A3001, Type GU or GUb for use at all non-mass concrete pours at all reinforced concrete structures.

.3 Supplementary cementing materials: with 20% to 30% hydraulic slag, by mass of total cementitious materials to CAN/CSA-A3001 and CAN/CSA-A363.

.4 Water: to CAN/CSA-A23.1/A23.2.

.5 Aggregates: to CAN/CSA-A23.1/A23.2 hard, dense, well graded aggregates of normal mass-density, approved by the Departmental Representative both as to quality and source:
- .1 Aggregates to be free from materials identified as having deleterious reactions with certain constituents of cements. Minimal amounts of these reactive materials will be given consideration for inclusion - the basis of consideration will be:
  - .1 Conformance to the requirement of CAN/CSA-A23.1/A23.2; and/or
  - .2 The performance criteria as given in Clause 5.9 of CAN/CSA-A23.1/A23.2.

.6 Admixtures:
- .1 Air entraining admixture: to ASTM C260.
- .2 Chemical admixture: to ASTM C494/C494M, Specification for Chemical Admixtures for Concrete.
- .3 Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.7 Non-premixed (dry pack) grout for formwork cone packing: composition of nonmetallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing a minimum compressive strength of 35 MPa at 28 days.

.8 Curing compounds and other curing materials: to CAN/CSA-A23.1/A23.2 and to ASTM C309.

.9 Bonding agent: to ASTM C1059.

.10 Other concrete materials: to CSA-A23.1/A23.2.

.11 Anchor rods and cast-in anchors: to CSA-G40.21, Grade 300W, round bar stock threaded at one or both ends to receive a washer and nut.
- .1 All components shall be hot-dip galvanized to ASTM A123/A123M-09.

.12 Cold Drawn steel wire for Concrete Reinforcement: to CSA G30.13.

.13 Fibres: to ASTM C1116/C1116M-10a and CAN/CSA-S807-10.
- .1 13mm-50mm polypropylene Monofilament Macro - fibers with large Denier.
- .2 The following is a list of acceptable products:
  - .1 TUF-STrand SF, manufactured by The Euclid Chemical Company. Phone: 1-800-321-7628.
  - .2 Strux 90/40, Manufactured by Grace Construction Products, Phone: 1-877-423-6491.
  - .3 Nycon-XL-Plus100 or 200, Manufactured by Nycon Corp., Phone: 1-800-456-9266.
  - .4 Or equivalent product upon approval of Departmental Representative.

.14 Joint sealer: to CAN/CGSB-19.13 Sealing Compound, two component, elastomeric, chemical curing. Type I for horizontal joints, Type II for vertical joints.

.15 Polyethylene foam: use as bond breaker between joint filler and sealer as shown on drawings.

.16 Premoulded joint fillers: ASTM D7174-05 - New Standard Specification for Preformed Closed-Cell Polyolefin Expansion Joint Fillers for Concrete Paving and Structural Construction.

.17 Waterstop:
- .1 To be a flexible PVC (polyvinyl chloride) waterstop extruded from an elastomeric plastic material of which the basic resin is prime virgin polyvinyl chloride. The PVC compound shall not contain any scrapped or reclaimed material or pigment whatsoever.
  - .1 Performance requirements to meet:
    - .1 Tensile strength (ASTM D638) - 13.8 MPa (2000 psi) minimum.
    - .2 Tear resistance (ASTM D624) - 43.8 N/mm (225 lb/in).
    - .3 Hardness shore A 15 (ASTM D2240) - 76 to 81.
    - .4 Ultimate elongation (ASTM D638) - minimum 300%.
    - .5 Water absorption (ASTM D570) – 0.005% to 0.02% maximum.
    - .6 Low temperature brittleness (ASTM D746) - Passed @ -35°F/-37°C.
    - .7 Cold bend test at -45°C for 2 hours - no cracking.
    - .8 Stiffness in flexure (ASTM D747) - 4.8 MPa (700 psi).
    - .9 Specific gravity (ASTM D792) - 1.4.
    - .10 Accelerated extraction (CRD-C 572): tensile strength - 12.75 MPa (1850 psi), elongation - 350%
    - .11 Effect of Alkali (CRD-C 572): weight change - +0.1%, hardness change - +1 point.
  - .2 Waterstop type:
    - .1 For all vertical surfaces at construction and expansion joints of the new wall: ribbed with center bulb type having the following dimensions:
      - .1 Width: 230 mm.
      - .2 Thickness: 9.5 mm
    - .2 For all vertical surfaces at construction and expansion joints between new wall and existing wall: ribbed with center bulb type for retro-fitting:
      - .1 width of extension: 150mm
      - .2 Thickness: 5mm min.
    - .3 For all horizontal joint surfaces at construction joints between footing and wall:
      - .1 Width: 150mm.
      - .2 Thickness: 9.5mm
  - .3 The following is a list of acceptable products: New wall construction and expansion joints.
    - .1 Greenstreak PVC waterstop: model Type 706 manufactured by Greenstreak Inc., Phone:800-325-9504.
    - .2 DuraJoint PVC waterstop: model Type 9 manufactured by Durajoint Concrete Accessories, Phone:888-833-8308.
    - .3 or an equivalent alternative provided by Contractor for approval by Departmental Representative.
    - .4 Hydrophilic type waterstop will not be considered as an alternative to ribbed waterstops.

.18 Wire/nylon Ties for Concrete Reinforcement: Refer to Section 03 20 00 - Concrete reinforcing.

.19 Chairs, Bolsters, Bar Supports, Spacers: Adequate for strength and support of reinforcing construction conditions. Use non-corrodible materials for all concrete work which will be exposed to view in the finished work to CAN/CSA-A23.1.

2.5 CONCRETE MIX

.1 Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
- .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.

.2 Provide concrete mix to meet following plastic state requirements:
- .1 Uniformity: no segregation.
- .2 Placeability: provide the lowest slump compatible with the conditions of placement. Slump shall be measured at the point of discharge;
  - .1 For Refacing (coping of walls): 100 mm +/- 30 mm.
- .3 Workability: free of surface blemishes, loss of mortar, colour variations, segregation.
- .4 Finishability: to satisfaction of the Departmental Representative.
- .5 Set time: to conditions of pour and to acceptance of the Department Representative.

.3 Provide concrete mix to meet following hard state requirements:
- .1 Durability and class of exposure: C-1
- .2 Compressive strength at 28 days age: 35 MPa minimum.
- .3 Intended application: water retaining structure (Canal Wall).
- .4 Surface texture: all deformities repaired including tie-rods; sack rubbed to provide a uniform texture and colour.
- .5 Nominal size of coarse aggregate: 22-24 mm maximum.
- .6 Air content: 5-8%
- .7 Maximum water Cement ratio: 0.38
- .8 Fibers: minimum application rate of 1.8kg/Cu.M of concrete unless otherwise noted.
  - .1 In Accordance to Manufacturer's recommendations for application rate.
  - .2 Time of fibre application to be in accordance with manufacturer's recommendations.
- .9 Volume stability: acceptable volume change range due to shrinkage, creep and freeze thaw cycle.

.4 Admixtures: to approval of Department Representative and to the quantities in accordance with manufacturer's recommendation. Use admixtures to correct deficiencies in the mix or improve placement of concrete.
- .1 Department Representative may withdraw prior approval of admixture if conditions encountered during course of work indicate unsatisfactory results.
- .2 Do not use calcium chloride or materials containing calcium chloride.

.5 Weigh aggregates, cement, water and admixture separately when batching. No alternative method of measuring will be permitted.

.6 Concrete pumpability characteristic shall be sufficient for the selected equipment and shall be co-ordinated between the Contractor and the concrete supplier.

.7 Provide quality management plan to ensure verification of concrete quality to specified performance.

PART 3 - EXECUTION

3.1 GENERAL

.1 Ensure that reinforcing bars and anchors, and other necessary items are in-place, clean and undamaged.

.2 Notify the Departmental Representative at least two (2) working days in advance of each proposed concrete placement.

.3 Use proper and timely placing, finishing and curing practices.

3.2 PREPARATION

.1 Provide Departmental Representative forty-eight (48) hours' notice confirmation before each concrete placement. All reinforcing must be free of foreign debris and in place ready for inspection twenty-four (24) minimum prior to ordering concrete.

.2 Install all items to be embedded prior to commencement of work.

.3 Construct mortar-tight formwork in accordance with reviewed formwork drawings, maintain tolerances of finished concrete work as specified in CAN/CSA A23.1/A23.2.

.4 Ensure formwork, reinforcement and inserts are not disturbed during concrete placement.

.5 Prior to placing of concrete, obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.6 Pumping of concrete will be permitted only after confirmation and approval of equipment, mix design, proposed method of protection of concrete during placing and, curing in adverse weather.

.7 During concreting operations:
- .1 Concrete shall be compacted thoroughly and uniformly by means of internal vibrators, conforming to CSA A23.1, Clause 7.4.4.
- .2 Size and number of internal vibrators shall be based on rate of placement.
- .3 Development of cold joints not allowed.
- .4 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.8 Roughen surfaces of hardened concrete to full amplitude of 5mm minimum when required to bond with fresh concrete.

.9 Thoroughly clean all surfaces in contact with fresh concrete of all foreign material including ice, snow, and standing water prior to placement of new concrete.

.10 Prepare old concrete surface such that the surface is SSD (Surface Saturated Dry) prior to new concrete placement. Verify that there is no standing water prior to pour.

.11 Protect previous Work from staining.

.12 Clean and remove stains prior to application of concrete finishes.

.13 Maintain accurate records of poured concrete items; records to include but not

limited to:
.1 Date and time of placed concrete.
.2 Location of pour with reference to geodetic stations.
.3 Quality of concrete
.4 Air temperature and number of samples taken.

3.3 CONSTRUCTION

.1 Maintain required temperature of concrete substrate and ambient air within enclosure for duration of curing period recommended by manufacturer for dowel placement. Refer to 05 05 20.

.2 Concrete Substrate: For concrete placed when air temperature is at or below 5°C, pre-heat existing concrete substrate for a minimum period of 3 days. A minimum substrate temperature of 5°C is required 36 hours prior to placing concrete, and must be maintained until the concrete is placed.
.1 Protect concrete by a windproof shelter of canvas or other material. At no point let walls of shelter touch formwork. Provide sufficient space for removal of formwork for finishing. Supply approved heating equipment. Vent the products of combustion outside the protective shelter.

.3 Fibres:
.1 Comply with manufacturer's recommendations for adding and mixing requirements.
.2 Finished Concrete surface shall be a smooth surface with no exposed fibers.

.4 Joint fillers:
.1 Furnish filler for each joint in a single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
.2 Locate and form construction and expansion joints as indicated. Location of expansion joints, for refacing part of work, to coincide with existing joints. Install joint filler, bond breaker and sealer as indicated in drawings.

.5 Waterstops:
.1 Install waterstops at locations shown on the drawings and to CAN/CSA-A23.1/A23.2-14 and manufacturer's recommendations.
.1 Install waterstops to provide continuous water seal.
.2 Do not distort or pierce waterstop in any way as to hamper performance.
.3 Do not displace reinforcement when installing waterstop.
.4 As required, tie waterstops rigidly in place.
.5 Use only straight heat welded/sealed butt joints in field.
.6 Use factory welded corners and intersections unless otherwise approved by the Departmental Representative.
.7 Use adhesive and sealant as recommended by manufacturer for installation.

.6 Embedded parts:
.1 Set other embedded parts and openings as indicated or specified elsewhere (as required).
.2 Check locations and sizes of embedded parts and openings shown on drawings.

3.4 FORMWORK

.1 Construct mortar-tight formwork in accordance with reviewed formwork drawings,

Maintain tolerances of finished concrete work as specified in CAN/CSA-A23.1/A23.2.

.2 Where forms appear to be unsatisfactory, stop work until defects are corrected.

.3 Strip forms to CAN/CSA-A23.1/A23.2.

3.5 CONCRETE REFACING NEAR OR BELOW WATER/ICE LEVEL

.1 Dewater to allow for the completion of concrete repairs extending below the water or ice level, as shown on drawings, as required.

.2 Local dewatering will not be required during the drawdown period, but formwork may extend into the water for part of the work.

.3 Anticipate that water will either reach or come within 0.5 m of the wall during work period.

3.6 PLACING CONCRETE

.1 Place concrete continuously from start to finish:
- .1 At such rates as to permit satisfactory placing and compaction; plan the work and use such methods and performance rates as to allow no cold joints and/or honeycomb;
- .2 During clement weather or with protection;
- .3 During daylight hours;
- .4 Without unscheduled construction joints.

.2 When pumping of concrete is authorized by Departmental Representative:
- .1 Coordinate with concrete supplier selection of appropriate pumping equipment for approved concrete mix and placement application. Refer to sub-section 2.5 – Concrete Mix.
- .2 Arrange equipment so that no vibrations result which might damage freshly placed concrete. Use reversible pumps.
- .3 Operate pump so that a continuous stream of concrete without air pockets is produced.

.3 When pumping is discontinued and concrete remaining in pipe line is to be used, void pipe line in a manner that prevents contamination of concrete or separation of ingredients.

.4 Consolidate concrete with high speed internal vibrators.

.5 Do not commence placing concrete until the Departmental Representative has inspected and approved forms, falsework, reinforcing steel, conveying, spreading, consolidation and finishing equipment, and curing and protective methods.

.6 Structural items:
- .1 Do not place load upon finished structural items or any portions thereof until authorized by Departmental Representative.
- .2 Except as approved by Departmental Representative on the basis of tests, the minimum curing time is to be 7 days.

3.7 INSERTS

.1 Cast in drains, sleeves, ties, anchors, reinforcement, waterstops, pipes, joint fillers and other inserts required to be built-in.
- .1 Sleeves and openings greater than 100mm X 100mm not indicated, must be reviewed

by the Departmental Representative.

.2 Do not permit penetrations, sleeves, or other openings to pass through walls, except where approved by the Departmental Representative.

.3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from the Departmental Representative before placement of concrete.

3.8 FINISHING

.1 Finishing of unformed surfaces shall commence after the bleed water has disappeared and when concrete has stiffened sufficiently to prevent the working of excess mortar to the surface. Use procedures in accordance with CSA A23.1/A23.2 to remove excess bleed water, where required. No additional water shall be used to facilitate finishing.

.2 Initial finishing: to CAN/CSA-A23.1/A23.2 clause 22.3, screed unformed surfaces true to grade and free of surface irregularities exceeding 5 mm under a 3 m straightedge placed in any direction on the plane surface.

.3 Final finishing: float and trowel to CAN/CSA A23.1/A23.2 clause 7.6.4.2 and 7.6.4.3.

.4 Unformed surface concrete tolerance to conventional classification in accordance with straight edge method, to A23.1/A23.2, table 22, class B.

.5 For formed surfaces, use only smooth-form facing material to produce a smooth, hard and uniform texture on concrete.

.6 Acceptable site reference sample for purposes of comparison in assessing compliance with the smooth-form finish, required for this project, will be established by Departmental Representative.

.7 Apply smooth-rubbed finish on all surfaces where bug-holes are greater than 8 mm in diameter. Undertake sack-rubbed finish as soon as the surface is accessible, that upon stripping the forms. Do work in accordance with CSA 23.1/CSA A23.2, clause 7.7.4.2 "Sack-Rubbed Finish".

.8 Tie holes and surface defects beyond the acceptable level, as identified in the reference sample, shall be patched. All fins shall be completely removed.

.9 Complete patching of form-tie holes, cutout areas, and cavities to CAN/CSA A23.1-14 Clause 7.9.3 using materials that matching in colour with concrete surface.

3.9 PROTECTION AND CURING

.1 For concrete placed when air temperature is at or below 5°C, in addition to cold weather requirements of CAN/CSA-23.1/A23.2:
  .1 Protect concrete by means of windproof shelter of canvas or other material to allow free circulation of inside air around fresh concrete. Do not permit walls of shelter or any point of shelter to touch formwork or concrete surface.
  .2 Supply approved heating equipment. Vent the products of combustion outside the protective shelter. Equipment shall be capable of keeping inside air at a constant temperature sufficiently high to maintain concrete at following curing temperatures:
    .1 For an initial 3 days, a temperature of not less than 15°C not more than 27°C, as measured at concrete surfaces.

.2 For the following 4 days of the curing period, at a temperature of not less than 10°C and not more than 30°C for a concrete thickness of between 0.3 m and 1 m.

.3 Keep concrete surfaces moist continuously while protected.

.4 Reduce temperature at a rate not exceeding 10 degrees Celsius per day until outside temperature has been reached.

.2 For concrete placed when the air temperature is at or above 27°C, provide the hot weather protection and protection from drying required by Clause 7.4.1.2 and 7.4.1.4 of CAN/CSA-A23.1-14. Ensure concrete temperatures at placing meet the requirements of Table 14, Page 131. Take suitable control measures when mixing ingredients.

.3 Unformed surfaces: cure with burlap and water. Presoak burlap by immersing in water for 24hr period prior to placement. Carefully place two layers of damp burlap on surface of concrete. Overlap each strip by at least 150 mm and secure against displacement by wind. Maintain burlap in place and keep thoroughly wet for seven (7) days after day of placing.

.4 Formed surfaces: if formwork is left in place for seven (7) days or more, no additional curing will be required. If formwork is removed in less than seven (7) days, cure in manner specified for unformed surfaces for remainder of seven day period.

.5 During curing period uncover only such areas that are immediately needed for finish treatment. Recover and continue curing.

.6 Submit a temperature Control Plan to the Departmental Representative a minimum seven (7) days prior to commencement of placing any concrete that requires temperature control, for review of compliance with contract requirements.

.1 Plan shall include, as a minimum, the following:

.1 Concrete elements of which the plan applies.

.2 Temperature monitoring system, including the location and depth, number of thermocouples, and frequencies of recordings to be used in each placement.

.3 Method of ensuring concrete temperature and temperature difference are maintained for the duration of the protection period.

.4 Any alterations to work schedule, production, delivery schedule, and time of placement for temperature control purposes.

.5 Any modifications to mix design for temperature control purposes.

.6 Any other specific measures to be taken.

.7 In addition, for concrete subject to cold weather, the temperature control plan shall include the following:

.1 Type of insulation, R Value and number of layers, including test data verifying the R Value. The submission for cold weather protective measures shall be accompanied by samples of insulation, if requested by the Departmental Representative.

.2 Type and layout of heaters and type and extent of housing.

.8 Temperature record:

.1 Data logger temperature records and a record of any actions taken to maintain control of temperature and temperature difference shall be forwarded to the Departmental Representative at the end of each working day during the temperature monitoring period. At the end of the temperature monitoring period, the Contractor shall submit to the Departmental Representative a complete temperature record, including graphical plot of temperature versus time.

3.10 TEMPERATURE MONITORING

.1 The Contractor shall monitor the concrete and ambient temperature for:
  .1 Any concrete subject to cold weather.

  .2 Thermometers capable of temperature recording for concrete temperature measurement shall be installed prior to placing concrete. Thermometers for monitoring ambient air temperature shall be installed in the shade close to the surface of the concrete at a minimum frequency of two (2) thermometers per every two wall segment lengths.

  .3 Recording of concrete temperature shall begin at the start of placement. The Temperature shall be recorded automatically at intervals no greater than 1 hour until the end of the monitoring period. The monitoring period shall be equal to the seven (7) day curing period.

  .4 The Contractor shall take necessary action to maintain the temperature within the specified limits.

  .5 The Departmental Representative shall be provided access to verify temperature readings. The digital temperature indicators shall be left in place until the end of the monitoring period.

3.11 BONDING AGENT

.1 Apply two coats of bonding agent on all sawcut faces.

.2 Follow the manufacturer's instructions for application.

3.12 EXPANSION JOINTS

.1 Install premoulded joint filler in expansion joints full depth, as indicated in Contract documents and to CSA A23.1/A23.2.

3.13 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review: to CSA-A23.1/A23.2.
  .1 Laboratory to be certified to CSA A283.
  .2 Testing to include:
    .1 Air content
    .2 Slump
    .3 Temperature upon delivery
    .4 Collection of test cylinders
      .1 Four cylinders as per CSA-A23.1/A23.2: one 7-day field cured, one 7-day lab cured, two 28-day lab cured.

.2 Departmental Representative will pay for costs of quality Control testing.

.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.

.4 If tests do not meet requirements of the Departmental Representative, take such measures as indicated in CAN/CSA-23.1/23.2, and approved by the Departmental Representative.

.5 Inspection or testing by Departmental Representative or third party service provider will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

3.14 CLEANING

.1 Use trigger operated spray nozzles for water hoses.

.2 Designate cleaning area for tools to limit water use and runoff.

.3 Cleaning of concrete equipment to be done in accordance with Section 01 35 46.

.4 Designate method of capturing unused or waste concrete and bleed water.

.5 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies requirements for drilling dowel anchor holes, and supply and installation of dowel anchors, including epoxy adhesive system and greasing, as indicated on drawings and in specifications.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01.

.2 The work of the anchor installation will be paid for under payment item included in the Lump Sum Cost Price with the GFRP reinforcements:
  .1 Anchor Dowels – Type D1 – per unit anchor installed.
  .2 Anchors Dowels – Type D2 - per unit anchor installed.

.3 Work for dowel anchors includes: drilling hole in concrete base material; supplying and placing anchors; and supplying and placing the anchor epoxy, as per manufacturer's recommendations and requirements.

.4 Housing and heating are included in the Lump Sum Cost.

.5 All other work necessary for the completion of the work of this section will not be measured separately for payment, but will be considered as incidental to the work of this section.

1.3 RELATED SECTIONS

.1 Section 03 25 13 - GFRP Reinforcing.

PART 2 - PRODUCTS

2.1 MATERIALS- GENERAL

.1 Use materials approved by the Departmental Representative.

.2 Anchors to be complete with all accessory parts as specified by the manufacturer, and additional accessories indicated on the drawings or described in the specification.

.3 All anchors GFRP components of the anchor.

2.2 DOWEL ANCHORS

.1 GFRP – Glass fiber Reinforced Polymer with a minimum guaranteed tensile strength (T) and minimum tensile modulus of elasticity (E) as follows:
  .1 25M – High modulus (HM)– >249 kN (Tu) and 64.1 GPa (E).
  .2 15M – HM rebar anchor with anchor head shall have a minimum guaranteed pull out strength (Fp) of 80kN.

.2 Adhesive type anchors with epoxy acrylate resin. Polyester resins will not be accepted.

.3 GFRP bars shall have a sand coating and a development length equal to an equivalent steel reinforcing bar.

.4 Refer to drawings for minimum specified embedment depth.

.5 Size and location:
.1 Type D1 – 25M (#7 GFRP –std Type II) bars with GFRP anchor head, for main refacing anchorage.
.2 Type D2 – 15M (#5 GFRP – Type III) bars with GFRP anchor heads, for all refacing.

2.3 EPOXY GROUT

.1 Acrylic Epoxy Adhesive: winter-grade, pre-packaged, two component adhesive consisting of base resin and fast set hardener, mixed when dispensed from dual chamber cartridge.
.1 Cold weather or hot weather: Select weather appropriate formulated epoxy for fast curing and installation for conditions at time of placement. Temperature ranges for base material from -23°C to +40°C.
.1 Acceptable product: Hilti HIT-ICE or HIT-HY 150 or approved alternative.

PART 3 - EXECUTION

3.1 GENERAL

.1 Except as specified in this section, install to the manufacturer's recommendations.

.2 For all dowel anchors: provide housing and heating for anchors as required. Maintain temperature of concrete substrate and ambient air within enclosure for duration of curing period recommended by manufacturer.

.3 Drill anchor holes using rotary or core drilling equipment. No percussion drilling will be allowed.
.1 If rotary drilling equipment causes damage, use diamond core drilling equipment or provide alternative method to Departmental Representative for approval.

.4 Minimum substrate temperature shall be maintained above 5° Celsius minimum, prior to grouting.

.5 Drilled holes must be completely filled with epoxy grout. Use appropriate mixer filler tube and extensions to ensure proper installation of adhesive.

.6 Twist during installation and slowly insert fastener ensuring that enough adhesive was used. Some adhesive should overflow.

.7 Do not disturb anchor between specified gel times and cure time.

.8 Anchors may vary in length. Cut to lengths as indicated and as required.

3.2 EXPANSION DOWELS

.1 Drill holes in concrete substrate to grout manufacturer’s recommendations.

.2 Clean holes thoroughly of dust and debris.

.3 Sizes and location as indicated.

.4 Grout dowel by completely filling hole with epoxy prior to placing dowel.

.5 Support dowel in position until epoxy has set.

.6 Allow epoxy to set completely prior to placing new concrete.

.7 Grease indicated end of dowel to prevent bond and apply dowel expansion cap immediately prior to placing concrete.

3.3 CONTROL PLAN

.1 Contractor to provide documentation from supplier related to sampling and testing of raw materials and final products. Monitoring of the manufacturing process shall be done in a way that ensures consistent performance of the product throughout the production run.
    .1 Manufacturer shall keep records of:
        .1 raw material approvals,
        .2 polymer mixture proportions,
        .3 inspection at varying stages of production,
        .4 Certificates of compliance.

.2 Departmental Representative may request testing and inspection of anchors to confirm that the products comply with the requirements in this document.

3.4 MANUFACTURERS' SPECIFICATIONS

.1 Keep a manual of manufacturer's specifications and installation procedures at the work site.

END OF SECTION

PART 1- - GENERAL

1.1 DESCRIPTION

.1 This section specifies requirements for the fabrication and installation of the Canal channel handrail system and includes:
- .1 supply and installation of new line posts;
- .2 supply and installation of new expansion posts;
- .3 Supply, surface coating and installation of handrail, epoxy anchors, and all associated components.

1.2 RELATED WORK

.1 Section 02 41 21 - REMOVALS.

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01.

.2 Work covered by this section will be paid for under payment items included in the Unit Price Table:
- .1 Item No.5 - Line Posts: This item covers the work described in subsection 1.1.1.1.
- .2 Item No.6 - Expansion Posts: This item covers the work described in subsection 1.1.1.2.
- .3 Item No.7 - Pipe Railing: This item covers the work described in subsection 1.1.1.3.

.3 All other work, necessary to the completion of the work of this section, will not be measured separately for payment, but will be considered as incidental to the work of this section.

1.4 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Shop Drawings:
- .1 Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

.3 Submit sample for review and acceptance of aluminum fabrication material and techniques by Departmental Representative:
- .1 Rail Sample: 300mm long, Straight section of 48mm diameter aluminum pipe rail with 60mm diameter fixed collar and lock collar, powder coated finish after fabrication. Install lock scree into lock collar.

.4 Submit mock-up of line and expansion post finish for review and acceptance by Departmental Representative:
- .1 Submit two (2) sample panels (300X300X25mm) of post finish to compare with texture of existing posts and as reference for new cast units.

1.5 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).

.1 ASTM B210, Specification for Aluminum and Aluminum –Alloy Drawn Seamless Tubes.
.2 ASTM B221-14, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
.3 ASTM B241/B241M-16, Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
.4 ASTM C260/C260M – 10a (2016), Standard Specification for Air-Entraining Admixtures for Concrete.
.5 ASTM C494/C494M-16, Standard Specification for Chemical Admixtures for Concrete.
.6 ASTM C1017/C1017m-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
.7 ASTM B429/B429M-10e1, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
.8 ASTM E935-13e1, Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
.9 ASTM B209/B209M-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
.10 ASTM F593-17, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
.11 ASTM F3125/F3125M - 15a, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
.12 ASTM A767/A767M-16 Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement

.2 CSA International
.1 CSA S157-05/S157.1-05 (R2015) - Strength Design in Aluminum / Commentary on CSA S157-05, Strength Design in Aluminum
.2 CSA W59.2-M1991 (R2013), Welded Aluminum Construction.
.3 CSA W47.2-11 (R2015), Certification of companies for fusion welding of aluminum.
.4 CSA W48-14 Filler Metals and Allied Materials for Metal Arc Welding.

.3 Aluminum Association (AA)
.1 Designation System for Aluminum Finishes.

.4 American Architectural Manufacturers Association (AAMA)
.1 AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.
.2 AAMA 2604-10, Voluntary Specification, Performance Requirements and test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.

.5 National Association or Architectural Metal Manufacturers (NAAMM)
.1 NAAM AMP 500-06, Metal Finishes Manual.

.6 Health Canada/ Workplace Hazardous Materials Information System (WHMIS)
.1 Materials Safety Data Sheets (MSDS)

.7 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.

.8 Canadian Highway Bridge Design Code (CHBDC)
.1 S16.1-14, Commentary on S6-14.

1.6 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:
- .1 Store materials off ground and in accordance with manufacturer's recommendations.
- .2 Replace defective or damaged materials with new.

1.7 QUALITY ASSURANCE

.1 Departmental Representative to inspect and accept rails, gates and railing turn downs prior to anodizing and coating system finish.

1.8 SAMPLES

.1 Submit two (2) 300mm long finished samples of each type of treatment.
- .1 Finished coating system.

PART 2 - PRODUCTS

2.1 CONCRETE POSTS

.1 Cement: to CAN/CSA-A3001, Type GU.

.2 Supplementary cementing materials: to CAN/CSA-A3001.

.3 Water: to CAN/CSA-A23.1.

.4 Aggregates; to CAN/CSA-A23.1/A23.2.
- .1 No. 2 Green Madoc aggregate;
- .2 River wash sand or martar sand.

.5 Air-Entraining admixtures: to ASTM C260.

.6 Chemical admixtures: to ASTM C494.

.7 Superplasticizer: to ASTM C1017.

.8 Anchor bolt for line and expansion posts: high-strength bolts to ASTM F3125/F3125M -18, hot dip zinc coating.

.9 Adhesive type anchors with epoxy acrylate resin. Polyester resins will not be accepted.

.10 Reinforcing steel: billet steel, grade 400W, deformed bars to CAN/CSA-G30.18, galvanized, unless indicated otherwise.

.11 Cold-drawn annealed steel wire ties: to CSA G30.3.

.12 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.

.13 Galvanized reinforcement: to
  .1 ASTM A123/A123M-17.
  .2 ASTM A767/A767M-16.

.14 Bar bending shall be done prior to galvanizing and conform to standard ASTM A767/A767M-16.

.15 Zinc coating thickness shall be a minimum mass of 610g/m2 per surface coated.

.16 All galvanized reinforcement must receive a chromate treatment.

.17 Construction adhesive: Compatible with concrete and rubber.

2.2 CONCRETE MIX

.1 The concrete mix will be in accordance with CAN/CSA-A23 and as per the following
  .1 Exposure class: C-1.
  .2 Aggregates: No. 2 Green Madoc aggregate with river wash sand or mortar sand.
  .3 Minimum compressive strength: 35 MPa @ 28 days.
  .4 Minimum cement content: 360 kg/m3
  .5 Maximum Water/Cement ratio: 0.4.
  .6 Slump: 70 (+-) 20 regardless of location of placement.
  .7 Air content: 6.5% (+-) 1.5%.
  .8 Admixtures subject to Departmental Representative's approval.
  .9 Cement: type GU Portland cement.

2.3 PIPE HANDRAIL

.1 Railing pipes, Sleeves and collars: Aluminum to ASTM B221-14 and ASTM B241/B241m-16, Alloy 6061-T6, Schedule 80.

.2 Base Plates and Gate Accessories: Aluminum to ASTB B209/B209M-14, Alloy 6061-T6.

.3 Anchor Bolt and Hex Nut: Stainless Steel to ASTM F593-17, Type 316.

2.4 PAINT SYSTEM - PIPE HANDRAIL

.1 Powder Coating:
  .1 All handrail pipe and other components shall be finished with black thermoplastic organic coating by powder coat application.
  .2 Prior to powder coating, all surfaces to be chemically cleaned and treated and prepared in accordance to AAMA 2604. Multistage phosphate conversion coating may be used.
    .1 Mechanical preparation – (SSPC-SP6) 2-3 mils (51-76 microns) anchor profile using clean, sharp edged blast media. Properly preparing parts prior to powder coating is essential for quality finish. This includes cleaning, rinsing, drying, and ensuring the substrate surface is free and clear of foreign contaminates.
    .2 Recommended thickness: 8 mil or as prescribed by manufacturer. Comply to AAMA 2604, including, but not limited to, average film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify in writing to Departmental Representative of any conditions detrimental to the proper and timely completion of the work.
  .1 Examine substrates to receive anchors verifying that locations of concealed reinforcements have been clearly marked for the installer.
  .2 Beginning of the Work shall indicate acceptance of the areas and conditions as satisfactory by Contractor.

3.2 FABRICATION OF CONCRETE POSTS

.1 The mold to fabricate precast concrete posts will be supplied by Departmental Representative. Contractor to coordinate and be responsible for pick-up and return of Molds from the National Capital Commission’s Albion Road Storage Facility.
  .1 Molds have been used frequently, therefore contractor is to make sure that when cast is made, the base is properly leveled and posts sit plumb to center line.

.2 Dimensions and sizes of new line and expansion: Refer to the drawings for details.
mold

.3 Mock-up and first batch of posts to be inspected and accepted prior to casting full contract quantity.

.4 Reinforcing bars to be sized and placed as indicated in drawings. Ensure that 50 mm of concrete cover is maintained.

.5 All concrete edges shall be chamfered as provided for in the mold supplied.

.6 Touch up reinforcing bars with Organic zinc rich paint prior to casting, as required to ASTM A780 and CAN/CGSB-1.181.

.7 Texturing: Execute using a chemical retardant and pressure wash; other methods of exposing aggregate will only be allowed on special approval by the Departmental Representative. Submit two sample panels measuring 300 mm by 300 mm by 25 mm to the Departmental Representative for approval of finish texture prior to casting, and for comparison to texture of the cast units once completed.

.8 Place and adhere synthetic rubber or neoprene sleeve to inner surface of post rail openings through which Aluminum handrails will pass to isolate aluminum contact with concrete surfaces.

3.3 WELDING

.1 Supplier to be qualified under CSA W47.2.

.2 Weld to CSA W59 and CSA W48.

.3 Test fit finished railing components in shop including test fit in posts and verify railing slides through post openings adequately with rubber/neoprene sleeves.

.4 Fabricate railings, railing down turns and corners square, true, straight and

accurate to required size, with joints closely fitted.

3.4 INSTALLATION

.1 Install line and expansion posts and light standards along centerline of coping with the base flush with coping surface.
- .1 Grind base of post or surface of coping as required to ensure full contact and prevent posts from rocking after installation.
  - .1 Assemble template to verify plumbness.
- .2 Maintain given number and equidistant spacing of line posts between expansion posts and light standards as shown on Drawings.
- .3 For line and expansion posts: install and provide housing and heating for anchors as per epoxy grout manufacturer's recommendations.
- .4 Install anchor to minimum embedment shown on the drawings.
- .5 Installation of anchor to ensure that there are no trapped air bubbles in the epoxy adhesive.
- .6 Variation in Plumbness: Post standards to be in accordance to ACI 301 and AC 347, with respect to plumbness of vertical lines and surfaces (6mm per 3m distance).
- .7 Install synthetic rubber or neoprene media under aluminum base plates.

.2 Weld steel pipe railing sections using a butt weld all around, ground flush with the surface. Refer to drawings for expansion joint and collar connection details.

.3 Provide synthetic rubber or neoprene gaskets under aluminum base plates.

.4 Touch-up all pipe railings as required, and in accordance with paint manufacturer's instructions.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:
  .1 General requirements that are common to NMS sections found in Division 26 – Electrical.

1.2 SCOPE

.1 These specifications cover the complete labor, materials, equipment and incidentals required to provide electrical service for Rideau Canal in Ottawa, Ontario.

.2 Provide and commission of distribution equipment as follows:
  .1 Power Conductors
  .2 Ducts in trench
  .3 Secondary Grounding

.3 Provide all labour and equipment to decommission and dispose of all existing electrical equipment as indicated on the drawings and specifications.

1.3 CONSTRUCTION PHASING

.1 All work to be coordinated with the Departmental Representative to avoid impacting on the operation of the normal and essential systems.

1.4 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 CSA C22.1-15, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
  .2 CAN3-C235-83(R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
  .3 CSA C22.3 No. 1-10, Overhead Systems
  .4 CSA-B651-04 (R2010), Accessible Design for the Built Environment.
  .5 CSA C22.2 No .0.3-96, Test Methods for Electrical Wires and Cables.
  .6 CSA C22.2 No.41-M1987(R1999), Grounding and Bonding Equipment.
  .7 CSA C22.2 No. 211.2-06, Rigid PVC (Unplasticized) Conduit.
  .8 CSA Z462-15, Workplace Electrical Safety Standard

.2 American National Standards Institute (ANSI)/Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
  .1 IEEE SP1122-[2000], The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.
  .2 ANSI/IEEE 837-2002, Qualifying Permanent Connections Used in Substation Grounding.
  .3 IEEE 1048-2003, Guide for Protective Grounding of Power Lines.

.3 Electrical and Electronic Manufacturer’s Association of Canada (EEMAC)
  .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor equipment.
  .2 EEMAC Y1-1-1955, Green Colour for Outdoor equipment.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

.5 Infrastructure Health & Safety Association
.1 IHSA Excavating with Hydrovacs in the Vicinity of Underground Electrical Plant – Safe Practice Guide, latest edition.

.6 IEC International Standard
.1 IEC International Standard 61882 Hazard and Operability Studies (HAZOP Application guide).

1.5 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN-3-C235-83 No.1-01.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels for control items in English and French.

1.6 SUBMITTALS

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

.2 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and provision of material safety data sheets acceptable to Labour Canada and Health and Welfare Canada.
.1 Product Data: submit WHMIS MSDS to NCC Representative.

.3 Submit for review “As-built” single line electrical diagrams in glazed frames and locate where appropriate.
.1 Electrical kiosks for outdoor installations.

1.7 RECORD DRAWINGS

.1 Show on the record drawings the exact path of raceways linking all outlets, junction and pull boxes; the location of junction and pull boxes, existing utility owned 115kV and 13.2kV rated cables, the number and size of conductors in all raceways.

.2 Show on the riser or “one line” diagrams all junction boxes and pull boxes and identify them with respect to location within the work area. Cross-reference these boxes between risers and site plans.

1.8 SHOP DRAWINGS

.1 Shop drawing review will be done only to ascertain general compliance with the technical requirements of the tender documents.
.1 Shop drawings for the contractor plan and protection details for the existing utility owned 115kV and 13.2kV rated cable pipes
.1 Shall also be reviewed by and coordinated with Hydro Ottawa, Hydro

One and shall bear the stamp of a professional engineer in the Province of Ontario.

.2 Allow for 12 weeks in advance of construction for each utility to review contractor plan for working around and supporting/protecting utility infrastructure, proposed construction of documented engineered support, protection and emergency access & restoration plan.

.2 Review of the shop drawings will not release contractor from any responsibility to meet tender document requirements, dimensions and quantities.

.3 Do not release materials for fabrication or assembly until shop drawings are reviewed by the Engineer.

.4 Submit for review, a minimum of six (6) copies of shop drawings of the following equipment:
- .1 Lighting fixtures and lamp posts.
- .2 All distribution equipment.
- .3 Wiring devices, starters and control devices.
- .4 Surface mounted raceways and cable tray.
- .5 Any additional equipment as required by the Engineer.

1.9 OPERATION AND MAINTENANCE DATA

.1 Include in operations and maintenance data:
- .1 Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.

1.10 EQUIPMENT

.1 Quality Control:
- .1 Provide CSA certified equipment and material.
- .2 Submit test results of installed electrical systems and instrumentation.
- .3 Permits and fees: Furnish and pay for Certificates of Acceptance from Electrical Inspection Authority (ESA).
- .4 Submit, upon completion of Work, load balance report as described in PART 3 - Load Balance.
- .5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work.

.2 Manufacturer's Field Reports: manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and other systems testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.11 QUALITY ASSURANCE

.1 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices as per the conditions of Provincial Act respecting manpower vocational training and qualification.
- .1 Employees registered in provincial apprentices 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.

.2 Site Meetings:
.1 Site Meetings: as part of Manufacturer's Field Services described in Part 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
.1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.
.2 Twice during progress of Work at 25% and 60% complete.
.3 Upon completion of Work, after cleaning is carried out.

.3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 70 50 – Health and Safety Requirements.

1.12 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide schedule within 2 weeks after award of Contract.

.2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling as per Engineer’s instructions.

1.13 SYSTEM STARTUP

.1 Instruct operating personnel in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service Consultant to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation and ensure that operating personnel are conversant will aspects of its care and operation.

PART 2 - MATERIALS

2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 33 00 – Submittal Procedure.

.2 Material and equipment to be CSA certified.

.3 Factory assemble control panels and component assemblies.

2.2 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of inspection authorities.

.2 Signs, minimum size 175 x 250 mm.

2.3 UNDERGROUND CABLES IN DUCTS

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Ground wire: minimum 12 AWG

.3 Copper conductors: size as indicated, with 1000 V insulation of chemically cross linked thermosetting polyethylene material rated RWU90XLPE.

2.4 WIRING TERMINATIONS

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

2.5 CONNECTORS AND TERMINATIONS

.1 Heavy duty copper compression connectors as required, sized for conductors.

2.6 GROUNDING

.1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.

.2 Grounding conductors: Stranded copper, soft annealed, size as indicated.

.3 Insulated grounding conductors: green.

.4 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.5 Non corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
- .1 Grounding and bonding bushings.
- .2 Protective type clamps.
- .3 Bolted type conductor connectors.
- .4 Thermit welded type conductor connectors.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors.

2.7 CONDUITS

.1 Rigid PVC conduit: to CSA C22.2 No. 211.2.

.2 Conduit Fittings:
- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90º bends are required for 25 mm and larger conduits.

.3 Expansion fittings for rigid conduit:
- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

.4 Fish Cord: Polypropylene.

2.8 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:
  .1 Nameplates: lamacoid 3 mm thick plastic engraving sheet.
    .1 Emergency Power System: matt red finish face, white core.
    .2 Normal Power System: mat white finish face, black core.
    .3 Lettering accurately aligned and engraved into core and mechanically attached with self-tapping screws.
    .4 Sizes as follows:

NAMEPLATE SIZE			
Size	**Dimensions**	**No. of lines**	**Height of letters**
1	10 x 50 mm	1	3 mm
2	12 x 70 mm	1	5 mm
3	12 x 70 mm	2	3 mm
4	20 x 90 mm	1	8 mm
5	20 x 90 mm	2	5 mm
6	25 x 100 mm	1	12 mm
7	25 x 100 mm	2	6 mm

.2 Labels: Use clear self-adhesive labels “P-touch” type with 4 mm high black letters

.3 Wording on nameplates and labels to be approved by Engineer prior to manufacture.

.4 Allow for maximum of fifty (50) letters per nameplate and label.

.5 Identification to be English and French.

.6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.7 Identify equipment with Size 7 labels engraved as directed by NCC Representative.

.8 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.9 Terminal cabinets and pull boxes: indicate system and voltage.

.10 Transformers: indicate capacity, primary and secondary voltages.

2.9 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, 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 "Labelling" of all branch circuit wiring including phase conductors, neutrals, to be done on both ends of all circuit wires plus in any junction and/or pull

boxes located in between using self-adhesive labels.

2.10 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.

Systems	Prime Colour	Auxiliary Colour
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 250 V (emergency)	Yellow	Blue
up to 600 V (emergency)	Yellow	Green & Red

2.11 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
.1 Paint outdoor electrical equipment green.
.2 Paint indoor switchgear and distribution enclosures light gray.

PART 3 - EXECUTION

3.1 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.

3.2 NAMEPLATES AND LABELS

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

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.2 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.3 Install fish cord in empty conduits.

.4 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.5 Dry conduits out before installing wire:

.6 Group conduits wherever possible on surface channels.

.7 Do not pass conduits through structural members except as indicated.

.8 Conduits in cast-in-place concrete:
- .1 Locate to suit reinforcing steel.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.

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

3.4 INSTALLATION OF CABLES IN DUCTS

.1 Install cables as indicated in ducts.

.2 Do not pull spliced cables inside ducts.

.3 Install multiple cables in duct simultaneously.

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.

.6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.7 After installation of cables, seal duct ends with duct sealing compound.

3.5 MARKERS

.1 Mark cable every 150 m along cable runs and changes in direction.

.2 Where markers are removed to permit installation of additional cables, reinstall existing markers.

.3 Install concrete type markers.

.4 Lay concrete markers flat and centred over cable with top flush with finish grade.

3.6 INSTALLATION OF CONNECTORS AND TERMINATIONS

.1 Bond and ground as required to CSA C22.2No.41.

.2 Compression lugs are to be provided for connections of #8 AWG or larger.

3.7 INSTALLATION OF GROUNDING

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where PVC is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Use mechanical connectors for grounding connections to equipment provided with lugs.

.5 Soldered joints not permitted.

.6 Install bonding wire for flexible conduit, connected at one end to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.7 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.8 Install separate ground conductor to outdoor lighting standards.

.9 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

.10 Ground secondary service pedestals.

3.8 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list: Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting and kitchen equipment.

.2 Install grounding equipment as required to ensure step and touch potentials are controlled by the use of an equipotential work zone prior to operating any equipment including hydro-excavating equipment within one meter of the high voltage utility cable pipes.

3.9 MOUNTING HEIGHTS

.1 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

3.10 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.11 FIELD QUALITY CONTROL

.1 Load Balance:
  .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
  .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
  .3 Provide upon completion of work, load balance report as directed in

Submittals: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests:
- .1 Power distribution system including phasing, voltage, grounding and load balancing.
- .2 Circuits originating from branch distribution panels.
- .3 Lighting and its control.
- .4 Insulation resistance testing:
  - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
  - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
  - .3 Check resistance to ground before energizing.

.3 Carry out tests in presence of Departmental Representative.

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

.5 Provide a list of test results showing location at which each test was made, circuit tested and result of each test.

.6 Remove and replace entire length of cable if cable fails to meet any of test criteria.

.7 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of the Engineer and local authority having jurisdiction over installation.

.8 Perform tests before energizing electrical system.

.9 Disconnect ground fault indicator during tests.

.10 Supply and pay for instruments, meters, equipment and personnel required to conduct test during and at conclusion of project.

.11 Provide test records to the Departmental Representative

3.12 CLOSEOUT SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00.
- .1 As-built equipment and system.
- .2 Product data.
- .3 Operation and maintenance data.
- .4 Spare parts, and special tools.
- .5 Warranties
- .6 Commissioning report

3.13 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to

prevent rusting.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for excavation of built and natural features of the surrounding landscaping in order to complete work as indicated by drawings and specifications.

.2 Excavation and backfilling shall include all necessary labour, material and withinequipment as required to excavate, stockpile, transport, dispose, backfill and compact as indicated on the drawings and as specified. Supply, installation and removal of silt fence barrier shall be considered included.

.3 Work includes but is not limited to:

- .1 Removal and disposal of asphalt pathway as required to allow for wall refacing, including all required asphalt sawcuts.
- .2 Removal and disposal of common excavation material as required to allow for the removal, refacing of the existing retaining concrete wall structure.
  - .1 Hydro excavation will include hydrovac services for all excavation within 1.5m of the buried utility 115kV Hydro One cables, as shown on the drawings.
  - .2 Common excavation will include services for all excavation within 1.5m of the retaining wall within the canal, as shown on the drawings.
- .3 Removal and disposal of all material excavated during construction.
  - .1 All material obtained during excavation shall be considered contaminated.
- .4 Removal and disposal of all material excavated from canal channel.
  - .1 All material obtained during excavation within canal channel shall be considered contaminated.
  - .2 All other excavated material shall be considered not contaminated unless is cross-contaminated during construction.
- .5 Supply and placement of granular backfill in the excavated areas listed in sub-section 1.1.3.3 to subgrade.
- .6 Supply and placement of clean granular material free of fines and washed backfill in the excavated areas listed in sub-section 1.1.3.2 and 1.1.3.4 to subgrade.
- .7 Supply and placement of geotextile/membrane and clean granular material free of fines and washed for temporary access pad and staging area within the canal channel including protection of existing structures at entry and egress points.
- .8 Backfilling, including compaction, compaction testing by third party and connection and installation of a repaired catch basin system.
- .9 Disposing of surplus material.

1.2 EXISTING SITE AND SUB-SURFACE CONDITIONS

.1 Sub-Surface investigation reports are available upon request and may be obtained from Departmental Representative.

- .1 Final report 636464- Rap-002 – Rideau Canal Walls – Herridge St to Mutchmor Rd, Geotechnical Study by SNC-Lavalin, 2017.
- .2 Final report EX-00001 Ottawa Walls Investigations – Rideau Canal, RS 2.1.1 – Investigations, studies and Reports, 2018

.1 Site 2 – Clegg street

.2 Notify Departmental Representative in writing if subgrade conditions at site differ from those indicated and await further instructions.

1.3 PROTECTION

.1 Protect excavated earth from freezing by approved method.

.2 Grade around excavations to prevent surface water runoff into excavated areas.

.3 Protect bottoms of excavations from weather. Should softening in bottom of excavation occur due to water or other causes, remove softened soil and replace with structural (Mud Slab) concrete at no additional cost.

1.4 RELATED SECTIONS

.1 Section 02 41 16 – Structure Demolition

.2 Section 02 41 21 - Removals.

.3 Section 32 12 16 - Asphalt Concrete Paving.

.4 Section 03 30 00 - Cast-in-Place Concrete.

1.5 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01.

.2 Payment for these items shall be included in the Unit Price Table. Excavated materials will be measured in cubic metres in their original location:

.1 Item No.8 - Asphalt Excavation: This item covers the work described in subsection 1.1.3.1.

.2 Item No.9 - Hydro Excavation: This item covers the work described in subsection 1.1.3.1.

.3 Item No.10 – Common Excavation: This item covers the work described in subsection 1.1.3.2, 1.1.3.3, and 1.1.3.7.

.4 Item No.11 - Backfilling: This item covers the work described in subsection 1.1.3.3, 1.1.3.5, and 1.1.3.7.

.5 Item No.13 – Catch Basin repairs & Connections: This item covers the work described in the subsection 1.1.3.7.

.6 Item No.14 – Removal and disposal of contaminated material: This item covers the work described in the subsection 1.1.3.3 and 1.1.3.4.

.3 Placing and spreading of topsoil where applicable, will not be measured for payment and will be considered as part of the LUMP SUM price item for landscaping and is covered in Section 32 94 00.

.4 Shoring, bracing, cofferdams, construction platforms, underpinning and de-watering of excavation will not be measured separately for payment and is to be included in lump sum payments.

1.6 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA S350-M1980 limestone(R2003), Code of Practice for Safety in Demolition of Structures.

.2 Federal Legislature.
  .1 Canadian Environmental Assessment Act (CEAA), 1992, c. 37.
  .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
  .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

.3 Ontario Occupational Health and Safety Act (OHSA).

.4 Ontario Provincial Standard Specification / Drawings (OPSS/OPSD), Ontario Ministry of Transportation.
  .1 OPSS 902 Nov 2010, Ontario Provincial Standard Specifications, Construction specification for trenching, backfilling, and compacting.
  .2 OPSS 1004 Nov 2012, Ontario Provincial Standard Specification, Material Specification for Aggregates - Miscellaneous.
  .3 OPSS 1010, April 2013, Ontario Provincial Standard Specification, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.

.5 Infrastructure Health & Safety Association:
  .1 Excavating with hydrovacs in the vicinity of underground electrical plant – safe practice guide.

1.7 DEFINITIONS

.1 "Common excavation" includes all materials, excluding rock and concrete, which must be removed to complete the work including boulders and rock fragments less than 0.5 m3 in volume, and soil of whatever nature encountered. Work shall also include, but not be limited to:
  .1 Providing shoring and sheeting required to protect trees and other site objects.
  .2 Disposing of surplus material.

.2 "Backfilling" includes:
  .1 Supplying, placing, grading and compacting granular material (Granular A, Granular B, native fill, rip-rap, Limestone screening).
  .2 Backfilling includes filling.

.3 "Rock": any solid material in excess of 0.5 m3 which cannot be removed by means of heavy duty mechanical excavating equipment. Concrete and frozen material are not classified as rock.

.4 Topsoil:
  .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
  .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimetres in any dimension.

.5 “Concrete Excavation” – careful manual removal of portion of concrete structure to specified dimensions without damaging surrounding structures, structure for new concrete to be tied into, or structure excavating from.

1.8 REQUIREMENTS OF REGULATORY AGENCIES

.1 Adhere to municipal and provincial requirements relating to safety of excavations and protection of workers.

1.9 QUALITY ASSURANCE

.1 Ensure Work is performed in compliance with CEPA, CEAA, TDGA, and applicable provincial regulations.

.2 Contractor shall provide:
- .1 Gradation curves for materials specified and supplied from each source.
- .2 Compaction testing shall be conducted by the Contractor every 50 Sq.m of surface area for each:
  - .1 300mm loose lift of Granular B backfill material, after compaction.
  - .2 150mm loose lift of Granular A backfill material, after compaction.
- .3 Compressive strength testing of concrete to determine when 70% of compressive strength of newly placed concrete is achieved in areas to be backfilled.

1.10 SOURCE QUALITY CONTROL

.1 Sieve Series: MTO OPSS 1010 April 2013 Sieve Series or ASTM E11 Series equivalents.

.2 Samples and sampling: to ASTM D75/D74M.

.3 Maximum density and optimum moisture: to ASTM D698-12e2.

1.11 ENVIRONMENTAL REQUIREMENTS

.1 Do Work in accordance with Section 01 35 46 – ARCHAEOLOGICAL, CULTURAL, AND ENVIRONMENTAL PROCEDURES.

1.12 MATERIALS HANDLING

.1 Transport, store and handle granular materials in such a manner as to eliminate segregation.

1.13 SUBMITTALS

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

.2 Submit copies of certified bills of landing from authorized disposal sites and reuse and recycling facilities for material removed from site to Departmental Representative upon request.

.3 Prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Section 01 74 20 and indicate:
- .1 Descriptions and anticipated quantities of materials to be recycled and landfilled.
- .2 Number and location of dumpsters.
- .3 Anticipated frequency of tippage.
- .4 Name and address of haulers and waste facilities.

.4 Quality Control: In Accordance with Section 01 45 00:
- .1 Submit to Departmental representative written notice when bottom excavation is reached.

.5 Provide details of:
.1 Proposed excavation methods and equipment.
.2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field/clearance record from utility authority and location plan of relocated and abandoned services, as required.

1.14 QUALITY ASSURANCE

.1 Submit design and supporting data at least four (4) weeks prior to beginning Work.

.2 Engage services of qualified Professional Engineer, registered or licensed in Province of Ontario, Canada in which work is to be carried out to design and inspect cofferdams, shoring, sheeting, bracing, and underpinning as required for Work and as set out in Section 35 20 22 and acceptable to the Departmental Representative and Authorities having Jurisdiction.

.3 Have drawing and support data checked, signed and stamped and sealed by a Professional Engineered registered or licensed in the Province of Ontario responsible for their designs.

.4 Keep design, temporary works construction plans, details and supporting data on site.

1.15 PROTECTION OF EXISTING FEATURES

.1 Existing buried utilities and structures:
.1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
.2 Prior to commencing excavation work, notify Departmental Representative or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Departmental Representative or authorities having jurisdiction to clearly mark such locations to prevent disturbance during work.
.2 Confirm locations of buried utilities by careful test excavations.
.1 Confirm locations of buried utilities by careful test excavations or soil hydrovac methods.
.2 Construct a minimum of 4 test excavations along the length of the suspected utility location.
.3 Provide confirmation of buried utilities by hydrovac methods as indicated on contract drawings.
.4 Fill test excavation pits to grade with acceptable soil once utilities are confirmed.
.3 Maintain and protect from damage, steam, water, sewer, gas, electric, telephone and other utilities and structures encountered.
.1 Excavation work near the 115KV Hydro One cables can be safely performed as long as there is a minimum of 18” of the existing limestone crush covering the cables.
.4 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before re-routing or removing. Costs for such work will be paid as an extra to the contract.
.5 Record location of maintained, re-routed and abandoned underground lines.
.6 Existing surface features:
.1 Conduct, with Departmental Representative, condition survey of existing

trees, bushes and other plants, lawns, light poles, pavement, benches, garbage containers, ,and roads which may be affected by work.

.2 Protect existing surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Departmental Representative.

.3 Where required for excavation, cut roots or branches as approved by Departmental Representative.

.1 Identify plants and limits of root systems to be preserved as approved by Departmental Representative.

.2 Where root removal within one (1) meter beyond dripline, or pruning within dripline is required, consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Departmental Representative.

.7 Refer to Occupational Health and Safety Act Ontario Regulation 213/91, Part III, for excavation regulations.

1.16 BLASTING

.1 Blasting is not permitted.

PART 2 - PRODUCTS

2.1 BACKFILL MATERIALS

.1 Granular backfill: to Ontario Provincial Standard Specification 1010, April 2013 for:

.1 Granular A. Maximum size 19.0 mm.

.2 Granular B, Type II. Maximum size 150 mm

.3 Subsurface drainage Fill: optional construction pad material.

.1 Provide Departmental Representative gradation requirements prior to use.

.2 Native fill: clean fill taken from canal bed adjacent to wall section to be replaced.

.3 Common Fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75mm, cinders, ashes, sods, refuse or other deleterious materials.

.4 Rip-Rap: Hard, dense , durable, quarry stone, free from seams, cracks or other structural defects, with relative density not less than 2.65, to meet following size distribution:

.1 Not more than 10% of total volume of stones with individual volume less than 4 dm^3.

.2 Not more than 10% of total volume of stones with individual volume of 10 dm^3 or more.

.3 Remaining percentage of total volume to have uniform distribution of stones between 4 and 10 dm^3 size.

.5 Drainage Material: 19mm crushed clean stone, Type I or II gravel in accordance to OPSS 1004.

.6 Sand Bedding shall consist of sand conforming to the gradation requirements of mortar sand according to OPSS 1004.

.7 Limestone Screening: Clean, hard durable particles of natural screenings resulting from the crushing of rock, stone or gravel and shall be free of clay, silt or other objectionable material meeting all OPSS standards 1001, 1004 and 1010.

2.2 CATCH BASIN SYSTEM

.1 Storm Drain pipe Through wall:
- .1 PVC storm pipe as per OPSS 1841, drainage pipe with a smooth interior, non-perforated, 320kPa minimum pipe stiffness, nominal outside diameter of 300mm, manufactured to meet CSA B182.1, B182.2 and B182.4 for appropriate type of PVC plastic pipe product.
- .2 Service connection pipe shall be according to CSA B182.1, and shall have bell and spigot joints with elastomeric gaskets.

.2 Mortar
- .1 Mortar for joints shall be comprised of one part normal Portland cement and two parts mortar sand, wetted with only sufficient water to make the mixture plastic. The mortar sand shall be according to OPSS 1004, the normal Portland cement shall be according to OPSS 1301, and the water shall be according to OPSS 1302.

PART 3 - EXECUTION

3.1 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

.2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with 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.

3.3 STOCKPILING

.1 Stockpile fill materials in areas designated by Departmental Representative. Stockpile granular materials in manner to prevent segregation.

3.4 ASPHALT REMOVAL

.1 Remove asphalt full depth and to full width of pathways and to the width required to perform the work.

.2 Sawcut asphalt to depth required to achieve a clean straight edge between asphalt to remain in place and new asphalt. Minimum depth of sawcut is 50 mm.

.3 Dispose of excavated asphalt in an approved landfill site off Canal lands.

3.5 HYDROVAC AND COMMON EXCAVATION:

.1 Excavate materials to lines, elevations and dimensions indicated or directed by Departmental Representative.

.2 Earth bottoms of excavations to be dry undisturbed soil, reasonably level, free from loose or organic matter.

.3 Correct over-excavation below proposed bottom of excavation elevation with granular material compacted to 98% maximum dry density or 20 MPa lean concrete.

.4 Shore, sheet or otherwise protect excavations in accordance with approved shop drawings.

.5 Hand trim, make firm and remove loose material and debris from excavations immediately prior to placing concrete or granular backfill. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

3.6 BACKFILLING WITH GRANULAR BACKFILL

.1 Do not proceed with backfilling operations until Departmental Representative has inspected and approved work in place.

.2 Backfill material under paved areas is covered under Section 32 12 16 - Asphalt Paving.

.3 Backfill spaces excavated and not occupied by parts of substructure or other permanent works, with the specified backfill material placed up to the approved elevations, and between the approved limits.

.4 Do not backfill adjacent to structure until it has sufficient strength (at least 70% of specified compressive strength) to withstand earth and compaction pressures and approval has been obtained from Departmental Representative.

.5 Areas to be backfilled to be free from debris, snow, ice, water or frozen ground.

.6 Place backfill material in uniform layers not exceeding 300 mm for granular 'B', and 150 mm for granular 'A' loose thickness and simultaneously on sides of structures or other item so that loading is equalized.

.1 Cut out “soft” areas and fill with suitable material until specified compaction can be obtained.

.7 Compact each layer to minimum 98% of maximum dry density in accordance with

ASTM D698-12e1.

.8 When working in areas with limited space, employ approved mechanical hand operated tamping devices.
  .1 When using hand operated tamping devices, deposit backfill material in uniform layers not exceeding 100 mm loose thickness.

.9 The stockpiling and re-use existing granular fill will be permitted only upon approval of Departmental Representative.

3.7 RIP RAP

.1 Place rip-rap along canal channel side of wall at locations associated with catch basin discharge outlets during temporary works and for final work.
  .1 Area coverage: 1.5m wide and 2m long, perpendicular to canal wall

3.8 CLEANING AND RESTORATION

.1 Keep site clean and organized throughout deconstruction.

.2 Upon completion of project, remove debris, trim surfaces and leave work site clean.

.3 Upon completion of project, reinstate areas affected by Work to condition which existed prior to beginning of Work.

.4 At end of construction, contractor to remove all of the granular material used for access pad including the physical barrier geotextile membrane.
  .1 This work is to be completed during the spring draw down period.
  .2 A secondary silt barrier is to be installed for the removal work during the granular pad outside of the existing silt barrier/geotextile membrane used to separate the granular pad from the canal bottom.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 31 23 15 - Excavating and Backfilling.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
  .1 ASTM D698-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ftü (600 kN-m/mü)).

.2 Government of Québec, Minister of Transport
  .1 Cahier des charges et devis généraux (CCDG).

.3 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB-1.74-2001, Alkyd Traffic Paint.

.4 Ontario Provincial Standard Specifications (OPSS)
  .1 OPSS 310-November 2008, Construction Specification for Hot Mix Asphalt.
  .2 OPSS 314-November 2004, Construction Specification for Untreated Granular, Subbase, Base, Surface Shoulder, and Stockpiling.
  .3 OPSS 1150-November 2008, Material Specification for Hot Mix Asphalt.

1.3 PROTECTION

.1 Protect all structures and site features that may be damaged by paving machinery, equipment or personnel. Make good property damaged due to paving operations.

.2 Take necessary precautions to protect workmen and public from hazards of paving operations.

.3 Keep all traffic off newly paved areas until paving properly cured.

1.4 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01.

.2 Payment for these items shall be included in the Unit Price Table:
  .1 Item No.11 - Asphalt HL3 Fine: This item covers all the work described in this section, including but not limited to, line painting and supply/re-grading/leveling/compacting additional granular material for the bike/pedestrian pathway.
  .2 Primer is considered included in the asphalt surface course and will not be measured separately for payment.
  .3 Cleaning pavement surfaces is considered included in the asphalt surface course and will not be measured separately for payment.
  .4 Granular materials will be paid for under payment items in Section 31 23 15.

.3 This section does not include the following:
.1 Asphalt Removal, which is described in Section 31 23 15.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Asphalt concrete: to OPSS 1150.

.2 Prime coat: SS-1 to OPSS 1103.

.3 Tack Coat: SS-1 to OPSS 1103

.4 Granular A Aggregate to: OPSS 1010.

.5 Traffic paint: yellow to CGSB 1.74M.

.6 Paint thinner: to CGSB 1.5.

PART 3 - EXECUTION

3.1 GRANULAR BASE

.1 Re-grade existing granular base where needed and add granular 'A' material as required to eliminate depressions in the new asphalt and bring the granular base 50 mm below final asphalt grade. Compact granular material to 98% Standard Proctor Modified Dry Density to ASTM D1557.

.2 Provide new granular base where needed. Place minimum 300 mm compacted thickness of granular 'A' material sub-base and bring the granular base 50 mm below final asphalt grade. Compact granular material to 98% Standard Proctor Modified Dry Density to ASTM D1557.

3.2 PAVEMENT CONSTRUCTION

.1 Apply tack coat along cold asphalt joints and exposed concrete surfaces as per with OPSS 310.

.2 Application of prime coat: OPSS 302.

.3 Apply asphalt emulsion primer at 0.38 to 0.54 litres per square metre and allow to cure to sticky or tacky condition. Apply asphalt before primer becomes hard.

.4 Pavements thickness for pathway: 50 mm HL 3 Fine.

.5 Construction of asphalt concrete: OPSS 310 and CCDG.

3.3 LINE PAINTING

.1 Apply line paint 100 mm wide along centreline of pathway.

.2 Paint to be applied on a smooth, clean, dust free, dry surface with an approved applicator.

.3 Apply paint in accordance with manufacturer's recommendation.

END OF SECTION

PART 1 - GENERAL

1.1 MEASUREMENT AND PAYMENT PROCEDURES

.1 There shall be no separate measurement for payment for the work under this Section. Include costs in the Contract Lump Sum Price.

.2 Payment Shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work.

1.2 DESCRIPTION

.1 This section specifies the requirements for reinstating damaged landscaped areas within the work and staging areas, access route and areas disturbed by the work and consists of:
- .1 Supplying, placing, and finish grading of a topsoil bed.
- .2 Supplying and placing nursery sod.
- .3 Supplying and placing plant material, accessories, mulch, planting, and tree support as required.
- .4 Maintain sodded areas until acceptance.

.2 All disturbed sodded areas, including outside the work area limits, including the pedestrian detour, to be covered with topsoil, smoothed to the finish grade, and re-sodded at Contractor's expense.

.3 Work specified elsewhere:
- .1 Protection of mature trees and other plant materials during construction: to Section 01 35 43.

1.3 RELATED SECTIONS

.1 Section 01 11 00 - General Instructions.

.2 Section 01 35 43 – Archaelogical, Cultural & Environmental procedures.

.3 Section 02 41 21 - Removals.

1.4 REFERENCES

.1 Definitions:
- .1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

.2 Reference Standards:
- .1 Agriculture and Agri-Food Canada (AAFC).
  - .1 Plant Hardiness Zones in Canada-2000.
  - .2 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Canadian Nursery Landscape Association (CNLA)
  - .1 Canadian Standards for Nursery Stock-2006.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

1.5 PRELIMINARY INSPECTION

.1 Establish the condition of sodded areas and planting beds to be disturbed by completion of work in conjunction with Departmental Representative prior to starting work.

1.6 SOURCE QUALITY CONTROL

.1 At least two (2) weeks before starting final topsoil work, advise Departmental Representative of proposed sources of topsoil and sod. Provide Departmental Representative with access to the sources for inspection, sampling and testing, if required.
  .1 Soil testing by recognized testing facility for pH, P, K, and Organic Matter.

.2 When proposed sources are approved, use no other sources without written authorization from Departmental Representative.

.3 Landscape work to be done in accordance with: Ontario Horticultural Trades Association.

.4 Obtain approval from Departmental Representative of plant material prior to planting.

.5 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations.

1.7 DELIVERY AND STORAGE

.1 Schedule deliveries in order to keep storage at the job site to a minimum without causing delays.
  .1 Schedule to include:
    .1 Quantity and type of plant material.
    .2 Shipping dates.
    .3 Arrival dates on site.
    .4 Planting Dates.

.2 SOD:
  .1 Deliver, unload and store rolled sod on pallets only.
  .2 Schedule sod laying to coincide with preparation of soil surface.
  .3 Schedule sod installation when frost is not present in ground.
  .4 Deliver sod to site within 24 hours of being lifted and lay sod within 36 hours of being lifted.
  .5 Do not deliver small, irregular, or broken pieces of sod. Departmental Representative will reject these.
  .6 During wet weather, allow sod to dry sufficiently to prevent tearing during lifting and handling.
  .7 During dry weather, protect sod from drying. Water sod as necessary to ensure its vitality and prevent dropping soil in handling. The Departmental Representative will reject dried-out sod.
  .8 Supply sod in standard-sized units and of a uniform thickness, rolled for easy handling.

.3 PLANT MATERIAL:
  .1 Protect plant material from frost, excessive heat, wind and sun during delivery.

.2 Protect plant material from damage during transportation:
.1 Delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
.2 Delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
.3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.
.3 Storage and Handling Requirements:
.1 Immediately store and protect plant material which will not be installed within 1 hour in accordance with supplier's written recommendations and after arrival at site in storage location approved by Departmental Representative.
.2 Protect stored plant material from frost, wind and sun and as follows:
.3 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in topsoil and watering to full depth of root zone.
.4 For pots and containers, maintain moisture level in containers.
.5 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.

1.8 WARRANTY

.1 For plant material over 75 mm calliper the 12 months warranty period is extended to 24 months.

.2 Departmental Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

1.9 SCHEDULING OF SODDING WORK

.1 Schedule sod laying to coincide with final topsoil operations.

.2 Obtain Departmental Representative's approval of the schedule for sodding before proceeding.

PART 2 - PRODUCTS

2.1 TOPSOIL

.1 New topsoil to be a friable sandy-clayish loam of good humus content, suitable for supporting sod growth, free from:
.1 Debris and stones over 50 mm diameter.
.2 Coarse vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
.3 Soil texture based on the Canadian System of Soil Classification, to consist of 20 to 70 percent sand, minimum 7% clay, and contain 2 to 10 % organic matter by weight.
.4 Contain no toxic elements or growth inhibiting materials.

.2 Approval of topsoil material subject to soil testing and analysis. Testing of topsoil will be carried out by testing laboratory designated by Departmental Representative. Departmental Representative will pay for cost of tests.

2.2 SOD

.1 Nursery sod: Quality and source to comply with standards outlined in "Guide Specification for Nursery Stock", Section 17, 1978 edition, published by Canadian Nursery Trades Association.
  .1 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.

.2 Sod establishment support:
  .1 Geotextile fabric: biodegradable, 25 mm square mesh.
  .2 Biodegradable starch pegs: 17 x 8 x 200 mm.

2.3 PLANT MATERIAL

.1 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.

.2 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.
  .1 Source of plant material: grown in Zone 1 in accordance with Plant Hardiness Zones in Canada.
  .2 Plant material must be planted in zone specified as appropriate for its species.
  .3 Plant material in location appropriate for its species.

.3 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.

.4 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or container grown.

2.4 WATER

.1 Free of impurities that would inhibit plant growth.

2.5 STAKES

.1 Wood, pointed one end, 38 x 38 x 2300 mm, as required.

2.6 TRUNK PROTECTION

.1 Plastic: perforated spiraled strip.

2.7 MULCH

.1 Bark chip: varying in size from 25 to 50 mm in diameter, from bark of coniferous trees.

.2 Wood chip: varying in size from 50 mm to 75 mm and 5 to 20 mm thick, free of bark, small branches and leaves.

.3 Shredded wood: varying in size from 25 to 125 mm in length, from coniferous trees.

2.8 FERTILIZER

.1 Synthetic commercial type as recommended by manufacturer, as required.
.1 Industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or applications or defined by soil test.

PART 3 - EXECUTION

3.1 PREPARATION OF TOPSOIL SUB-GRADE

.1 SOD:
.1 Verify that grades are correct. If discrepancies occur, notify Departmental Representative and do not start other landscape work in that area until instructed to do so in writing by Departmental Representative.
.2 Grade soil, eliminating uneven areas and low spots, ensuring that new sodded surface will be faired-off to the existing sodded areas with no sharp transition.
.3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials. Remove debris which protrudes more than 75 mm above surface. Dispose of removed material off site.
.1 Coarse cultivate entire area which is to receive topsoil to depth of 100 mm. Coarse cultivate those areas where equipment used for hauling and spreading has compacted soil.
.4 Fine grade surface free of humps and hollows to smooth, even grade, to tolerance of plus or minus 10 mm, for Turf Grass Nursery Sod, surface to drain naturally.

.2 PLANTING MATERIAL:
.1 Verification of Conditions: verify conditions of substrate are acceptable for planting installation in accordance with manufacturer's written instructions.
.2 Visually inspect substrate in presence of Departmental Representative.
.3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PLACING AND SPREADING OF TOPSOIL

.1 Place topsoil after Departmental Representative has accepted sub-grade.

.2 Spread topsoil to 150 mm minimum depth after settlement and 80% compaction. Keep final elevation 15 mm below finished grade to allow room for sod.

.3 Manually spread topsoil around trees, shrubs and obstacles.

.4 Grade to eliminate rough spots and low areas and ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.

.5 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative. Leave surfaces smooth, uniform and firm enough to resist deep footprints.

3.3 ACCEPTANCE OF TOPSOIL GRADING

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

3.4 SURPLUS TOPSOIL MATERIAL

.1 Dispose of materials not required off site.

3.5 SODDING

.1 Obtain Departmental Representative's approval of topsoil grade and depth before starting sodding.

.2 Loosen surface of topsoil where it has become compacted.

.3 Protect all sodded areas against any damage until sod has been fully established. Supply and install required protective apparatus.

3.6 SOD PLACEMENT

.1 Lay sod within 18 hours of being lifted if air temperature exceeds 20 degrees C.

.2 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.

.3 Roll sod as directed by Departmental Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.7 MAINTENANCE OF SODDED AREAS

.1 Maintain sodded and seeded areas until accepted by Departmental Representative.

.2 Apply water to ensure establishment and continuous growth of grass. Apply sufficient water to ensure moisture penetration of 200 mm into soil below sod.

.1 Water application to be done in such a manner that mitigates and minimizes erosion of top soil below newly placed sod and does not create washout areas.

.3 Cut grass when it reaches a height of 80 mm. Cut grass thereafter frequently enough to be kept at a height of 80 to 100 mm. Allow clippings to remain.

3.8 ACCEPTANCE OF SOD MATERIAL

.1 Approval of material at its source does not prevent subsequent rejection on job site.

.2 Perform following operations from time of installation until acceptance.
- .1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 150 mm.
- .2 Cut grass to 80 mm when or prior to it reaching height of 100 mm.

.3 Sod will be approved when:
- .1 Growth of sodded areas has been properly established;
- .2 Turf is free of bare and dead spots;
- .3 No surface soil is visible from height of 1500mm when grass has been mowed to a height of 80 mm; and,
- .4 Grass has been cut a minimum of 2 times prior to acceptance.

3.9 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 weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.

.2 Repair and re-sod dead or bare spots to satisfaction of Departmental Representative.

.3 Cut grass and remove clippings that will smother grass to height as follows:
- .1 Turf Grass Nursery Sod:
  - .1 80 mm during normal growing conditions.

3.10 SODDING ON SLOPES GREATER THAN THREE TO ONE

.1 Lay sod sections perpendicular to slopes greater than 3:1 (run/rise) and secure with stakes. Place stakes 3 per m, 100 mm below top edge to prevent shifting of sod and drive stakes flush with top of sod soil.

3.11 EXCAVATION AND PREPARATION OF PLANTING BEDS

.1 For individual planting holes:
- .1 Stake out location and obtain approval from Departmental Representative prior to excavating.
- .2 Excavate to depth and width as recommended by Manufacturer.
- .3 Remove rocks, roots, debris from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
- .4 Scarify sides of planting hole.

3.12 PLANTING

.1 For bare root stock, place 50 mm backfill soil in bottom of hole.
- .1 Plant shrubs with roots placed straight out in hole.

.2 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.

.3 Plant vertically in locations as indicated.
.1 Orient plant material to give best appearance in relation to structure, roads and walks.

.4 For trees and shrubs:
.1 Backfill soil in 150 mm lifts.
.1 Tamp each lift to eliminate air pockets.
.2 When two thirds of depth of planting pit has been backfilled, fill remaining space with water.
.3 After water has penetrated into soil, backfill to finish grade.
.2 Form watering saucer as indicated.

.5 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.

.6 Water plant material thoroughly.

.7 After soil settlement has occurred, fill with soil to finish grade.

3.13 MULCHING

.1 Ensure soil settlement has been corrected prior to mulching.

.2 Spread mulch as required.

3.14 MAINTENANCE DURING ESTABLISHMENT PERIOD FOR PLANTS

.1 Perform following maintenance operations from time of planting to acceptance by Departmental Representative.
.1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
.1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
.2 Replace or re-spread damaged, missing or disturbed mulch.
.3 For non-mulched areas, cultivate as required to keep top layer of soil friable.
.4 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.
.5 Remove dead or broken branches from plant material.
.6 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

3.15 MAINTENANCE DURING WARRANTY PERIOD FOR PLANTS

.1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.
.1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
.2 Replace or re-spread damaged, missing or disturbed mulch.
.3 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations.
.4 Apply fertilizer in early spring as indicated by soil test.
.5 Remove and replace dead plants and plants not in healthy growing condition.

.6 Submit monthly written reports to Departmental Representative identifying:
.1 Maintenance work carried out.
.2 Development and condition of plant material.
.3 Preventative or corrective measures required which are outside Contractor's responsibility.

3.16 CLEANING

.1 Upon Completion, remove surplus materials, rubbish, tools, and equipment.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

.1 Turbidity curtain shall include all necessary labour, materials and equipment required to supply, install, maintain, and remove the turbidity curtain during in-water work as part of the preservation of the waterway.

1.2 RELATED SECTIONS

.1 Section 01 33 01 - Submittal Procedures.

.2 Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 There shall be no separate measurement for payment for the work under this Section. Include costs in the Contract Lump Sum Price.

.2 Payment shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work.

.3 There shall be no further compensation for modifications to the sediment and erosion control plan including the turbidity curtain should this plan need to be modified to meet the permitting requirements and/or specifications.

1.4 REFERENCES

.1 American Society for Testing and Materials (ASTM)
- .1 ASTM D4491/D4491M(2015), Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
- .2 ASTM D4595-11, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
- .3 ASTM D4716/D4716M-14, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
- .4 ASTM D4751-12, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-4.2, Textile Test Methods.
- .2 CAN/CGSB-148.1, Methods of Testing Geosynthetics.
  - .1 No.2-M85, Mass per Unit Area.
  - .2 No.3-M85, Thickness of Geotextiles.
  - .3 No.6.1-93, Bursting Strength of Geotextiles Under No Compressive Load.
  - .4 No.7.3-92, Grab Tensile Test for Geotextiles.
  - .5 No.10-94, Filtration Opening Sizes.

.3 Canadian Standards Association (CSA)
- .1 CAN/CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel.

.2 CAN/CSA-G164-M92 (R2003), Hot dip Galvanizing of Irregular Shaped Articles.

.4 Ontario Provincial Standard Drawings (OPSD)
.1 OPSD 219.260 November 2015, Turbidity Curtain.
.2 OPSD 219.261 November 2015, Turbidity Curtain, Seam Detail.

.5 Ontario Provincial Standard Specification (OPSS)
.1 OPSS 518 November 2011, Construction Specification for Control of Water from Dewatering Operations.
.2 OPSS 805 November 2015, Construction Specification for Temporary Erosion and Sediment Control Measures.

1.5 SUBMITTALS

.1 Submit details of the temporary turbidity curtain system to the Departmental representative prior to the start of the Work.
.1 Submittals to include but not limited to:
.1 Material data sheets for geotextile.
.2 Installation, monitoring, maintenance, and removal procedures.
.3 Installation drawings.
.4 Seam details.
.5 Anchoring details.

.2 Submit to Departmental representative details of geotextile material and seam at least ten (10) working days prior to commencing work.

.3 Complete the submission of a Sediment Control Plan as described in the Ministry of Natural Resources Technical Note, TN-20, Sediment Control Plans: Reducing Sediment concerns at Water Crossings, dated 1992, to the Departmental Representative to meet the requirements of all review agencies. Ensure compliance of the sediment control plan throughout the project.

1.6 DELIVERY AND STORAGE

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

PART 2 - PRODUCTS

2.1 MATERIAL

.1 The Contractor shall provide Type 2 DOT Turbidity Curtain to meet the following specifications, if work to extend into the summer navigational season:
.1 Fabric: 22 oz/sq yd PVC-coated polyester; optional filter fabric for skirt.
.2 Flotation: 8-in to 12-in diameter (depending on skirt depth) expanded polystyrene (EPS) foam contained in individually sealed float pockets.
.3 Top tension: 5/16-in galvanized steel cable (9,800 lb breaking strength) contained in a polyethylene tube.
.4 Bottom tension and ballast: 5/16-in galvanized steel chain: 7,600 lb breaking strength; 0.93 lb/ft weight.
.5 End connectors: High-tensile-strength aluminum universal connector at

float and top tension cable. ASTM 3/8-in stainless steel locking pins. Lacing grommets on reinforced fabric on lower skirt. Chain ends shackled section-to-section. Tool-free connections.

.6 Section length: 50 ft and 100 ft, standard.

.7 Skirt depth: to 50 feet; can be tapered to conform to bottom profile.

.8 Furling lines: available on request.

.9 Available accessories: anchor systems, ropes, marker buoys, solar-powered lights, repair kits.

.2 General:

.1 Geotextile: New, woven, synthetic fibre fabric geotextile or membrane supplied in rolls.

.2 Curtain Depth: To be determined by the Contractor and approved by Departmental Representative.

.3 Length: as specified on contract Drawings.

.3 Composed of: minimum 85% by mass of polypropylene polyester with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 60 days.

.4 Physical properties:

.1 Thickness: to CAN/CGSB-148.1, No.3, minimum 0.8 mm.

.2 Mass per unit area: to CAN/CGSB-148.1, No.2, minimum 220 g/m.

.3 Tensile strength and elongation (in any principal direction): to ASTM D4595.

.4 Tensile strength: minimum 1350N, wet condition.

.5 Elongation at break: minimum maximum 25%.

.6 Seam strength: minimum 1350N equal to or greater than tensile strength of fabric.

.7 Mulle burst strength: to CAN/CGSB-4.2, method 11.2, minimum 400N, equal to or greater than tensile strength of frabic.

.5 Hydraulic properties:

.1 Apparent opening size (AOS): to ASTM D4751.

.2 Low permeability synthetic material or geotextile impregnated with elastomeric spray.

.6 Securing pins and washers: to CAN/CSA-G40.20/ G40.21, Grade 300W, minimum 30% recycled content, hot-dipped galvanized with minimum zinc coating of 600 g/m to CAN/CSA-G164.

.7 Seams: sewn in accordance with manufacturer's recommendations.

.8 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

.9 Turbidity curtain to be properly weighted with ballast to maintain adequate seal and contact with canal bed.

.10 Design filter material to consider grain size characteristic, and the principals of maintaining sufficient flow and prevention of particle movement through the material.

PART 3 - EXECUTION

3.1 GENERAL

.1 Install turbidity curtain after acceptance of Sedimentation Control Plan.
  .1 Plan to consider areas that may be dry at start of Work and wet at the end of Work.
  .2 Coordinate use of sediment barriers and turbidity curtains for overall Sedimentation Control Plan.

.2 Turbidity curtain shall consist of turbidity curtain geosynthetic, load line, floatation, ballast, anchors, mooring buoys, mooring lines, adjustment lines, and tie-downs.

.3 Complete the submission of a Sediment Control Plan as described in the Ministry of Natural Resources Technical Note, TN-20, Sediment Control Plans; Reducing Sediment concerns at Water Crossings, dated 1992, to the Departmental Representative. Where directed by the Departmental Representative, submit to the review agencies as part of any permit requirements. Modify the sediment and erosion control plan to address the review agency comments. Ensure compliance of the sediment control plan throughout the project.
  .1 Plan to consider areas that may be dry at start of Work and wet at end of Work.
  .2 Co-ordinate use of sediment barriers and turbidity curtains for overall sedimentation Control Plan.

.4 Supply, install, maintain and remove silt curtains when instructed by the Departmental representative.

.5 Monitoring of water turbidity outside the silt curtain will be done by the environmental professional retained by the Contractor and results are to be made available for review by the Departmental Representative.

.6 As per the Canadian Water Quality Guidelines for the Protection of Aquatic Life:
  .1 The maximum increase in total suspended solids above background levels:
    .1 25 mg/L in a period of 24 hours in all waters during clear flows or in clear waters.
    .2 5 mg/L in average suspended sediment during a period of long-term exposure (>24 hours).
    .3 Total suspended solids should not exceed 75 mg/L irrespective of background levels in a 24 hour period.
    .4 If such a change is observed take immediate corrective action. Work may be stopped to address the problem.
  .2 Turbidity standards: Water discharged from dewatering into surface water bodies should have a turbidity:
    .1 <8 NTUs ((Nephelometric turbidity units, mg/L) above the background levels during short term exposure periods not to exceed 24 hours.
    .2 <2 NTUs above background levels for long term exposure.
    If Turbidity levels exceed 75 mg/l (or 25 NTU), or are above 25 mg/L but <75mg/L then work may be stopped to address the problem.

3.2 INSTALLATION

.1 Turbidity curtains shall consist of turbidity curtain geosynthetic, load line, flotation, ballast, anchors, mooring buoys, mooring lines, adjustment lines, and tie-downs.

.2 Design to conform to Ontario Provincial or Type II DoT Standard Specification, OPSS 577 and Ontario Provincial Standard Drawings: OPSD 219.260 and OPSD 219.261 as a minimum.

.3 Turbidity curtains shall be constructed as follows:
- .1 The floatation shall provide support along the length of the turbidity curtain.
- .2 A sleeve shall be formed and heat-sealed or sewn along the entire bottom edge of the turbidity curtain geosynthetic, to contain the ballast in the sleeve. Breaks may be made in the sleeve to facilitate pulling, provided they are a minimum 100 mm in size and spaced at minimum 3 m intervals.
- .3 Where turbidity curtain geosynthetic is joined to provide a continuous run, the sections shall be connected to provide a continuous seal and prevent the escape of turbid water between the sections.
- .4 The turbidity curtain, as prepared for installation, shall be of sufficient width to account for water depth and wave action.
- .5 The turbidity curtain shall be of sufficient length to permit work inside the area enclosed by the curtain without restricting equipment operations, and personnel from working.
- .6 Adjustment lines shall be placed at maximum intervals of 10m, and are to encircle the turbidity curtain from top to bottom.
- .7 The turbidity curtain shall be prepared for installation by furling and tying with furling ties every 1.5m for the entire length of the curtain.
- .8 Anchor locations shall be established as is necessary to maintain the turbidity curtain in place and functioning.
- .9 Provide buoys or other navigational markers to identify location of turbidity Curtain, if required.
- .10 Seal the ends of the turbidity curtain where it terminates at the existing structure face.
- .11 Install turbidity curtains directly outside of dewatering structures where construction activity takes place.

3.3 OPERATION AND MAINTENANCE

.1 Turbidity curtains shall be installed to prevent sediment passage, from the area enclosed by the curtain, to the remaining water body. Turbidity curtains shall be installed and maintained in a manner that avoids entry of equipment, other than hand-held equipment or boats, to the remaining water body.
- .1 Install multiple turbidity curtains, if required, to isolate individual work areas or around activities that may cause increased sedimentation.

.2 Equipment is permitted in the work area where activities are carried out in the dry and area is enclosed by silt and or turbidity curtain.
- .1 Only the working end of machinery shall directly enter the water, if work is required in the wet. The working end of the machinery will be clean and maintained free of mechanical operation leaks. Complete the in-water work activity as quickly as possible, minimizing the time equipment is in water. Do not leave equipment in water during non-operational use periods.

.3 Turbidity curtains shall be operated and maintained in the specified location, with the entire top edge above the water surface.

.4 The curtain shall be free of tears and gaps, and the bottom edge of the curtain

is to be continuously in contact with the water course bed so that sediment passage from the area enclosed is prevented.

.5 Any folds in the turbidity curtain which form next to the flotation collar shall be regularly monitored and freed of collected sediment.

.6 Monitor and maintain the turbidity curtains booms both during and outside normal working shifts as required. Provide all personnel, materials and equipment necessary to maintain, repair or relocate the silt curtain system.

.7 Carry out construction operations to minimize impact on fish habitat from both disturbed sediments and fill materials.

.8 Replace damaged or deteriorated geotextile to approval of Departmental representative.

.9 Remove turbidity curtain when authorized by the Departmental representative after completion of the work.

3.4 WATER QUALITY PERFORMANCE CRITERIA

.1 Turbidity:
- .1 Monitor as per approved Environmental Management Plan (EMP).
- .2 The maximum increase in turbidity above background is [8] NTUs.
- .3 Turbidity measurements will be taken 1 m below water surface. Four (4) measurements will be made at each elevation in five (5) minute periods. The average of eight (8) measures will be compared with the background values. Average values that exceed the allowable increase above background will be deemed non-compliant.
- .4 Turbidity measurements for receiving environment to be collected both upstream and downstream of the Work Area. For manual monitoring, measurements can be limited to twice per day when discharge water is not visibly cloudy, but should be made more frequently otherwise. Alternately, turbidity data may be collected by continuous recorders with data loggers placed upstream and downstream provided that data is downloaded weekly and supplemented with manual spot measurements.
- .5 When background levels are below 8 NTU’s maximum increase is 8 NTU’s from Background levels for short term exposure (i.e. 24 hour period) and maximum average increase is 2 NTUs from background levels for a longer term exposure (i.e. 30 day period) at point of discharge and receiving environment from in-water work.

3.5 CORRECTIVE ACTIONS FOR WATER

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

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

.1 This section covers the provisions for a temporary active treatment system (ATS)for the treatment and discharge of groundwater, water seepage through the cofferdam works and/or accumulated stormwater from dewatered area, excavations or other areas within the work zone requiring dewatering.

.2 The use of an ATS needs to be done in conjuncture with proper ESC plan that starts with erosion control, incorporates a multi-barrier approach and capturing of groundwater, seepage water or stormwater prior to being impacted by the site sediments to mitigating sediment releases from the site.

1.2 RELATED SECTIONS

.1 Section 01 33 01 - SUBMITTAL PROCEDURES.

.2 Section 01 35 46 – ARCHAEOLOGICAL, CULTURAL AND ENVIRONMENTAL PROCEDURES.

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 There shall be no separate measurement for payment for the work under this Section. Include costs in the Contract Lump Sum Price.

.2 Payment shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work.

.3 There shall be no further compensation for modifications to the temporary active treatment system should the system need to need to be modified to meet the permitting requirements and/or specifications.

1.4 REFERENCES

.1 Canadian Council of Ministers of the environment (CCME). 1999a (Updated 2002). Canadian Water Quality Guidelines for the Protection of Aquatic Life: Canadian Council of Ministers of the Environment, Winnipeg).

.2 Department of fisheries and Oceans of Ministry of Environment Lands and Parks (DFO). 1982. Land development guidelines for the protection of aquatic habitat.

.3 Anionic Polyacrylamide Application Guide for Urban Construction, prepared by the Toronto and region Conservation , June 2013

.4 Polymer Backgrounder: The Nature, Efficacy and Safety of Polymers for Erosion and Sediment Control, prepared by the Toronto and region Conservation , January 2014

1.5 DISCHARGE ALTERNATIVE

.1 As an alternative to a temporary active treatment system, the Contractor may discharge into a municipal owned sewer/water treatment works instead of using a temporary

active treatment system. If groundwater, water seepage through the cofferdam works, dewatering structure, construction platform and/or accumulated stormwater are discharged to a municipal owned sewer/water treatment works, the contractor shall:

.1 obtain a municipal wastewater discharge permit and complete with any additional laboratory analysis and/or assessment required to obtain the municipal wastewater discharge permit;
.2 comply with requirements of Acts, Regulations, By-Laws in force and permit requirements for wastewater discharge into a municipal water treatment works;
.3 pay all fees and other associated cost to obtain the municipal owned sewers/wastewater discharge permit, for discharging the water or additional work required under the permit.

1.6 SUBMITTALS

.1 Submit details of the temporary active treatment system (ATS) to the Departmental Representative at least one week prior to commencing Work.

.2 Submission to include:
.1 Title sheet.
.2 Table of contents.
.3 Certification or demonstration of training in the designing, operation and maintenance of the ATS.
.4 Description and schedule of the discharge activities.
.5 Discharge alternatives, including:
.1 Discharge into municipal sewers/water treatment works;
.2 Discharge into surface waters
.6 Treatment system description and components, including heating system if required.
.7 Anticipated flow rates.
.8 Operation and maintenance manual for the equipment.
.9 Material Safety Data Sheets (MSDS).
.10 Monitoring, sampling, and reporting plan, including QA and QC.
.11 Health and safety plan.
.12 Spill prevention plan.
.13 Spill response plan.
.14 Field-recorded data, visual inspection, calibration procedures, and examples of logs.
.15 Descriptions of measuring equipment
.16 Shop drawings showing:
.1 Section and plan views of treated water effluent treatment systems;
.2 Location of sampling points for water quality measurements;
.3 Flow path and placement of pipes, hoses, pumps, holding tanks and other equipment used to convey water;
.4 General position of treatment components relative to dewatered area, excavations or other areas within the work zone requiring dewatering and adjacent areas not to be impacted by the project activities;
.5 Point of treated water discharge.
.17 Daily inspection report form.
.18 Municipal wastewater discharge permit if required.
.19 The flocculants-handling work plan must include:
.1 Description of procedures to prevent accidental spillage, overfeeding into the treatment system, or other mishandling of agents;
.2 Water temperature operation range of agent;
.3 Monitoring plan for flocculants;
.4 Description of the flocculating agents, including chemical and trade

names;
.5 Acute or chronic toxicity levels for aquatic organisms of the agents, in accordance to Environment Canada / DFO /EPA testing methods;
.6 Monitoring plan to detect a residual agent at concentrations at or below the established acute toxicity levels for freshwater and marine conditions for that agent.

.20 Allow 20 days for review. If revisions are required, the Engineer notifies you of the date the review stopped and provides comments. Submit a revised ATS plan within 15 days of receiving the comments. The Department Representative's review resumes when a complete plan has been resubmitted.

1.7 INSPECTION REPORTS

.1 If the ATS discharges treated effluent, submit a daily inspection report within 24 hours. The daily inspection report must include:
.1 Discharge volumes.
.2 Water quality monitoring records
.3 Discharge point information that includes:
.1 Date and time;
.2 Weather conditions,
.3 Presence or absence of water fowl or aquatic wildlife;
.4 Color and clarity of the effluent discharge;
.5 Erosion or scouring of the canal bed at the discharge point;
.6 Photographs labeled with the time, date, and location.

1.8 NOTICE OF DISCHARGE REPORTS

.1 If observations and measurements confirm that a water quality standard is exceeded, submit the notice of discharge within 48 hours after exceeding the limits. The notice of discharge must include documentation of the reasons for exceeding the water quality standard and any corrective work performed to prevent a recurrence.

1.9 QUALITY ASSURANCE

.1 Regulatory Requirements:
.1 The design, installation, operation, and monitoring of the temporary ATS and monitoring of the treated effluent must comply with the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life.

1.10 QUALIFIED ATS DESIGNER AND OPERATORS

.1 The ATS shall be designed, installed and inspected by professionals qualified in the use of polymers for the purpose of clarification of captured water from dewatering areas or excavation. In this context, an individual will be considered 'qualified' if they can demonstrate sufficient knowledge of the use of polymers in construction applications based on previously completed training and field experience. Any other on-site staff working with the polymer shall work under the direct supervision of the qualified person.

.2 The training must:
.1 Be specific to the operation of the ATS and flocculent agent for construction dewatering and stormwater clarification, including:
.1 Coagulation and flocculent basics, including chemistry and physical processes
.2 System design and operating principles
.3 Control systems

.4 Coagulant and flocculent agent selection, such as jar testing and dose determination
.5 Handling and safety measures for the toxicity of agents
.6 Monitoring, sampling, and analysis
.7 Reporting and recordkeeping
.8 Emergency response

.2 Consist of a formal class with a certificate.

1.11 EQUIPMENT CALIBRATION

.1 Calibrate the flow meter and devices for taking water quality measurements under the manufacturer's instructions and in the presence of the Engineer.

1.12 Quality Control

.1 Water discharged from a temporary ATS must comply with the water quality objective stipulated in Section 01 35 46 – ARCHAEOLOGICAL, CULTURAL AND ENVIRONMENTAL PROCEDURES for discharge effluents and the receiving environment.

.2 At the point of discharge the test discharged water from an ATS under the test methods shown in the following table:

Quality characteristic	Test method	Detection limit (min)	Requirement (as per section 01 35 46)
Turbidity (min, NTU) (by Contractor)	EPA 0180.1 or field test with calibrated portable instrument	1	- maximum increase of 8 NTU above background for short –term periods (<24-h); - maximum increase of 2 NTU above background for long-term periods (>24-h to 30 days); - absolute maximum of 35NTu irrespective of the background levels.
Total suspended solids (TSS) (by third party testing)	Laboratory test		- maximum increase of 25mg/l above background for short –term periods (<24-h); - maximum increase of 5 mg/l above background for long-term periods (>24-h to 30 days); - absolute maximum of 75mg/l irrespective of the background levels.
pH	Field test with calibrated portable instrument	0.2	- Lower limit = 6.0 - Upper limit = 9.0

.3 If requested by the Department representative, demonstrate that the residual amount of acrylamide content in the discharge water is less than 0.05%.

1.13 HANDLING, STORAGE AND DISPOSAL

.1 Any persons involved in mixing, applying or otherwise handling an anionic PAM product should follow health and safety guidance provided by the manufacturer. As a minimum the following measures are to be followed:

- .1 A dust mask must be worn at all time when handling granular form of anionic PAM.
- .2 Eye protection must be worn when granular or liquid forms of PAM are being mixed or applied, or otherwise used in a way that could generate a dust or mist. In the event of accidental eye contact, thorough rinsing for several minutes is recommended.
- .3 Plastic, rubber or leather gloves must be worn during handling to protect hands from direct contact with the product. In the event of skin contact, wash thoroughly with water and soap.

.2 Storage of flocculent agent to be in accordance with guidance provided by the manufacturer and as stipulated for the handling of hazardous materials in section 01 35 46.

.3 Water is not to be used for the cleaning of PAM spills. If the spilled product is dry, clean up should be done by simple sweeping or another method of removal without water. If the spilled product is wet, an absorbent material (e.g. sawdust) can help to dry it out so that it can be safely collected and removed.

.4 Disposal of expired or otherwise compromised anionic PAM products is be carried out in accordance with guidance from the product manufacturer or distributor.

PART 2- PRODUCTS

2.1 MATERIAL

.1 General:

- .1 An ATS must be designed for the site conditions, anticipated sediment load, water temperature and anticipated flow rate and must include (1) a treatment system, (2) a collection and conveyance system, and (3) a discharge method and location.
- .2 Monitoring equipment must be interfaced with the control system of the ATS to provide shutoff or recirculation whenever effluent readings do not comply with the turbidity and pH limits.
- .3 The control system must default to recirculation or shutoff during a power failure or catastrophic event.
- .4 The control system must control the amount of the flocculent agent to prevent overdosing.

.2 Treatment System:

- .1 The treatment system must be capable of removing sediment and turbidity-producing suspended solids. Primary and secondary treatment may be required, or the design of the treatment system may require combined use of the various treatment components in series to achieve effective treatment. The treatment system must have components to:
  - .1 Remove sediment and turbidity-producing suspended solids. Components may include desilting basins, settling tanks, sediment traps, gravity bag filters, sand media filters, pressurized bag filters, cartridge filters, in-line flocculants, temporary holding tanks, or any

combination necessary to provide primary and secondary treatment.
.2 Adjust the pH:
.1 Injection of carbon monoxide Addition of sulfuric, phosphoric, citric, or nitric acid under the supplier's specifications for the treatment of water with high pH. You may use hydrochloric acid if the water is dechlorinated before discharge.
.2 Filtration through a limestone bed or the addition of sodium hydroxide for the treatment of water with a low pH.
.3 Bring and maintain water temperature flowing through the system within the operation range to the flocculent agent and to prevent ATS from freezing or icing up during cold weather.

.3 Flocculent agents:
.1 Only flocculent agents using water soluble anionic polyacrylamides (PAM) as the active polymer ingredient are to be used. Products containing a synthetic cationic polymer or chitosan are not be used due to their higher toxicity to aquatic organisms.
.2 Acute and chronic toxicity test data, is to be provided to the Departmental representative, from the manufacturer or a third party organization for the following aquatic organisms: fathead minnow (Pimephales promelas), rainbow trout (Oncorhynchus mykiss) and water flea (Daphnia magna. The LC-50 concentrations (the concentration of polymer that is lethal to 50% of the sample population) listed in toxicity reports should exceed the maximum possible product release rate.
.3 The anionic PAM used in the flocculent agent shall have a molecular weight between 6 and 24 mg/mol, with 12 to 15 mg/mol preferred.
.4 Emulsion forms of anionic polyacrylamides are not to be used.
.5 Residual acrylamide content in the agent to be less than 0.05%.
.6 Product to be package and /or labeled with product expiry date, use instruction, application rates, mixing methods, maintenance requirements, safe handling and, storage and disposal methods.

.4 Collection and Conveyance System:
.1 The collection and conveyance system must include pumps and piping to convey the water from the point of dewatering or stormwater capture to the treatment system and to the point of discharge. Pumps and piping to be in accordance with section 35 20 22.

.5 Monitoring Equipment:
.1 Monitoring equipment for the ATS must capable of recording data at least once every 15 minutes and cumulative flow data daily. The recording system must have the capacity to record a minimum of 7 days of continuous data.

PART 3 - EXECUTION

3.1 GENERAL

.1 Discharge treated water to be discharged to the canal surface water such that it does not:
.1 Cause erosion and scour. If scour occurs, repair the damage and install an energy dissipater.
.2 Impact the natural bedding and aquatic life.

.2 Maintain the ATS to provide proper functioning and prevent leaks. Repair or replace

the any component of the dewatering equipment that is not functioning properly.

.3 Remove sediment from the storage or treatment cells as necessary to ensure the cells maintain their required water storage capability. Disposed sediment off-site as contaminated soil at a registered landfill site.

.4 Wash water from rinsing of storage or treatment cells is not be discharged directly to canal surface water. Wash water is to be collected and either disposed off-site, or re-cycled through the ATS once is put back into operation.

.5 Relocate the ATS as needed.

3.2 OPERATION OF SYSTEM

.1 Prior to start-up of ATS, perform sampling and test turbid water to be treated to determine that required dosage and flocculent agent formulation which will be capable to remove solids to a concentration suitable for discharge. Written report of the agent performance is to be provided to the Department representative. Repeat the sampling and testing as required as condition at the site changes and dosage and/or formulation of flocculent agent need to be adjusted.

.2 Operate ATS in accordance with manufacture written instruction.

.3 Operate conveyance system to ensure that water flow through the ATS is within the operation range of the flocculent agent formulation and dosage.

3.3MONITORING

.1 General
- .1 While operating the ATS, comply with requirement for monitoring and reporting as stipulated in section 01 35 46. Monitor:
  - .1 Effluent turbidity
  - .2 Effluent pH
  - .3 Effluent flow rate and flow volume
- .2 Use a flow meter to measure all discharges from treatment activities.

3.4 WATCHKEEPER

.1 Ensure continuity of water treatment by designating a Watchkeeper to make periodic checks at times when Work is not in progress. Watchkeeper's qualifications under this Section are to be sufficient to perform general maintenance of the ATS, monitoring duties, load flocculent agent into the ATS and/or adjust flocculent agent dosage as required.

3.5 CORRECTIVE MEASURES

.1 If observations and measurements determine the water quality limits are exceeded, immediately stop the discharge, notify the Engineer, and start corrective measures to change, repair, or replace the equipment and procedures used to treat the water.

.2 After the Engineer inspects and authorizes your corrective measures, resume treatment and discharge activities under the startup-phase sampling requirements before resuming regular-phase sampling.

END OF SECTION