



Public Services and
Procurement Canada

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Approvisionnement Canada

SPECIFICATIONS FOR RECONSTRUCTION OF DAM AT LOCK 38

PWGSC PROJECT No: R.076951.906

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Prepared for:

Public Services and Procurement Canada

Canada

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END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Title and Description of Work
- .2 Contract Method
- .3 Work planning
- .4 Parks Canada Agency occupancy and operation of navigation lock

1.2

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

1.3 RELATED REQUIREMENTS

- .1 Section 01 14 00 - Work Restrictions
- .2 Section 01 20 01 - Site Access
- .3 Section 01 35 43 - Environmental Procedures
- .4 Section 01 41 00 - Regulatory Requirements
- .5 Section 01 71 00 - Examination and Preparation

1.4 WORK COVERED BY
CONTRACT DOCUMENTS

- .1 Work of this Contract is comprised of reconstruction of the Dam at Lock 38 of the Trent-Severn Waterway (TSW) located approximately 4 km west of the Town of Bolsover, ON (44° 30' 37" N and 79° 06' 23" W); and further identified as PSPC Project R.076951.906.
 - .2 The Construction Work includes but is not limited to the following:
 - .1 Obtaining regulatory permits, certificates of authorization and approvals;
 - .2 Temporary Site Access;
 - .3 Construction facilities /staging areas;
 - .4 Vehicular traffic control / detours;
 - .5 Public and Waterway Navigation safety;
 - .6 Drainage, sediment and erosion control and other environmental protections;
 - .7 Cofferdams and dewatering of the work area, including maintenance of the dewatering system;
 - .8 Water diversion / cofferdam work, including
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- maintenance and operation of the diversion system;
 - .9 Protection / Stabilization of the existing lock and dam structures to remain and other works including embankments, walls, buildings/facilities, during construction;
 - .10 Preparation and implementation of an Emergency Response Plan (ERP), Operation /Monitoring/Surveillance Plan (OMS) for the Contractor's temporary works;
 - .11 Demolition of the existing concrete dam structure;
 - .12 Salvage of the existing crab winches, crab winch rails and clips, embedded winch tie-down anchors, life safety rings, signage, water level monitoring gauge and other identified equipment;
 - .13 Construction of the new concrete dam structure and related work;
 - .14 River and embankment erosion protection;
 - .15 Removal of cofferdam, water diversion system and other temporary works;
 - .16 Site reinstatement and restoration.
- .3 In addition, the work under this contract, the Contractor will also be responsible for:
- .1 The design, approvals and monitoring work associated with installing and maintaining the temporary water control works (cofferdam, water diversion, stabilization of lock wall, dewatering, sediment control etc.)
 - .2 The design, approvals and monitoring work associated with temporary construction works (stabilization of embankments and structures to remain, water and sediment control etc.)
 - .3 Acquiring additional nearby land(s) for the purpose of temporary staging area(s) / construction facilities.

1.5 LOCATON OF WORK

- .1 Dam at Lock 38 is located on Talbot River, approximately 6 km west of the Town of Bolsover, ON. The legal location is Parts 1, 2, and 3 of Lot 4, Concession 11, Township of Brock (Thorah), Regional Municipality of Durham (south side), and Part 1, 2, 3, and 4 of Lot 4, Concession B, Township of Ramara (Mara), County of Simcoe (north side).
- .2 The dam is one of 143 dams that are used to regulate the water levels for navigation on the Trent-Severn Waterway. The dam is owned and operated by the Parks Canada Agency (PCA).

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| <u>1.6 EXAMINATION OF SITE</u> | .1 | Visit site before submitting tender. Examine site, adjacent premises, means of access and egress, and investigate and be fully informed of the nature and extent of the work required, difficulties in performing the work, site access, facilities available for delivery, placing, operating plant and for delivery of materials. |
| | .2 | A mandatory site visit will be organized to allow Bidders to examine site, adjacent premises, and condition of existing structure(s) before submitting a bid. |
| | .3 | Be completely familiar with every detail and intent of these specifications and scope of work to be performed, and regulatory requirements governing Work. |
| <u>1.7 CONTRACT METHOD</u> | .1 | Construct Work under combined unit price and lump sum price contract. |
| <u>1.8 COST BREAKDOWN</u> | .1 | Within 5 days of notification of acceptance of bid, provide the Departmental Representative with a cost breakdown for both lump sum and unit price items as outlined in Section 01 22 01-Measurement and Payment. |
| | .2 | Submit breakdown in metric (SI) units. |
| | .3 | Upon approval from the Departmental Representative cost breakdown will be used as basis for progress payment. |
| <u>1.9 CONSTRUCTION SCHEDULE AND CASH FLOW</u> | .1 | Within 15 days of award of the Contract, provide the Departmental Representative with a copy of the Construction Schedule and estimated Cash Flow corresponding to the construction schedule in accordance with "Doing Business with PWGSC". |
| | .2 | The construction schedule is to be prepared in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT). |
| | .3 | The estimated cash flow is to be provided for each month of the fiscal year from April to March. |
| | .1 | Revise and update Cash Flow estimate at the beginning of each month to reflect schedule and contract changes. |

1.10 CONTRACTORS'S TECHNICAL SUPPORT

- .1 Within 5 days of acceptance of bid, submit a list of design engineers and specialists that will support the Contractor to deliver the project.
- .2 Contractor's Technical Support Team must include (but not limited to):
 - .1 Environmental Specialist
 - .2 Health and Safety Specialist
 - .3 Dam Structure/hydraulic/Civil Engineer (Diversion, Cofferdams, Dewatering, Temporary works etc.)
 - .4 Geotechnical Engineer (excavation/excavation shoring/erosion etc.)
 - .5 Monitoring Specialist (precision movement monitoring of temporary and permanent works)
 - .6 Qualified Surveyor (OLS and CLS certified) for layout and monitoring.

1.11 WORK PLANNING

- .1 Plan and schedule the Work such as to allow the navigation lock to remain open throughout the navigation season (Friday prior to Victoria Day in May to Wednesday after Thanksgiving in October).
- .2 Construction Work for the cofferdam, diversion, dewatering system and stabilization work is to be planned, scheduled and executed by the Contractor to minimize interference with the use and operation of the lock by the Parks Canada Agency.
- .3 Plan and schedule in-water work and any tree removal work as to not interfere with restricted time periods as outlined in Section 01 14 00 - Work Restrictions.
- .4 Road closures are to be minimized. If required, construct a vehicular turn-around on both sides of excavation work on Canal Road or Ball Avenue in accordance with authorities having jurisdiction. Turn-around must be capable to accommodate school buses and emergency vehicles.
- .5 Ensure that fire access/controls to work area and adjacent properties are maintained at all time.
- .6 Maintain access to the dam and lock station for PCA staff all times. Advise PCA when vehicular access is to be temporarily restricted.
- .7 Maintain residential access including temporary residential turn around at all times.
- .8 Maintain/protect all structures, services and utilities that are to remain throughout the work. Undertake any relocations to the requirement of the

local authorities.

- .9 Carry out work in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) and approved schedule.

1.12 ARCHAEOLOGICAL, CULTURAL AND ENVIRONMENTAL PROTECTION

- .1 Trent-Severn Waterway, Lock 38 and the Dam at Lock 38 are National Heritage Sites.
- .2 Parks Canada Agency is the main Environmental Authority for Trent-Severn Waterway Projects.
- .3 The Contractor shall seek and obtain acceptance of Departmental Representative and PCA's Environmental Authority on submittals or changes in scope of work or methodologies that may affect archaeological resources, cultural resources or environment prior to providing direction to the Contractor.
- .4 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 Departmental Representative and may require issuing revised permit.
- .6 Site may contain possible cultural and archaeological resources.
- .7 Employ minimal intervention approach for all work.
- .8 Damage to heritage elements will not be tolerated.
- .9 All works to be done in accordance with requirements of Section 01 35 46 - ARCHAEOLOGICAL AND CULTURAL PROCEDURES.

1.13 WATER MANAGEMENT AND CONTROL

- .1 PCA will continue their responsibility of water management and control on the Trent-Severn Waterway throughout the duration of the construction period. PCA will instruct the Contractor on water management operations, including stoplog manipulation.
- .2 The Contractor will operate the water diversion to control the water levels of the upper reach of the dam in accordance with PCA operational instructions. Refer to Section 01 14 00 - Work Restrictions and Section 35 20 22 - Dewatering and

Diversion. Responsibilities will include (but not limited to):

- .1 Record keeping of the diversion system
 - .2 Contractor be available on a daily basis for water control (including weekends and statutory holidays)
 - .3 Contractor must conduct stoplog manipulation within one (1) hour of direction from the Parks Canada Agency
 - .4 Operations could occur multiple times a day
- .3 Unless otherwise instructed the Contractor is to maintain the water levels within the navigation range during the navigation season. The Contractor is not to allow the water levels to go above or below set navigation range without prior authorization from Departmental Representative.
- .4 In order to minimize impact of high flows on the diversion system, the Contractor is to actively attempt to keep the water levels during navigation and outside of the navigation season near the lower end of the operating ranges.
- .5 The Contractor shall provide adequate environmental protection as per Section 01 35 46- ARCHAEOLOGICAL AND CULTURAL PROCEDURES.
- .6 Sequence of handover of water management operations:
- .1 Parks Canada Agency will continue the water management operations on the existing dam until the work on the water diversion system is completed, commissioned and ready for operation.
 - .2 The Contractor is to carry out water management operations on the water diversion system until the work on the new dam has been completed, commissioned and accepted by the Departmental Representative, the cofferdams have been deconstructed, and Parks Canada Agency has taken over the dam structure.
- .7 The Contractor is to install necessary water monitoring equipment to assist with water management. As a minimum the following equipment shall be supplied:
- .1 Temporary staff gauge, installed in calm water, upstream of the diversion system entrance. The size of markings on the gauge are to be such that it can be easily read from the water diversion control structure. The staff gauge must be established in 1978 Geodetic Survey of Canada (GSC) datum. The

location must be approved by the Departmental Representative.

1.14 COORDINATION WITH
PARKS CANADA AGENCY

- .1 Contractor shall provide safe access to the parking lot behind (north of) the lock master building or such other location agreed to by the Departmental Representative.
- .2 Contractor shall limit use of premises for Work, storage and access to allow;
 - .1 Parks Canada Agency staff access to the lock master building and dam;
 - .2 Maintenance and operation of the dam by Parks Canada Agency staff during the construction period;
 - .3 Unrestricted entry and egress to the lock by Parks Canada Agency staff and recreational boaters during the navigation season.
- .3 Any usage of the lock by the Contractor during the navigation season, for moving material or equipment will require 7 days notification. The lock will not be available to the Contractor outside the navigation season.
- .4 Parks Canada Agency shall continue to have control and full access to the existing dam structure for water management operation until the water diversion system has been completed and commissioned and the Contractor has taken over the water management operations.

1.15 CONTRACTOR USE OF
PREMISES

- .1 Contractor has unrestricted use of site for the purpose of construction, as defined by the construction limit, until final acceptance of the Work.
- .2 Coordinate use of premises with Departmental Representative.
- .3 Confine work, including temporary structures, plant, equipment and materials to established Construction Limit, unless otherwise agreed to in writing by the Departmental Representative.
- .4 The Contractor will not have access or use of any lock master building, including the use of the public washrooms.
- .5 For construction facilities on Parks Canada Agency property, locate temporary buildings, access roads, drainage facilities, services and utilities for approval by the Departmental Representative and

maintain in clean and orderly manner.

- .6 If required, the Contractor, at their sole discretion, shall obtain and pay for use of additional off-site storage or staging areas needed. The use, maintenance, and restoration of additional off-site storage or staging areas are to be captured within a lease agreement between the Contractor and the property owner, exclusively.
- .7 The use, maintenance, and restoration of all roadways shall be the sole responsibility of the Contractor.

1.16 PARKS CANADA AGENCY OCCUPANCY AND NAVIGATION LOCK OPERATION

- .1 Parks Canada Agency shall have access to the lock master building, dam, the navigation lock and adjacent land at all times during entire construction period for execution of normal maintenance and operations
- .2 Cooperate with Departmental Representative in scheduling operations to minimize conflict.
- .3 The navigation lock shall remain open to recreational boaters throughout the navigation season.

1.17 COMMUNICATION PROTOCOL

- .1 Due to nature of the work of on-going water management and control issues, and continued operation of the navigation lock, a communication protocol will need to be established between the Departmental Representative and the Contractor prior to commencement of work
- .2 In general terms the Communication Protocol will address:
 - .1 Daily communication related to water management and control;
 - .2 Communication related to urgent safety concerns;
 - .3 Communication related to urgent environmental concerns;
 - .4 Communication related to scheduled and unscheduled Contractor or Parks Canada Agency operation activities;
 - .5 Communication related to construction and contract issues;
 - .6 Communication with the general public.

1.18 SITE DOCUMENTATION

- .1 Maintain on site, one copy of each document as follows:
 - .1 Historic Canals Regulations Permit,

- .2 Contract Drawings (Full Size),
- .3 Specifications,
- .4 Addenda,
- .5 Reviewed Shop Drawings,
- .6 List of Outstanding Shop Drawings,
- .7 Field Test Reports,
- .8 Copy of Approved Work Schedule,
- .9 Site Specific Health and Safety Plan,
- .10 Site Specific Environmental Protection Plan
- .11 Basic Impact Assessment (BIA)
- .12 Red Line drawings of As-Built Changes marked on Full Size Contract Drawings

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 Connecting to existing services
- .2 Special scheduling requirements
- .3 Critical dates
- .4 Water level on the river

1.2 RELATED REQUIREMENTS

- .1 Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart
- .2 Section 01 32 00 - Construction Progress Documentation
- .3 Section 01 35 00.06 - Special Procedures for Traffic Control
- .4 Section 01 35 43 - Environmental Procedures
- .5 Section 01 35 46 - Archaeological and Cultural Procedures
- .6 Section 01 41 00 - Regulatory Requirements
- .7 Section 01 56 00 - Temporary Barriers and Enclosures
- .8 Section 01 71 00 - Examination and Preparation
- .9 Section 32 93 10 - Trees, Shrubs and Ground Cover Planting
- .10 Section 35 20 22 - Dewatering and Diversion

1.3 EXISTING UTILITIES & SERVICES

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

- .3 Provide surveyed plans to Departmental Representative, Utility Companies and owner of other services of existing and temporary relocations of existing utilities or services to facilitate the Work. Obtain all permits and pay all associated costs for temporary works including relocating utilities or services to their final location. Coordinate schedule with respective companies and owners.
- .4 Provide measures to maintain personnel, pedestrian, boat and vehicular traffic.
- .5 Construct barriers and enclosures in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.4 NAVIGATION SEASON RESTRICTION

- .1 Navigation Season: The Waterway is open to the general public for navigation from Friday prior to Victoria Day in May to Wednesday after Thanksgiving in October.
- .2 Navigation Lock Operation Hours:
 - .1 Opening of navigation to last week in June
 - .1 Monday to Thursday: 10:00am to 3:30 pm.
 - .2 Friday to Sunday: 9:00am to 6:30pm.
 - .2 Last week in June to first week in September:
 - .1 Monday to Thursday: 9:00am to 5:30pm
 - .2 Friday to Sunday: 9:00am to 6:30pm
 - .3 First week in September to Closure of Navigation:
 - .1 Monday to Friday: 10:00am to 3:30pm.
 - .2 Saturday - Sunday: 9:00am to 4:30pm.
- .3 These hours are subject to change.

1.5 ENVIRONMENTAL RESTRICTIONS

- .1 Section 01 35 43 - Environmental Procedure list environmental restrictions and times frames that need to be considered in the planning of the Work.

1.6 EXISTING STRUCTURES/ACCESS

- .1 Notify Departmental Representative and local road authority of intended interruption of service or access.
- .2 Maintain water access to Lock 38 during the navigation season.
- .3 Maintain vehicular access at all times to requirements set out in Section 01 20 01 - Site

Access, and to:

- .1 Residences along Canal Road, Regional Road 50, and Ball Avenue East. Where access (driveways) is affected by the work, modify or relocate access as appropriate.
- .2 Parks Canada Agency staff to Lock 38 Lock Control building.
- .4 The existing lock structure cannot to be used as part of the water diversion system or to assist with water management.
- .5 Any usage of the lock during navigation season for moving material or equipment will require 7 days notification. The lock will not be available to the Contractor outside the navigation season.
- .6 No heavy equipment is to be placed and operated in the immediate vicinity of the lock structures. To the greatest extent possible, maintain six (6) metres equipment clearance from the lock wall of unless approved by the Departmental Representative. Do not place heavy equipment on the lock entrance (upstream) or the cutoff wall joining the lock and the dam. At areas of close proximity immediately downstream of the cutoff wall, provide measures to minimize the equipment loading such as pads.

1.7 ROAD CLOSURE AND TRAFFIC DETOUR

- .1 Undertake road closure and traffic detour as set out in Section 01 35 00.06 - Special Procedures for Traffic Control.
- .2 Where work involves disruption to and rerouting of vehicular traffic, provide Departmental Representative with a Traffic Control Plan to the requirement of the local authorities and the standards set out in the Ontario Traffic Manual Book 7, Temporary Conditions.
- .3 Provide a minimum of four weeks formal notification of detour to local road authorities, emergency services, Canada Post, and local school boards.
- .4 Install road closure and construction advertising signs, two weeks in advance of planned road closure.
- .5 Provide turn-around facilities at Canal Road and Ball Avenue if required, to the requirements of the local municipality and authorities having jurisdiction.

1.8 ROAD AND BRIDGE LOAD RESTRICTIONS

- .1 Regional Road 50 (Regional Municipality of Durham and County of Simcoe) and Canal Road
- .1 The bridge crossing the Talbot River on Regional Road 50 (Morgan Bridge) and the Regional Road 50, downstream of Lock 38, each have a load restriction of 5 tonnes.
 - .2 If the Contractor plans on using either the bridges on Regional Road 50 or the Regional Road 50/Canal Road as part of their haul route, they will be responsible to obtain authorization from the Regional Municipality of Durham, County of Simcoe, and Township of Ramara beforehand. Provide a copy of the authorization to the Departmental Representative.
 - .3 Should authorization not be given, the Contractor is responsible to make alternative arrangements at no additional cost to the project.
 - .4 The Contractor is responsible for any and all costs associated with any requirements of the local authority having jurisdiction.
- .2 Talbot River crossing on Simcoe Street (Trent-Severn Waterway Bridge 44)
- .1 This single lane swing bridge, is owned and operated by the Parks Canada Agency, and has an 8 tonnes load restriction.
 - .2 During the navigation season the bridge can be temporarily closed to vehicular traffic when it is open for boat traffic.
 - .3 The swing bridge is not to be used by construction equipment or hauling vehicles.

1.9 SPECIAL REQUIREMENTS

- .1 Through the direction of the Parks Canada Agency, maintain water levels on the Talbot River for navigation and other seasonal requirements through operation of the diversion structure.
 - .2 Coordinate water levels and flows in the Talbot River to Section 35 20 22 - Dewatering and Diversion.
 - .3 Coordinate any operation of the diversion system control structure with Trent-Severn Waterway Operations to permit manipulation of the downstream dam. Failure to do so could result in unacceptable water flows and levels, and possibly flooding of the downstream reach.
 - .4 Provide downstream flow for the walleye spawning sanctuary on the Talbot River below the Talbot Dam in April-May period as directed by the Parks Canada
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Agency.

- .5 Any in-water work undertaken in the Talbot River must occur outside the fishery spawning window of March 15 to July 15. In-water work and work adjacent to the watercourse is to be done in accordance with Section 01 35 43 - Environmental Procedures.
- .6 Tree cutting and clearing work is not to be undertaken during the migratory bird nesting season, between April 1 and August 31. Tree cutting and clearing work is to be done in accordance with Section 01 35 43 - Environmental Procedures and Section 31 11 00 -Clearing and Grubbing.
- .7 Obtain all regulatory permits and / or authorizations to Section 01 41 00 - Regulatory Requirements and implement measures to comply with permits and certificates of authorization requirements.
- .8 Blasting for demolition and rock excavation is prohibited.

1.10 CONTRACTORS USE OF DEWATERED AREA

- .1 Contractor's use of the dewatered area is limited for the sole purpose of construction activity. The dewatered area shall not be used for:
 - .1 The Contractor's construction facilities or staging area, including site washroom facilities, and workers parking area;
 - .2 Fuel storage or refueling station;
 - .3 Storage of machinery, equipment or material; and
 - .4 The contractor's brown water treatment facility.
- .2 All equipment and machinery used within the dewatered area must be kept in good working condition and free of fuel, lubricants, coolant and other deleterious material that could enter the water body.

1.11 WATER LEVELS

- .1 All water level elevations are managed in 1978 Geodetic Survey of Canada datum.
- .2 The upstream range for the navigation level at Dam at Lock 38 is 234.58 m to 234.68 m.
- .3 The downstream range for the navigation level at Dam at Lock 38 is 230.34 m to 230.44.
- .4 During the non-navigation season (October to May),

the maximum upstream water level is 234.54 m.

- .5 The maximum downstream water level during the non-navigation season is 230.30 m.
- .6 Approximately four weeks after the close of navigation season (May long weekend to October long weekend), the water level in the Trent-Severn Waterway, along the Talbot River, is lowered for the winter season.
- .7 At a time determined by the Parks Canada Agency, the stop logs are placed in the various structures to allow the reaches to fill naturally during the spring freshet to the navigation season levels.
- .8 The Contractor is solely responsible for making their own interpretation of the data included herein, and any received from the Parks Canada Agency.
- .9 The Contractor is cautioned that, while the Trent-Severn Waterway / Parks Canada Agency endeavors to manage the water levels within the indicated ranges, it cannot be held responsible for events, or the result of events, that are not under its control.

1.12 HOURS OF WORK

- .1 The normal hours of work are to be in accordance with the noise by-laws of the local municipality.
- .2 The Contractor is not to work during the weekend and public holiday without prior authorization from the Departmental Representative. Coordinate timings with the Departmental Representative.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- .1 Dam at Lock 38 is located on Talbot River, approximately 4 km west of the Town of Bolsover, ON. The legal location is Parts 1, 2, and 3 of Lot 4, Concession 11, Township of Brock (Thorah), Regional Municipality of Durham (south side), and Part 1, 2, 3, and 4 of Lot 4, Concession B, Township of Ramara (Mara), County of Simcoe (north side).
- .2 The work of this Section includes but is not limited to:
 - .1 The use of local and regional roads to access the Work area.
 - .2 Acquisition and use of Contractor staging area(s).
 - .3 Construction of temporary turn-arounds where required.
 - .4 Providing construction fence and perimeter security measures around work area.
 - .5 Maintaining the work/storage area for the duration of the work.
 - .6 Removal of the temporary facilities and access.

1.2 RELATED REQUIREMENTS

- .1 Section 01 14 00 - Work Restrictions
- .2 Section 01 20 01 - Site Access
- .3 Section 01 33 00 - Submittal Procedures
- .4 Section 01 35 00.06 - Special Procedures for Traffic control
- .5 Section 01 35 43 - Environmental Procedures
- .6 Section 01 35 46 - Archaeological and Cultural Procedures
- .7 Section 01 41 00 - Regulatory Requirements
- .8 Section 01 48 00 - Construction Control and Monitoring
- .9 Section 01 52 00 - Construction Facilities
- .10 Section 01 56 00 - Temporary Barriers and Enclosures
- .11 Section 01 71 00 - Examination and Preparation

- .12 Section 01 74 11 - Cleaning
- .13 Section 31 11 00 - Clearing and Grubbing

1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 Measurement Procedure: work under this section will not be measured for payment and shall form part of the contract Lump Sum Price.

- .2 Payment of this Section shall be as set out in Section 01 22 01 - Measurement and Payment.

1.4 SUBMITTALS AND SHOP DRAWINGS .1 Undertake submittals including shop drawings to Section 01 33 00 - Submittal Procedures.

.2 Be responsible for the conceptual and detailed design of all access systems.

.3 Submit three sets of shop drawings showing layout and details of access systems to the Departmental Representative for review.

.4 Provide a plan of the usage/layout of the Parks Canada Agency (PCA) lands for review by the Departmental Representative.

.5 Provide a plan which eliminates the tracking of mud onto local roads, from the work site or laydown and storage areas. The Contractor is responsible for maintaining the cleanliness of the roadway to the satisfaction of the Departmental Representative.

.6 Provide a Restoration Plan for Parks Canada Agency's lands acceptable to the Departmental Representative. The restoration plan shall include the removal of the contractor's temporary works, regrading of the affected areas, reconstruction of the parking area, access road, and the landscaping work as set out in the contract drawings.

1.5 ACCESS TO THE WORK .1 The dam site can be accessed by either the south or the north side of the Talbot River as follows:

- .1 From the north side of the river, the dam is accessible from Lock 38, which is located adjacent to the dam. The Lock station is accessible from Canal Road, which runs along the north side of the Talbot River. (See Section 01 14 00 for load restriction on Regional Road 50)
- .2 On the north side of the Talbot River, the dam can only be accessed by foot by crossing over the lock gates.

- .1 The lock gates may be fully open during the non-navigation season, thereby cutting off pedestrian access.
- .2 The lock gates are operated for boat navigation which may interrupt pedestrian traffic.
- .3 Parks Canada Agency owns land on the opposite (south) bank with access off Ball Avenue East; however, right-of-way access may be required for construction. Ball Avenue East is accessed off Highway 48, approximately 4.7 km east of Highway 12.
- .4 For the access to the work and to the Contractors off-site facilities/staging areas by local roads and highways, and for the closure of Canal Road, make all arrangements, obtain any required permits from the authorities having jurisdiction. The work includes, but is not limited to:
 - .1 Prepare a traffic control and detour plan in accordance to Section 01 35 00.06 and the requirements of the authorities having jurisdiction (including but not limited to; Township of Ramara, City of Kawartha Lakes and the Regional Municipality of Durham, Brock Township and the County of Simcoe).
 - .2 Confine activities to such routes and load limits as specified by the authorities having jurisdiction.
 - .3 Clean, maintain, and undertake dust control on haul routes in accordance with the authorities having jurisdiction and Section 01 35 43 - Environmental Procedures.
 - .4 A copy of the permit and agreed arrangements with the authorities having jurisdiction for the usage of local roads and highways is to be provided to the Departmental Representative.
- .5 As part of the planning for the access to the work site via the local roads make provisions for:
 - .1 Vehicular access to private residences and cottages along Canal Road and Ball Avenue East. Particular attention shall be given to private residences that are located next to the work areas.
 - .2 Safe area for children boarding a school bus.
 - .3 Access for Parks Canada Agency staff members to the Lock Station.

1.6 CONTRACTORS STAGING
AREA (S)

- .1 The Contractor is responsible to acquire and pay for additional land for use and staging area/construction facilities. In general terms the staging area(s) is to be used for the following:
 - .1 Fuel storage and refueling station, with containment measures acceptable to the Departmental Representative;
 - .2 Parking of machinery;
 - .3 Material delivery area and temporary storage site for construction/demolition material and waste;
 - .4 Facilities including site-office/trailers, site washroom facilities and workers parking area;
 - .5 Associated power generators;
 - .6 Sediment settling basin/filtration system for the dewatering activities;
 - .7 Drying/stockpiling excavated material;
 - .8 Temporary storage of material as acceptable to the Departmental Representative.
- .2 Modification / change in the use of the staging area(s) on PCA land is to be approved by the Departmental Representative.
- .3 Prior to mobilization onto the staging area(s), undertake environmental testing of each site in accordance with the requirement of Ontario Regulation 511/09 "Soil, Groundwater and Sediment Standards for Use under Part XV.1 of the Environmental Protection Act, dated April 2011". Provide all testing reports to the Departmental Representative.
- .4 Obtain all permits as required for the use and preparation of the site. Provide all permits to the Departmental Representative.
- .5 The contractor is responsible for any clear cutting of trees and shrubs and their disposal, and the site preparation to the requirements of all local bylaws and regulatory agencies and to the approval of the Departmental Representative.
- .6 Provide details of site preparation for the intended usage.
- .7 In preparing this area, the Contractor needs to consider the general grading and drainage of the property and ensure that any work being done for the preparation of these areas will not cause additional runoff toward neighbouring properties. The Contractor shall protect existing water wells, water supply lines, drain lines, related utilities and services.

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	.8	Construct access road/entrance to the requirements of the local authority having jurisdiction. Include the construction of a mud mat at staging area entrance and such other areas as may be deemed necessary by the Contractor.
	.9	Install construction fencing at staging area on Parks Canada Agency property, to the extent as shown on contract drawings and as requested by the Departmental Representative.
	.10	Address the tracking of mud onto Canal Road and other local roads. Implement the approved plan.
	.11	At completion of the Work, prior to land restoration, undertake further environmental testing in accordance with the requirement of Ontario Regulation 511/09 "Soil, Groundwater and Sediment Standards for Use under Part XV.1 of the Environmental Protection Act, dated April 2011" and provide results to the Departmental Representative, highlighting non-conformance. This testing is to confirm that the areas have not been contaminated as result of the work by the Contractor. The Contractor shall bear the cost of removal, disposal and replacement of any contaminated soil.
<u>1.7 ACCESS TO AND USE OF PARKS CANADA AGENCY PROPERTY</u>	.1	Restrict usage of Parks Canada Agency property to agreed construction limits as set on the contract drawings.
	.2	Contractor may be required to prune trees on the north river embankment adjacent to the Lock Master building for any diversion / work / storage areas in order to move equipment or materials onto Parks Canada Agency property. All pruning work to be undertaken by a certified arborist.
	.3	Maintain access and utilities to the Parks Canada Agency Lock Master building at all times.
	.4	Respect set speed limits and operate construction vehicles in such a way as to minimize dust and noise. The power supply to any affected facilities needs to be restored, to applicable regulation upon completion of the work.
<u>1.8 PRE-CONDITION ASSESSMENT</u>	.1	Carry out a Pre-Construction inspection and document the condition of staging areas and haul routes as described in Section 01 48 00 - Construction Control and Monitoring.
	.2	Areas of Canal Road and Ball Avenue East will be

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	<p>disturbed due the construction activities at the dam site. Restoration of local roadways will be the sole responsibility of the Contractor, to the satisfaction of the authority having jurisdiction.</p>	
<u>1.9 DELINEATION OF WORK/STORAGE AREA</u>	.1	Supply, install, and maintain for the duration of the work a construction fence delineating the work area as shown on the contract drawings and as agreed by the Departmental Representative.
	.2	Provide secure entrances to all openings in the perimeter fence to prevent public access to the work areas at all times during construction.
	.3	Remove the fences in their entirety from the site after work is completed. All repairs to be undertaken at the Contractors expense.
<u>1.10 PARKING</u>	.1	Parking will be limited to areas confined by the limits of work. Do not block residential vehicular access to driveways. The area immediately to the north of the Lock Master Building will be reserved for four (4) parking stalls for Parks Canada Agency staff during construction period. Four (4) parking stalls will also be provided to EDCJV adjacent to their site trailer. Parking lot at Lock 38 is to be restored to its current condition (or better) in its current configuration at the end of construction. Access to the Lock Master Building by Parks Canada Agency staff is to be maintained at all times.
<u>1.11 SNOW CLEARING</u>	.1	Snow removal at Canal Road and Ball Avenue East up to the construction limits will be carried out by the Township(s).
	.2	The Contractor is responsible for snow clearing within the work area, the work/storage area and all parking areas and access to lock station, including the parking lot and driveway at Lock 38.
	.3	Included in these areas is all snow removal to access these areas or to complete the work.
	.4	Contractor will not be responsible for clearing the snow from the haul route to the Work site. No claims will be considered should these haul routes become inaccessible during the course of the work.
<u>1.12 SECURITY</u>	.1	Secure the work area in a manner satisfactory to the Departmental Representative. This includes fencing off the construction site to prevent public access to all areas where construction activities

occur.

- .2 Take appropriate security precautions to safeguard equipment, tools, and materials on site.

PART 2 - PRODUCTS

- | | | |
|---|----|---|
| <u>2.1 STAGING AREA AND OTHER
SITE ACCESS</u> | .1 | Materials imported to the site must be acceptable to the Departmental Representative. |
| | .2 | Imported fill materials shall meet the chemical properties for materials at or near water in accordance with the requirement of Ontario Regulation 511/09 "Soil, Groundwater and Sediment Standards for Use under Part XV.1 of the Environmental Protection Act, dated April 2011" - Table 8 - Generic Site Condition Standards for Use within 30 m of a Water Body in a Potable Groundwater Condition. |

PART 3 - Execution

- | | | |
|---|----|--|
| <u>3.1 REQUIREMENTS REGULATORY
AGENCIES</u> | .1 | Obtain approvals from and pay all fees of Federal, Provincial Agencies and Municipal Authorities for works as may be required by this Contract. |
| <u>3.2 TRAFFIC CONTROL</u> | .1 | Implement a traffic management plan and all required signage and traffic control devices as set out in Section 01 35 00.06 - Special Procedures for Traffic Control. |
| <u>3.3 REMOVAL</u> | .1 | Any material placed on the river bottom for temporary access to the work and for environmental management is to be removed. |

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 This section provides a list of work items covered under the Contract Lump Sum Price and the procedures for payment that will be applied to these work items within the Contract Lump Sum Price.
- .2 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.

1.2 LUMP SUM PRICE ITEMS

- .1 Lump Sum Price - all Work other than that, which is specifically designated in the Unit Price Table, shall be included Contract Lump Sum Price. This item includes all costs to undertake the Work.
- .2 The items of work listed below are not intended to be complete, but are provided to give an indication to the Contractor how the Contract Lump Sum Price will be broken down for payment purposes. As such, 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.
- .3 Items of work to be considered in the Contract Lump Sum Price are, but not limited to:
 - .1 Mobilization/Demobilization, including:
 - .1 General site preparation, clearing and grubbing, soils stripping etc.
 - .2 General maintenance and cleaning of work site, site access, and haul routes;
 - .3 Site security;
 - .4 Snow removal;
 - .5 Temporary utilities;
 - .6 Site Offices;
 - .7 Shop drawings;
 - .8 Submittals, approvals, permits and fees (other than specified below);
 - .9 Agreements/permits/authorization and releases with private landowners, municipalities and other authorities having jurisdiction;
 - .10 Dust and noise management;
 - .11 Protection, maintenance, relocation and reconnection of existing services and utilities.

- .2 Contractor Staging Areas (off-site)- Construction/deconstruction including:
 - .1 Preparation, clearing and grubbing, soil stripping, rough grading and granular backfill, drainage of area etc. as required;
 - .2 Sediment and erosion control measures;
 - .3 Temporary utilities;
 - .4 Site security;
 - .5 Construction Fencing;
 - .6 General maintenance and cleaning;
 - .7 Dust and noise management;
 - .8 Land restoration (as per lease agreement)
 - .9 Lease agreement payment (as required).
- .3 Turning Areas - If required, construction of turning areas on Canal Road and Ball Avenue, on both side of excavated area. Construction to be in accordance with Township standards.
- .4 Traffic Control - Temporary measures for vehicle and navigation traffic control provisions and maintenance
- .5 Dewatering and Diversion - Design and approvals, construction, maintenance, operation (including record keeping), deconstruction and restoration (including grading, top soiling, fine grading and sodding), reconstruction of residential and lock driveways and parking lot, private dock, fencing and gates, and reconnection of electrical service and any water supply lines.
- .6 Dewatering/Recharging - Dewatering and dewatering maintenance, including removal of fish trapped in dewatered area, and recharging of dewatered area.
- .7 Construction Control and Monitoring - Condition surveys and monitoring of temporary works.
- .8 Drainage/Sediment/Erosion Control - Temporary drainage, sediment and erosion control and treatment at work area, construction, maintenance and removal.

1.3 CONTRACT LUMP SUM PRICE .1
WORK ITEMS PAYMENT
PROCEDURES

Items of Work will be paid within Contract Lump Sum Price at completion of the particular item of work, as set out below and subject to the approval of the Departmental Representative.

- .1 Mobilization/Demobilization - 40% initial mobilization, 20% on completion of demobilization, and 40% pro-rated over duration of contract.

- .2 Contractor Staging Areas (off-site) - 50% construction activity, 30% deconstruction activities, and 20% maintenance activities pro-rated over duration of contract.
- .3 Turning Areas (off-site)- 50% construction activity, 30% deconstruction activities, and 20% maintenance activities pro-rated over duration of contract.
- .4 Construction Control and Monitoring - 20% initial activities (program development and approvals/installation of measures/initial work), 10% removal of measures/reporting and 70% maintenance/monitoring pro-rated over duration of the work item.
- .5 Traffic Control - 20% initial activities (program development and approvals/installation of measures/initial work), 10% removal of measures/reporting and 70% maintenance/monitoring pro-rated over duration of the work item.
- .6 Dewatering/Recharging - 20% initial activities (program development and approvals/installation of measures/initial work), 10% removal of measures/reporting and 70% maintenance/monitoring pro-rated over duration of the work item.
- .7 Drainage/Sediment/Erosion Control - 20% initial activities (program development and approvals/installation of measures/initial work), 10% removal of measures/reporting and 70% maintenance/monitoring pro-rated over duration of the work item.
- .8 All other costs associated with the work will be pro-rated over duration of contract.

1.4 UNIT PRICE ITEM
MEASUREMENT AND PAYMENT
PROCEUDRES

- .1 Item No. 1 - Contractor Staging and Turning Areas (on Parks Canada Agency property) - Construction/deconstruction including:
 - .1 Preparation, clearing and grubbing, soil stripping, rough grading and granular backfill, drainage of area etc. as required;
 - .2 Sediment and erosion control measures;
 - .3 Temporary utilities;
 - .4 Site security;
 - .5 General maintenance and cleaning;
 - .6 Dust and noise management;
 - .7 Land restoration.
- .2 Item No. 1 - Site Access (on Parks Canada Agency property) - Construction and deconstruction of temporary works for access to upstream and downstream work areas.
- .3 Item No. 2 - Cofferdam - Cofferdam - Design and approvals, construction, maintenance and deconstruction of the upstream and downstream cofferdams.

- .4 Item No. 3 - Excavation- excavation of work area including hauling, stockpiling and disposal.
- .5 Item No. 4 - Demolition - Removal, reuse and/or disposal of existing dam and associated works.
- .6 Item No. 5 - Salvage - Removal, storage, re-installation of designated items, including transportation to and from Parks Canada compound designated by Department Representative.
- .7 Item No. 6 - Concrete Works (and associated works, excluding miscellaneous steel embedded components):
 - .1 Piers;
 - .2 Sluiceway;
 - .3 Bulkhead;
 - .4 Spillways;
 - .5 Concrete Deck
 - .6 Cut-Off Wall(connection to lock);
 - .7 Retaining wall; and
 - .8 Apron;
- .8 Item No. 7 - Backfilling and Grading - supplying, hauling, placement and compaction of site and imported materials within work area.
- .9 Item No. 8 - Erosion Protection - Supply and installation of materials for Erosion Protection Upstream and Downstream - Rip-rap shall be paid at the contract unit price by the unit quantity.
- .10 Item No. 9 - Miscellaneous Metal Work:
 - .1 Gain Liner;
 - .2 Sill Beams;
 - .3 Railing;
 - .4 Gain Covers;
 - .5 Water gauge monitoring well;
 - .6 Winch Trolleys Rail and Assembly; and
 - .7 Stop log slide rails.
- .11 Item No. 10 - Timber - stop logs and other wood components on dam.
- .12 Item No. 11 - Dam Safety Signage (permanent).
- .13 Item No. 12 - Safety Boom - supply and installation of safety boom assembly, including in-water and shore anchors (permanent).
- .14 Item No. 13 - Trees, Shrubs and Ground Cover Planting - supply, placement and maintenance including watering of trees, shrubs and ground cover planting in landscape areas.
- .15 Item No. 14 - Dewatering standby
- .16 Item No. 15 - Excavation Standby
- .17 Item No. 16 - Demolition Standby
- .18 Item No. 17 - Concrete Foundation (Base) - additional concrete for supplementing rock removal.
- .19 Item No. 18 - Rock Removal - shall be paid at the contract unit price by the unit cubic metres. This item shall include the removal of rock as required for new construction. It will be measured in cubic metres in place within the lines and limits shown on the drawings.
- .20 Item No. 19 - foundation grouting - including drilling, packing, testing, grouting operations

- and all associated costs.
- .21 Quantities will be taken from cross section showing original rock surface and actual grade line set by Departmental Representative.
- .22 No payment will be made for rock 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.
- .23 Include in the price of rock excavation the cost of rock crushing and associated work for reuse.

1.5 PREPARING SCHEDULE OF UNIT PRICE TABLE ITEMS

- .1 Submit separate schedule of unit price items of Work requested in Bid 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.

1.6 PROGRESS PAYMENT

- .1 The Departmental Representative will review the draft progress payment format/breakdown to ensure alignment to the Basis of Payment. Should an amendment be required, the Contractor must revise the draft progress payment to the approval of the Departmental Representative.
- .2 Draft applications for payment are to be submitted to the Departmental Representative for review and approval. If the Departmental Representative amends application, the Departmental Representative will give notification in writing giving reasons for amendment.

1.7 SUBSTANTIAL PERFORMANCE OF WORK

- .1 Prepare and submit to Departmental Representative comprehensive list of items to be completed or corrected and apply for a review by Departmental Representative to establish Substantial Performance of Work. Failure to include items on list does not alter responsibility to complete Contract.
- .2 No later than 10 days after receipt of list and application, Departmental Representative will review Work to verify validity of application, and no later than 7 days after completing review, will notify Contractor if Work or designated portion of Work is substantially performed.
- .3 Departmental Representative: state date of Substantial Performance of Work or designated portion of Work in certificate.
- .4 Immediately following issuance of certificate of Substantial Performance of Work, in consultation with Departmental Representative, establish a reasonable date for finishing Work.

1.8 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF WORK

- .1 After issuance of certificate of Substantial Performance of Work:
- .1 Submit application for payment of holdback amount.
- .2 Submit sworn statement that accounts for labour, subcontracts, products, construction machinery and equipment, and other indebtedness which may have been incurred in Substantial Performance of Work and for which Owner might in be held responsible have been paid in full, except for amounts properly retained as holdback or as identified amount in dispute.
- .2 After receipt of application for payment and sworn statement, Consultant will issue certificate for payment of holdback amount.

1.9 PROGRESSIVE RELEASE OF HOLDBACK

- .1 If Departmental Representative has certified that Work of subcontractor or supplier has been performed prior to Substantial Performance of Work, Departmental Representative shall pay holdback amount retained for such subcontract Work, or products supplied by such supplier, on day following expiration of holdback period for such Work stipulated in lien legislation applicable to Place of Work.
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- .2 In addition to provisions of preceding paragraph, and certificate wording, ensure that such subcontract Work or products is protected pending issuance of final certificate for payment and be responsible for correction of defects or Work not performed regardless of whether or not such was apparent when such certificates were issued.

1.10 FINAL PAYMENT

- .1 Submit application for final payment when Work is completed.
- .2 Departmental Representative will, no later than 10 days after receipt of application for final payment, review Work to verify validity of application. Consultant will give notification that application is valid or give reasons why it is not valid, no later than 7 days after reviewing Work.
- .3 Departmental Representative will issue final certificate for payment 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 ADMINISTRATIVE

- .1 The Departmental Representative will schedule and administer project meetings throughout the progress of the work.
- .2 The Departmental Representative will prepare agenda for meetings.
- .3 The Departmental Representative will distribute written notice of each meeting, in advance of meeting date.
- .4 The Contractor is to provide physical space and make arrangements for meetings to accommodate a minimum of 12 people.
- .5 The Departmental Representative will preside at meetings.
- .6 The Departmental Representative will record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .7 The Departmental Representative will reproduce and distribute copies of minutes after meetings and transmit to meeting participants.
- .8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

- .1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

1.3 PROGRESS MEETINGS

- .1 During course of Work and two weeks prior to project completion, schedule progress meetings on bi-weekly basis.
- .2 Contractor, major Subcontractors involved in Work, Departmental Representative, Parks Canada Agency,

and Consultants are to be in attendance.

.3 Agenda to include but not limited to the following:

- .1 Review, approval of minutes of previous meeting.
- .2 Review of Work progress since previous meeting.
- .3 Problems which impede construction schedule.
- .4 Health and safety issues and concerns.
- .5 Environmental Protection Issues and concerns.
- .6 Water control and diversion operations.
- .7 Field observations including monitoring reports, problems and conflicts.
- .8 Review of off-site fabrication delivery schedules.
- .9 Corrective measures and procedures to regain projected schedule.
- .10 Revision to construction schedule.
- .11 Progress schedule, during succeeding work period.
- .12 Review submittal schedules: expedite as required.
- .13 Maintenance of quality standards.
- .14 Review proposed changes for effect on construction schedule and on completion date.
- .15 Other business.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - Execution

3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 77 00 - Closeout Procedures

1.2 PROGRESS PHOTOGRAPHS

- .1 Sizes: Prints 200 mm x 300 mm
- .2 Type: semi-matt with binding margin at one edge.
- .3 Paper: double weight, unmounted.
- .4 Number of prints required: 4 sets.
- .5 Identification: typewritten name and number of project and date of exposure on 25 x 50 mm white patch in upper right hand corner reverse side.

1.3 ELECTRONIC COPY

- .1 Submit electronic and hard copy of colour digital photography in jpg or tiff format, fine resolution.
- .2 Identification: name and number of project, date of exposure and viewpoint/descriptor indicated.
- .3 Number of viewpoints: four (4) viewpoint of work area and two (2) at each staging area and at key elements of the work progress as determined by Departmental Representative. Provide viewpoint location plan where requested by the Departmental Representative.
- .4 Frequency: take weekly photographs and submit monthly with progress statement as directed by Departmental Representative. During periods of inactivity at work site, take photographs bi-weekly at the same viewpoints. At project closeout, provide electronic file of all compiled referenced photographs.
- .5 Camera to have a rating of 12 Megapixels and set at high resolution.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - Execution

3.1 NOT USED

- .1 Not Used.
-

END OF SECTION

PART 1 - GENERAL

1.1 DEFINITIONS

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

1.2 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
-

- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
 - .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
 - .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Substantial Completion and Final Completion as defined times of completion are of essence of this Subcontract.
 - .5 Make allowance for obtaining of regulatory permits, other agency approvals, obtaining of additional lands for staging areas, receiving permission to temporarily relocate utilities, and establishing a waste management and disposal plan.
 - .6 Project milestones form interim targets for Project Schedule.
 - .1 Due to the fish spawning season in water work is not allowed between March 15th and July 15th. As such, the Contractor cannot build or remove cofferdams and temporary retaining / shoring walls in the Talbot River or the Trent-Severn Waterway approaches/canal to Lock 39 within this period. This restriction also applies to any work involving movement of equipment in the water during this period.
 - .7 Due to the migratory bird nesting season, no tree cutting will be allowed between April 1st and August 31st.
 - .8 Start of drawdown to winter water levels normally occurs the week following the navigation closure. The Trent-Severn Waterway does not have an exact date when the water levels are raised back to the navigation levels, as the spring run-off depends on the snowfall and spring weather for that particular year. As a practice the navigation water levels are typical restored by the end of April.
 - .9 Trent-Severn Waterway navigation season and hours of operation:
 - .1 Navigation season and hours of operation are described in Section 01 41 00 Work Restriction.
 - .10 Contractor must take these constraints and other constraints mentioned in Section 01 14 00 into considerations while developing the detailed project schedule and must show them and as activities in the GANTT chart.
-

1.3 MASTER PLAN

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

1.4 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
 - .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Design submission of the temporary works
 - .4 Permits / DFO Approval.
 - .5 Mobilization and site camp/staging area preparation.
 - .6 Environmental controls.
 - .7 Site instrumentation/monitoring.
 - .8 Traffic control.
 - .9 Construction of diversion with water level, flow control and erosion protection measures.
 - .10 Construction upstream cofferdam including temporary boom, navigation and construction signage.
 - .11 Construction downstream cofferdam including temporary boom, navigation and construction signage.
 - .12 Dewatering with environmental control.
 - .13 Site access.
 - .14 Salvage of identified items/materials.
 - .15 Excavation and demolitions work.
 - .16 Foundation and base preparation.
 - .17 Structural concrete of dam walls, piers, piers, slabs, apron, deck, cut off wall resurfacing, and miscellaneous embedded metals.
 - .18 Backfill and erosion control work.
 - .19 Installation of handrails, crab winch system, stoplogs, stoplog guide covers, stoplog slide rails, and staff gage.
 - .20 Removals of cofferdams, temporary booms and boating / construction signage.
 - .21 Removals of diversions works and Restoration.
 - .22 Installation of permanent fencing.
-

- .23 Installation of dam safety and navigation safety signage.
- .24 Installation of upstream and downstream boom assembly with anchors.
- .25 Construction /restoration of public and private roads and driveways.
- .26 Removals of temporary works.
- .27 Site and camp restoration including landscaping work.
- .28 Restoration of external staging areas including environmental testing as required.
- .29 Inspection for completion of all work and issuing of Substantial Certificate of Completion.
- .30 Other activities as specified by the Departmental Representative.

- .3 Update Project Schedule on bi-weekly basis reflecting activity changes and completions, as well as activities in progress.
- .4 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.5 PROJECT MEETINGS

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

1.6 PROGRESS PAYMENT REQUEST RELEASE

- .1 Project schedule reporting as described above is condition for Progress Payment release by the Departmental Representative.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.
-

PART 3 - Execution

3.1 NOT USED .1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 This section specifies general requirements and procedures for contractors' submissions of shop drawings, product data and samples to Departmental Representative for review.
- .2 Additional specific requirements for submissions are specified in individual sections of Divisions 01 to 32.
- .3 All submittals must be delivered in accordance with "Doing Business with PWGSC".

1.2 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review in other Sections of this Specification. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed. A minimum of up to 20 working days should be allowed for document review by the Departmental Representative.
 - .2 Do not proceed with Work affected by submittal until review is complete.
 - .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
 - .4 Where items or information is not produced in SI Metric units converted values are acceptable.
 - .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to this specific project will be returned without being examined and considered rejected.
 - .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
 - .7 Verify field measurements and affected adjacent Works are co-ordinated.
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- .8 Present calculation briefs containing all information required to support detailed design of structures as indicated in these specifications.
- .9 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .10 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .11 Keep one reviewed copy of each submission on site.

1.3 MEASUREMENT FOR PAYMENT .1

The work covered by this section will not be considered separately for payment but will be considered as incidental to Work.

1.4 SHOP DRAWINGS AND
PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
 - .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario.
 - .3 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. Indicate cross references to design drawings and specifications.
 - .4 Allow a minimum of up to 20 working days for Departmental Representative's review of each submission.
 - .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
 - .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify
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Departmental Representative in writing of revisions other than those requested.

- .7 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 PSPC Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
 - .8 Submissions include:
 - .1 Date and revision dates.
 - .2 PSPC Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of design, installation, performance verification and decommissioning of temporary and permanent works, including load bearing structures duly stamped by a professional engineer, licensed to practice in Ontario (with Canadian related experience to items of work being designed) as specified in the respective Sections including:
 - .1 Design methodology including criteria, assumptions, and standards.
 - .2 Calculations.
 - .3 Details.
 - .6 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.
 - .9 After Departmental Representative's review, distribute copies.
 - .10 Submit electronic copies of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably
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request.

- .11 Submit electronic copies 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.
 - .12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
 - .14 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets (MSDS) concerning impedances, hazards and safety precautions as required in Section 01 35 29.06 Health and Safety Requirements.
 - .15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
 - .17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
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- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .21 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.5 SAMPLES

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

- .7 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .8 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.6 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic copy of colour digital photographs in jpg format with monthly progress statement as directed by Departmental Representative.
- .2 Project identification: name and number of project and date of exposure indicated.

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

<u>1.1 SECTION INCLUDES</u>	.1	This section covers work related to traffic control and safety, and traffic detours in and around the work area.
<u>1.2 RELATED SECTIONS</u>	.1	Section 01 14 00 - Work Restriction
	.2	Section 01 20 01 - Site Access
	.3	Section 01 22 01 - Measurement and Payment
	.4	Section 01 33 00 - Submittal Procedures
	.5	Section 01 35 43 - Environmental Procedures
	.6	Section 01 35 46 - Archaeological and Cultural Procedures
	.7	Section 01 48 00 - Construction Control and Monitoring
	.8	Section 01 56 00 - Temporary Barriers and Enclosures
	.9	Section 01 71 80 - Examination and Preparation
	.10	Section 01 74 11 - Cleaning
	.11	Section 01 78 00 - Closeout Submittals
<u>1.3 REFERENCE STANDARDS</u>	.1	Ontario Ministry of Transportation, Book 7 of the Ontario Traffic Manual - Temporary Conditions (MTO - Book 7).
<u>1.4 MEASUREMENT AND PAYMENT PROCEDURES</u>	.1	There shall be no separate measurement for payment for the work under this Section. Include cost in the Contract Lump sum Price.
	.2	Payment shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work.
<u>1.5 ACTION AND INFORMATIONAL SUBMITTALS</u>	.1	Submit in accordance with Section 01 33 00-Submittal Procedures.
	.2	Submit Traffic Control Plan to the Departmental Representative and local authorities (Brock Township, Township of Ramara, City of Kawartha

Lakes and the Municipality of Durham).

- .3 Provide a construction Traffic Control Plan for both work related and local traffic detour to the Ontario Traffic Manual requirements, and to the governing authorities and Departmental Representative.
- .4 Traffic Control Plan to include permits, notification of emergency services and local school boards regarding road closures and detours
- .5 Traffic Plans need to be approved by the local Authorities prior to any road and lane closure, and accepted by the Departmental Representative.

1.6 PROTECTION OF PUBLIC TRAFFIC

- .1 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.
 - .4 Do not close road or any lanes of road without approval of Departmental Representative and local authorities.
 - .5 Before re-routing traffic erect suitable signs and devices in accordance with instructions contained in the MTO - Book 7, and in accordance with the local Authorities requirements.
 - .6 Road closure notice signs are to be erected four weeks in advance of Canal Road closure.
 - .1 Talbot Drive and the lock station closure notice sign is to be erected two weeks in advance of the work commencement at on the diversion system at the lock station.
 - .7 Notice and traffic control signage are to be in both official languages.
 - .8 Provide and maintain road access and egress to property fronting along Work under Contract and at other areas as indicated, unless other means of road access exist that meets the approval of Departmental Representative and local Authorities.
 - .9 Where detours are to be constructed for public usage, construct roads to the requirements of the local Authorities

1.7 INFORMATIONAL AND
WARNING DEVICES

- .1 Provide and maintain signs, flashing warning lights and other devices required to indicate construction activities, detour or other temporary and unusual conditions resulting from Project Work which requires road user response.
- .2 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified in the MTO - Book 7.
- .3 Meet with Departmental Representative prior to commencement of Work to prepare list of signs and other devices required for project. If situation on site changes, revise list and resubmit for approval by the Departmental Representative and local authorities.
- .4 Continually maintain traffic control devices in use by:
 - .1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.
 - .2 Removing or covering signs which do not apply to conditions existing from day to day.

1.8 CONTROL OF PUBLIC
TRAFFIC

- .1 Provide competent flag persons, trained in accordance with, and properly equipped as specified in, MTO - Book 7 in the following situations:
 - .1 When public traffic is required to pass working vehicles or equipment that 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 For emergency protection when other traffic control devices are not readily available.
 - .6 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.
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1.9 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 accepted by Departmental Representative and the local Authorities to protect and control public traffic, existing conditions for traffic to be restricted as follows:
 - .1 Canal Road, between Regional Road 50 and Simcoe Street.
 - .1 Road closed to public traffic with detour provided.
 - .2 Section of Canal Road between Regional Road 50 and Work area, and between Simcoe Street and Work area, traffic to be limited to local traffic only.
 - .2 Ball Avenue East, traffic to be limited to local traffic

1.10 DETOUR AND TRAFFIC
PLAN

- .1 Provide a construction Traffic Control Plan for both work related and local traffic detour to the Ontario Traffic Manual requirements, and to the governing authorities, Agency and Departmental Representative.
- .2 Traffic Control Plan to include permits, notification of emergency services and local school boards regarding road closures and detours.
- .3 Traffic Plans need to be approved by the local Authorities prior to any road closure.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS .1 This Section describes requirements for the health and safety of persons on Site, safety of equipment and property on Site and for protection of persons and property adjacent to the Site that may be affected by performance of the Contract Work. These requirements apply to all Sections of the Technical Specifications and Contract Drawings without limitation.

The Contractor is to control the Work to provide compliance by the Contractor, the Contractor's personnel and those of Subcontractors, vendors, suppliers and Independent Contractors (third party equipment operators or vehicle drivers for example) with the policies, requirements, plans and stipulations of the provided Site Specific Occupational Health and Safety Plan (SSOHSP). The provided SSOHSP shall be considered by the Contractor as the minimum standard of care applicable to the Work. The Work may need or otherwise warrant additional policies, requirements, plans and stipulations than those described in the SSOHSP. This determination is the sole responsibility of the Contractor as Constructor.

The Departmental Representative will monitor the Contractor's health and safety protection measures and will identify whenever such protection is found to be ineffective and may direct changes to the protective measures or work procedures of the Contractor to remedy such ineffectiveness.

1.2 REFERENCE STANDARDS .1 The provided SSOHSP latest version including Contractor supplied programs, plans, information and technical appendices required by the SSOHSP to be provided by the Contractor and included as part of the provided SSOHSP.

The provided SSOHSP is intended to be prescriptive in nature and govern/establish the minimum performance expectations for the execution of the Work. The Departmental Representative may from time to time direct the Contractor to update and revise the SSOHSP to incorporate required improvements in the SSOHSP or to reflect changes in or the changing nature of the Work.

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 This Section describes requirements for the protection of the environment that apply to the Work. These requirements apply to all Sections of this Specification, without limiting the conditions and approvals imposed by statute.
 - .2 Control Work to provide effective environmental, waterbody and fish habitat protection. Departmental Representative will monitor environmental protection measures and will identify whenever such protection is found to be ineffective. Change protective measures or work procedures as directed by Departmental Representative.
 - .3 The Environmental Management and Protection Plan has been provided by the Departmental Representative as part of the contract documents. It is intended to be prescriptive in nature and govern/establish the minimum performance expectations for the execution of the work. The Contractor must accept the EMPP and provide its specific program, plans, and required appendices specifying how the work is to be executed in conformance with it.
 - .4 Meet or exceed the requirements of all environmental legislation or regulations, including all amendments up to the project date provided that in any case of conflict or discrepancy the more stringent requirements shall apply. The following apply;
 - .1 Historic Canals Regulations, SOR/93-220, Department of Transport Act, May 1993.
 - .2 Environmental Protection Act, Province of Ontario, R.S.O., 1990.
 - .3 Fisheries Act (R.S.C., 1985, c. F-14, s.1);
 - .4 Species at Risk Act Section 73.
 - .5 Migratory Birds Convention Act (S.C. 1994 c.22), Section 5.
 - .6 Navigation Protection Act; (R.S.C. 1985, c. N-22, c. 31, s. 316) Section 5(1) (Part 2-Item 43)
 - .7 Ontario Water Resources Act, Province of Ontario, R.S.O, 1990.
 - .8 Ontario Provincial Standard Specification OPSS 805, November 2015, Construction Specification for Temporary Erosion and Sediment Control Measures.
 - .9 Historic Canal Regulations (HCR) apply to and govern work under this Contract. Regulations may be obtained from Justice Canada's website at: <http://laws->
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lois.justice.gc.ca/eng/regulations sor-93-220/

- .5 Basic Impact Analysis with associated environmental mitigation measures are found in attached contract appendices. Contractor to comply and meet stated measures.
- .6 Changes not addressed by BIA will require additional mitigation measures to be approved by Departmental Representative. The Environmental Management and Protection Plan is a living document and may from time to time be updated to reflect changes in the nature of work. The Contractor is required to update the Environmental Management and Protection plan to reflect these changes, at no additional cost.

1.2 DEFINITIONS

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
 - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, 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 introduced to a waterbody, could degrade water quality or impact fish, fish habitat, and/or aquatic wildlife. This includes, but is not limited to:
 - .1 Concrete dust.
 - .2 Soils (clay, silt, sand).
 - .3 Oil, diesel, or gasoline.
 - .4 Chipped or fresh mortar, concrete and admixtures.
 - .5 Alkali water resulting from fresh concrete or cementations grout.
 - .6 Salt.
 - .7 Solvents.
 - .8 Grout.
 - .9 Paint.
 - .10 Lead.
 - .11 X
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- .4 Drip line - 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: fence consisting of approved material, supported by wooden or steel posts and being a minimum of 1.2 m high, without breaks or unsupported sections.
- .6 Designated Substances: Hazardous materials as defined and listed on Ontario Regulation 490/09.
- .7 Brown Water - water from within the dewatered area that for whatever reason must be treated for turbidity and likely pH prior to its release to the Talbot River. *Brown Water* typically results from rainfall or snow melt within the dewatered area, construction water such as demolition dust control, pre-soaking of existing concrete surfaces, green cutting, curing and other related sources, *Blue Water* that has become (for whatever reason) *Brown Water* or *Blue Water* that has been advertently or mistakenly contaminated with *Brown Water*.
- .8 Blue Water - inflows to the cofferdams that can be effectively and efficiently captured and returned directly to the Talbot River either upstream or downstream without any turbidity or pH treatment). *Blue Water* inflows will consist primarily of Talbot River water that finds its way through, around or under the cofferdam structures.
- .9 Surge Capacity - This staging facility will serve to:
 - .1 Receive, retain and make available for recirculation filter backwash water, and
 - .2 Stage high flows with the large volumes of turbid water associated with the drawdown of each stage of the dewatering. Turbid water will be drawn from this staging facility and treated through the water treatment plant at manageable flow rates.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00-Submittal Procedures.
- .2 Before commencing construction activities or delivery of materials to site, submit Environmental Management and Protection Plan for review and approval by Departmental Representative.
- .3 Environmental Management and Protection Plan must include comprehensive overview of known or

potential environmental issues to be addressed during construction. EMPP must show consideration of early winter thaw and spring freshet conditions in the event that project timing slips into this period. EMPP must demonstrate that this condition is planned for and work activities will be halted or revised accordingly. The potential environmental issues associated with the construction activities include, but are not limited to, the following:

- .1 Introduction of fines or sediment into the waterways - during placement of rock fill; rock excavation; cofferdam construction; dewatering; construction of new dam; demolition of existing dam; coffer dam removals; commissioning of new dam
- .2 Contamination of waterways due to spills - during refueling; during concrete pours or cleanout; a hydraulic line rupture; an accidental spill of lubricants.
- .4 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5 Include in Environmental Management and Protection Plan:
 - .1 Names of persons responsible for ensuring adherence to Environmental Management and Protection Plan.
 - .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
 - .3 Names and qualifications of person[s] responsible for training site personnel.
 - .4 Descriptions of environmental protection personnel training program.
 - .5 Erosion and sediment control plan identifying 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 stockpile material, such as vegetating of material, for stockpile material that are to be inactive for a period exceeding 30 days are to form part of the erosion.
 - .7 Drawings indicating locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to

- contain materials on site.
 - .8 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather.
 - .1 Plans to include measures to minimize amount of material transported onto paved public roads by vehicles or runoff.
 - .9 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.
 - .1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
 - .10 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
 - .11 Spill Prevention Plan: including location/procedures for storage and refuelling of all fuel and fuel operated equipment located near waterway. Fuel containers are to have secondary containment, overfill and spill protection. Fueling area is to be contained to address potential spillage. All heavy equipment used near waterway is to be in good condition. Any equipment that is leaking any fluid is to be removed from the site
 - .12 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris. Where waste materials are not to be incorporated into the works and are to be disposed off-site at an approved landfill as part of the Solid Waste Management Plan, provide to the Departmental Representative a letter from the receiving station agreeing to accept the waste material and Waste Site Certificate of Approval. Carry out disposal to the requirements on Ontario Regulation 347.
 - .13 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash do not become air borne and travel off project site.
 - .14 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
 - .15 Waste Water Management Plan identifying methods and procedures for management and/or
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discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water.

- .16 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.
- .17 Noise Control Plan: including notifying local residents in advance of potential disruption from noise activities. Establish a communications protocol / plan acceptable to the Departmental Representative.
- .18 Potable Water Supply: including monitoring of existing groundwater wells. Where well water supplies are impacted, revise construction activities to mitigate the impact to the satisfaction of the Departmental Representative.
- .19 Flood Contingency Plan: identifying measures to be undertaken in the event of significant flows in the waterway. Measures to include storage of equipment and material out of the waterway that have not been secured or form part of the construction works.

1.4 FIRES

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

1.5 TURBIDITY CONTROL AND DRAINAGE

- .1 Comply with the Ministry of Environment and Climate Change (MOECC) regulation for Water Taking Environmental Activity and Sector Registry (Water Taking EASR Guide: <https://www.ontario.ca/page/water-taking-user-guide-environmental-activity-and-sector-registry>).
- .2 Ensure turbidity control of water released during work using a heavy-duty DOT TYPE II turbidity curtains. Flow dissipaters and/or filter bags, or equivalent, shall be placed at water discharge points to prevent erosion and sediment release.
- .3 Do not pump water and discharge directly into waterway.
 - .1 Send discharge to staging facility and water treatment system before being released into waterway. The Staging facility must have a minimum volume of 264000 US gallons or 1000 cubic meters.
 - .2 Water from initial dewatering may be pumped directly into waterway if turbidity of discharged water is less than background

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- turbidity levels observed upstream of work areas.
- .3 Water from within 1 m of basin bottom or water with turbidity greater than background turbidity to be pumped to staging facility and water treatment system.
 - .4 For dewatering, fish screens must comply with DFO Freshwater Intake End-of-Pipe Fish Screen Guidelines when pumping in fish-bearing water to prevent impingement or entrainment of fish.
 - .5 Monitor water quality for suspended sediment levels exceeding identified requirements during in water activities.
- .4 Provide marine grade heavy duty turbidity curtain (DOT type II) to enclose areas where sediments may enter waterway. Turbidity curtain to be fabricated for this Work, anchored, or weighted down along its length to form continuous seal on basin bottom and marine structures with adequate flotation at water surface to prevent over spills of turbid water. Sediment/turbidity curtains shall be as close to the work area as possible, and deployed in a manner that prevents entrapment of fish inside the curtain. If water levels/conditions do not permit the flotation of a turbidity curtain, other measures as approved will be implemented.
- .5 The Contractor shall be prepared, where the full implementation of ESG controls for in water work will not allow them to meet discharge criteria to, at the Contractor's own cost, alter construction methodology, slow down, reduce construction intensity, and/or stop work to meet specified discharge criteria through the completion of their work.
- .6 Mechanical filtration of turbid water is also acceptable.
- .7 Filter material will consider the grain size characteristics of the sediment and shall be designed around the principals of maintaining sufficient hydraulic flow and prevention of particle movement through the material.
- .8 Provide sediment control during any in-water work to control turbidity levels. Controls to be implemented prior to commencing Work and to remain in place until all suspended sediments have settled. Turbidity curtains should not be used as a settling area for dewatering activities.
- .9 In-water work shall be performed in a manner that minimizes the disturbance of the watercourse bottom and dispersion of sediment.
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- .10 In the event of significant sedimentation or escape of debris caused by construction activities, Contractor to stop work immediately, notify Departmental Representative, report to the MOECC, and take appropriate measures to confine work and modify Environmental Plan including installation of new environmental measures or additional turbidity curtains.
- .11 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .12 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.
- .13 Sediment, debris, and erosion control measures to be inspected daily to ensure that they are functioning properly and are maintained and upgraded as required.
- .14 If sediment, debris or erosion control measures are not functioning properly, no further work will be permitted until the sediment/ erosion problem has been rectified and accepted by Departmental Representative and PCA Environmental Authority. Consider setting up backup settling pond in case first pond fails to work to keep pumps operating continuously.
- .15 Sediment, debris and erosion control measures shall be left in place until disturbed areas within the work area have been stabilized and any sediments in the water have settled. Removal will be permitted only after written approval from the Departmental Representative.
- .16 Water containing a high level of silt or sediment will be treated by discharging to settling basins, or sediment traps prior to release to waterway. Water quality downstream of construction activities and turbidity curtains to not exceed recommended DFO and CCME guidelines on water quality for protection of aquatic life.
- .17 Control turbidity of water released during the Works 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 ESPC, Federal, Provincial, and Municipal regulations.
 - .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 regulatory requirements.
- .18 Where in-water work is required and pre-approved by Departmental Representative, the work area shall be enclosed by a heavy-duty turbidity curtain (DOT TYPE II) to prevent sediment escape from enclosed area.
 - .1 Monitor water quality for suspended sediment levels exceeding identified requirements during in-water activities.
- .19 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.
- .20 CCME has set criteria wherein the allowable increase in total suspended solids (TSS) beyond background levels is 25 mg/l for short-term exposure (24 hr. period) and or maximum average increase of 5 mg/L for long term exposures (>24 hr. to 30d).
 - .1 Contractor shall provide protocol and methodologies for monitoring the TSS from any discharge point (treated or untreated) to the watercourse.
 - .2 Contractor to ensure that TSS levels at points of discharge and in the receiving environment do not exceed an absolute TSS value, to be based on the background value at the site, and determined prior to construction.
- .21 Turbidity Monitoring may be completed in conjunction with monitoring of TSS.
 - .1 Turbidity monitoring should be completed during dewatering discharge that is ultimately received by a surface water feature, at a minimum frequency of twice per day during active dewatering.
 - .2 The representative background location of turbidity measurement should be at least 20-30 m upstream from the work zone, and the downstream location should be about 10 m downstream of the turbidity curtain should access allow, and within the discharge plume zone where feasible. Contractor to modify turbidity monitoring location if necessary. Once established, the upstream and downstream locations are to remain in the same locations.
 - .3 During active dewatering discharge:
 - i. Turbidity at the downstream location

- should not exceed the turbidity at the upstream location by more than 8 NTUs, when turbidity is below 80 NTUs at the upstream location or,
 - ii. Turbidity at the downstream location should not exceed the turbidity at the upstream location by more than 10%, when turbidity is equal to or above 80 NTUs at the upstream location.
 - .4 Daily turbidity records shall be maintained by the contractor.
 - .22 Develop Erosion and Sediment Control Plan (ESC) 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.
 - .1 Sediment, debris, and erosion control measures must be inspected daily to ensure that they are functioning properly and are maintained and upgraded as required.
 - .2 Backup ESC materials to be kept onsite to be available as needed.
 - .23 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 characteristic of sediment must be considered when selecting filter fabric material. Filter fabric material shall be designed around 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 versus 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.
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- .24 An environmental inspector should be on site, and provide advice, to ensure that activities that could have a negative impact to the natural environment are effectively mitigated as construction proceeds.
- .25 If the ESC strategies outlined on the SSEMP are not effective in preventing the release of a deleterious substance, including sediment, then alternative measures must be implemented to minimize potential. Changes to the SSEMP must be approved by Departmental Representative and an updated SSEMP/Permit may be required.

1.6 WILDLIFE PROTECTION

- .1 Water drawdown to occur either before or soon after boating navigation season ends and not be lowered below winter operating levels to protect turtle species.
- .2 Detail procedures for preventing turtle entry and nesting within disturbed project area in SSEMP.
- .3 Place temporary reptile exclusion fencing around stockpiled material and construction areas that may attract turtle nesting activities.
 - .1 Synthetic plastic Erosion Control Blankets/Mats should not be utilized, particularly during nesting season, as they pose as an entrapment hazard to turtles. Standard sediment fencing on site should not have mesh/netted backing. Fibre-based bio-degradable Erosion Control Blankets/Mats only are to be utilized.
 - .2 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
- .4 For guidance on how to plan and install exclusion fencing, refer to the document titled "Ontario Ministry of Natural Resources and Forestry. April 2016. Best Management Practices for Mitigating the Effects of Roads on Amphibians and Reptile Species at Risk in Ontario." Environmental Management Plan to detail procedures for avoiding disturbance to wildlife and nesting birds, and Species at Risk.
- .5 Install bat boxes to offset the potential loss of day roosts for species-at-risk bats.

1.7 AQUATIC LIFE
PROTECTION

- .1 In-water work is to be completed before March 15, each year, to protect fish populations. Restricted in-water activities between March 15th and July 15th are in water excavation, in-filling, rock/armour stone placement, in water concrete/tremie pours, transfer/ movement of granular material or aggregates.
- .2 Amphibians, reptiles, fish, or crustaceans that could become or have become trapped within dewatered cofferdam area, or in other construction zones, to be captured and transferred "live" immediately by authorized personnel in accordance with permit conditions, to nearest waterbody as directed by Departmental Representative.
 - .1 Work program to be overseen by Departmental Representative and PCA Environmental Authority to ensure proper capture and handling of aquatic life.
 - .2 Advise Departmental Representative and PCA Environmental Authority 24 hours prior to fish rescue.
 - .3 Minimize length of time fish are out of water.
 - .4 Use appropriate equipment when removing stranded fish.
 - .5 Monitor Work areas with deeper pool areas where fish is congregating, if safe to do so seine or dip nets can be operated to remove the fish.
 - .6 Document by species, counted and removed any fish found within dewatered areas, fish to be placed in nearest waterbody.
- .3 Should suspected species at risk be encountered during project staging, construction, or demobilization, contact Departmental Representative and PCA Environmental Authority immediately.
- .4 Report to Departmental Representative and PCA Environmental Authority, invasive species found within project area.
- .5 Round gobies or other invasive species to be euthanized rather than returned to water system.

1.8 SPECIES AT RISK

- .1 Parks Canada has identified critical habitat for Eastern Whip-poor-will. Northern Map Turtle, Snapping Turtle, Milk Snake, Barn Swallow, and Butternut have been noted as possible species at risk in the vicinity. Potential species at risk
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include the Red-headed Woodpecker, Little Brown Bat, Northern Bat, Snapping Turtle, Milksnake, and Hognose Snake.

- .2 Minimize disturbed areas and clearly mark Work space. Park on roads or disturbed areas only.
- .3 Provide training to all employees before beginning work on site on identifying species at risk and procedures to follow if species at risk are encountered. Employees must be able to identify potential species at risk and know the proper procedures to follow when they encounter a species at risk. Special emphasis will be made on Blanding's Turtle sightings.
- .4 Perform daily site sweeps before beginning work to ensure that there are no species at risk in work area.
 - .1 Should any suspected species at risk - including snakes or turtles and/or eggs, work is to halt immediately and Parks Environmental Assessment Staff notified.
 - .2 If species at risk are observed or encountered, the individual must not be harmed, harassed, or killed. Stand back and allow animal to leave site.
 - .3 If a turtle or snake is found within the limits of the fencing it should be left alone to leave the area if possible or the animal should be gently placed outside of the construction site. Typically, animals should be released not more than 250m from the capture site. Release sites should be near water with vegetation cover for shelter.
 - .4 Stop work and contact Departmental Representative and PCA's Environmental Assessment Officer (705-761-1634) on how to proceed if species at risk does not or cannot leave site on its own accord. Additional measures to avoid impacts may be required before work can restart.
- .5 Install bat boxes to offset the potential loss of day roosts for species-at-risk bats. PCA to determine number and locations.

1.9 INVASIVE SPECIES

- .1 Clean mud, dirt, and vegetation off machinery and equipment before entering work site and before leaving work site. Inspect and clean in accordance with the SSEMP and the Ontario Clean Equipment Protocol for Industry:
<https://www.ontarioinvasiveplants.ca/wp->

content/uploads/2016/07 /Clean-Equipment-
Protocol_June2016_D3_WEB-1.pdf

- .2 Equipment and vehicles to be used in water, to be cleaned before and after use. This includes any visible mud, vegetation, mussels.
 - .1 Drain of standing water.
 - .2 Clean with hot water (>50°C) at high pressure (>250 psi).
 - .3 Allow to dry for 2-7 days in sunlight before transporting between waterbodies.
 - .4 Conduct cleaning minimum 30 m from edge of waterbody.
- .3 Should an invasive species be encountered (or at least suspected), a photo and report of the specimen should be sent to Parks Canada's EA staff. Known invasive species already existing in the Trent-Severn Waterway system at the specified location:
 - .1 Purple Loosestrife.
 - .2 Round Goby.
 - .3 Rusty Crayfish.
 - .4 Tatarian Honeysuckle.
 - .5 Water Soldier.
 - .6 Wild Parsnip.
 - .7 Yellow Iris.
 - .8 Zebra Mussels
- .4 Round gobies and other invasive species found during dewatering activities shall be euthanized and disposed of appropriately, offsite. This shall be reported to PCA.
- .5 Use weed-free material for erosion control and stabilization ensuring that seed does not potentially contain invasive plants.
- .6 Commercially purchased seeds should have a label that states following:
 - .1 Species.
 - .2 Purity: no less than 90%.
 - .3 Weed seed content: tag should state no invasive plants are present, only use certified weed-free seed.
 - .4 Germination of desired seed: germination should not be less 50% for most species with exceptions for some shrubs and forbs.

- .7 Move only contaminate-free materials to non-infested areas to prevent spread of invasive plants.
- .8 Properly dispose of any found invasive species to ensure no further propagation.
- .9 Mud, dirt and vegetation should be cleaned from clothing and footwear prior to entering the work site, and prior to leaving the work site.
- .10 Preventative and Control Measures, as identified in the Ontario Waterways (2017) document to be incorporated into the SSEMP and implemented by the Contractor.

1.10 PLANT AND TREE PROTECTION

- .1 Protect trees, trees roots and plants on site and adjacent properties where indicated.
 - .2 Provide barriers around trees which may be affected by work, including staging areas.
 - .1 Erect barriers at dripline plus a 1.5 m distance within Work area.
 - .2 Barriers consist of Plastic fencing, "international orange" plastic (polyethylene) web fencing secured to conventional metal "T" or "U" posts driven to a minimum depth of 450 mm on 2 m minimum centers shall be installed at the limits of clearing, or as otherwise approved in the SSEMP.
 - .3 Maintain barriers in good repair throughout duration of Work.
 - .4 Remove barriers upon completion of Work.
 - .5 Where restrictions impede barrier placement, seek acceptance of Departmental Representative and PCA Environmental Authority for alternative solutions.
 - .3 Protect roots of designated trees to dripline plus 1.5 m during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
 - .1 In the event that the installation of root-protectant fencing is not possible and/or ideal, alternative measures, as approved by PCA, must then be implemented. Such measures must provide a sufficient amount of soil compaction prevention with regards to the highest level of activity to occur within the immediate area of protection.
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- .4 Limit clearing, grubbing, and tree branch removal to areas of work or access indicated on accepted shop drawings.
- .5 Damage to trees due to Contractor's operations:
 - .1 Where practical, the branches of the large trees should be trimmed back as the first option rather than cutting the entire tree
 - .2 Broken branches 25 mm or greater in diameter: cut back cleanly at break, or to within 10 mm of their base, if substantial portion of branch is damaged Departmental Representative will direct.
 - .3 Exposed roots 25 mm or larger: cut back cleanly to soil surface within five (5) calendar days of exposure.
 - .4 Damaged bark: neatly trim back to uninjured bark, without causing further injury, within five (5) calendar days of damage.
- .6 Reduce soil displacement and compaction by using heavy machinery in designated areas, construction access roads, and on existing vehicle paths.
- .7 Use equipment of low bearing weight and low-pressure tires whenever possible, and avoid using heavy machinery on saturated ground.
- .8 De-compact subsoil which has been compacted from the movement of construction equipment and project staging.
- .9 Prune trees close to trunk, make shallow undercut first, then follow with top cut. Do not use axe for pruning.
- .10 Cut trees at ground level and do not leave pointed stumps.
- .11 Clear vegetation by hand from unstable or erodible banks; where possible avoid using heavy machinery.
- .12 Replace damaged lawn to pre-construction state with topsoil and sod in work zone.
- .13 No vegetation clearing to occur between April 1st and August 31st of any year to protect nesting birds.
 - .1 If vegetation clearing must take place during this period, an avian biologist must be present to screen and clear the area of nests no more than (2) days prior to clearing.

- .14 Prepare suitable planting plan and erosion and sediment controls for acceptance by Departmental Representative when conducting grubbing.
 - .15 Use native species for tree planting and ground cover with mulch to prevent erosion and help seeds germinate.
 - .16 Keep site stabilized if there is insufficient time (at least four weeks) remaining in the growing season for seeds to germinate, or if at risk of germinating and being damaged by frost.
 - .17 Visual site inspections to be conducted in spring and fall for first two growing seasons following planting. If any plantings are found dead or failing, mitigation measures to be implemented to reduce risk of future failure and plants to be replaced and monitored accordingly.
 - .18 Trees, shrubs and vegetation which are to remain throughout construction should be properly identified and delineated.
 - .19 Disturbance of vegetation along shoreline must be limited to what is required for allowing reasonable completion of the project with minimal environmental impact; if necessary, riparian vegetation will be removed last and kept to a minimum.
 - .20 Should any vegetation require chipping/mulching, the after product will be stored on site for the duration of the project to supplement erosion and sediment control methods when required.
 - .21 Minimize clearing as much as possible to maintain riparian vegetative cover and windbreaks, where possible maintain vegetated buffer at shoreline and minimize clearing near water bodies. If buffers cannot be maintained, avoid grubbing of vegetation root mass in proximity to shorelines and stream banks. Vegetation clearing from unstable or erodible banks or riparian areas shall be minimized or undertaken by hand.
 - .22 Delineate areas to be avoided with flagging tape or temporary fences.
 - .23 Ensure appropriate handling procedures are followed for noxious weeds such as Giant Hogweed or Wild Parsnip.
 - .24 Root system of trees identified to remain should be properly delineated and fenced off, so as to protect the root system from being crushed and
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impacted by machinery.

- .25 In the event that the installation of root-protective fencing is not possible and/or ideal, alternative measures, as approved by PCA, must then be implemented. Such measures must provide sufficient amount of soil compaction prevention with regards to the highest level of activity to occur within the immediate area of protection.
 - .1 For areas of light-to-medium levels of traffic activity, a geotextile cloth shall be placed over the area of protection and covered with 200 mm, minimum, thick layer of wood mulch material.
 - .1 Pins or staples must be used to secure the geotextile material to the ground.
 - .2 For areas of medium-to-high levels of traffic activity, a geotextile cloth shall be placed over the area of protection and covered with 200 mm, minimum, thick layer of wood mulch material. The wood mulch material shall then be covered with 19 mm thick sheets of plywood.
 - .1 The plywood will break down over time, and shall be replaced periodically to retain its effectiveness.
 - .2 19 mm thick laminated large sheets of plywood are recommended for use.
 - .3 Over time, wood mulch material can degrade, move, or wash away. Wood mulch must be replenished as necessary in order to maintain a layer of 200 mm thickness at all times.
 - .4 Wood mulch material should not be permitted to pile against the trunk(s) or root flare(s) the tree(s), as this may lead to unwanted bark rot and damage to the tree, subsequently leading to reduction in tree(s) health and potentially tree(s) death.
 - .5 Alternative methodology for soil-compaction prevention may be utilized (ex. blast mats), as reviewed and approved by PCA.
 - .26 Native grasses, shrubs, etc. should be planted to match existing species growing on the sites as per restoration plan.
 - .27 Common milkweed should be actively restored. If milkweed has grown by project initiation, then as a precautionary measure, plants should be pulled and moved to non-affected areas where milkweed is growing, if there is the potential for larvae and eggs to be present on the affected plants.
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- .28 The success of all vegetative plantings shall be assessed through visual site inspections conducted at least once each spring and each fall for the first two growing seasons following planting. If at any time during the monitoring period any plantings are found dead or failing, mitigation measures shall be implemented to reduce the risk of future failure and the plants shall be replaced and monitored accordingly.

1.11 IN-WATER WORK

- .1 No in-water work is permitted between March 15th and July 15th of any year, unless otherwise approved by the Regulators.
- .2 In-water work includes the construction of temporary cofferdams, the discharge of water directly to the waterway, tremie pours, and the removal of the existing structures.
- .3 Work must comply with the Fisheries Act, as regulated by the Department of Fisheries and Oceans.
- .4 In-water work must comply with 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 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 SSEMP as applicable and approved by Departmental Representative.
- .8 No acid-bearing (containing sulphides) or metal leaching rock shall be used for in-water works.
- .9 Monitor water quality for suspended sediment levels exceeding identified requirements during in water activities.

1.12 WORK ADJACENT TO WATERWAYS

- .1 Do not release deleterious materials into waterways.

- .2 Do not use salt as a de-icer or sand for traction within 30 m of waterway.
 - .1 Where ice is a safety concern, use environmentally acceptable de-icing or traction materials accepted by Departmental Representative.
 - .2 No de-icer or traction materials allowed to enter the waterway.
- .3 Ensure equipment and temporary access structures such as scaffolding placed in waterbodies are free of earth material, and excess, loose or leaking fuel, lubricants, coolant, and other deleterious material that could enter waterway.
 - .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 product 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 Design and construct temporary crossings to minimize erosion to waterways.
- .7 Stockpiles of excavated or fill materials must be stored and stabilized away from water. Runoff from the excavated or fill material must be contained from entering the watercourse by sediment fencing installed 1 m out from the base and all around the stockpiled material. Stockpiled material should be covered with tarpaulin or other approved covering.
- .8 Paint metal and wood surfaces in an environmentally safe way and take appropriate preventive and corrective actions.

1.13 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 Should conditions at the work site indicate that there are negative impacts to fish or their habitat, all work shall cease until the problem has been corrected and Parks Canada EA staff has been consulted.
- .3 Departmental Representative may direct Contractor to other areas of work within the project limits while issues are investigated.
- .3 If turbidity spikes confirmed, report that to Department Representative and investigate potential cause of Spike and take corrective actions upon approval by the Departmental Representative.

1.14 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control measures installed under this contract.
 - .2 Spills of deleterious substances:
 - .1 Immediately contain, limit spread and clean up in accordance with federal regulatory requirements.
 - .2 Report immediately to Ontario Spills Action Centre: 1-800-268-6060 and PCA.
 - .3 Further information on dangerous goods emergency cleanup and precautions including a list of companies performing this work can be obtained from the Transport Canada 24-hour number (613) 996-6666 collect.
 - .4 Using appropriate safety precautions collect liquid or solidify liquid with an inert, non-combustible material and remove for disposal.
 - .5 Be responsible for all costs of cleaning up any spills to the satisfaction of the Departmental Representative.
 - .6 Have an environmental emergency response plan in place and a spill kit readily available.
 - .3 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 materials being handled.
 - .4 Ensure worker use of personal protective equipment appropriate to minimize risk of exposure to
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sediment and water in Work Area. Personal protective equipment should include, as a minimum, gloves, long-sleeved shirts, long pants, waterproof/chemical-resistant footwear, hearing protection, and safety glasses.

- .5 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.
- .6 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.

1.15 SEDIMENT, DUST AND
EROSION CONTROL

- .1 Submit an Erosion and Sediment Control Plan, prepared by a qualified individual. Plan can be submitted as a stand-alone submission or as a part of Site-Specific Environmental Management Plan. SSEMP to demonstrate:
 - .1 Focus primarily on erosion control and sediment control secondary.
 - .2 Areas to be controlled; including adjacent areas that could be negatively impacted by construction activities.
 - .3 Drainage areas and patterns based on construction design and site topography.
 - .4 Plan for directing sediment-laden run-off to on-site detention or retention facilities.
 - .5 Plan for diverting clean storm run-off from site and exposed areas.
 - .6 Channels for necessary design discharge.
 - .7 Plans for temporary and permanent erosion control needs for all channels.
 - .8 Consideration of project schedule in selecting environmental controls.
 - .9 Consideration of seasonal requirements and plans for design controls and practices for controlling associated erosion and settlement.
- .2 All areas of the work site prone to erosion which are disturbed by ongoing work shall be stabilized with erosion control blankets, mulch and/or pre-

approved alternative methods to keep soil in place.

- .3 Prior to starting work that will create dust or debris (such as wood sawing, excavation, backfilling, etc.) install effective mitigation techniques for sediment, dust, debris and erosion control in accordance with Federal, Provincial, and Municipal laws and regulations, and to the satisfaction of the Departmental Representative and PCA Environmental Authority.
 - .1 Maintain these protective measures at all times, including during shut down periods.
 - .2 Choose appropriate controls based on particle size present in sediment.
- .4 Provide a 1 (one) metre high sediment barrier in all areas where, due to construction activities, sediment, or debris may enter the waterway. This includes, but is not limited to, sediment barrier installed around staging and work areas, and on waterway bed (or ice surface) parallel to embankments and/or retaining walls. Install heavy duty DOT TYPE II turbidity curtain approximatively 2 m to 3 m from embankment or wall.
- .5 Maintain a standby supply of pre-fabricated sediment barrier, or an equivalent ready-to-install sediment control device.
- .6 Maintain effective surface drainage and direct run-off away from work areas and into adequately vegetated areas.
- .7 Excavation to cease during periods of heavy rainfall, unless run-off is contained from entering waterway.
- .8 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
- .9 Implement erosion and sediment control measures prior to Work and maintain during Work phase. The following principles should be considered:
 - .1 Diversion 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 waterways as a result of mobilized sediments.
 - .5 Filtration of sediment carrying flows.
 - .6 Collection of captured or contained sediments.

.7 Treatment of pH.

- .10 Consider particle size present in the sediment and native soils including concrete sediments to select appropriate control options.
- .11 Erosion and sediment controls must be selected to treat particle size present in native soils and sediments on the Work.
- .12 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.
- .13 Disturbed areas of the work site shall be stabilized immediately and re-vegetated as soon as conditions allow. Exposed areas should be covered with erosion control blankets or other measures to keep the soil in place and prevent erosion until re-vegetated.
- .14 Phase vegetation removal to reflect construction activity; grubbing should not be conducted too far ahead and too large an area to be properly mitigated with Erosion and Sediment controls.
- .15 Sediment control measures and exclusion fencing must be removed in a way that prevents the escape or re-suspension of sediments.

1.16 OPERATION AND
MAINTENANCE OF EQUIPMENT

- .1 Maintain machinery and equipment to be clean, free of leaks, and in optimal working condition.
 - .1 Ensure measures are in place to minimize impact of spills.
 - .2 Provide and use drip trays under fuel-powered equipment and machinery to prevent discharge of oil, grease, antifreeze, or other materials into the ground or waterways.
 - .3 Equipment and heavy machinery used shall meet or exceed all applicable emission requirements.
 - .4 Any vehicle or equipment entering waterway to be free of fluid leaks and externally degreased.
 - .5 Use biodegradable hydraulic fluids for machinery that will be working in or around the river.
 - .6 Clean equipment prior to entering waterway in designated area at least 30 m from waterway.
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- .7 All equipment to be thoroughly cleaned prior to coming on site, to reduce risk of invasive species introduction from outside sources.
 - .8 Do not operate heavy equipment in waterway, except when operated from barge or after dewatering is completed.
 - .9 Operate machinery from stable location.
 - .10 Only allow working end of machinery to directly enter water. Working end of machinery to be clean and free of leaks.
 - .1 Complete the in-water activity as quickly as possible to minimize the time equipment is in the water; do not leave equipment in water during breaks.
 - .11 Leave machinery running only while in actual use, except where extreme temperatures prohibit shutting machinery down.
 - .12 Designate a re-fueling depot with spill management equipment in place. Re-fueling areas will have a spill containment kit immediately accessible.
 - .13 Conduct all vehicle/equipment maintenance and refueling over impermeable /absorptive material situated at a designated site that is located at least 30 m away from nearest waterway.
 - .1 If 30 m is not possible, area should be reviewed by Departmental Representative.
 - .14 Store oils, lubricants, fuels, and chemicals in secure areas on impermeable pads.
 - .15 In case of fuel heaters to be located with 30 m of a waterbody, use large drip pan to contain possible leakage from heater or refueling operations. Absorptive material to be placed at bottom of drip pan for added measure.
 - .16 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.
 - .17 No overnight/long term parking is allowed on cofferdams. No long-term parking is allowed in dewatered areas. Exception may be given to large cranes or equipment after approval of Departmental Representative.
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| <u>1.17 CLEANING OF CONCRETE EQUIPMENT</u> | .1 | Use only trigger-operated spray nozzles for water hoses. |
| | .2 | Departmental Representative will designate a cleaning area for equipment and tools to limit water use and runoff. |
| | .3 | The cleaning area shall be no closer than 30 m from waterway to reduce potential for contamination of the waterway. |
| | .4 | Where no safe cleaning area is available, Contractor to provide a settling pond where the equipment can be cleaned. All alkali water is to be disposed of in accordance with Federal, Provincial, and local authority requirements. |
| | .5 | Employ measures to prevent entry of concrete wash water or leachate from uncured concrete into the water. |
| | .6 | 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. |
| | .7 | 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. |
| <u>1.18 REMOVED MATERIALS</u> | .1 | Unless otherwise specified, materials designated for removal become the Contractor's property and shall be removed from site. |
| <u>1.19 HAZARDOUS MATERIALS</u> | .1 | Place materials defined as hazardous or toxic waste in designated containers. |
| | .2 | Comply with requirements of Workplace Hazardous Materials Information System (WHIMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Safety Data Sheets (SDS) acceptable to Human Resources Development Canada, Labour Program. |
| | .3 | Store Hazardous Materials in secure areas on impermeable pads, provide berms if necessary. |
| | .4 | Dispose of hazardous materials and designated substances in accordance with Ontario Regulation 347/90. |

1.20 CLEAN UP

- .1 Clean up work area as work progress.
 - .2 At the end of each work period, and more often if ordered by the Departmental Representative or PCA Authority, remove debris from site, neatly stack material for use, and clean up generally. Progress Cleaning should be in accordance with Section 01 74 11 - Cleaning.
 - .3 Permit no undue amounts of debris, trash or garbage to accumulate on-site.
 - .4 Concrete debris to be placed into watertight container daily, and or more frequently as directed.
 - .5 Separate and recycle all materials that can be recycled.
 - .6 Do not bury rubbish on site.
 - .7 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.
 - .8 Ensure all emptied containers are sealed and stored safely for disposal away from children and / or the Public.
 - .9 Spills:
 - .1 Have environmental emergency response plan in place, spill kit, and other materials readily available on- site to respond quickly if spills occur.
 - .1 Spill kit to be maintained on site.
 - .2 Contractor to ensure adequate additional resources available.
 - .2 Report spills and accidental sediment releases immediately to Departmental Representative, PCA Environmental Authority, and Ontario Ministry of Environment and Climate Change Spills Action Centre (Telephone No. 1-800-268-6060).
 - .3 Secure source of spill to stop flow of spill and isolate area of spill.
 - .4 Using appropriate safety precautions, collect liquid or solidify liquid with an inert, non-combustible material, or absorbent pads.
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- .5 Clean-up, remove, and dispose of contaminated materials in accordance with Federal requirements, SDS, or as directed by Ontario Ministry of Environment and Climate Change.
- .6 Be responsible for costs of cleaning up spills by method accepted by Departmental Representative.
- .7 Submit documentation of remediation techniques and test results as requested to Departmental Representative.
- .10 Remove all scaffolding, temporary protection, surplus materials, tools, plant, rubbish and debris and dispose of them in an approved manner off-site at following times:
 - .1 By April 15 for Work that may affect Lock operations.
 - .2 At completion date of Work for all other areas.
- .11 All debris on river bed (including unused aggregate/concrete rubble) shall be completely removed and area restored to original state upon completion of work.
- .12 Clean areas under contract to a condition at least equal to that previously existing and to approval of Departmental Representative and PCA Environmental Authority.
- .13 The area inside of cofferdams, if necessary, will be cleaned and restored; alternatively, the cofferdam footprint to be capped with clean rock, in order to mitigate turbidity from the former construction area as the areas are re-flooded.
- .14 Tools, equipment, temporary structures, utilities, barriers or parts thereof, used or maintained for purpose of this project, must be removed from site after completion of project.

1.21 TRANSPORTING AND DISPOSAL OF WASTE MATERIAL

- .1 All waste subject to Regulation 347/90 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 Obtain and submit Waste Generator Numbers, permits, manifests and all other paperwork necessary to comply with the regulation.

- .3 Recyclable material and waste to be removed from site in accordance with all federal, provincial, and municipal regulations to licensed disposal facilities in accordance with Section 01 74 19- WASTE MANAGEMENT AND DISPOSAL and in accordance with regulations (i.e., O. Reg. 102/94 and O. Reg. 558/00, R.R.O. 1990, 347).
- .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 waterways.

1.22 MIGRATORY BIRD PROTECTION

- .1 Tree cutting and clearing work is not to be undertaken during the migratory bird nesting season, between April 1st and August 31st.
- .2 If tree cutting and clearing work during the nesting season, a nest survey will need to be conducted by a qualified avian biologist immediately (within two days) prior to commencement of work to identify and locate active nests of species.
- .3 If active nest are present, the Contractor shall develop a mitigation plan to address any potential impact on migratory birds or their active nests. The plan will need to be reviewed by Environment Canada prior to implementation.

1.23 CONCRETE ACTIVITIES

- .1 Maintain isolation of all cast-in-place concrete and grouting from fish-bearing waters for a minimum 48 hours if ambient air temperature is above 0°C and for a minimum of 72 hours if ambient air temperature is below 0°C or until significantly cured with pH reaching neutral levels.
- .2 Avoid concrete and grouting activities during or immediately after wet weather conditions.
- .3 Ensure use of concrete, sealants, and other compounds in accordance with appropriate Product Technical Data Sheet.
- .4 Ensure Work involving cement containing materials will not deposit, directly or indirectly sediments, debris, concrete, concrete fines, wash, or contact water into or about watercourse.
- .5 Remove dust, debris, unused aggregate and concrete rubble generated as result of concrete work and dispose off-site ensuring materials does not enter

waterway.

- .6 Place concrete debris into watertight container daily, or more frequently as directed.
 - .7 Isolate all work from waterway.
 - .8 A CO² regulator, tank and diffuser hose will be kept on site in the event of concrete spills. The system will be sized for concrete volumes used in Work area. It should be deployed for tremie concrete, if required; or as stated in .13 below, when forms are not or cannot be isolated from moving water.
 - .9 Use of neutralizing acids is not permitted.
 - .10 Direct concrete wash water to a collection and treat to effectively remove all suspended solids, dissipate velocity and prevent deleterious substances from entering waterway.
 - .11 In event of a release of concrete, notify Departmental Representative, PCA Environmental Authority and Ontario Ministry of Environment and Climate Change Spills Action Centre (Tel: 1-800-268-6060).
 - .1 Clean up and execute remediation immediately in accordance with provincial and federal regulatory requirements and accepted by PCA Environmental Authority.
 - .2 Install additional turbidity curtain or sediment barriers as necessary.
 - .3 Document remediation, testing, results to be submitted to Departmental Representative and PCA Environmental Authority.
 - .12 Maintain pH at discharge point into watercourse between 6.5 and 9.0. Water with pH > 9 cannot be released directly back into the watercourse, but must be treated prior to release. Water with a pH ≥ 12.5 is considered toxic and treated as a hazardous waste under Ontario Regulation 347 of the Environmental Protection Act and wastewater in this condition must be removed from the site.
 - .13 Additional environmental mitigation measures are required for placement of tremie concrete, concrete or where forms are in contact with the water course, or where contaminated water may enter the watercourse:
 - .1 Ensure concrete forms are tight and no flow is occurring.
 - .2 Isolate area with curtain or impermeable
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material specified for concrete particulates; ensure fish exclusion is followed.

- .3 Isolated area should be the minimum size required to complete task.
- .4 For tremie pours or where water comes into contact with the forms, CO₂ system must be installed and operating along the entire length of the isolated area; the tank shall be used to release carbon dioxide gas into an affected area to neutralize pH levels. Ensure sufficiently sized tanks for the concrete volumes used.
- .5 Workers shall be trained in the use of the system.
- .6 Use of neutralizing acids is not permitted unless the system is designed and implemented by a qualified professional.
- .7 pH monitoring shall be conducted inside and outside the containment area.

1.24 AIR QUALITY AND 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.

- .2 On-site vehicles to have a Drive Clean Emissions Report in accordance with O. Reg. 361/98: Motor Vehicles under the Environmental Protection Act, R.S.O.
 - .1 Departmental Representative or PCA Environmental Authority reserve 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.
- .3 Keep record of complaints and issues to monitor and mitigate public complaints.
 - .1 Contractor to address issues that arise.
- .4 Comply with municipal Noise By-Laws.
- .5 Notify public of planned activities that may cause disturbances and schedule them to avoid sensitive time periods.
- .6 Minimize idling of construction equipment and machinery.

- .7 Use well maintained equipment and machinery fitted with fully function emission control systems, mufflers, exhaust baffles, and engine covers.

1.25 WATER QUALITY

- .1 Do not exceed Ontario Water Quality Guidelines due to project activities.
 - .2 Ensure that sediment settling basins are of adequate size to allow for excess sediment run-off and erosion.
 - .3 Place only washed and clean material free of fine particulate matter in or near water where previously planned or authorized. Fine materials such as limestone-based aggregates, unwashed rocks or materials that have the possibility of being suspended or transported downstream should not be used.
 - .4 Snow containing salt or sand may not be dumped or allowed to melt into waterway.
 - .5 Water quality to be maintained in accordance with Canadian Council of Ministers of the Environment, Canadian Water Quality Guidelines for the Protection of Aquatic Life.
 - .6 Record pH measurements of water inside and outside containment area.
 - .7 Water with pH>9 cannot be released directly into the watercourse; such water must be treated prior to release.
 - .8 Water with pH>12.5 is treated as a hazardous waste in accordance with Ontario Regulation 347/90 of the Environmental Protection Act and water must be removed from site.
 - .9 Monitor water for: unacceptable levels of suspended sediments and turbidity in accordance with Section 35 49 25- TURBIDITY CURTAIN.
 - .10 Submit weekly water quality reports.
 - .11 Stop work in immediate area in the event pH, sedimentation or turbidity exceed identified thresholds and implement mitigation measures accepted by Departmental representative.
 - .12 Store chemicals and materials in dry storage to prevent infiltration of leachate into water table or surface run- off.
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1.26 FLOODS, EXTREME
WEATHER, AND ICE FORMATION

- .1 Undertake construction under normal weather conditions, to the extent possible, and design project worksite to withstand variable weather conditions.
- .2 Minimize risk of inundation due to wet weather by grading, providing drainage and covering or protecting surfaces.
- .3 Stabilize work area against impact of high flow and heavy rainfall events at the end of each workday.
- .4 Restrict construction activities and stabilize excavations during wet weather to reduce surface run-off from exposed Work areas.

1.27 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 and Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
 - .1 Take action only after receipt of written approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 GENERAL MITIGATION
MEASURES

- .1 Contractor shall comply with and enforce compliance by employees of prescribed environmental mitigation measures outlined in Environmental Management Plan and Basic Impact Assessment (BIA) and other
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federal, provincial, territorial or municipal acts or regulations applying to the National Parks and Historic Sites of Canada.

- .2 Execute, during the work, the environmental mitigation measures mentioned below.
 - .1 Fish and Fish Habitat - Minimize the duration of in-water work.
 - .2 Abide by these mitigation measures and best management practices outlined within Fisheries and Oceans Canada's (DFO's) online guidance materials: Measures to Avoid Causing Harm to Fish and Fish Habitat (<http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/measures-mesures-eng.html>)
 - .3 Suspend in-water work activities during periods of heavy rains.
 - .4 Do not proceed to in-water work /activities during the timing restrictions as per section 01 14 00 - WORK RESTRICTIONS. In summary, no in-water work/activity is allowed from March 15 to July 15.
 - .5 With the exception of the installation of the cofferdams, complete in-water work in the dry.
 - .6 Cofferdam fill to be washed and free of fines. Locations for the granular cofferdams to be isolated and fish salvage/rescue conducted prior to infilling using floating sediment curtain from the water surface to the river bed.
 - .7 The intakes of pumping hoses will be equipped with an appropriate device to avoid entraining and impinging fish.
 - .8 Retain the services of a qualified fish biologist who will be on-site during the dewatering process in order to rescue stranded fish (or other aquatic fauna).
 - .9 Should water from the river overtop isolated areas, dewater following the above procedures.
 - .10 For bank stabilization use rip-rap consisting of clean rock, free of fines.
 - .11 Use clean machinery free of leaks.
 - .12 Following completion of each phase of construction, retain the services of a biologist who will survey the downstream area of dried waterbed prior to removal of the cofferdams to confirm that spawning habitat has been returned to pre-construction conditions or better. The upstream cofferdam
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can then be removed slowly with the sluice gates closed (to minimize transportation of fines downstream).

- .13 Activities will follow measures to Avoid causing harm to Fish and Fish Habitat including Species at Risk:
 - .1 No blasting is allowed.
 - .2 Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.
 - .3 Develop and implement an Erosion and Sediment Control Plan for the site that minimizes the risk of sedimentation of the waterbody.
 - .4 Note that additional mitigation measures to protect water, soil and sediment quality are also required to protect Fish and Fish Habitat
 - .5 Capture and relocation of an endangered or threatened aquatic species at risk will require approval from DFO.
 - .14 If recommended by a qualified person and approved by PCA, exclusion zones or "no go" areas will be established to protect areas with known residences (e.g., hibernacula, dens, nests).
 - .15 If recommended by a qualified person and approved by PCA, conduct "Pre-stressing" activities within a few days prior to the onset of site preparation (vegetation clearing and grubbing) to encourage wildlife to move away from a site.
 - .16 On a daily basis, an inspection or "sweep" of the work area shall be performed prior to commencement of project works and activities to ensure wildlife is not present in the work area (include in site checklist).
 - .17 Field information regarding incidental encounters with wildlife (non-SAR wildlife) shall be compiled and reported on a daily basis. For incidental encounters, the following information should be recorded in the field:
 - .1 Locations, dates and time of day where the species were encountered;
 - .2 Names of species encountered;
 - .3 Photographs of the species, if taken;
 - .4 Condition of animal.
 - .18 If injured/dead wildlife are encountered
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report to PCA immediately. PCA may require retrieval and storage on ice of carcass for laboratory testing

- .19 All vehicles and equipment used by project personnel will follow any construction zone speed limits to reduce the risk of hitting wildlife, as enforced by the Departmental Representative.
- .20 Work areas will be kept clean and free of potential hazards to wildlife such as wire, cable, tubing, plastic, antifreeze or other materials that wildlife may eat or become entangled in.
- .21 Waste will be stored, handled, and transported in accordance with the Waste Management Plan, including storage of all solid waste in sealed, bear-proof containers.
- .22 Feeding of wildlife is prohibited.

3.2 BIRDS

- .1 Conform to the Migratory Bird Convention Act, 1994
- .2 Minimize the removal of natural vegetation.
- .3 Retain the services of a qualified biologist to educate workforce on potential wildlife which could occur in the vicinity of the work area and measures to avoid wildlife.
- .4 Removal of woody vegetation will not occur during the breeding bird season from March 31st to August 31st inclusive, unless a qualified biologist has searched the site for nests and concluded that no nests are present, no more than 7 days prior to clearing. If nests are found, a protective buffer around the nest location will be required until such time that the nest is abandoned.
- .5 When possible, complete work during daylight. If nighttime lights are used, they are to be installed so as to illuminate the work area only to minimize impacts to nighttime activities of wildlife.
- .6 Install the appropriate mufflers on vehicles and equipment.
- .7 Minimize vehicle and equipment engine idling.
- .8 Designate access routes for construction vehicles from and to the construction area.

3.3 NOISE AND VIBRATION

- .1 Vehicles and equipment will have the appropriate

mufflers installed.

- .2 Minimize vehicle and equipment engine idling.
- .3 Designate access routes for construction vehicles from and to the construction area.
- .4 When possible complete work during daylight hours and in accordance with local noise bylaws.
- .5 Notify residents of planned activities that may cause disturbance and schedule them to avoid sensitive time periods.

3.4 PUBLIC HEALTH AND SAFETY

- .1 Clearly delineate works using fencing and appropriate signage prior to commencement of construction.
- .2 Site fencing shall be of solid material construction.
- .3 Restrict public access to site during construction works and access to the site is limited to construction personnel.
- .4 Access to site will be completed via controlled access points.
- .5 Remove designated substances per industry Best Management Practices and safety guidelines prior to construction.
- .6 Identify/label, record, and report of regulated wastes, products and substances, together with hazardous material through a Workplace Hazardous Material Information System assessment (WHMIS).
- .7 Designate access routes for construction vehicles from and to the construction area and speed limits will be established and adhered to as necessary.
- .8 Handle construction waste to the Waste Management Plan including the safe handling and appropriate disposal of designated substances.
- .9 Designate a temporary waste storage area that meets the requirements of the Ontario Environmental Protection Act, Guidelines for Environmental Protection Measures at Chemical and Waste Storage Facilities (2007), Fire Protection and Prevention Act (Fire Code) and Ontario Regulation 347. Maintain the area so as to prevent leaks, spills or damage/deterioration to waste containers, has adequate containment, is secure, is protected from weather and is not located in an area within 30 m

of a watercourse and has no direct drainage leading to a watercourse.

- .10 Provide appropriate disposal containers for the prompt disposal of waste.
- .11 Remove full disposal containers to the appropriate waste disposal facility on a regular basis.
- .12 Handle wastes that require special handling requirements according to the appropriate local, provincial and federal legislation.
- .13 Collect organic/food waste daily and store it in closed, animal resistant containers until disposed of at an approved waste disposal site.
- .14 Keep the staging area tidy and free of litter.

3.5 AESTHETICS

- .1 Clearly delineate the work areas using fencing and appropriate signage prior to commencement of construction.
- .2 Limit access to the site to construction personnel.
- .3 Provide appropriate disposal containers for the prompt disposal of waste and remove full disposal containers to the appropriate waste disposal facility on a regular basis.
- .4 Remove solid nonhazardous construction waste (e.g. material packaging) generated during the construction process from the site to an approved disposal/recycling location.
- .5 Collect organic/food waste daily and store it in closed, animal resistant containers until disposed of at an approved waste disposal site.
- .6 Handle construction waste according to the Waste Management Plan.
- .7 Designate a temporary waste storage area that meets the requirements of the Environmental Protection Act, Guidelines for Environmental Protection Measures at Chemical and Waste Storage Facilities (2007), Fire Protection and Prevention Act (Fire Code) and Ontario Regulation 347. Maintain the area so as to prevent leaks, spills or damage/deterioration to waste containers, has adequate containment, is secure, is protected from weather and is not located in an area within 30 m of a watercourse and has no direct drainage leading to a watercourse.

- .8 Remove full disposal containers to the appropriate waste disposal facility on a regular basis.
- .9 Handle wastes that require special handling requirements according to the appropriate local, provincial and federal legislation.
- .10 Keep the staging area tidy and free of litter.

3.6 RECREATIONAL VALUE

- .1 Clearly delineate works using fencing and appropriate signage prior to commencement of construction in order to safely guide the public around the site.
- .2 Limit access to the site to construction personnel.

3.7 TOURISM VALUE

- .1 Clearly delineate the work areas using fencing and appropriate signage prior to commencement of construction.
- .2 Limit access to the site to construction personnel.
- .3 Designate access routes for construction vehicles from and to the construction area and speed limits will be established and adhered to as necessary.

3.8 RIPARIAN PROPERTY

- .1 Install Sediment and erosion control measures prior to the commencement of construction work and in-water activities (cofferdam construction, etc.)
 - .2 In-water sediment/turbidity curtains shall be deployed in a manner that prevents entrapment of fish inside the curtain.
 - .3 The Cofferdams will be constructed of steel structures and clean rock fill and be designed to withstand maximum flood event expected during construction and work has been phased in order to ensure that the project site will continue to be able to pass flood flows.
 - .4 The area inside of cofferdams, if necessary, will be cleaned and restored during final site restoration; alternatively, the cofferdam footprint can be capped with clean rock, in order to mitigate turbidity from the former construction area as the areas are re-flooded. All debris on bed (including unused aggregate/concrete rubble) shall be completely removed and area restored to original state upon completion of work.
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- .5 Rip-rap for bank stabilization will consist of clean rock, free of fines.

3.9 LOCAL ECONOMY

- .1 Clearly delineate the work areas using fencing and appropriate signage prior to commencement of construction.
- .2 Limit access to the site to construction personnel.
- .3 Designate access routes for construction vehicles from and to the construction area and speed limits will be established and adhered to as necessary.

3.10 LAND AND WATER ACCESS

- .1 Clearly delineate the work areas using fencing and appropriate signage prior to commencement of construction in order to guide members of the public around the site.
- .2 Limit access to the site to construction personnel.
- .3 Designate access routes for construction vehicles from and to the construction area and speed limits will be established and adhered to as necessary.
- .4 The area immediately upstream of the Crowe Bay dam is restricted through the use of a safety boom to prevent boats from approaching too closely to the structure.

3.11 AIR QUALITY

- .1 Develop and submit for review a Dust Management Plan and Fire Prevention and Preparedness Plan prior to construction.
 - .2 Use equipment and vehicles equipped with dust collectors and mufflers as appropriate.
 - .3 During concrete removal, tarps will be used to contain airborne dust particles.
 - .4 Apply water, at a minimum, on a daily basis, to inactive disturbed surface areas. Apply water more frequently if required to prevent the visible emissions of fugitive dust.
 - .5 Apply water to unpaved road used for vehicular traffic at a frequency sufficient to prevent the visible emissions of fugitive dust.
 - .6 Grade regularly and maintain unpaved roads to avoid
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washboarding and rutting that can increase fugitive dust emissions.

- .7 Post speed limits throughout the facility to control fugitive dust on unpaved roads.
- .8 Cover loads on haul trucks.
- .9 During very windy conditions, avoid or reduce activity that generated fugitive material handling/transfer dust. If it is not possible to reschedule the activity, increase application of water for dust suppression.
- .10 Consider a sprinkler or spray system for areas requiring frequent wetting.
- .11 Apply water to open stockpiles on a daily basis when there is evidence of wind driven fugitive dust.
- .12 Surround wetted stockpiles with sediment erosion control fencing.
- .13 Spray materials with the potential to generate dust with water 15 minutes prior to handling and/or at points of transfer.
- .14 Burning of waste materials is prohibited.
- .15 Disturbed areas will be re-vegetated following a re-vegetation plan which will utilize native shrubs and trees, based on local conditions, to promote the quick re-growth of a natural habitat and minimize fugitive dust.

3.12 GROUNDWATER QUALITY

- .1 Do not use herbicides in clearing of vegetation.
- .2 During concreting, employ measures to reduce the potential for contamination.
- .3 Wash-out stations for concrete trucks will be indicated by signage and located a minimum of 30 m from the river and in an area where appropriate precautions have been taken to contain wastewater and leftover concrete.
- .4 Do not use local groundwater for construction activities and do not drill well for groundwater. If necessary, off-site water will be trucked in.
- .5 Develop and submit for review to the Departmental Representative a spill response plan prior to the beginning of construction.

- .6 Designate a temporary waste storage area for the storage of fuels, lubricants, etc. Maintain the area so as to prevent leaks, spills or damage/deterioration to waste containers, has adequate containment, is secure, is protected from weather and is not located in an area within 30 m of a watercourse and has no direct drainage leading to a watercourse.
- .7 Locate emergency spill kits on site.
- .8 Fully train the construction crew on the use of clean- up materials in order to minimize impacts of accidental spills.
- .9 Monitor the area for leakage and in the event of a minor spillage halt the activity and implement corrective measures. Immediately report spills to the MOECC Spills Action Centre (1 800 268-6060) and the Departmental Representative.

3.13 SURFACE WATER QUALITY

- .1 Develop and submit for review to the Departmental Representative a Surface Water, Erosion and Sediment Component Plan prior to construction activities.
- .2 Be responsible to ensure that the measures chosen are appropriate for the site and are functioning as intended.
- .3 Maintain and monitor sediment and erosion control measures daily, provide the results of monitoring, and ensure adjustments as needed are made on a continuous basis.
- .4 No work will occur in or within 30 m of the water until the appropriate sediment and erosion control measures have been properly implemented. These will be designed to prevent the movement of suspended sediments and concrete outside of the work area.
- .5 Stop work if sedimentation issues occur outside of the temporary work area until the cause of sedimentation is identified and addressed to the satisfaction of the Departmental Representative.
- .6 Should dust particles be created during concrete crushing, excavation, stockpiling etc. suppress them using the appropriate method (i.e. water spraying).
- .7 Use small machinery to remove riparian vegetation.
- .8 Where possible, restrict vehicle traffic to access

roads.

- .9 Whenever possible, reduce bank erosion by leaving a minimum of 60 cm stump in place from trees removed along the shoreline.
- .10 Ensure that new shoreline, created during re-profiling, is stable immediately following excavation. Use rip-rap free of fines.
- .11 In-water activities with the exception of the construction of the cofferdams will take place in the dry and in an isolated area.
- .12 Complete isolation of the work area using cofferdams and sediment curtains.
- .13 Place rock on the shoreline approach for the construction of the granular cofferdams and access ramps. Following completion this rock will be removed, and shorelines reclaimed to pre-construction conditions or better.
- .14 The temporary in-water work areas will then be dewatered, and the water returned to the river after undergoing treatment for suspended sediments. The water will be discharged at a location where every precaution has been taken to ensure that no introduction of sediments to occur and that returning water does not cause erosion or re-suspension of sediments. The water returning to the river needs to be of similar or better quality than the river itself in order to reduce potential impacts to water quality downstream.
- .15 Monitor the drilling activities for the installation of the sheet pile cofferdam for suspended sediments and take measures, as needed, to prevent downstream migration of a sediment plume (i.e. tremie and turbidity curtains).
- .16 Before beginning work on the Cofferdams, if required, the sluices in the existing dam would be opened as far as possible on the opposite side and closed on the work side in order to reduce water flow within the work area and minimize transportation of suspended sediments downstream.
- .17 Use clean, washed rocks, free of fines in the construction of the cofferdams.
- .18 The removal of the cofferdams will be completed with a downstream turbidity curtain in place. Water will be allowed to slowly enter the area that had been isolated by the cofferdams. The turbidity curtain will be left in place until the water suspended sediments settled and then be removed

carefully to ensure that sediment trapped is not released downstream.

- .19 Submit a drawing showing access ramps to the river. Minimize the access ramps and locate outside of identified exclusion zones.
 - .20 Use clean, washed, aggregates to construct access ramps.
 - .21 Machinery working in the temporary work area will be clean of mud and free of leaks.
 - .22 Fully remove access roads/ramps into the dewatered work area once the work is completed.
 - .23 Additional materials (i.e. rip-rap, filter cloth and silt fencing) should be readily available in case they are needed promptly for erosion and/or sediment control.
 - .24 Do not remove sediment fencing until the terrestrial vegetation has become re-established.
 - .25 Indicate wash-out stations for concrete trucks by signage. Locate wash-out stations a minimum of 30 m from the river and in an area where appropriate precautions have been taken to contain wastewater and leftover concrete.
 - .26 Store stockpiles of soil or fill material at least 30 m from the river, with the possible exception of clean rip-rap, and protect by silt fencing.
 - .27 Use no herbicides in clearing of vegetation.
 - .28 Dewater the temporary in-water work areas and return the water to the river after undergoing treatment for suspended sediments.
 - .29 Maintenance on construction equipment such as refueling, oil changes or lubrication will only be permitted in designated area located at a minimum of 30 m from the shoreline and outside of the drip line of trees to be retained and in an area where sediment erosion control measures and appropriate precautions will be made to prevent oil, grease, antifreeze or other materials from inadvertently entering the ground or the surface water flow.
 - .30 Locate emergency spill kits on site.
 - .31 Fully train the construction crew on the use of clean- up materials in order to minimize impacts of accidental spills.
 - .32 Monitor the area for leakage and halt the activity
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in case of a minor spillage and implement corrective measures. Report immediately spills to the MOECC Spills Action Centre (1-800-268-6060) and the Departmental Representative.

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| <u>3.14 DRAINAGE AND FLOODING</u> | .1 | Prepare an Emergency Preparedness Plan to specify mitigation measures that will be undertaken in the event of an exceptionally large flood occurring during construction work and commissioning to ensure safety of workers, and persons and properties upstream and downstream of the dam. |
| | | |
| <u>3.15 TERRESTRIAL SPECIES AT RISK</u> | .1 | Species At Risk (SAR), species of conservation concern, and sensitive habitats (i.e. hibernacula, wetlands, colonial nesting sites or overwintering areas) will be identified in the EIA, to be completed by Parks Canada. |
| | .2 | If SAR, species of conservation concern, or sensitive habitats are identified at, or near the work site, ensure proper authorizations have been obtained and mitigation measures put in place prior to starting work |
| | .3 | Inform workers on identifying Species at Risk and Species of Special Concern. If an unexpected rare plant or animal species are encountered, halt construction activities and inform the Departmental Representative who will contact Environment Canada and PSPC to provide advice on additional mitigation measures or permits which may be required. Do not approach or handle the species (i.e., do not harm or harass the species). |
| | .4 | Surround stockpiled materials by sediment control fencing to prevent turtle nesting. |
| | .5 | Use existing access roads as much as possible and post clearly speed limits on site access and construction roads to minimize the potential for road mortality. |
| | | |
| <u>3.16 TERRESTRIAL HABITAT AND SPECIES</u> | .1 | Clearly demark work areas by fencing. |
| | .2 | Surround stockpiled materials by sediment control fencing to prevent turtle nesting. |
| | .3 | Use existing access roads as much as possible and post clearly speed limits on site access and construction roads to minimize the potential for road mortality. |
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- .4 Should mammal, reptile or amphibian species be encountered during construction, immediately stop the construction activities until the animal has safely moved out of harm's way. If an individual that is not a SAR needs to be moved it may be relocated to its appropriate habitat outside of the work area. Species at Risk should only be handled by authorized personnel.
- .5 Minimize the removal of natural vegetation.
- .6 Install snow fencing outside of the drip line of trees not intended for removal to prevent soil compression, root damage and to minimize damages to branches.
- .7 Prune branches of trees that overhang the work area to prevent unintentional harm.
- .8 No grubbing of stumps will occur within the drip line of trees not intended for removal.
- .9 Use small equipment in order to prevent harming woody vegetation not intended for removal.
- .10 If possible, remove vegetation during the winter months to avoid impact to soil.
- .11 Stockpiling of cleared vegetation or chips will be situated away from the water and outside of the drip lines of trees.
- .12 Do not remove woody vegetation during the breeding bird season, unless a qualified biologist has searched the site for nests and concluded that no nests are present, no more than 7 days prior to clearing. The breeding bird season will be confirmed in the EIA.
- .13 When possible, complete work during daylight. If nighttime lights are used install them so as to illuminate the work area only to minimize impacts to nighttime activities of wildlife.
- .14 Vehicles and equipment will have the appropriate mufflers installed to minimize sound disturbance to wildlife.
- .15 Do not leave food scraps and garbage at the project site.
- .16 Handle construction waste according to the Waste Management Plan.
- .17 Install well keyed-in and maintained sediment fences along the shoreline which will also serve as

barriers to keep turtles outside of the work area.

- .18 Inform the construction crew of the potential for Blanding's Turtles to occur, and other species identified in the EIA. Avoid harming turtles. If turtles are in the way, wait for the turtle to pass. Snapping turtles can be moved if needed (but should not be picked up by the tail or near the front half of the carapace).
- .19 Limit speed of travel of vehicular traffic to low speed during mid-October to November (when turtles are moving towards wintering areas) and early spring (when they are leaving wintering areas for nesting sites).
- .20 Wildlife and habitat related mitigation measures identified in the EIA and other measures proposed must be included in the site-specific EMP and accepted by PCA.

3.17 SOIL AND SEDIMENT QUALITY

- .1 Environmental Site Assessment done in support of the current project determined that there is a low probability of contamination by current and historical activities. If signs of contamination (e.g. odor, construction debris) are observed in soils or sediment during construction activities, the Contractor shall take appropriate measures to ensure no cross- contamination will occur according to the Ontario Environmental Protection Act O. Reg 153/04.
- .2 Maintenance on construction equipment such as refueling, oil changes or lubrication will only be permitted in designated areas located at a minimum of 30 m from the shoreline and outside of the drip line of trees to be retained and in an area where sediment erosion control measures and other applicable precautions have been made to prevent oil, grease, antifreeze or other materials from inadvertently entering the ground or the surface water flow.
- .3 Stockpiling (including debris from demolition and contained soil) will be done on an impermeable surface. No debris from demolition will be reused on the site.
- .4 All equipment working in or near the water will be well maintained, clean and free of leaks.
- .5 Avoid operation, storage, repairs and maintenance of machinery outside the delineated work areas.
- .6 Store appropriate spill control materials and

equipment on the construction site in order to address potential spills and properly train staff in their use.

- .7 Use biodegradable hydraulic fluids for machinery that will be working in or around the river.
 - .8 Locate emergency spill kits on site.
 - .9 Fully train the crew on the use of clean-up materials in order to minimize impacts of accidental spills.
 - .10 Monitor the area for leakage and in the event of a minor spillage halt the activity and implement corrective measures. Report immediately spills the MOECC Spills Action Centre (1800 268-6060) and the Departmental Representative.
 - .11 Store hazardous materials in a secure location and inspect the containment measures on a regular basis.
 - .12 Work with cement (or other grout) and the cleaning of cement handling equipment will occur in the dry (except for sheet pile cofferdam where containment curtain will be used), behind cofferdams. Store cement or grouting supplies in a dry location, under cover and away from the drainage zone and at least 30 m from the watercourse. Locate concrete washout stations at least 30 m away from the watercourse and in an area where appropriate precautions have been taken to contain wastewater and leftover concrete. Utilize containment measures for the on-site handling of wash water or other slurries. Inspect containment measures on a regular basis.
 - .13 Local soil will be stockpiled and re-used as opposed to bringing in soil from other locales. If outside material (e.g. top soil, sand) has to be used on the construction site, it will be reputedly sourced.
 - .14 Store contaminated soil that is in excess on site for the shortest time possible, covered, and dispose of at an approved facility. Contaminated soil remaining in place on site will be capped with clean fill, asphalt or concrete paving to ensure there is no access to contaminated soil.
 - .15 Implement appropriate sediment and erosion control measures prior to commencement of work in or within 30 m of the water.
 - .16 Install heavy duty turbidity curtains downstream of the cofferdam.
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- .17 Properly installed sediment fencing along the shoreline will be used to contain particles which may enter the water.
 - .18 Maintain both the sediment fencing and the curtain.
 - .19 Monitor sedimentation outside of the sediment fencing and curtain throughout the day and include daily photographs looking upstream, within and downstream of the work area (i.e. photograph water clarity each day prior to starting in-water works, a mid-day and again at the end of day). These photographs will serve as documentation that the sediment and erosion control measures are functioning.
 - .20 Provide additional monitoring during rain events.
 - .21 Ensure that the measures chosen are appropriate for the site and are functioning as intended.
 - .22 Stop in-water works and/or dewatering activities if sedimentation issues occur outside of the temporary work area.
 - .23 Spray water during concrete removal to prevent airborne dust dispersal.
 - .24 Minimize removal of riparian vegetation and complete removal using small machinery. Utilize existing road where possible.
 - .25 Whenever potential for bank erosion will be reduced by leaving a minimum of 60 cm stump in place from trees removed along the shoreline.
 - .26 Immediately stabilize the riparian area following excavation.
 - .27 In-water activities with the exception of the construction of the cofferdams will take place in the dry and in an isolated area.
 - .28 The in-water work areas will be dewatered, and water returned to the river after undergoing treatment for suspended sediments. Examples of treatments include: sediment bags at the end of the pump, rock check dams, straw bale / geotextile settling ponds or allowing the water to pass through a fully vegetated area.
 - .29 The water that is pumped from the isolated area may contain suspended sediments. Discharge the water at a location where every precaution has been taken to ensure that no introduction of sediments occurs. The water returning to the river needs to be of
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similar or better quality than the river itself.

- .30 Ensure that the returning water does not cause erosion or re-suspension of sediments (i.e. must be returned in such a way to reduce the energy of water).
- .31 Monitor the return of water to the river and be properly document.
- .32 Access to the temporary in-water work area will be from one location and will be situated outside of identified exclusion zones.
- .33 Use clean rock to construct the access ramp.
- .34 Machinery working in the temporary work area will be clean of mud and free of leaks.
- .35 Fully remove the access roads into the dewatered work area once the work is completed.
- .36 Additional materials (i.e. rip rap, filter cloth and silt fencing) should be readily available in case they are needed promptly for erosion and/or sediment control.
- .37 Do not remove the sediment fencing until the terrestrial vegetation has become re-established.
- .38 During concreting pouring follow measures to reduce the potential for contamination.
- .39 Indicate wash-out stations for concrete trucks indicated by signage. Locate stations a minimum of 30 m from the river and in an area where appropriate precautions have been taken to contain wastewater and leftover concrete. Install erosion control structures. These structures are to be left in place until vegetation is re-established and/or exposed soils are stabilized.

END OF SECTION

PART 1- GENERAL

1.1 DESCRIPTION

- .1 This Section describes requirements for protection of archaeological and cultural resources that apply to the Work. These requirements apply to all Sections of this Specification, without limiting the conditions and approvals imposed by statute.
- .2 Control Work to provide effective archaeological and cultural protection. Departmental Representative will monitor mitigation measures and will identify whenever such measures are found to be ineffective.
- .3 Comply with environmental requirements of Contract Documents, applicable federal, provincial, and local statutes, acts, regulations, and ordinances of Agencies having jurisdiction.

1.2 MEASUREMENT AND
PAYMENT PROCEDURES

- .1 There shall be no separate measurement for payment for work to protect known cultural resources as identified in the Basic Impact Assessment (BIA). The work under this Section. Include cost in the Contract Lump Sum Price.
- .2 Upon discovery of a potential previously unknown cultural resource, the contractor shall immediately cease the task underway in the area of the discovery (within 10 meters) such that the potential cultural resource is not disturbed further.
 - .1 The Contractor shall contact the Parks Canada Agency Project Leader, advise of the discovery, provide photos, and a description of the finding. The Parks Canada Agency will review the preliminary information reported by the Contractor and direct the Contractor on how to proceed.
 - .2 Upon cessation of the work, the Contractor will be eligible for task based standby payment while the Parks Canada Agency conducts an archeological assessment. The Parks Canada Project Leader will direct the Contractor when work in the affected area can resume.
 - .3 Payment shall be made as set out in Section 01 22 01 - MEASUREMENT AND PAYMENT and shall be included in the applicable item of work.

1.3 DEFINITIONS

- .1 Cultural Resource: any heritage or archeological artifacts, relics or antiquities including but not limited to:
 - .1 Corner stones and their contents
 - .2 Buried artifacts including tools, formwork,

stacked stones, dressed lumber, rough sawn lumber, round timbers, timber piles (round or squared off).

- .3 Remains and evidence of ancient persons and peoples including arrowheads, pottery, implements, shelters, clothing,

- .2 Character Defining Elements: any architectural detail unique to a structure

1.4 CANAL REGULATIONS AND PERMITS

- .1 "Historic Canal Regulations" apply to and govern work under this Contract.
- .2 Regulations may be obtained from Justice Canada's website at: http://laws-lois.justice.gc.ca/eng/regulations_sor-93-220/.
- .3 Contractor may not 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 and Protection Plan (EMPP).
 - .2 Occupational Health and Safety Plan.
- .4 Changes to project scope of work not assessed under site specific BIA will require review and acceptance by Departmental Representative and may require issuing revised permit.

1.5 HERITAGE PROTECTION

- .1 Trent-Severn Waterway, Lock 38 and the Dam at Lock 38 are Resources of National Heritage Value and have been designated by the Government of Canada as being of national historic and architectural significance.
- .2 Preserve cultural resources of site by executing Work without damage to site features.
- .3 Notify Departmental Representative and Parks Canada Agency Project Leader 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. Ensure that all personnel working on site undergo a

heritage induction to clearly identify the value of the place and how to avoid inadvertent impacts on cultural resources (known and unknown).

- .8 Notify Departmental Representative immediately where reasonable concerns exist that damage may result from work.
- .9 Contractor may propose alternative work methodologies to be accepted by Departmental Representative.
- .10 Protect possible cultural resources by excavating only to limits indicated.

1.6 HISTORICAL,
ARCHAEOLOGICAL CONTROL

- .1 Provide protection for historical, archaeological, cultural, and biological/vegetation resources in accordance with approved SEMP.
- .2 Accommodate PCA Cultural Resource Management (CRM) representatives' needs for documentation of existing structures after discovery.
- .3 Include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative to address situations where such resources not known to be on site are discovered during construction.
- .4 Should any archaeological or cultural resource be discovered while excavation, stop work. Contact Departmental Representative for direction prior to continuing work.

1.7 NOTIFICATION

- .1 Departmental Representative will notify Contractor in writing of observed non-compliance 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.
 - .2 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
 - .3 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

1.8 ACTION AND INFORMATION .1
SUBMITTALS

Prepare Historical, Archaeological, Cultural Resources, Biological Resources and Wetlands Plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands. Identify procedures to be followed if historical archaeological, cultural resources not previously known to be onsite or in area are discovered during construction.

1.9 DISPOSAL OF WASTE

- .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.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Use materials and products in accordance with OPSS 805.

PART 3 EXECUTION

3.1 MITIGATION MEASURES

- .1 Stage 1 and Stage 2 Archaeological resource assessments carried out in support of the project evaluated the project for potential sites/resources which may be affected by construction activities did not identify such sites/resources in the area to be affected by the construction of the project.
- .2 Parks Canada Agency may monitor and record some or all aspects of excavations, site access routes, and disturbances to soil overburden due to equipment and general work operations.
- .3 If human remains are discovered, notify immediately local police, the coroner's office, the Registrar of Cemeteries and the Departmental Representative.
- .4 Parks Canada has conducted a heritage recording of the dam and landscape. Additional recordings of the submerged components will be required once dewatering occurs but prior to demolition. Parks Canada Agency staff will clearly delineate any archaeologically sensitive areas and photo-document this activity for Parks Canada records. These areas will be deemed no-go zones for staging, vehicular traffic and machinery during the survey.
- .5 Ensure that all personnel working on site undergo a heritage orientation to clearly identify the value of the place and how to avoid inadvertent impacts

on cultural and archeological resources (known and unknown).

- .6 Main vehicular access routes and staging areas will be restricted to roadways and parking lots. If this is not possible, the use of protective covering such as geotextile protective mats with a wood chip lift or granular "A" gravel is required. All protective covering must be removed following construction and the area restored to pre-construction state. Excavation is not permitted during installation or removal of protective covering.
- .7 Should any historical dam(s) be exposed during de-watering activities, cease work and notify the Parks Canada Project Leader immediately.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 This Section references to laws, by laws, ordinances, rules, regulations, codes, orders of Authority Having Jurisdiction, and other legally enforceable requirements applicable to Work and that are; or become, in force during performance of Work.

1.2 REFERENCES TO REGULATORY REQUIREMENTS

- .1 Perform Work in accordance with National Building Code of Canada (NBC) 2015, National Fire Code of Canada (NFC) 2015 and Ontario Building Code (OBC) 2012 including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Specific design and performance requirements listed in the specifications or indicated on the Drawings may exceed the minimum requirements established by the referenced Building Code; these requirements will govern over the minimum requirements listed in the Building Code
 - .1 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

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 HAZARDOUS MATERIAL DISCOVERY

- .1 Stop work immediately when any hazardous material is encountered during demolition work. Notify Departmental Representative.

1.5 FLOATING PLANT

- .1 Mark floating equipment with lights in accordance with the Collision Regulations under the Canada Shipping Act.

1.6 NAVIGATION BUOYS AND MARKERS

- .1 Navigation hazard buoys and markers used on this project are to conform to the Canadian Coast Guard - Canadian Aids to Navigation System (TP 968) and to the Transport Canada - An Owner's Guide to Private Buoys (TP 14799E).

- .2 Provide a Navigation Plan for temporary works related to the dewatering and diversion as approved by Transport Canada and acceptable to the Agency and Departmental Representative. Construct signage to the requirements of Section 10 14 55 - Safety Signage. Install and maintain signage and buoys during the course of construction.

1.7 NATIONAL PARKS ACT

- .1 For projects located within boundaries of National Park, perform Work in accordance with National Parks Act.

1.8 RELICS AND ANTIQUITIES

- .1 Relics and antiquities, and items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tables, and similar objects found on site shall remain the property of Parks Canada. Protect such articles and request direction from Departmental Representative.
- .2 Should historic objects be uncovered during excavating, stop work immediately and notify the Departmental Representative. Do not resume work until directed to by the Departmental Representatives.
- .3 Archaeology staff from Parks Canada will monitor the project work and may require temporary stop of work to carry out site investigations.

1.9 WATER QUALITY

- .1 The contractor shall not impact the quality of surface water or groundwater.
- .2 The contractor shall obtain all respective permits and approvals to be able to undertake the work.

1.10 QUALITY ASSURANCE

- .1 Regulatory Requirements: Except as otherwise specified, Contractor shall apply for, obtain, and pay all fees associated with, permits, licenses, certificates, and approvals and applicable taxes required by regulatory requirements and Contract Documents, based on General Conditions of Contract and the following:
 - .1 Regulatory requirements and fees in force on date of Bid submission, and
 - .2 Any change in regulatory requirements or fees scheduled to become effective after date of tender submission and of which public notice has been given before date of tender

- submission
- .3 Store Hazardous Materials in secure areas on impermeable pads, provide berms if necessary.

PART 2 - PRODUCTS

- | | | |
|----------------------------------|----|--|
| <u>2.1 EASEMENTS AND NOTICES</u> | .1 | PCA will obtain permanent easements and rights of servitude that may be required for performance of Work. |
| | .2 | Contractor shall give notices required by regulatory requirements. |
| <u>2.2 PERMITS</u> | .1 | Tree Cutting: <ul style="list-style-type: none"> .1 Make application and obtain approval and related permit from the County of Simcoe and Region of Durham regarding any tree cutting outside PCA property and the indicated work limits. .2 Contractor to abide by all requirements of the permit. |
| | .2 | Water Taking: <ul style="list-style-type: none"> .1 Make application and obtain approval and related permit from the Ontario Ministry of Environment for removal of water from a watercourse or groundwater for a withdrawal greater than 50,000 lpd under Ontario Regulation 387/04. Dewatering of the waterway for construction will require a Permit to Take Water (PTTW). Where groundwater is withdrawn from wells adjacent to the work area to control seepage, obtain approval from the MOE to discharge directly to the watercourse beyond the active work area. .2 Contractor to abide by all the requirements of the permit. .3 Contractor is to include the cost of the PTTW application in the Contract Lump Sum Price. |
| | .3 | Department of Fisheries Review <ul style="list-style-type: none"> .1 The PCA will receive confirmation from Department of Fisheries and Oceans (DFO) as part of the Environmental Assessment (EA) screening that the dam reconstruction as described in the EA and these specifications is not likely to result in impacts to fish and fish habitat. .2 Should the Contractor approach and methodology for the reconstruction of the dam (including temporary works) differ from the description in the EA and these specifications, or if the proposed foot print of the temporary work goes beyond the |

indicated work limit, or if the proposed temporary works cannot meet applicable federal, provincial or local regulations.

PART 3 - Execution

3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Air entrainment testing, slump testing, casting of 7 day break and 28 day break cylinders, strength testing of cylinders and review/approval of mix designs.
- .3 Validation of construction elevations by an OLS and CLS surveyor.

1.2 REFERENCE STANDARDS

- .1 Departmental Representative Construction Quality Management Plan

1.3 INSPECTION

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.
- .5 Prior to watering up the completed work, the Departmental Representative shall verify that all commissioning plan activities and checklists have been completed.

1.4 INDEPENDENT INSPECTION AGENCIES

- .1 The Contractor shall engage third party (independent inspection company) for
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inspection/testing of material samples, civil works, metal works and finishes, as and when required.

- .1 Independent Testing and Inspection firm shall provide all test results directly to the Departmental Representative, with copy to the Contractor, in order to substantiate the level of Quality and workmanship is in compliance with the specifications and standards provided with the Contract Documents.
- .2 Independent testing firm shall be responsible for providing all necessary resources including manpower, apparatus and testing facilities required for laboratory and field testing.
- .3 The Contractor must provide a Quality Manager to control the quality of work at the site. This person will be responsible for execution of their own Quality Management Plan. This person must ensure the Departmental Representative is notified of the all inspections and complete inspection reports when required.
- .2 The Departmental Representative may engage from time to time, its own third party for inspection/testing of material samples, civil works, metal works and finishes, as and when required.
- .3 The Contractor shall present a Quality Plan with Inspection and Test Plan (ITP) in accordance with the Departmental Representative's Construction Quality Management Plan (CQMP) to ensure that there are no compromises in the quality standards set forth in this document or any revisions/amendments thereof. The Departmental Representative reserves the right to audit the Contractor's Quality Control Plan & System.
- .4 The Inspection and Testing Plan must identify hold, witness, inspection, record, and report points. The Plan must identify the specified acceptance criteria and demonstrate how this criteria has been achieved with supporting documentation. It must also identify which organization is required at each point of the ITP as well as their respective responsibilities.
- .5 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .6 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree

of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and re-inspection.

1.5 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.6 PROCEDURES

- .1 Notify Departmental Representative 3 working days in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.7 REJECTED WORK

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Repair other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner 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.

1.8 REPORTS

- .1 Submit copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

1.9 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as requested.

1.10 MILL TESTS .1 Submit mill test certificates as required of specification Sections.

1.11 EQUIPMENT AND SYSTEMS .1 Refer to Section 11 90 10 for definitive requirements.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 COMMISSIONING .1 Commissioning is an integral part of all phases of the Work. Commissioning and performance verification is a key element of the Construction Quality Management Plan. The Construction Manager must develop a Commissioning Plan in collaboration with the Departmental Representative. The site specific scopes of work will determine the extent of commissioning requirements. The Commissioning Plan is to address the planning, management and communications tools relating to commissioning, setting out scope, standards, roles and responsibilities, expectations, and deliverables. It is to provide an overview of commissioning, and sets out the process and the methodology for successful commissioning of the project. Commissioning will provide a fully functional facility whose systems, equipment and components have been proven to meet all the Client's functional requirements before the date of acceptance.

.2 The initial draft and final draft of the Commissioning Plan must be submitted to the Departmental Representative for review with the Construction Quality Management Plan. The Plan must incorporate as a minimum:

- .1 Importance of the Commissioning Plan
- .2 Roles and responsibilities
- .3 Revisions to this Commissioning Plan
- .4 Risk assessment
- .5 Objectives of commissioning
- .6 Extent of commissioning
- .7 Deliverables relating to O&M perspectives
- .8 Deliverables relating to the commissioning process
- .9 Deliverables relating to the administration of commissioning

- .10 The commissioning process
- .11 Training Plan.
- .3 The Contractor's Commissioning Plan is to be modeled as described on the PSPC National Project Management System (NPMS) Commissioning Manual.
- .4 The Commissioning Team will comprise of: the Contractor Commissioning Specialist; the Departmental Representative; and other Specialty Consultants and subcontractors as may be deemed appropriate by the Departmental representative.
- .5 As part of the Commissioning Plan, the Contractor will water up each portion of the dewatered area, independently, for a period of 5 days. This is intended to confirm the presence of any leaks through the structure. Should any leaks be observed, the Contractor will dewater the area again to repair any deficiencies, at no additional cost. This process shall continue until are leaks are completely sealed.
- .6 The commissioning plan may include opening one sluiceway at a time and monitoring effects over several days. Downstream shoreline impacts may result in requirements for additional shoreline protection measures.

END OF SECTION

PART 1- GENERAL

1.1 DESCRIPTION

- .1 Work under this section relates to condition surveys and monitoring of structures and buildings which are adjacent to the construction site, including the Lock structures, and which may be affected by excavation, dewatering and slope stabilization works and vibration producing activities (such as pile driving, sheet pile driving/vibrating, concrete demolition work, excavation of frozen ground, and operation of heavy construction equipment)
- .2 The Contractor is advised that structures, buildings and water supply wells are located close to the proposed work and that construction activities are to be conducted in such a manner to preclude damage to these structures, buildings and wells. The Contractor shall be responsible for any damage caused by their activities.
- .3 The Contractor shall undertake environmental monitoring of the sediment and erosion control system including water quality (turbidity and pH) of discharge from dewatering operations. Additional monitoring upstream of the work area must be undertaken daily in order to confirm background turbidity levels. Turbidity and pH levels must also be taken and recorded daily at the locations identified in the SSEMP.
- .4 The scope of work described in this section is a minimum requirement for conducting a condition survey and monitoring of the work. The Contractor's temporary works Design Engineer together with the Contractor's Movement Monitoring Specialist are to review and advise the Departmental Representative on movement and vibration criteria and any additional monitoring requirements.
- .5 The monitoring work under the present scope only covers the construction area and immediate surroundings. The Contractor shall take full responsibility for other areas as part of their construction operation including haul routes.

1.2 RELATED REQUIREMENTS

- .1 Section 01 11 00 - Summary of Work
 - .2 Section 01 20 01 - Site Access
 - .3 Section 01 33 00 - Submittal Procedures
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- .4 Section 01 35 43 - Environmental Procedures
- .5 Section 01 71 00 - Examination and Preparation
- .6 Section 01 77 00 - Closeout Procedures
- .7 Section 02 41 16 - Structure Demolition
- .8 Section 31 23 16.26 - Rock Removal
- .9 Section 35 20 22 - Dewatering and Diversion
- .10 Sections 35 62 16 - Cofferdams

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

1.4 INDEPEDENDENT INSPECTION FIRMS

- .1 An Independent Inspection/Monitoring Firm(s) shall be retained by the Contractor for the purpose of inspecting and/or monitoring portions of Work as described in this section. Cost of such services will be borne by the Contractor.
- .2 The Independent Inspection/Monitoring Firm(s) team shall be qualified and competent in:
 - .1 Performing condition surveys;
 - .2 The determination of allowable movement including displacement and vibration at structures and embankments;
 - .3 The protection of groundwater wells;
 - .4 The establishment of measurement procedures and their implementation;
 - .5 Monitoring and reporting.
- .3 The Condition Survey shall be undertaken by a qualified and competent inspector.
- .4 If requested by the Departmental Representative, submit the inspector and monitoring specialist qualification and experience.

1.5 DEFINITIONS

- .1 Movement Monitoring Specialist: refers to the independent inspection / monitoring firm which is responsible for the work under this section
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- .2 Temporary works Design Engineer: refers to the engineer retained by the Contractor to design and oversee the construction of temporary works such as water diversion and cofferdam structures, stabilization (shoring) walls and any other temporary works required to complete the work under the Contract.

1.6 CONSTRUCTION CONTROL AND MONITORING

- .1 At least 30 days prior to start of work, the Contractor shall submit their Construction Control and Monitoring (CCM) plan. The plan shall be prepared in conjunction with the work area dewatering and water diversion construction plans, the excavation and stability wall construction plans, demolition plan and environmental management plan for sediment and erosion control.
- .2 As a minimum the CCM plan is to cover:
 - .1 The format and extent of the Condition Survey;
 - .2 The methodology to be used to monitor existing cracks and potential movement in existing buildings and other structures including the Lock and embankments;
 - .3 The extent and methodology for soil movement monitoring program at existing structures and embankments, including establishment of critical movement criteria, type of monitoring equipment and frequency of measurement.
 - .4 The vibration monitoring program, including influence vibration zone, safe and critical vibration levels and anticipated vibration levels at the closest structure, including type of monitoring equipment and frequency of measurement.
 - .5 The turbidity control and drainage water as part of the sediment and erosion control plan.
 - .6 Measures to protect existing groundwater wells and their services.
- .3 Prior to commencement of the work meet with Departmental Representative to discuss the CCM plan, report format, report frequencies, emergency report and distribution list.

1.7 GROUNDWATER WELL MONITORING

- .1 The Contractor is to install four monitoring wells near the excavation area. The wells are to have a 50mm diameter casing complete with protective capping and PVC screen with no. 10 slot. Exact
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location and details of monitoring will be finalized on site (Include cost of wells in the contract Lump Sum Price).

1.8 TURBIDITY CONTROL AND DRAINAGE WATER

- .1 The Contractor shall undertake quality (turbidity) monitoring of any discharge water to a receiving stream as part of their sediment and erosion control plan as set out in Section 01 35 43 - Environmental Procedures.

1.9 CONDITION SURVEY

- .1 Prior to commencement of the work, a Pre-Construction Condition Survey Report of adjacent properties and structures, within 50 m of the defined construction limit at a minimum that may be affected by the work under this contract shall be submitted by the Contractor.
- .2 The Condition Survey shall be undertaken by the Contractor's qualified inspector together with the Departmental Representative, private landowners and Township/municipality representatives.
- .3 The survey shall include the location and condition at adjacent properties including Parks Canada property located outside of the contract limits of work of: buildings; structures; underground structures; and utility structures.
- .4 Condition Surveys are to be performed for all building and structures located within 40 metres from the edge of excavation and dewatering work, and/or 50 metres from vibration producing activities. As a minimum, the following properties and structures are to be surveyed:
 - .1 Trent-Severn Waterway (TSW) property including lock chamber and retaining walls, gates and lock control building and approach walls (this includes underwater inspections with photos and video).
 - .2 Adjacent properties along Canal Road
 - .3 Adjacent properties located along Ball Avenue East.
- .5 Furthermore, Condition Survey is to be performed for:
 - .1 Township and municipalities roads
 - .2 Staging and material storage areas.
 - .3 Shoreline at edges of construction areas.
- .6 The Contractor shall perform a monthly inspection of the haul routes and of Ball Avenue East and

report their findings to the Departmental Representative. Repair and make good any damage to the satisfaction of the Local Authorities having jurisdiction.

- .7 Upon completion of the work under the contract a Post-Construction Condition Survey shall be performed on all properties, buildings or structures that were surveyed as part of the Pre-Construction Condition Survey. The survey needs to focus on the same issues that were identified under the original survey, plus any new issues that may have developed during the construction period.

1.10 CONDITION SURVEY REPORT

- .1 Prepare and submit a DRAFT Condition Survey Report for review and approval by the Departmental Representative within 10 days of construction commencement.
- .2 Revise as required by the Departmental Representative and submit Final version of report.

1.11 MONITORING

- .1 The Contractor will be responsible to carry out monitoring of Parks Canada land and assets. Monitoring work is to include:
 - .1 Monitoring of cracks in buildings and other structures which were identified as part of the Pre-Construction Condition Surveys;
 - .2 Movement monitoring: lock chamber walls, lock entrance walls, retaining walls, and earthen embankments;
 - .3 Vibration (seismographic) monitoring.
 - .4 Time lapse photography of the project from upstream and downstream of the dam. Two cameras must be positioned with a clear view of the dam and take high resolution photos every hour. These photos must be combined together to form a time lapse movie of the construction from start to finish.
 - .2 Cracks in buildings and structures monitoring:
 - .1 Displacement monitoring gauges shall be installed across any significant existing crack to monitor for any additional building/structure distress due to work under this contract.
 - .2 Location and number of gauges will be established by the Contractor and the Departmental Representative.
 - .3 Gauges shall be read prior to commencement of construction activities and shall continue on
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a weekly basis until the completion of vibration producing construction activities.

- .4 The Departmental Representative is to be advised of any significant crack displacement detected by the monitoring gauges.

.3 Movement monitoring:

- .1 Lock concrete chamber, approach walls, and retaining walls:

- .1 Install monitoring points along the concrete retaining wall of the lock structures. The monitoring points should be spaced at 5 metres (max).
- .2 The monitoring points are to be durable, not interfere with the operations of the lock or construction activities, and ensure accurate and repeatable readings.

- .2 Earthen embankments

- .1 Install monitoring points along the top edge of the earthen embankments located between the lock and the dam and along the south embankment adjacent to the dam. The monitoring points should be spaced at 10 metres (max).
- .2 The monitoring points are to be durable and not interfere with construction activities and provided accurate and repeatable readings.
- .3 In general these may be installed as follows:
 - .1 A +/-50mm diameter hole is drilled to 1.5m (to be below the frost line). An ABS tube is placed in the hole (to fit snugly).
 - .2 A rod (+/-20mm) is inserted into the tube and driven 300mm into undisturbed ground, below the end of the ABS tube.
 - .3 The rod is to extend at least one meter above the ground surface and have a survey target attached to it. The rod and target are to be protected by a sleeve similar to the one used on ground water monitoring wells.

- .3 The work also includes the construction of two (minimum) reference monuments, from which the monitoring points can be easily surveyed. If acceptable, these reference monuments may also serve as temporary bench mark for the construction.

- .4 Survey work for the movement monitoring is to have an accuracy of +/- 2 mm in the x, y, and z planes.
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- .5 Movement monitoring schedule:
 - .1 Pre-construction: Initial measurements are to be taken before any work is started. Initial readings are to be taken on two different days, and results should be identical.
 - .2 Construction: Measurements are to be taken on a daily basis during sheet pile and/or pile installation, excavation, stability wall anchor installation (if required), demolition, backfill and compaction work near the structures (minimum 10m).
 - .3 Post-construction activities: Measurements can be reduced to a bi-weekly basis for the first two weeks following the completion of the activities listed above. If no movement has been observed during this period, the monitoring can be discontinued until the next activity.
 - .4 Construction and post-construction activities: The Contractor will undertake daily visual inspection of the areas being monitored. The visual inspection shall continue until substantial completion of the work.
 - .6 Monitoring criteria:
 - .1 The movement criteria given below are nominal criteria and need to be reviewed and confirmed by the Monitoring Firm and temporary works Design Engineer:
 - .1 Lock concrete chamber, approach walls, and retaining walls:
 - .1 Total movement of 5 mm at any monitoring point - stoppage of work and review of construction procedure including a condition assessment of the lock structure and lock entrance wall.
 - .2 Total movement of 10 mm at any monitoring point - stoppage of the work, add, adjust, replace or repair damaged and weakened elements of stabilization (shoring) system or modify work procedure. A condition assessment of the lock structure and lock entrance wall will also be required.
 - .2 Earth embankment:
 - .1 Total movement of 10 mm at any monitoring point -
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- stoppage of work and review of construction procedure.
 - .2 Total movement of 25 mm at any monitoring point - stoppage of the work, add, adjust, replace or repair damaged and weakened elements of stabilization (shoring) system or modify work procedure.
- .2 If at any time the lock structure or the lock entrance walls exhibit signs of distress, all work is to stop, the situation assessed and modification made to the stabilization (shoring) system or to the work procedure
- .3 Reporting:
 - .1 The Monitoring Firm shall provide a written record of findings including new data and its interpretation including other figures and graphs. The record shall be continuous and shall be provided within 24 hours of the measurements being taken.
 - .2 The Contractor Design and Monitoring Specialist shall provide recommendations based on the findings to the Departmental Representative.
 - .3 The report shall be clear and concise and be acceptable to the Departmental Representative.
 - .4 Action requirements by the Contractor shall be clearly defined with schedule of implementation.
 - .5 An addendum to the report shall be made by the Monitoring Engineer based on the result of the action taken by the Contractor to address the construction issue.
- .4 Vibration (Seismograph) monitoring:
 - .1 The monitoring specialist shall:
 - .1 Establish vibration influence zones and safe vibration levels and develop the Contractors vibration monitoring program for the lock structure, approach walls, lock entrance wall and lock master's building, and other structures as required.
 - .2 Install a vibration

monitoring point to bedrock on the south side of the dam to capture vibration.

- .3 Supervise the Contractor vibration monitoring program.
- .2 During vibration producing activities, the Contractor shall monitor vibration levels, and shall not exceed the established safe level to preclude damage to the adjacent structure.
- .3 The vibration monitoring equipment shall be capable of:
 - .1 Continuous recording of peak particle velocity.
 - .2 Providing permanent record of the entire vibration event.
 - .3 Providing an alarm when vibration limit exceed the established safe vibration level.
 - .4 Being remotely monitored by the Monitoring Specialist.
- .4 Copies of all vibration records and associated construction activities (pile driving, sheet pile driving/vibrating, concrete demolition work, excavation of frozen ground, and operation of heavy construction equipment) data shall be provided to the temporary works Design Engineer and Departmental Representative on a daily basis.
- .5 Reporting:
 - .1 The Monitoring Firm shall provide a written record of findings including new data and its interpretation including other figures and graphs. The record shall be continuous and shall be provided within 24 hours of the measurements being taken.
 - .2 The Contractor Design and Monitoring Specialist shall provide recommendations based on the findings to the Departmental Representative.
 - .3 The report shall be clear and concise and be acceptable to the

- Departmental Representative.
- .4 Action requirements by the Contractor shall be clearly defined with schedule of implementation.
 - .5 An addendum to the report shall be made by the Monitoring Specialist based on the result of the action taken by the Contractor to address the construction issue.
 - .6 Take appropriate measures to reduce movement and vibration to adjacent properties and structures. If ground movement or if vibration measurements exceeds set criteria, immediately stop all construction activity and inform Design engineer and Departmental Representative of the situation. Provide and implement remedial action to rectify the situation. Obtain written permission from Departmental Representative prior to resuming construction activities.
 - .7 Immediately repair any damage to any adjacent structure to the satisfaction of the Departmental Representative.

PART 2 - PRODUCTS

- 2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

- 3.1 ADJUSTMENT .1 Monitor stabilization / shoring system performance and maintain its effectiveness by making adjustments, replacing or repairing damaged and weakened elements of system until substantial completion of project

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 35 29.06 - Health and Safety Requirements
- .3 Section 01 35 43 - Environmental Procedures.
- .4 Section 01 52 00 - Construction Facilities
- .5 Section 01 56 00 - Temporary Barriers and Enclosures
- .6 Section 01 77 00 - Closeout Procedures

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Heater numbers, types, locations, capacities.
- .3 Fan numbers, types, locations, capacities.
- .4 Number and location of fire extinguishers.
- .5 Shop drawings of enclosures.
- .6 Location and type of electrical and communication services including any relocation of existing utilities, services, and temporary supports.
- .7 Location, type and service for sanitation facilities.

1.3 INSTALLATION AND REMOVAL

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Remove from site all such work after use.

1.4 DEWATERING

- .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water in accordance to Section 35 20 22 - Dewatering and Diversion.
 - .2 Provide standby equipment (generator and pumps) to ensure continuous and safe operation of dewatering works.
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- .1 Performing condition surveys;
- .2 The determination of allowable movement including displacement and vibration at structures and embankments;
- .3 The protection of groundwater wells;
- .4 The establishment of measurement procedures and their implementation;
- .5 Monitoring and reporting.

.3 The Condition Survey shall be undertaken by a qualified and competent inspector.

.4 If requested by the Departmental Representative, submit the inspector and monitoring specialist qualification and experience.

1.5 DEFINITIONS

.1 Monitoring Engineer: refers to the independent inspection / monitoring firm which is responsible for the work under this section

.2 Design Engineer: refers to the engineer retained by the Contractor to design and oversee the construction of the temporary works required to complete the work under the Contract.

1.6 WATER SUPPLY

.1 Contractor to make arrangements and provide continuous supply of potable water for construction and personal use.

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

.3 Contractor will pay for utility charges at prevailing rates.

1.7 HEATING EQUIPMENT

.1 Use heater equipment type acceptable to the Departmental Representative.

.2 Heating fuels:

.1 Use electrical, gas, diesel oil or other fuels acceptable to the Departmental Representative.

.2 Fuel Storage: to requirements of Fire Commissioner of Canada. Fuel storage is to be located away from domestic water wells, water course, and sediment settling pond or any other water surfaces. Fuel storage location to be approved by the Departmental Representative.

- .3 Heating Equipment Refueling and Containment: Equipment that needs to be located near open water or within the excavated area is to be placed in a containment system which can contain any spillage or leaking of fuel. Containment system to be approved by Departmental Representative.
- .4 Ensure that heating requirement is met by providing, at optimum efficiency of equipment, capacity of 125% of heat requirement and sufficient number of standby heaters ready for use on site.
- .5 Vent exhaust of heating equipment to outside of housing and well clear of combustible materials and air intakes.

1.8 TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2 Construction heaters used inside building must be vented to outside or be non-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 surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain minimum temperatures in areas where construction is in progress as specified in individual Section for items of work.
- .5 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.

- .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 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: to Section 03 33 00 - Cast-In-Place Concrete.
 - .2 For other sections where heating is required for cold-weather protection, heating requirements shall be in accordance with manufacturer's recommendations or applicable codes, regulations and standards.

1.9 TEMPORARY POWER AND LIGHT

- .1 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal and on-going utilization cost.
- .2 Provide and maintain temporary lighting throughout project.

1.10 TEMPORARY COMMUNICATION FACILITIES

- .1 Provide and pay for temporary fax, telephone, data hook up, lines, equipment necessary for own use and use of Departmental Representative.
- .2 Pay for long distance charges to a maximum of 1500 minutes per month. Invoice Departmental Representative for direct costs beyond this period with supporting documentation.

1.11 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction governing codes, regulations and bylaws.

- .2 Burning rubbish and construction waste materials is not permitted on site or at off-site laydown and storage areas.

PART 2 - PRODUCTS

- 2.1 NOT USED .1 Not Used.

PART 3 - Execution

- 3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Construction aids.
- .2 Office and sheds.
- .3 Parking.
- .4 Project identification.

1.2 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.
- .2 Payment shall be made as set out in Section 01 22 01 - Measurement and Payment and shall be included in the applicable item of work.

1.3 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.189-2000, Exterior Alkyd Primer for Wood.
 - .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-0121-1978 (R2003), Douglas Fir Plywood.
 - .3 CAN/CSA-S269.2-M1987 (R2003), Access Scaffolding for Construction Purposes.
 - .4 CAN/CSA-Z321-96 (R2006), Signs and Symbols for the Occupational Environment.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

1.5 INSTALLATION AND REMOVAL

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
 - .2 Identify areas which have to be gravelled to prevent tracking of mud.
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- .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 CAN/CSA-S269.2.
- .2 Provide and maintain scaffolding, ramps, swing staging, platforms, 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 their use of hoists.
- .2 Hoists / cranes to be operated by qualified operator.

1.8 SITE STORAGE/LOADING

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.9 CONSTRUCTION PARKING

- .1 Parking will be permitted on site within the Construction Limits.
- .2 Provide and maintain access to project site including the lock master building and Parks Canada Agency lock system.
- .3 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. Contractor responsible for repair of damage to roads caused by construction operations.

1.10 SECURITY AND MONITORING

- .1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays.
 - .2 Contractor shall pay for monitoring of the site during periods of no construction activity and to maintain and service dewatering and heating equipment.
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- .3 Contractor shall pay for the operation of the diversion works as required to maintain seasonal operating levels, including periods of no construction activity.

1.11 OFFICES

- .1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
- .2 Provide marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors to provide their own offices as necessary. Direct location of these offices.
- .4 Departmental Representative's Site office.
 - .1 Provide temporary office for Departmental Representative.
 - .2 Inside dimensions minimum 3.6 m long x 3 m wide x 2.4 m high, with floor 0.3m above grade, complete with 4 50% opening windows and one lockable door.
 - .3 Insulate building and provide heating system to maintain 22 degrees C inside temperature at -20 degrees C outside temperature.
 - .4 Finish inside walls and ceiling with plywood, hardboard or wallboard and paint in selected colours. Finish floor with 19 mm thick plywood.
 - .5 Install electrical lighting system to provide min 750 lx using surface mounted, shielded commercial fixtures with 10% upward light component.
 - .6 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.
 - .7 Equip office with 1 x 2 m table, 6 chairs, 6 m of shelving 300 mm wide, one 3 drawer filing cabinet, one plan rack and one coat rack and shelf.
 - .8 Maintain in clean condition.

1.12 EQUIPMENT, TOOL AND MATERIALS STORAGE

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

- 1.13 SANITARY FACILITIES
- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
 - .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.
- 1.14 CONSTRUCTION SIGNAGE
- .1 Provide and erect project sign, within three weeks of signing Contract, in a location designated by Departmental Representative.
 - .1 Project signage
 - .2 Road closure signs at Canal Road and/or Ball Avenue E identifying the time line of closure and other traffic signage to Section 01 35 00.06.
 - .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 No other signs or advertisements, other than traffic, pedestrians and warning signs, are permitted on site.
 - .4 Provide project identification site sign comprising foundation, framing, and 1200 x 2400 one mm signboard as detailed and as described below.
 - .1 Foundations: 15 MPa concrete to CSA-A23.1 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 CAN/CGSB 1.189.
 - .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.
 - .5 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 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.
- .6 Indicate on sign, name of Owner, Consultant, Contractor and Subcontractor with logo, Name of Project, Project Identification Reference of design style established by Departmental Representative
- .7 Direct requests for approval to erect Consultant/Contractor signboard to Departmental Representative. For consideration general appearance of Consultant/Contractor signboard must conform to project identification site sign. Wording in both official languages.
- .8 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.
- .9 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 measures for protection and diversion of traffic as set out in Section 01 20 01 and Section 01 35 00.06.
- .2 Provide and erect, within four weeks prior any road closure, two road closure notice signs in a location designated by Departmental Representative.
- .3 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .4 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
- .5 Protect travelling public from damage to person and property.
- .6 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .7 Verify adequacy of existing roads and allowable load limit on these roads.

- .8 Construct access and haul roads as necessary.
- .9 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
- .10 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .11 Dust control: adequate to ensure safe operation at all times.
- .12 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.
- .13 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .14 Provide snow removal during period of Work of construction and access roads.
- .15 Remove, upon completion of work, construction and access roads designated Departmental Representative.

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 not in construction facilities.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENT CONTROL PLAN

- .1 Prepare, implement, monitor and maintain an Erosion and Sediment Control Plan (ESCP) to provide water quality protection. The ESCP is

to mitigate the potential for soil erosion and discharge of soil-bearing runoff or airborne dust resulting from the Contractor's construction operations from entering all watercourses including drainage ditches, environmental sensitive areas, adjacent properties to the Working Area, and from the Contractor's camp. The ESCP is also to address turbidity control to prevent sediment migration from the Working Area while in-water work is being performed, and from temporary diversion works.

- .2 Carry out construction operations that may impact upon water quality in a manner that strictly meets the requirements of all applicable legislation and regulations.
 - .3 Determine and conform to the requirements of the Department of Fisheries and Oceans (DFO), the Ontario Ministry of the Environment (MOE), the local municipality and/or Township, the area Conservation Authority, and any other Governmental Regulatory Agencies having jurisdiction in the Working Area or over any potentially impacted watercourses.
 - .1 It shall be the responsibility of the Contractor to obtain written approvals from DFO, MOE and the area Conservation Authority for the Contractor's proposed water quality protection schemes.
 - .4 Before commencing work, provide four (4) copies of a detailed Erosion and Sediment Control Plan for the Contractor's proposed water quality protection schemes bearing the seal and signature of a qualified Professional Engineer licensed to practice in the Province of Ontario. The ESCP will contain but is not limited to the following:
 - .1 Description of site condition, potential erosion and sediment issues at the site and associated risk;
 - .2 Description and details of environmental controls to be put in place;
 - .3 Phasing steps and coordination of environmental control measures installation with sequence of construction;
 - .4 Inspection, monitoring and maintenance program of all control measures during construction, work stoppage and post-construction, including additional inspections following large storm events and other periods of runoff;
 - .5 Monitoring plan of water quality at outlet of any construction site discharge at a receiving watercourse, and within the
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- watercourse where in-water activities are taking place, to the requirements of Section 01 48 00;
- .6 Control measures and procedure to be employed during commissioning and operations of the diversion system, and commissioning and initial operation of the new dam;
 - .7 Emergency contingency plan (provision of additional labour, equipment and materials to install additional control measures, and detail an emergency response plan in case of an accidental event);
 - .8 Procedures and phasing of the removal and disposal of the control measures;
 - .9 Removal of all sediment and other materials contained by the temporary works.
- .5 The designer of the ESCP is to visit the site prior, during and after construction to plan and evaluate the requirements for control measures, their installation and their effectiveness. The designer is to conduct a thorough inspection, as part of their site assessment, and provide a risk assessment and mitigation plan to the Contractor and the Departmental Representative. The ESCP shall be revised as required as a result of their site assessment and monitoring.
- .6 In the event of a work stoppage due to weather, seasonal work stoppage, contractual disputes or direction by a Regulatory agency, the Contractor is to continue monitoring and maintaining the erosion and sediment control measures.
- .7 Guidelines for the development of an ESCP can be found in the 2007 Ministry of Transportation (Ontario), Environmental Guide for Erosion and Sediment Control During Construction of Highway Projects, and the 2006 Greater Horseshoe Area Conservation Authorities, Erosion and Sediment Control Guideline for Urban Construction.
- .8 Drawing C005, Construction Limits and Protections has been prepared to demonstrate the general requirements for an ESCP for the Work area. It is the Contractor responsibility to develop and detail the ESCP to ensure that all Regulatory requirements and environmental criteria for discharge to a water course are satisfactorily met.
- .9 Measures may include but shall not be limited to the following: sediment ponds, silt fences/ barriers, straw bales, geotextiles, check dams and/or berms, biodegradable filter socks, erosion mats, vegetation, interceptor ditch/swales, mechanical equipment, or other recognized technologies and methods available at the time of
-

construction.

- .10 Contractor shall supply and install additional or alternative measures as directed by the Engineer or Project Supervisor if the installed control measures fail to perform adequately.
 - .11 Monitor weather forecasts and schedule the Work in order to minimize the risk of sediment-laden runoff entering any watercourse and other environmentally sensitive areas.
 - .12 The ESCP shall provide a contingency plan to include the provision of additional labour, equipment or materials to install additional control measures, and detail an emergency response plan in case of an accidental event.
 - .13 Ensure all workers, including sub-contractors, in the working areas are aware of the importance of the erosion and sediment control measures and informed of the consequences of the failure to comply with the requirements of the Regulatory Agencies and these specifications.
 - .14 Clean out accumulated sediment deposits periodically as required at the sediment control devices, including those deposits that may originate from outside the construction area. Accumulated sediment shall be removed in such a manner that prevents the deposition of this material into any sewer or watercourse and avoids damage to the control measure. The sediment shall be removed from the site at the Contractor's expense and managed in compliance with the requirements for excess earth material, as specified elsewhere in the Contract.
 - .15 Immediately report to the Departmental Representative any accidental discharges of sediments material into either the watercourse or adjacent ditches. Appropriate response measures, including any repairs to existing control measures or the implementation of additional control measures, shall be carried out by the Contractor without delay.
 - .16 Remove the sediment control measures when, in the opinion of the Departmental Representative, the measure(s) is no longer required. All sediment and erosion control measures shall be removed in a manner that avoids the entry of any equipment, other than hand-held equipment, into any watercourse, and prevents the release of any sediment or debris into any sewer or watercourse within or downstream of the Working Areas.
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END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 20 01 - Site Access
- .2 Section 01 33 00 - Submittal Procedures
- .3 Section 01 35 00.06 - Special Procedures for Traffic Control
- .4 Section 01 35 29.06 - Health and Safety Requirements
- .5 Section 01 35 43 - Environmental Procedures
- .6 Section 01 35 46- Archaeological and Cultural Procedures
- .7 Section 01 48 00 - Construction Control and Monitoring
- .8 Section 01 71 00 - Examination and Preparation
- .9 Section 01 77 00 - Closeout Procedures
- .10 Section 02 41 16 - Structure Demolition
- .11 Section 32 01 90.33 - Tree and Shrub Preservation.
- .12 Section 35 20 22 - Dewatering and Diversion

1.2 REFERENCE STANDARDS

- .1 Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD).
- .2 Ontario Ministry of Transportation, Book 7 of the Ontario Traffic Manual - Temporary Conditions.

1.3 MEASUREMENTS 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
- .2 Payment of this Section shall be as set out in Section 01 22 01 - Measurement and Payment.

1.4 INSTALLATION AND
REMOVAL

- .1 Provide temporary controls in order to execute Work expeditiously.
 - .2 Remove from site all such work after use.
-

- 1.5 WORK AREA DELINEATION
- .1 Erect and maintain temporary site enclosures 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 of the public to the Work area.
 - .2 Place construction warning signage at the work area and construction camp.
 - .3 Provide lockable truck entrance gate(s) as approved and conforming to applicable traffic restrictions on adjacent roads. Equip gates with locks and keys.
 - .4 Provide and maintain temporary floating barriers to define the Work area in the waterway and to restrict access to boating public to dewatering and diversion Works, as indicated on the drawings and as set in Section 35 42 15 - Safety Boom.
- 1.6 CONSTRUCTION AND DETOUR SIGNAGE
- .1 Provide a construction Traffic Control Plan for both work related and local vehicular traffic as set out in Section 01 35 00.06 - Special Procedures for Traffic Control.
 - .1 Provide barricades to direct traffic to alternate routes as provided in the construction Traffic Control Plan.
 - .2 Provide a pre-construction record of the approved haul route annotated as to location, and any road deficiencies as set out in Section 01 20 01 - Site Access.
 - .3 Identify measures to upgrade haul road for construction traffic to governing authorities, Agency, and Departmental Representative.
 - .1 Upon confirmation, implement haul road upgrades to the requirements of the Municipalities and the Departmental Representative.
 - .4 Provide Notice and Detour Signage in both official languages and by graphic symbols as identified in the construction Traffic Control Plan.
- 1.7 GUARD RAILS AND BARRICADES
- .1 Provide secure, rigid guard rails and barricades around deep excavations.
- 1.8 NAVIGATION WARNING SIGNAGE
- .1 The traffic plan mentioned above shall also address boating traffic.
-

- .2 Provide and maintain navigation warning signage and markers regarding construction and temporary Works as identified on the drawings and set out in Section 10 14 55 - Safety Signage.

1.9 TREE PROTECTION

- .1 Provide barrier around trees and plants designated to remain. Protect from damage by equipment and construction procedure in accordance with Section 32 01 90.33 - Tree and Shrub Preservation.

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 areas, and for public and Parks Canada staff access to the waterway and related structures and buildings.
- .2 Undertake approved measures to upgrade haul road for construction traffic.

1.11 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 public.

1.12 FIRE ROUTES

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

1.13 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.

1.14 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse in accordance with Section 01 74 21 - Construction / Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - Execution

3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Product quality, availability, storage, handling, protection, and transportation.
- .2 Manufacturer's instructions.
- .3 Quality of Work, coordination and fastenings.
- .4 Existing facilities.

1.2 RELATED REQUIREMENTS

- .1 Section 01 45 00 - Quality Control
- .2 Section 01 33 00 - Submittal Procedures

1.3 REFERENCE STANDARDS

- .1 Within text of each specifications section, reference may be made to reference standards. Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .2 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .3 Cost for such testing will be borne by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.
- .4 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.

1.4 OPSS ONTARIO PROVINCIAL STANDARD

- .1 Whenever OPSS Ontario Provincial Standard Specifications and OPSD Ontario Provincial Standard Drawings are been quoted in these specifications, any standards, specifications or publications which are referred to within the specified OPSS or OPSD form an integral part of those documents and thus form an integral part of these specifications, unless specifically otherwise mentioned.
- .2 OPSS Ontario Provincial Standard Specifications and OPSD Ontario Provincial Standard Drawings quoted in these specifications are available online at:

<http://www.raqsa.mto.gov.on.ca/techpubs/ops.nsf/OPSHomepage>.

1.5 QUALITY

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided. Salvage materials as identified for reuse shall be safely and securely stored.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.
- .6 Quality control shall be provided by the Departmental Representative as set out in Section 01 45 00 - Quality Control.

1.6 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
 - .2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.
-

1.7 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber, safety boom on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.8 TRANSPORTATION

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Pay costs of transporting of specified material and equipment to be salvaged and re-used to and from the facility designated by Departmental Representative. Work includes loading and unloading, handling and storing such products.

1.9 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in specifications install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
 - .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's
-

instructions, so that Departmental Representative will establish course of action.

- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.10 QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.11 CO-ORDINATION

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

1.12 REMEDIAL WORK

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.13 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and pedestrian ,vehicular traffic, boat traffic and/or building occupants.
 - .2 Protect, relocate or maintain existing active
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services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

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

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|---|----|---|
| <u>1.1 SECTION INCLUDES</u> | .1 | Field engineering survey services to measure and stake site. |
| | .2 | Recording of subsurface conditions found. |
| | .3 | List of geotechnical reports, and environmental studies undertaken for the project and available to the contractor. |
| | .4 | Description of existing Lock 38. |
| <u>1.2 REFERENCES</u> | .1 | Owner's identification of existing survey control points and property limits. |
| <u>1.3 MEASUREMENT AND PAYMENT PROCEDURES</u> | .1 | The work covered by this Section will not be considered separately for payment but will be considered as incidental to work of this specification. Include cost in Contract Lump Sum Price. |
| <u>1.4 QUALIFICATIONS OF SURVEYOR</u> | .1 | Qualified registered land surveyor with Ontario Land Surveyor (OLS) and Canadian Land Surveyor (CLS) designations, licensed to practice in the province of Ontario, acceptable to Departmental Representative. |
| | .2 | Qualified and experienced surveyor with Ontario Land Surveyor (OLS) and Canadian Land Surveyor (CLS) designations, acceptable to Departmental Representative is to carry out the layout work of dam and setting the sill elevation. |
| | .3 | Qualified and experienced surveyor, acceptable to Departmental Representative is to carry out the layout work of earth works. |
| <u>1.5 SURVEY CONTROL POINTS</u> | .1 | Existing base horizontal and vertical control points are designated on drawings. |
| | .2 | Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction. |
| | .3 | Make no changes or relocations without prior |
-

written notice to Departmental Representative.

- .4 Report to Departmental Representative when a control point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .5 Require surveyor to replace control points in accordance with original survey control.

1.6 SURVEY REQUIREMENTS

- .1 Qualified land surveyor is to prepare as found record of the structure and ancillary works including confirmation of all elevations, dimensions, and alignments indicated on the contract drawings. This must be provided in AutoCAD format. Any deviations between as found conditions and contract drawings must be brought to the attention of the Departmental Representative upon discovery.
 - .2 Establish reference lines and levels as shown on contract drawings, locate and lay out, by instrumentation.
 - .3 Establish reference line, perpendicular to flow, in alignment with the upstream face of the dam as shown on the contract drawings.
 - .1 Provide northing, easting and elevation of the reference points for the upstream reference line as shown on the contract drawings to the Departmental Representative.
 - .4 Establish reference line, parallel to flow, in alignment with the centerline of the center pier as shown on the contract drawings.
 - .1 The center point between the center pier steel gain liners must be identified on the top of the pier and provided northing, easting and elevation to Departmental Representative.
 - .2 Reference line must be established by projecting a line through the center point between the gains, perpendicular to the upstream face reference line.
 - .3 Provide northing, easting and elevation of the reference points for the pier center reference line as shown on the contract drawings to the Departmental Representative.
 - .5 Stake for grading, fill and topsoil placement and landscaping features.
 - .6 Stake slopes and berms.
-

- .7 Establish foundation and stake batter boards for foundations.
- .8 Establish lines and levels for sluiceway, sluiceway sill, spillway, spillway sill, and bulkhead elevations.

1.7 EXISTING SERVICES

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

1.8 RECORDS

- .1 Qualified land surveyor is to prepare as built record of the structure and ancillary works including confirmation of all elevations, dimensions, and alignments indicated on the contract drawings. This must be provided in AutoCAD format.
- .2 Maintain a complete, accurate log of control and survey work as it progresses.
- .3 On completion of foundations including foundation of temporary work, which may be left in place on completion of work, and major site Works and improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work as part of As-Built record documentation.
- .4 Record locations of maintained, re-routed and abandoned service lines.
- .5 Submit paper and electronic copies of record drawings per Section 01 78 00 - Closeout Submittals.

1.9 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit name and address of Surveyor to Departmental Representative.
- .2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work including survey records.

1.10 DAM AT LOCK 38

- .1 The concrete condition of the dam is described in

EXISTING CONDITIONS

various geotechnical report attached to the tender package.

- .2 Water levels at the dam vary according to the season and operations of the dam.
- .3 The contractor shall salvage and deliver to the Parks Canada yard in Kirkfield the following:
 - .1 Stop logs and hangers.
 - .2 Crab winches and tie-down clips/anchor, to be refurbished by Parks Canada. Pick up refurbished equipment and reinstall on new dam.
 - .3 Flootation safety rings.
 - .4 Dam warning and navigation signage.

1.11 LOCK 38 EXISTING CONDITIONS

- .1 Lock 38 is located immediately adjacent to the dam.
- .2 The contract drawings show the shape of the Lock as taken from available drawings. The Lock was not surveyed and the condition of the structure has not been evaluated.

1.12 SUBSURFACE CONDITIONS

- .1 Copies of geotechnical investigations are available as part of tender package.
- .2 In the event of disagreement between the plans and specification and recommendations made in the reports, the plans and specification will govern.
- .3 Reference information is for general information and is not guaranteed. The Contractor is responsible for ensuring the information is sufficient for the purposes of this Contract and for supplementing this information if necessary.
- .4 Interpretation of the reference information is strictly the Contractor's responsibility. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., could be greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.
- .5 IDENTIFICATION OF REPORTS
 - .1 Geotechnical Investigation And Concrete

Condition Assessment, Dam At Lock 38, Trent-Severn Waterway, Ontario, prepared by DownUnder Geotechnical Limited, July 2017.

.2 Talbot Dam and Lock 38 2013 Geotechnical Site Investigation Report, prepared by KGS Group, October 2014.

.3 Geotechnical Investigation and Concrete Condition Assessment - Lock 37 Downstream Wall, Lock 38 Downstream and Upstream Wall, Trent-Severn Waterway, prepared by DownUnder Geotechnical Limited, August 2017.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS
- .1 Section 01 35 43 - Environmental Procedures
 - .2 Section 01 35 46 - Archaeological and Cultural Procedures
 - .3 Section 01 74 21 - Construction/Demolition Waste Management and Disposal
 - .4 Section 02 81 01 - Hazardous Materials
- 1.2 REFERENCES
- .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
 - .2 United States Environmental Protection Agency (USEPA)
 - .1 EPA 833-F-11-006 - Stormwater Best Management Practices: Concrete Washout [2012]
- 1.3 PROJECT CLEANLINESS
- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
 - .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
 - .3 Clear snow and ice from project site and staging areas. Temporary bank/pile snow within work limits and/or remove from site as required.
 - .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris. Provide on-site containers for collection of waste materials and debris.
 - .6 Provide and use marked separate bins for recycling. Refer to Section 01 74 21- Construction/Demolition Waste Management and Disposal. Dispose of waste materials and debris from site and deposit into waste containers at end of each working day.
 - .8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
 - .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
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- .10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .11 Clean and maintenance of haul routes on a weekly basis, or in accordance with the authorities having jurisdictions, whichever is more stringent.
- .12 Collect, retain and dispose all the concrete washout water (or washwater) and solids in leak proof containers in accordance with:
 - .1 EPA 833-F-11-006 - Stormwater Best Management Practices: Concrete Washout;
 - .2 Section 01 74 21 Construction/Demolition Waste Management and Disposal; and
 - .3 Section 02 81 01 - Hazardous Materials.

1.4 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, surplus stockpiled material, construction machinery and equipment not required for performance of remaining Work from project site and staging area.
- .2 Remove waste products and debris and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste materials and debris from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of surplus stockpiles material, waste and debris.
- .6 Remove stains, spots, marks and dirt from railing, signs, safety booms, and dam equipment.
- .7 Inspect finishes and equipment and ensure specified workmanship and operation.
- .8 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .9 Remove dirt and other disfiguration from exterior surfaces.
- .10 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .11 Remove snow and ice from access to building.

.12 Clean drainage systems.

.13 The area inside of the downstream coffer dams will be cleaned prior to commissioning, in order to mitigate turbidity from the former construction area as it is watered up.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 WASTE MANAGEMENT GOALS

- .1 Prior to start of Work conduct meeting with Departmental Representative review and discuss PSPC's waste management goal and Contractor's proposed Waste Reduction Workplan for Construction, Renovation and /or Demolition (CRD) waste to be generated.
- .3 Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by CRD activities.
- .4 Protect environment and prevent environmental pollution damage.

1.2 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 greater than 2,000 m2.
 - .2 Ontario Environmental Protection Act (EPA)
 - .1 Regulation 102/94, Waste Audits and Waste Reduction Workplans.
 - .2 Regulation 103/94, Source Separation Programs.
 - .3 Canadian Construction Association (CCA)
 - .1 CCA 81-2001: A Best Practices Guide to Solid Waste Reduction.
 - .4 Public Services and Procurement Canada (PSPC)
 - .1 2002 National Construction, Renovation and Demolition Non-Hazardous Solid Waste Management Protocol.
 - .2 CRD Waste Management Market Research Report (available from PWGSC's Environmental Services).

1.3 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedure.
 - .2 Section 01 35 43 - Environmental Procedures
 - .3 Section 01 35 46 - Archaeological And Cultural Procedures.
 - .4 Environmental Protection Act, R.S.O. 1990, Chapter E.19.
 - .5 R.R.O. 1990, Regulation 347, Amended to O. Reg.
-

326/03 Waste Management.

- .6 Environmental Quality Act (Q-2).
- .7 Regulation respecting solid waste (Q-2, r.3.2).
- .8 Regulation respecting hazardous materials (Q-2, r.15.2).
- .9 Ontario Regulation 102/94 - Waste Audits and Waste Reduction Work Plans.
- .10 Ontario Regulation 103/94 - Industrial, Commercial and Institutional Source Separation Programs.

1.4 DEFINITIONS

- .1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority or other users of material for recycling approved by the Departmental Representative.
 - .2 Class III: non-hazardous waste - construction renovation and demolition waste.
 - .3 Inert Fill: inert waste - exclusively asphalt and concrete.
 - .4 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
 - .5 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
 - .6 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
 - .7 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
 - .8 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
-

- .9 Separate Condition: refers to waste sorted into individual types.
- .10 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.
- .11 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating required submittal and reporting requirements.
- .12 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials generated by project. Specifies diversion goals, implementation and reporting procedures, anticipated results and responsibilities. Waste Reduction Workplan (Schedule B) information acquired from Waste Audit.

1.5 DOCUMENTS

- .1 Post and maintain in visible and accessible area at job site, one copy of following documents:
 - .1 Waste Reduction Workplan.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00-Submittal Procedures.
- .2 Prepare and submit following prior to project start-up:
 - .1 1 hard copy and 1 electronic copy of completed Waste Reduction Workplan (WRW).
- .3 Prepare and submit on monthly basis, throughout project or at intervals agreed to by Departmental Representative the following:
 - .1 Receipts, scale tickets, waybills, and/or waste disposal receipts that show quantities and types of materials reused, recycled, or disposed of.

1.7 WASTE REDUCTION WORKPLAN (WRW)

- .1 Prepare and submit WRW at least 10 days prior to project start-up.
 - .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 limited to:
 - .1 Applicable regulations.
 - .2 Specific goals for waste reduction identify existing barriers and develop strategies to overcome them.
 - .3 Destination of materials identified.
 - .4 Deconstruction/disassembly techniques and schedules.
 - .5 Methods to collect, separate, and reduce generated wastes like brick, corrugated cardboard, wood, gypsum board, steel etc.
 - .6 Location of waste bins on-site.
 - .7 Security of on-site stock piles and waste bins.
 - .8 Protection of personnel, sub-contractors.
 - .9 Clear labelling of storage areas.
 - .10 Training plan for contractor and sub-contractors.
 - .11 Methods to track and report results reliably.
 - .12 Details on materials handling and removal procedures.
 - .13 Recycler and reclaimer requirements.
 - .14 Quantities of materials to be salvaged for reuse or recycled and materials sent to landfill.
 - .15 Requirements for monitoring on-site wastes management activities.
- .4 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .5 Post WRW or summary where workers at site are able to review content.
- .6 Monitor and report on waste reduction by documenting total volume (in tonnes) and cost of actual waste removed from project.

1.8 USE OF SITE AND FACILITIES

- .1 Execute Work with minimal interference and disturbance to normal use of premises.
- .2 Maintain security measures established by facility provide temporary security measures approved by Departmental Representative.

1.9 WASTE PROCESSING SITES

- .1 Contractor is responsible to research and locate waste diversion resources and service providers. Salvaged materials are to be transported off site to approved and/or authorized recycling facilities or to users of material for recycling. Submit proof
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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 Province of Ontario

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

Telephone: 800-565-4923 or 416-323-4321

Fax: 416-323-4682

.2 Recycling Council of Ontario:

.1 Name: 215 Spadina Avenue, #225, Toronto, ON, M5T

Telephone: 416-657-2797

Fax: 416-960-8053

E-mail: rco@rco.on.ca

1.10 QUALITY ASSURANCE

.1 After award of Contract, a mandatory site examination will be held for this Project for Contractor and/or sub-contractors responsible for construction, renovation demolition/deconstruction waste management.

.1 Date, time and location will be arranged by Departmental Representative.

.2 Waste Management Meeting: Waste Management Co-ordinator is to provide an update on status of waste diversion and management activities at each meeting.

1.11 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.

.2 Unless specified otherwise, materials for removal becomes Contractor's property.

.3 Protect, stockpile, store and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

- .5 Protect structural components not removed and salvaged materials from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.
- .7 Protect surface drainage, mechanical and electrical from damage and blockage.
- .8 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.
- .9 Separate and store materials produced during project in designated areas.
- .10 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to off-site processing facility for separation.
 - .3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.
- .11 Materials reused on-site are considered to be diverted from landfill and as such are to be included in all reporting.

1.12 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
 - .2 Do not dispose of oil, mineral spirits, volatile materials, waste, paint thinner into waterways, storm, or sanitary sewers.
 - .3 Dispose of contaminated excavated materials in designated areas in accordance with approved EMPP.
 - .4 Keep records of construction waste including:
 - .1 Number and size of bins.
 - .2 Waste type of each bin.
 - .3 Total tonnage generated.
 - .4 Tonnage reused or recycled.
 - .5 Reused or recycled waste destination.
 - .5 Remove materials on-site as Work progresses.
 - .6 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in the waste audit.
-

- 1.13 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.

- 1.14 SCHEDULING
- .1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

PART 2 - PRODUCTS

- 2.1 NOT USED
- .1 Not Used.

PART 3 - EXECUTION

- 3.1 APPLICATION
- .1 Do Work in compliance with WRW.
 - .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

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

- 3.3 DIVERSION OF MATERIALS
- .1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Departmental Representative and consistent with applicable fire regulations.
 - .1 Mark containers or stockpile areas.
 - .2 Provide instruction on disposal practices.
-

- .2 On-site sale of recovered, recyclable, salvaged and reusable materials is not permitted.

3.4 CANADIAN GOVERNMENTAL
DEPARTMENTS CHIEF
RESPONSIBILITY FOR THE
ENVIRONMENT

- .1 Government Chief Responsibility for the Environment:

Province	Address	General Inquires	Fax
Ontario	Ministry of Environment and Energy, 135 St. Clair Avenue West Toronto ON M4V 1P5	416-323-4321 800-565-4923	416-323-4682

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 22 01 - Measurement for Payment
- .2 Section 01 33 00 - Submittal Procedures
- .3 Section 01 32 16.07 - Construction Progress Schedule
- .4 Section 01 35 43 - Environmental Procedure
- .5 Section 01 45 00 - Quality Control
- .6 Section 01 48 00 - Construction Control and Monitoring
- .7 Section 01 74 20 - Construction / Demolition Waste Management and Disposal
- .8 Section 35 20 22 - Dewatering and Diversion
- .9 Section 35 42 15 - Safety Boom
- .10 Section 35 42 19 - Preservation of Watercourses

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .2 Request Departmental Representative's inspection.
 - .2 Departmental Representative Inspection:
 - .1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Environmental testing to be undertaken by the Contractor at staging areas on PCA lands to confirm that there has been no impact to the soils. Any issues arising from the testing shall be addressed by the Contractor at their expense.
 - .4 The Contractor shall provide a release
-

- to the Departmental Representative from owners of adjacent lands indicating that there are no impacts to their services and utilities (water, sanitary, storm drainage; electricity, communications) as a result of the Dam at Lock 38 construction activities.
- .5 The contractor shall provide a release to the Departmental Representative from the municipality and/or County regarding restoration of Canal Road and/or Ball Avenue and all haul roads in the immediate vicinity of the dam.
- .6 The contractor shall provide to the Departmental Representative the certification that the construction activities have not impacted the structural integrity of the lock and associated structures to the best of their knowledge along with a report on all related monitoring activities and of final inspection (video) of underwater lock walls, floor, gate and mechanical works, and foundations, including approach walls and retaining walls.
- .7 The contractor shall provide a release to the Departmental Representative from any waste transfer / receiving station and/or registered landfill as part of the Waste Management Workplan.
- .8 The contractor shall provide a release to the Departmental Representative from landowners whose lands have been used as a construction staging area indicating their acceptance of the site clean-up / grading /restoration.
- .3 Completion Tasks: the Contractor is to sign and submit written certificates in English that tasks have been performed as follows:
- .1 Work: completed and inspected for compliance with Contract Documents.
- .2 Defects: corrected and deficiencies completed.
- .3 Equipment and systems: tested, adjusted and fully operational.
- .4 Operation of systems: demonstrated to Owner's personnel.
- .5 Work is complete and ready for final inspection.
- .4 Final Inspection:
- .1 When completion tasks are done, submit new certificates and request final inspection of Work by Departmental Representative and Contractor.
- .2 When Work is deemed incomplete according to Departmental

- Representative, complete outstanding items and request re-inspection.
- .3 The Contractor shall notify the municipality / County, emergency services and any school board regarding the date for reopening haul roads to all traffic.
- .4 Upon final acceptance by the Departmental Representative, the contractor shall formally request that the dam operation be taken over by the Parks Canada Agency on a particular date acceptable to the Departmental Representative.
- .5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make written application for Certificate of Substantial Performance.
- .6 Final Payment:
 - .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
 - .2 When Work deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
 - . 3 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for progressive payment of holdback amount in accordance with contractual agreement.

1.3 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 11- Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for recycling and/or reuse in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - Execution

3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 22 01 - Measurement and Payment
- .2 Section 01 33 00 - Submittal Procedures
- .3 Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart
- .4 Section 01 35 43 - Environmental Procedures
- .5 Section 01 45 00 - Quality Control
- .6 Section 01 48 00 - Construction Control and Monitoring
- .7 Section 01 74 21 - Construction/Demolition Waste Management and Disposal
- .8 Section 35 20 22 - Dewatering and Diversion
- .9 Section 35 42 15 - Safety Boom
- .10 Section 35 01 40.92 - Preservation of Water Courses
- .11 Section 01 71 00 - Examination and Preparation

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 All project documentation must be submitted to the Departmental Representative within a consolidated Project Manual. Upon review by the Departmental Representative, the Project Manual may need to be revised and resubmitted as necessary.
- .2 Pre-warranty Meeting:
 - .1 Convene meeting 1 week prior to project completion with Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:
 - .1 Verify Project requirements.
 - .2 Review warranty requirements, manufacturer's installation instructions.
 - .2 Departmental Representative to establish communication procedures for:
 - .1 Notifying construction warranty defects.
 - .2 Determine priorities for type of defects.
 - .3 Determine reasonable response time.

- .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
- .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.3 AS -BUILT DOCUMENTS AND .1
SAMPLES

Maintain at site and submit in Project Manual for Departmental Representative one record copy of:

- .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 One set, full-size paper copy of red-lined AS-BUILT drawings and Specifications, to be updated as the work progresses
 - .7 Field test records.
 - .8 Inspection certificates.
 - .9 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
 - .1 Provide files, racks, and secure storage.
 - .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
 - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
 - .2 In addition to the items listed above, include survey drawings and survey data included but not limited to that identified under section 01 71 00- Examination and Preparation.
 - .3 Original and as built project schedule including a narrative on variances.
 - .4 Relevant safety reports including internal and external inspections, hazard analysis and all incident reports.
 - .5 Environmental reports including incident reports, water quality monitoring records.
 - .6 Quality information including non-compliance reports, site instructions, requests for information, and testing results.
 - .7 Include movement and vibration monitoring reports.
-

- .4 Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.
- .6 Turn one set, paper copy of red-lined AS-BUILT drawings and specifications over to Departmental Representative on completion of work.
- .7 Turn one set, paper copy and electronic copy of record survey drawing and survey data as set out in Section 01 71 00 - Examination and Preparation over to Departmental Representative on completion of work.
- .8 If project is completed without significant deviations from Contract drawings and specifications submit to Departmental Representative one set of drawings and specifications marked as "AS-BUILT".

1.4 RECORDING INFORMATION
ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of black line opaque drawings, and in the Project Manual, Record information to create red-lined AS-BUILT drawings.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to established bench mark.
 - .2 Measured horizontal and vertical locations of adjacent structures, underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Field changes of dimension and detail.
 - .4 Changes made by change orders.
 - .5 Details not on original Contract Drawings.
 - .6 Referenced Standards to related shop drawings and modifications.

- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Amendments and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, contractor monitoring results as set out in Section 01 48 00 - Construction Control and Monitoring, waste management per Section 01 74 21 - Construction / Demolition Waste Management and Disposal as required by specifications sections.
- .7 Provide digital photos, if requested, for site records.

1.5 FINAL SURVEY

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

1.6 WARRANTIES AND BONDS

- .1 Submit warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .2 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within 10 days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .3 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is

determined.

- .4 Conduct joint 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.
- .5 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .6 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

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 demolition to complete work as indicated by the drawings and specification.
- .2 The staged demolition of the existing Talbot Dam includes but is not limited to:
 - .1 Removal of existing concrete as shown in the project drawings.
 - .2 Preparation of all remaining concrete surfaces against which new concrete is to be cast.
 - .3 Disposing off site all concrete debris and removed steel reinforcement.
 - .4 Disposing off site of all material not designated for salvage or reuse by owner.
 - .5 The salvage of existing stop log winch assemblies and tie downs; stop logs; stop log deck hangers; mooring anchors; notification, warning and advisory signage; safety equipment including life buoys; water level equipment, and such other items as may be directed by the Departmental Representative.
 - .6 Stacked stone wall on north embankment upstream of the dam is to be salvaged and replaced as is (each stone numbered and replaced in existing position) as necessary for the construction of the upstream cofferdam and other construction works.

1.2 REFERENCE STANDARDS

- .1 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 (OSHA).
- .4 Ontario Building Code (OBC).
- .5 Department of Justice Canada
 - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
 - .2 Canadian Environmental Protection Act (CEPA), 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.

1.3 DEFINITIONS

- .1 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, include but not limited to: poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or materials that endanger human health or environment if handled improperly.
- .2 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating related, required submittal and reporting requirements.
- .3 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill.
- .4 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Organize data as instructional manual.
- .2 Pre-Installation Meetings:
 - .1 Convene pre-demolition meeting 1 week prior to work of this Section, with Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:
 - .1 Verify project requirements.
 - .2 Arrange a site visit to examine existing site conditions adjacent to demolition work.
 - .3 Co-ordination with other construction subtrades.
 - .2 Hold project meetings biweekly.
 - .3 Ensure Contractor, subcontractor representatives, WMC representatives attend the meeting along with Departmental Representative.
 - .4 WMC must provide written report on status of waste diversion activity at each meeting.
 - .5 Departmental Representative will provide written notification of change to meeting schedule established upon contract award 24

hours prior to scheduled meeting.

.3 Scheduling:

- .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
 - .1 In event of unforeseen delay notify in writing Departmental Representative.

.4 Reporting:

- .1 Through data gathered from weigh bill or other methodology approved by the Departmental Representative, report the following information weekly to the satisfaction of the Departmental Representative:
 - .1 Description of material;
 - .2 Weight, quantity of material;
 - .3 Breakdown of re-use, recycling and landfill quantities;
 - .4 End destination of material.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 WMC is responsible for fulfilment of reporting requirements.
- .3 Prior to beginning of Work on site submit 3 copies of detailed Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal and indicate:
 - .1 Descriptions of and anticipated quantities in tonnes of materials to be salvaged reused, recycled and landfilled where applicable.
 - .2 Schedule of selective demolition.
 - .3 Number and location of dumpsters per type of waste material.
 - .4 Anticipated frequency of tipping.
 - .5 Name and address of haulers, and waste receiving and recycling facilities.
 - .6 Receiving facilities of material containing potential hazardous material. These materials are to be diagnosed in accordance with applicable regulations and not be designated for re-use.
 - .1 Existing wooden deck may contain CCA and
 - .2 Painted steel may contain lead.
- .4 Submit 4 copies of certified receipts from authorized disposal sites and reuse and recycling

facilities for material removed from site on a monthly basis upon request of Departmental Representative.

- .1 Written authorization from Departmental Representative is required to deviate from receiving organizations listed in Waste Reduction Workplan.

.5 Shop Drawings:

- .1 Submit to the Departmental Representative and/or authorities having jurisdiction for review and approval demolition drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.
- .2 Submit demolition drawings stamped and signed by professional engineer registered or licensed in Province of Ontario.

- .6 Prior to demolition of the existing structure, establish reference points (minimum of 4) that will allow the transfer of coordinates and elevations of the existing geodetic bench mark to the new geodetic bench mark on the new structure or such approved by the Department Representative. Provide all data regarding the reference points to the Departmental Representative. Survey work shall be undertaken by Ontario Legal Survey.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: Ensure Work is performed in compliance with applicable Provincial/ Territorial and Municipal regulations, CEPA, and CEAA.

1.7 SITE CONDITIONS

- .1 Environmental protection:
 - .1 Ensure Work is done in accordance with Section 01 35 43 - Environmental Procedures and Section 01 35 46 - Archaeological and Cultural Procedures.
 - .2 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
 - .3 Fires and burning of waste or materials is not permitted on site.
 - .4 Do not bury rubbish waste materials.
 - .5 Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses,

storm or sanitary sewers.

- .1 Ensure proper disposal procedures are maintained throughout project.
- .6 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.
- .7 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction as directed by Departmental Representative.
- .8 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .9 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.
- .10 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21.
- .2 Divert excess materials from landfill to site approved by Departmental Representative.
- .3 Separate for reuse and recycling and place in designated containers Steel, Metal waste in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Ensure emptied containers are sealed and stored safely.
- .6 Source separate for recycling materials that cannot be salvaged for reuse including wood, metal, concrete and asphalt.
- .7 Remove materials that cannot be salvaged for reuse or recycling and dispose of in accordance with applicable codes at licensed facilities.

1.9 EXISTING SITE AND STRUCTURE PROTECTION

- .1 Protect existing items 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 and at no cost to Departmental Representative.
- .2 Remove and store materials to be salvaged, in manner to prevent damage and in accordance with

requirements for maximum preservation of material.

- .3 Provide a pre-construction condition survey and assessment of the lock and related structures and infrastructure, utilities and services in accordance with Section 01 48 00. The inspections to include an underwater video with report of Lock 38 and ancillary structures.
- .4 Provide Instrumentation at and adjacent to structures to remain, to monitor movement (displacement) including settlement in area of excavation and at temporary works, to monitor vibration levels of construction activities and to monitor water levels of water of domestic water wells, in accordance with Section 01 48 00. Instrumentation equipment has to be installed, calibrated and initial reading taken prior to commencement of demolition work.
- .5 Prevent movement, settlement or damage to adjacent structures during demolition of the existing dam. Provide bracing, shoring or underpinning or such other measures as required and approved by the Departmental Representative. Repair damage caused by demolition as approved by Departmental Representative.
- .6 Support affected structures and, if safety of structure being demolished or adjacent structures appears to be endangered, take preventative measures and notify the Departmental Representative.
- .7 Acceptance by the Departmental Representative does not relieve the Contractor of their due diligence and responsibility for protection of other site works including salvaged materials.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- .1 Equipment and heavy machinery:
 - .1 On-road vehicles to: CEPA-SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations, CEPA-SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
 - .2 Measures shall be provided to protect site works to remain and other temporary measures installed by the Contractor for the construction.
 - .3 Leave machinery running only while in use, except where extreme temperatures prohibit shutting

machinery down.

- .4 Equipment shall be sized adequately for the work. Machinery used for concrete demolition must be chosen to minimize airborne pollution.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Protection of in-place conditions:
 - .1 Work in accordance with Section 01 35 43- Environmental Procedures and Section 01 35 46 - Archaeological and Cultural Procedures.
 - .2 Protect existing site works designated to remain and materials designated for salvage. In event of damage, immediately replace such items or make repairs to the satisfaction of the Departmental Representative and at no additional cost to the Agency.
 - .3 Provide a pre-construction condition survey and assessment of the Dam and related structures and infrastructure, utilities and services in accordance with Section 01 48 00 - Construction Control and Monitoring.
 - .4 Provide Instruction at and adjacent to structures to remain, to monitor movement (displacement) including settlement in area of excavation and at temporary works, to monitor vibration levels of construction activities and to monitor water levels of water of domestic water wells, in accordance with Section 01 48 00 - Construction Control and Monitoring. Instrumentation equipment has to be installed, calibrated and initial reading taken prior to commencement of demolition work.
 - .5 Prevent movement, settlement or damage of adjacent walks, services, properties adjacent grades, structures, trees, parts of existing building to remain, landscaping, and paving during demolition of the dam.
 - .1 Provide bracing, shoring, underpinning or such measures as required and approved by the Departmental Representative.
 - .2 Repair damage caused by demolition as directed by Departmental Representative.
 - .6 Support affected structures and, if safety of structure being demolished or adjacent structures appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.

- .7 Prevent debris from blocking surface drainage system and navigation channel, which must remain in operation.
 - .8 Protect layout and reference and control points during demolition work.
 - .9 Provide measures as necessary to protect the lock and ancillary works during demolition works acceptable to the Departmental Representative. Acceptance by Departmental Representative does not relieve the Contractor of their due diligence and responsibility for protection of other site works including salvaged materials.
- .2 Preparation:
- .1 Disconnect and re-route electrical service lines near the dam to be demolished.
 - .1 Post warning signs on electrical lines and equipment which must remain energized to serve other properties during period of demolition.
 - .2 Do not disrupt active or energized utilities designated to remain undisturbed and/or traversing premises.
 - .3 Inspect site and verify with the Departmental Representative
 - .4 Work in accordance with Section 01 35 43- Environmental Procedures

3.2 DEMOLITION

- .1 Obtain the Departmental Representative approval to start the demolition part of the work.
- .2 Do demolition work in accordance with Section 01 56 00 - Temporary Barriers and Enclosures, Section 01 35 43- Environmental Procedures and 01 35 29.06 Health and Safety Requirements.
- .3 Blasting operations not permitted during demolition.
- .4 Remove contaminated or dangerous materials as defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.
- .5 Prior to start of Work remove contaminated or hazardous materials listed as hazardous as directed by Departmental Representative from site and dispose of at designated disposal facilities in safe manner and in accordance with TDGA and other applicable requirements and Section 02 81 01- Hazardous Materials and 01 74 21- Construction/ Demolition Waste Management and Disposal and Section 01 35 46 - Archaeological and Cultural

Procedures.

- .6 Remove structural framing and supports, misc. metals, wood materials including cutoff sheeting and piles, and other non-concrete items.
- .7 Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction and Waste Reduction Workplan.
- .8 Demonstrate to the Departmental Representative the methodology of demolition will not result in physical or structural damage to the site works, lock components and buildings, infrastructures including water wells within and adjacent to the approved construction limits, to remain.
- .9 Mechanical winch assemblies will be refurbished by Parks Canada and returned to the site for re-installation by the Contractor.
- .10 Saw cut at concrete structures to remain to extent indicated on the Contract drawings to be able to construct the Works, and as necessary to provide Dewatering and Diversion Works and other temporary measures to protect existing works to remain.
- .11 Use a stiff broom to remove loose concrete surfaces and a high pressure water jet to clean the surfaces after the excavation has been complete.
- .12 Crush concrete generated due to demolition of structure to size suitable for recycling
 - .1 For further information regarding acceptable uses contact Provincial/Territorial aggregate producers associations and or Ministries of Transportation.
- .13 Use a handheld jack-hammer to roughen all existing concrete surfaces against which new concrete is to be cast. Use a high pressure water jet (do not exceed 1000 kPa) to clean all surfaces and to partially expose the coarse aggregate.
- .14 Keep the surfaces clean until new concrete is cast.
- .15 Do not discharge the water from cleaning directly to the watercourse. Direct the water to a settling pond, or filter before releasing to the watercourse. Work in accordance with Section 01 35 43- Environmental Procedures.
- .16 Undertake saw-cutting at concrete exposed surfaces where new concrete is cast against existing concrete.

- .17 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as work progresses.
- .18 Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative to the extent that there is no surface runoff from the structure being demolished. Provide other temporary measures to prevent the migration of air-borne particulate.
- .19 Use natural lighting to do Work where possible.
 - .1 Shut off lighting except those required for security purposes at end of each day.
- .20 At end of each day's work, leave Work in safe and stable condition.

3.3 CLEANING

- .1 Develop Waste Reduction Workplan related to Work of this Section.
 - .2 Waste Management: separate materials for reuse on new structure in accordance with 01 74 21- Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site for delivery to appropriate facility designated by Departmental Representative.
 - .2 Store and protect these items. Leave them ready for installation at other stages of the work. Items include but not limited to:
 - .1 Stoplogs
 - .2 Mechanical winches
 - .3 Stoplogs hangers
 - .4 Water level gage
 - .5 Safety Equipment
 - .6 Site notification, warning and advisory signage
 - .3 Items identified to be salvaged and stored on site for future reuse are to be stored in a safe manner as to ensure that they will not be damaged. Replace at Contractors' cost any damaged salvaged items. Eliminate double handling wherever possible.
 - .3 Divert excess materials from landfill to site approved Departmental Representative.
 - .4 Designate appropriate security resources / measures to prevent vandalism, damage and theft.
 - .5 Stockpile materials in a safe manner for workers
-

and equipment until removed from work area. Remove all stockpiled materials from the construction area at the end of the day.

- .6 Remove stockpiled material as directed by Departmental Representative, when it interferes with operations of project construction.
- .7 Upon complete of work, remove debris, trim surfaces and leave work site clean.
- .8 Demonstrate to the Demonstrate Representative that other site works have not physically or structurally damaged as a result of demolition works to the requirements of 01 48 00 - Construction Control and Monitoring.
- .9 Provide a methodology of repair for other site works damaged by the demolition work acceptable to the Departmental Representative.
- .10 Undertake repairs to the satisfaction of the Departmental Representative.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 03 20 00 - Concrete Reinforcement
- .2 Section 03 30 00 - Cast-in-Place Concrete

1.2 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-O86-01(R2006), Engineering Design in Wood (Limit States Design).
 - .3 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood (Limit States Design).
 - .4 CSA O121-M1978 (R2008), Douglas Fir Plywood.
 - .5 CSA O151-09, Canadian Softwood Plywood.
 - .6 CSA O153-M1980 (R2008), Poplar Plywood.
 - .7 CAN/CSA-O325.0-92(R2003), Construction Sheathing.
 - .8 CSA O437 Series-93(R2006), Standards for OSB and Waferboard.
 - .9 CSA S269.1-1975 (R2003), Falsework for Construction Purposes.
 - .10 CAN/CSA-S269.3-M92 (R2008), Concrete Formwork, National Standard of Canada
- .2 Council of Forest Industries of British Columbia (COFI)
 - .1 COFI Exterior Plywood for Concrete Formwork.

1.3 ACTION AND
INFORMATIONAL SUBMITTALS

- .1 Master Plan of Concrete Placement
 - .1 Submit master plan showing separate concrete placements and locations of construction joints, including proposed construction joints in addition to those indicated on the drawings.
 - .2 Co-ordinate submittal requirements and provide submittals required by Section 01 35 46 - Archaeological and Cultural Procedures.
 - .3 Submit WHMIS MSDS- Material Safety Data Sheets in accordance with Section 01 35 46- Archaeological, Cultural and Environmental Procedures.
 - .4 Joints: Expansion, Construction and Control
 - .1 Submit detailed shop drawing of each joint type. Submit an elevation or section take through the plane of the joint showing the
-

- walls, piers and slabs at the joint.
- .2 Submit details of waterstop system, types, splices, methods of securing and supporting waterstop in forms to maintain proper orientation and location during concrete placement.
- .3 Submit details of joint fillers, sealant, adhesives and other appurtenances.
- .4 Submit formwork shop drawings to reflect location of approved joints shown on Master Plan of Concrete Placement
- .5 Formwork
 - .1 Shop drawing submission shall bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Comply with CSA 8269.1, for falsework drawings.
 - .3 Comply with CSA S269.3 for formwork drawings.
 - .4 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, and materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts.
 - .5 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.
 - .6 Indicate sequence of erection and removal of formwork/falsework to minimize exposure time to adverse weather conditions.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 47 21- Construction/Demolition Waste Management and Disposal.
 - .2 Place materials defined as hazardous or toxic in designated containers.
 - .3 Divert wood materials from landfill to a recycling facility.
 - .4 Divert plastic materials from landfill to a recycling facility.
 - .5 Divert unused form release material from landfill to an official hazardous material collections site.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Formwork and Falsework:
 - .1 4 foot by 8 foot rough plywood placed horizontally. Wood and wood product formwork

materials to CAN/CSA 086.1 CSA 0153.

- .1 Plywood may be arranged vertically for radius sections of piers with approval from the Departmental Representative.
 - .2 Lumber for formwork and falsework: Grade-marked sawn lumber graded in accordance with NLGA and related CSA Standards
 - .3 Falsework materials: to CSA S269.1-16.
 - .4 Formwork for 6 mm inset 76 mm radius details shall be made of steel.
 - .5 Form ties: use removable ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.
 - .1 Form ties will not be allowed on surface exposed to view, those being the downstream surfaces above the minimum water levels both upstream and downstream.
 - .6 Form release agent: non-toxic, biodegradable, low VOC. 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.
 - .7 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 15 to 24 mm²/s at 40°C, flashpoint minimum 150°C, open cup.
 - .2 PVC waterstops:
 - .1 To be a flexible PVC (Polyvinyl chloride) 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.
 - .2 For all expansion joints: ribbed with centerbulb type having the following dimensions: 228 mm wide by 9.5 mm thick, inner bulb diameter of 13 mm.
 - .3 For construction joints: flat ribbed type having the following dimensions: 150 mm wide by 9.5 mm thick.
 - .4 For specified construction joints: Retrofit 160mm by 12.7 mm thick "T" type waterstop.
 - .1 Provide manufacturer recommended adhesive, anchors and stainless steel batten bar.
 - .5 Provide 2 continuous waterstop seals in all joints, unless noted otherwise.
 - .6 Performance Requirements to meet:
 - .1 Tensile strength: to ASTM D638 - 13.8
-

- MPa(2000 psi).
- .2 Tear resistance: 43.78N/mm or 102 kg/25.4 mm (225 lb/in) to ASTM D624.
- .3 Ultimate elongation: minimum 300% to ASTM D638.
- .4 Water absorption: 0.005 to 0.02% to ASTM D570.
- .5 Low temperature brittleness: to ASTM D746, passed@ -37.2°C/-38.3(-35°F/-37).
- .6 Cold bend test at -45°C for 2 hours - no cracking.
- .7 Stiffness in flexure: 4.8 kPa 700 psi) to ASTM D747.
- .8 Specific Gravity (ASTM D792) - 1. 4.

- .3 Hydrophilic waterstops.
 - .1 The waterstop shall be a combination of chloroprene rubber and chloroprene rubber modified to impart hydrophilic properties. Bentonite shall not be permitted.
 - .2 The waterstop shall have a delay coating to inhibit initial expansion due to moisture present in fresh concrete.
 - .3 Performance requirements for Chloroprene Rubber to meet:
 - .1 Tensile Strength: to ASTM D412 - 1300 PSI
 - .2 Ultimate Elongation: to ASTM D412 - 400%
 - .3 Hardness (shore A): to ASTM D2240 - 50 +/-5
 - .4 Tear Resistance: to ASTM D624 - 100 PSI
 - .5 Specific Gravity: 1.38 +/- 0.1
 - .4 Performance requirements for Modified Chloroprene (Hydrophilic) Rubber to meet:
 - .1 Tensile Strength: to ASTM D412 - 350 PSI
 - .2 Ultimate Elongation: to ASTM D412 - 600%
 - .3 Hardness (shore A): to ASTM D2240 - 52 +/- 5
 - .4 Tear Resistance: to ASTM D624 - 50 PSI
 - .5 Specific Gravity: 1.32 +/- 0.1
 - .6 Expansion Ratio: Volumetric Change in distilled water at 70 deg C - 3 to 1.
 - .5 Provide manufacturer recommended sealant with hydrophobic properties to secure waterstop to rough, dry concrete.

- .6 Provide cyanoacrylate adhesive (super glue) for all waterstop splices.

- .4 Backing rods:
 - .1 Closed cell polyethylene foam backer rod. Rod diameter shall be 3 mm larger than the joint width.

- .5 Concrete brick:
 - .1 Acceptable for support of bottom layer of bar in foundation. Broken concrete blocks and wood supports not acceptable.

- .6 Bond breaker:
 - .1 Polyethylene tape or coated paper

- .7 Joint Sealer:
 - .1 CAN/CGSB 19.13, high performance, moisture-cured, one-component, polyurethane-based, non-sag elastomeric sealant. Type I for Horizontal joints, Type II for vertical joints.
 - .2 Sealant to accommodate +/- 35% joint movement
 - .3 Sealant to be suitable for use from -40 deg C to + 77 deg C minimum.

- .8 Plastic Reinforcement Chairs:
 - .1 Reinforcement Chairs will not be allowed on surface exposed to view, those being the downstream surfaces above the minimum water levels both upstream and downstream.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION AND REMOVAL

- .1 Formwork Fabrication and Erection:
 - .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
 - .2 Fabricate and erect falsework in accordance with CSA S269.1.
 - .3 Do not place shores and mud sills on frozen ground.
 - .4 Provide site drainage to prevent washout of soil supporting mud sills and shores.
 - .5 Fabricate and erect formwork in accordance with CSA S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1.
 - .6 Align form joints and make watertight. Keep form joints to minimum.
 - .7 Form 76 mm radius fillet on all edges and corners of piers unless specified otherwise. Refer to drawings for detailing of chamfers
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- and fillets.
 - .8 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
 - .9 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes.
 - .10 Clean formwork in accordance with CSA A23.1, before placing concrete.
 - .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, form release shall be applied and re-applied until complete saturation has been accomplished prior to first use.
 - .2 Application:
 - .1 Apply concrete form release in accordance with manufacturer's instructions.
 - .3 Removal and Reshoring:
 - .1 With accordance to CSA A23.1 Section 6.5.
 - .2 Formwork shall not be removed under 48 hours from the time deposition within the forms is completed unless authorized by the Departmental Representative.
 - .3 Formwork shall be left in place until concrete has attained sufficient strength to support its own weight adequately, together with the construction loads likely imposed.
 - .1 Vertical elements: crack open formwork minimum 24 hours after concrete placement and flood cavity as required for Curing Type 3. Maintain formwork for minimum 5 days.
 - .2 Suspended elements: maintain until member has achieved minimum 75% of its design strength. Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as
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required.

- .4 Re-use formwork and falsework subject to requirements of CSA A23.1.
- .5 Do not remove winter protection

.4 Formwork at rock and foundation interface:

- .1 Scribe formwork and trim panels to prepare neat contact with foundation material.

3.2 INSTALLATION OF ACCESSORIES

.1 Waterstops (PVC)

- .1 Install waterstops at all construction joints (submerged and dry), which includes additional new vertical and horizontal joints created from the construction methods used. Follow manufacturer's recommendations.
- .2 Install waterstops to provide continuous water seal.
- .3 Do not distort or pierce waterstop in way as to hamper performance.
- .4 Do not displace reinforcement when installing waterstops. Maintain minimum cover between waterstop and reinforcement or embedded parts.
- .5 Use equipment to manufacturer's requirements to field splice waterstops.
- .6 Tie waterstops rigidly in place.
- .7 Use only straight heat sealed butt joints in field.
- .8 Use factory welded corners and intersections unless otherwise approved by Departmental Representative.
- .9 Secure vertical waterstop in correct position using bulkhead formwork.
- .10 Secure horizontal waterstop in positions using grommets, pre-punched holes, or hog rings evenly spaced along the length of the waterstop and wire tie to adjacent reinforcing steel to maintain position during placement.
- .11 Waterstop shall not be "wet-set" unless approved by the Departmental Representative.
- .12 Use adhesive, anchors and sealants as recommended by waterstop manufacturer for retrofit waterstops.
- .13 Provide level surface for installation of retrofit waterstops and complete installation per manufacturer's instructions.

.2 Hydrophilic waterstops:

- .1 Provide level, dry surface for the installation of hydrophilic waterstop.
 - .2 Utilize manufactures recommended sealant to secure watestop to dry substrate.
 - .3 Waterstop shall be joined by but joints and be sealed using cyanoacrylate adhesive (super glue).
 - .4 Cut coil ends square (or at proper angle for
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- mitered corners) with shears or sharp blade to fit splices together without overlaps.
- .5 Complete installation per manufacturer's instructions.
- .6 Maintain Hydrophilic waterstop in dry condition prior to concrete placement activities. Waterstop not protected from moisture shall be removed at the direction of the Departmental Representative.

.3 Embedded parts:

- .1 Set other embedded parts and openings as indicated or specified elsewhere.
- .2 Check locations and sizes of embedded parts and openings shown on drawings.

.4 Anchor bolts:

- .1 Set anchor bolts to templates in coordination with appropriate trade prior to placing concrete.
- .2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Departmental Representative.
- .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
- .4 Set bolts and fill holes with shrinkage compensating grout

.5 Joint filler:

- .1 Furnish filler for each joint in 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. Install joint filler, bond breaker and sealer.

.6 Joint Sealant:

- .1 Install to manufacturer's recommendations.

3.3 SMOOTH-FORM FINISH

- .1 The form facing material shall produce a smooth, hard, uniform texture on concrete.
 - .2 Material with raised grain, 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
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removed. An acceptable surface shall be as follows:

- .1 Free of Bug holes 10 mm in diameter or greater.
 - .2 Free of unsightly ridges, fins or undesirable bulging.
 - .3 Free of abrupt surface irregularities greater than 3 mm.
 - .4 Free of gradual surface irregularities greater than 15 mm as measured over 1.8 m.
- .4 Smooth-form finish shall be used for rounded edge surfaces unless otherwise shown or noted on design drawings.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 03 30 00 - Cast-in-Place Concrete
- .2 Section 01 33 00 - Submittal Procedures.
- .3 Section 01 29 0 - Payment Procedures
- .4 Section 01 74 21 - Construction/Demolition Waste Management and Disposal
- .5 Section 01 74 11 - Cleaning

1.2 PRICE AND PAYMENT
PROCEDURES

- .1 Measurement and Payment:
 - .1 Work under this section will not be measured for payment and shall form part of the Contract Lump Sum Price or Unit price for the applicable item of work for concrete.
 - .2 Payment of this Section shall be as set out in Section 01 29 0 - Payment Procedures and shall be incidental to the applicable item of work for concrete.
 - .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 stated in the Tender Form.

1.3 REFERENCE STANDARDS

- .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
 - .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 CSA
 - .1 CSA A23.1-14, Concrete Materials and Methods of Concrete Construction.
 - .2 CSA A23.2-14, Test Methods and Standard Practices for Concrete.
 - .3 CSA A23.3-14, Design of Concrete Structures.
 - .4 CSA G30.3-M1983(R1998), Cold Drawn Steel wire for Concrete Reinforcement.
 - .5 CSA G30.18-09, Carbon Steel Bars for
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- Concrete Reinforcement.
- .6 CSA G40.20-13, General Requirements for Rolled or Welded Structural Quality Steel.
- .7 CSA G40.21-13, Structural Quality Steel.
- .8 CSA W186-M1990(R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC) RSIC-2013, Reinforcing Steel Manual of Standard Practice.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Prepare reinforcement 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.
 - .1 Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
 - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
 - .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.
 - .1 Provide type B unless otherwise indicated
 - .3 Detail placement of reinforcing where special conditions occur.

1.5 QUALITY ASSURANCE

- .1 Submit in accordance with Section 01 45 00- Quality Control.
 - .1 Mill Test Report: Provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 2 weeks prior to beginning reinforcing work.
 - .2 Upon request, submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.
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- 1.6 DELIVERY, STORAGE AND HANDLING
- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .2 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
 - .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
 - .3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.
 - .4 Cold-drawn annealed steel wire ties: to G30.3-M.
 - .5 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
 - .6 Mechanical splices: subject to approval of Departmental Representative.

- 2.2 FABRICATION
- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
 - .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
 - .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
 - .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
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PART 3 - Execution

3.1 FIELD BENDING

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

3.2 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on placing drawings in accordance with CSA-A23.1/A23.2.
- .2 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .3 Minimum cover for reinforcement as per CSA A23.1 Table 17 except as noted on the drawings and below:
 - .1 75 mm for faces exposed to water such as piers, the rollway and submerged faces.
- .4 Ensure cover to reinforcement is maintained during concrete pour.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- .1 This section specifies requirements for the work Cast-In-Place Concrete.

1.2 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 45 00 - Quality Control
- .3 Section 02 41 16 - Structural Demolition
- .4 Section 03 10 00 - Concrete Forming and Accessories
- .5 Section 03 20 00 - Concrete Reinforcing
- .6 Section 03 35 00 - Concrete Finishing

1.3 PRICE AND PAYMENT PROCEDURES

- .1 Measurement and Payment in accordance with Section 01 22 01:
 - .1 All concrete work under this section will not be measured for payment and shall form part of the Contract Lump Sum Price.
 - .2 Payment of this Section shall be as set out in Section 01 22 01, and shall be included in the applicable item of work for concrete.
 - .2 All labour, equipment and materials for cast-in-place concrete including incidentals, complete as specified, shall be included in the applicable price for concrete work.
 - .3 No deductions will be made for volume of concrete displaced by reinforcing steel.
 - .4 Include in the price of concrete the heating or cooling of water and aggregates, and the provision of hot or cold weather protection including provision for pre-heating of existing substrate.
 - .5 Surface preparation to existing concrete will not be measured separately. Payment for work shall be as set out in Section 01 22 01 and shall be
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included in the applicable item of work for Structure Demolition.

- .6 Include in the price of concrete the installation of all items embedded therein e.g. waterstops.
- .7 Include in the prices of concrete the supply and installation of joint filler, bond breaker, bonding agent and joint sealer.
- .8 Include in the price of concrete work described in Section 03 10 00 - Concrete Forming Accessories and section 03 20 00 - Concrete Reinforcement.
- .9 Supply and installation of anchor bolts, nuts and washers and bolt grouting will not be measured but considered incidental to work.
- .10 Include in the price of concrete any foundation preparation of the receiving surface including dental concrete at bedrock surfaces and mud slab at existing soils.
- .11 All Other work, necessary to the completion of work of this section, will not be measured separately for payment and will be considered incidental to the work.

1.4 REFERENCE STANDARDS

- .1 ASTM International
 - .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-15, Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM C666 Freeze-thaw durability testing
 - .5 ASTM C1017/C1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .6 ASTM C1059, Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete
 - .7 ASTM D412-15a, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - .8 ASTM D624-2012, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
 - .9 ASTM D1751-2013e1, Standard Specification for Preformed Expansion Joint Filler for Concrete

- Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .10 ASTM D1752-2013, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .2 CSA International
 - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283-06-R2016, Qualification Code for Concrete Testing Laboratories.
 - .3 CAN/CSA-A23.5, Supplementary Cementing Materials.
 - .4 CAN/CSA-A362, Blended Hydraulic Cements.
 - .5 CAN/CSA-A363, Cementitious Hydraulic Slag.
 - .6 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .7 CAN/CSA-A3001-08, Cementitious Materials for Use in Concrete.
 - .8 CAN/CSA G40.21, Structural Quality Steels.
 - .9 CAN/CSA G30.18, Welded Steel Wire Fabric for Concrete Reinforcement.
 - .10 CAN/CSA G30.18, Billet Steel Bars for Concrete Reinforcement.
 - .11 CAN/CSA-W186, Welding of Reinforcing Steel in Reinforced Concrete Construction.
- .3 Conform to all the latest editions of reference standards. The standards provide the **minimum** requirements to be met by the Contractor and concrete supplier. Additional concrete requirements have been established in this specification. The most stringent requirement shall be followed and no deviation from the requirements will be considered at the time of construction.

1.5 ABBREVIATIONS AND ACRONYMS

- .1 Limestone 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 MS and MSb - Moderate sulphate-resistant cement.
 - .3 Type MH, MHb and MHL - Moderate heat of hydration cement.
 - .4 Type HE, HEb and HEL - High early-strength cement.
 - .5 Type LH, LHb and LHL - Low heat of hydration cement.
 - .6 Type HS and HSb - High sulphate-resistant cement.
- .2 Fly ash:

- .1 Type F - with CaO content less than 8%.
- .2 Type CI - with CaO content ranging from 8 to 20%.
- .3 Type CH - with CaO greater than 20%.

- .3 GGBFS - Ground, granulated blast-furnace slag.

- .4 SF - Silica fume with high silicon dioxide (SiO₂) content

- .5 N - Natural pozzolans

1.6 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with Section 01 32 16.07- Construction Progress Schedules - Bar (GANTT) Chart, convene pre-installation meeting one (1) week prior to beginning concrete works.

- .1 Ensure Departmental Representative, speciality contractor - finishing, forming and other key personnel attend.

1.7 SUBMITTALS

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

 - .2 At least four (4) weeks prior to beginning Work, provide Departmental Representative concrete mix design and product data that of the following materials proposed for use: aggregate source, curing compound, joint filler, joint sealant, and waterstops.

 - .3 At least four (4) 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
 - .4 Admixtures.
 - .5 Aggregates
 - .6 Water

 - .4 At least (4) weeks prior to commencing concrete work submit to Departmental Representative a Thermal Control Plan for including heat-of hydration testing results, insulating and curing periods, shrinkage cracks prevention, thermocouples
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installation, etc.

- .5 Do not proceed without written approval from Departmental Representative when deviations from mix design or parameters are found.
- .6 At least two (2) weeks prior to beginning Work, provide Departmental Representative a cold weather protection plan for concrete.
- .7 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - EXECUTION.
- .8 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time for concrete to be delivered to site of Work and discharged after batching.

1.8 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00- Quality Control.
 - .2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
 - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
 - .3 Minimum four (4) weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
 - .1 Falsework erection.
 - .2 Hot weather concrete.
 - .3 Cold weather concrete.
 - .4 Mass concrete
 - .5 Curing.
 - .6 Finishes.
 - .7 Formwork removal.
 - .8 Joints.
 - .9 Waterstop installation.
 - .10 Maintaining an environment for concrete curing.
 - .4 Ensure that mix design is adjusted suitably to
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prevent alkali aggregate reactivity problems. Refer to CSA A23.1-14 Annex B Alkali-Aggregate Reaction. Submit test data to ensure the following:

- .1 Use of proven non-reactive aggregates.
- .2 Use of a low-alkali hydraulic cement.
- .3 Use of supplementary cementing materials or other admixtures in adequate quantities in the concrete with such materials are proven effective in mitigating the detrimental effects of the reaction.
- .5 Refer to CSA A23.1-14 8.8 Low Shrinkage Concrete and provide testing in accordance with CSA A23.2-21C. The shrinkage of the proposed mix after 28 days of drying (at the concrete age of 35 days) shall not be greater than 0.040%.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
 - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to be submitted for review by Departmental Representative.

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 - GENERAL.

2.3 MATERIALS

- .1 Portland Cement: to CSA A3001, Type GU.
- .2 Supplementary cementing materials: Fly Ash Type F or CI as per CSA A3001.
- .3 Water: to CSA A23.1 Table 9 and Clause 4.1.1.2.

- .4 Aggregates: to CSA A23.1/A23.2. 20mm and 40mm Normal density coarse aggregates.
- .5 Admixtures:
 - .1 Air entraining admixture: to ASTM C260.
 - .2 Chemical admixture: to ASTM C494. & CAN3-A266.2, Type WN. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
 - .3 Superplasticizers: to ASTM C1017

2.4 MIXES

- .1 Provide the following concrete mixes:
 - .1 C-1 (modified) 20 mm aggregate
 - .2 C-1 (modified) 40 mm aggregate
 - .3 U-Fill
 - .4 Additional mixes as required for hot weather concreting, cold weather concreting and low heat of hydration mix to meet the requirements of Table 20 and Clause 8.5.5 of CSA A23.1.
 - .2 Proportion concrete mix in accordance with CSA A23.1-14. Modifications to the mix design are with accordance to the requirements ACI 350M-06 Section 4.6 Protection Against Erosion.
 - .3 Cast-in-place concrete: Exposure Class F-1 (modified).
 - .1 0.45 Maximum water-cement ratio.
 - .2 Hard dense aggregate.
 - .3 20 mm nominal maximum aggregate size (sections up to 1000 mm in thickness).
 - .4 40 mm nominal maximum aggregate size (sections thicker than 1000 mm). Elements thicker than 1000 mm are considered "mass concrete" as per requirements of clause 7.5.3 of CSA A23.1-14.
 - .5 Slump range 50 to 100 mm (without superplasticizers).
 - .6 35 MPa within 56 days (achieve 30 MPa within 28 days).
 - .7 Air content per CSA A23.1-14.
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2.5 NON-SHRINK NON-METALLIC GROUT .1 Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents to CSA A23.1.

.2 Compressive strength minimum 48 MPA at 28 days.

PART 3 - EXECUTION

2.5 PREPARATION

.1 Obtain Departmental Representative's written approval before placing concrete.

.1 Provide 48 hours minimum notice prior to placing of concrete.

.2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 Obtain approval of all embedded items in concrete prior to pouring of concrete.

.4 Prepare all surfaces for receiving concrete prior to setting forms to satisfaction of the Departmental Representative. Minimum expectations are as follows:

.1 Green cut concrete surfaces to receive subsequent concrete lifts to a 5 mm amplitude 24 hrs following initial concrete placement.

.2 Surface free of debris, construction materials etc.

.3 Surfaces (concrete or rock) saturated such that they are a Saturated Surface Dry (SSD) condition.

.4 Surfaces above 5 deg C.

.5 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.6 Pumping of concrete is permitted only after approval of equipment and mix.

.1 Loss of entrained air due to pumping shall be confirmed and the batched properties adjusted to provide the specified entrained air at deposition into the formwork.

.7 Ensure formwork, reinforcement, ties and inserts

are not disturbed during concrete placement.

- .8 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .9 Protect previous Work from staining.
- .10 Clean and remove stains prior to application for concrete finishes.
- .11 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, workability, air content, temperature and test samples taken.
- .12 Do not place load upon new concrete until authorized by Departmental Representative.

2.6 INSTALLATION/ APPLICATION

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
 - .2 Sleeves and inserts:
 - .1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.
 - .2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
 - .3 Sleeves and openings greater than 100 x 100 mm not indicated must be reviewed by Departmental Representative.
 - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.
 - .5 Confirm locations and sizes of sleeves and openings shown on drawings.
 - .6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
 - .3 Anchor bolts:
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- .1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
- .2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Departmental Representative.
 - .1 Formed holes: to manufacturers' recommendation.
 - .2 Drilled holes: to manufacturers' recommendations.
- .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
- .4 Set bolts and fill holes manufacturers' recommendations.
- .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .6 Grout colour to be similar to surrounded concrete

- .4 Drainage holes and weep holes:
 - .1 Form weep holes and drainage holes in accordance with Section 03 10 00- Concrete Forming and Accessories. If wood forms are used, remove them after concrete has set.
 - .2 Install weep hole tubes and drains as indicated.
- .5 Grout under base plates [and machinery] using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.

- .6 Finishing and curing:
 - .1 Refer also to Section 03 35 00 - Concrete Finishing.
 - .2 Meet or exceed the requirements of CSA A23.1-14.
 - .3 Install formwork liner on vertical elements to prevent moisture loss.
 - .4 Curing Type 3 for all cast-in-place concrete. This requirement is the most stringent in CSA A23.1-14 and shall be followed. Consideration will not be given to any requests that reduce the curing period.
 - .5 During curing period, uncover only such areas that are immediately needed for finish treatment. Recover and continue curing.

2.7 COLD WEATHER PROTECTION

- .1 For concrete placed when air temperature is at or below 5 degrees Celsius, in addition to cold weather requirements of CAN/CSA-A23.1:
 - .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

- .2 Maintain concrete or grout at following curing temperatures:
 - .1 For an initial 3 days, at a temperature of not less than 15 degrees Celsius nor more than 27 degrees Celsius at concrete surfaces.
 - .2 Cure at not less than 10 degrees Celsius for an extra 4 days.
 - .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.
- .3 Submit shop drawings for the heating and hoarding in accordance with Section 01 33 00 - Submittal Procedures

2.8 HOT WEATHER REQUIREMENTS

- .1 During hot weather place concrete to hot weather requirements of CAN/CSA-A23.1

2.9 BONDING AGENT

- .1 Apply two coats of bonding agent on all sawcut faces.
- .2 Follow the manufacturer's instructions for application

2.10 FIELD QUALITY CONTROL

- .1 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory approved by Owner for review to CSA A23.2-14.
 - .1 Ensure testing laboratory is certified to CSA A283.
- .2 Contractor will pay for costs of quality control testing.
- .3 Departmental Representative may conduct and pay for its own additional quality assurance testing.
- .4 If tests do not meet requirements of the Departmental Representative, take such measures as indicated in CSA A23.1 Clause 4.4.6

- .5 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.
 - .6 Contractor to submit a quality control plan to the Departmental Representative detailing proposed method of preventing cracking due to rapid shrinkage of the concrete.
 - .7 Cold Weather Concreting
 - .1 Additional test cylinders taken during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent for a minimum period of 72 hours.
 - .2 The Contractor must have maximum-minimum thermometers installed in accessible locations within the cold weather curing enclosure prior to pouring for the Departmental Representative to inspect during the pour and curing period. Ensure thermometers are properly acclimatized to concrete pour temperature within the curing enclosure and reset immediately following the pour at start of curing period.
 - .8 Standard Strength Tests
 - .1 Provide concrete for one standard strength test consisting of 3 cylinders for each 100 m³ of concrete of each type placed in any day. If the amount placed, for each type of concrete is less than 100 m³ in a day, provide concrete for one standard strength test. One cylinder will be tested at 7 days and two at 28 days.
 - .2 Complete one standard strength test for each 25 m³ of each type in any day at the start of the project until satisfactory control is established and the proposed mix has been accepted in the field by the Departmental Representative. Whenever tests fall outside of the specified limits, the testing frequency shall revert to one test per each 25 m³ of concrete.
 - .9 Air Content Testing
 - .1 Every load or batch of concrete shall be tested until satisfactory control of the air content is established and fewer tests are required by the Departmental Representative and Owner as per
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Clause 4.4.4.1.1.1 of CSA A23.1. Whenever tests fall outside of the specified limits, the testing frequency shall revert to one test per load or batch until satisfactory control is re-established.

- .2 Air content shall be tested at the point of discharge at project initiation to ensure specified air content is achieved with losses due to concrete pumping.

2.11 REPAIR OF DEFICIENT CONCRETE

- .1 Cracks (<0.3 mm)
 - .1 Follow manufacture application procedures as it may vary from the procedure implied below.
 - .2 Achieve a concrete surface profile (CSP) of CSP 3 as per the International Concrete Repair Institute (ICRI).
 - .3 Install flexible cementitious waterproofing to a saturated dry surface or saturated damp surface.
 - .4 Trowel and brush two coats to a build of 1.6 to 3 mm layer.
 - .5 Embed reinforcing fabric within the waterproofing along length of crack.
- .2 Cracks (0.3 mm to 6 mm):
 - .1 Epoxy crack inject cracks with low viscosity adhesive.
 - .2 Follow manufacture application procedures as it may vary from the procedure implied below.
 - .3 Set appropriate injection ports based on system used.
 - .4 Pressure inject at the lowest point and continue until there is an appearance of the resin at an adjacent port, thus indicating travel. Continue the procedure until all pressure injectable cracks have been filled.
 - .5 All packers shall be removed after injection is complete and all injection holes shall be patched with polymer modified repair mortar.
 - .6 Waterproof along length of crack and injection port holes with cementitious waterproofing and fabric reinforcement as described above in Section 3.8.1.
- .3 Cracks > 6 mm, honeycombing or deficient concrete areas:
 - .1 25 mm deep saw-cut at perimeter of deficient area.
 - .2 Remove deficient, unsound or delaminated concrete around reinforcing steel (if encountered).
 - .3 Prepare surface to ICRI CSP-4 or higher and apply bonding agent.
 - .4 Form and place polymer modified cementitious

material.

- 2.12 CLEANING
- .1 Cleaning of concrete equipment to be completed in accordance with Section 01 35 43.
 - .2 Divert unused concrete materials from landfill to local quarry or facility after receipt of written approval from Departmental Representative.
- 2.13 CONCRETE POUR RELEASE FORM
- .1 The Contractor shall obtain and document all concrete pours approval.

END OF SECTION

PART 1- GENERAL

1.1 REFERENCES

- .1 ASTM
 - .1 ASTM C309 Specification for Liquid Membrane Forming Compounds for Curing Concrete.
 - .2 ASTM E1155M Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20, Surface Sealer for Floors.
 - .2 CGSB 51 GP 51M Polyethylene Sheet for Use in Building Construction.
- .3 CSA International
 - .1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

1.2 ACTIONS AND
INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 ENVIRONMENTAL
REQUIREMENTS

- .1 Work area:
 - .1 Make work area water tight protected against rain and detrimental weather conditions.
- .2 Temperature:
 - .1 Maintain ambient temperature of not less than 10 degrees C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .3 Moisture:
 - .1 Ensure concrete substrate is within moisture limits prescribed by manufacturer.

1.4 DELIVERY, STORAGE AND
HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
 - .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 21.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Curing Compound:
 - .1 ASTM C309, Type 2.
 - .2 Combination curing and sealing compound: ASTM C309; Clear, non-yellowing compound.
- .2 Floor Hardener:
 - .1 Nonmetallic and non-coloured floor hardener: Premixed blend of mineral aggregates and densifying agents, and Portland cement, shake on type; Durag Premium by Sternson Ltd.; Diamag 7 by Sika Canada Inc., Maximent by Master Builders Technologies, Ltd.; Surflex by Euclid Admixture Canada, Inc.; or Quartz Tuff by Dayton Superior Canada Limited.
- .3 Surface Sealer:
 - .1 Clear, liquid surface hardener and dustproofer; Florseal by Sternson Ltd; Sealhard 400 by Sika Canada Inc., Floor Seal by Euclid Admixture Canada, Inc., or Day Chem Sure Hard (J 17) by Dayton Superior Canada Limited.
- .4 Wet Curing materials:
 - .1 Non staining waterproof curing paper, burlap, or canvas coverings.

PART 3 - EXECUTION

3.1 DEFECT REPAIRS

- .1 General
 - .1 Provide smooth form finish in accordance with CSA A23.1.
 - .2 Remove face formwork as soon as practical to facilitate repair of surface defects. Surface defects include formwork tie holes, bugholes with nominal diameter or depth greater than 6 mm, honeycomb and defective concrete, fins,

- projections, irregularities, offsets, spalled corners, and other defects.
- .3 Avoid damaging corners and keep edges sharp.
- .2 Formwork Tie Holes:
 - .1 Cut formwork ties 25 mm from surface of concrete.
 - .2 Make edges of depressions sharp.
 - .3 Fill depressions with pre-blended non shrink non-ferrous grout of same colour as the concrete for exposed concrete surfaces.
- .3 Irregularities:
 - .1 Grind smooth fins, projections, irregularities, and offsets, including those at visible construction joints.
 - .2 Where irregularities and offsets cannot be remedied by grinding, chip concrete surface sufficiently deep and apply thoroughly bonded pre-blended non shrink non-ferrous grout in similar procedure for repair of honeycomb and defective concrete.
- .4 Surface Depressions:
 - .1 Fill bugholes, and other surface depressions with a sand cement mortar to match the surface of surrounding concrete.
- .5 Spalled Corners:
 - .1 Use repair materials of similar appearance and strength as the surrounding concrete to reconstruct corner to match adjacent corners.
- .6 Honeycomb and Defective Concrete:
 - .1 Do not repair honeycomb and defective concrete until reviewed by Departmental Representative and permission granted to proceed with the repair work.
 - .2 Remove honeycomb and defective concrete down to sound concrete with edges slightly undercut or perpendicular to the surface. Remove a minimum depth of 25 mm. No feather edges are permitted.
 - .3 Pre-dampen patch area.
 - .4 Use pre-blended non shrink non-ferrous grout of same colour as the concrete for exposed concrete surfaces.
 - .5 Use bonding agents in patching work.
 - .6 Patch surface slightly higher than the surrounding concrete.
 - .7 Wet cure patches to equivalent of 10 days minimum.
 - .8 When patched surface has hardened, rub surface with carborundum brick to a true surface, free from streaks, discolourations, and other

imperfections, to match flush with surrounding concrete.

3.2 CONCRETE FINISHING

- .1 Concrete Finish:
 - .1 Use only rough plywood formwork.
 - .2 Use procedures as noted in CSA A23.1/A23.2 to remove excess bleed water during wet finish operations. Ensure surface of concrete is not damaged during bleed water removal.
 - .3 On completion thoroughly wash the surfaces with clean water.
- .2 Related Unformed Surfaces:
 - .1 Finishing, for 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. No additional water shall be used to facilitate finishing
 - .2 Provide a flat board screed finish for tops of piers, walls or buttresses, horizontal offsets, and similar unformed surfaces occurring in units cast in forms to a texture consistent with that specified for the formed surface unless some different finish is specified elsewhere.
- .3 Underside Elevated Slab Finish:
 - .1 After forms are removed grind off projections and patch defective areas.
- .4 Slabs or Floor Surfaces:
 - .1 Provide a flat board screed finish. Troweled edges will not be permitted.
 - .2 Ensure slabs and floor surfaces are sealed prior to applying the flat board screen finish.
- .5 Water Passages
 - .1 For exposed surfaces and surfaces that will conduct low velocity water flow (unformed roadway sections). After the concrete has hardened sufficiently, the concrete finish shall be floated by hand or machine sufficiently only to produce a uniform surface free from screed marks.
- .6 Construction Joints
 - .1 Green cut concrete surfaces to receive subsequent concrete lifts to a 5 mm amplitude 24 hrs following initial concrete placement.

3.3 CURING CONCRETE

- .1 Refer to 03 30 00 Cast-in-place Concrete for curing requirements.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 35 46 - Environmental Procedures
- .3 Section 01 45 00 - Quality Control
- .4 Section 03 10 00 - Concrete Forming and Accessories
- .5 Section 03 20 00 - Concrete Reinforcing
- .6 Section 03 30 00 - Cast-In-Place Concrete

1.2 MEASUREMENT PROCEDURES

- .1 Measure precast elements in units supplied, delivered, stored and erected.
- .2 Precast elements measured as individual units, will include cost, supply, delivery, storage and erection of bearing assemblies, anchor bolts, transverse connections and field grouting of grout keys between precast members.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283-06-R2016, Qualification Code for Concrete Testing Laboratories.
 - .3 CAN/CSA-A23.5, Supplementary Cementing Materials.
 - .4 CAN/CSA-A362, Blended Hydraulic Cements.
 - .5 CAN/CSA-A363, Cementitious Hydraulic Slag.
 - .6 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .7 CAN/CSA-A3001-08, Cementitious Materials for Use in Concrete.
 - .8 CAN/CSA G40.21, Structural Quality

Steels.

- .9 CAN/CSA G30.18, Billet Steel Bars for Concrete Reinforcement.

1.4 PERFORMANCE REQUIREMENTS

- .1 Tolerance of precast elements to CSA-A23.1/A23.2-14 and as specified on the drawings.
- .2 Length of precast elements not to vary from design length by more than plus or minus 10 mm.
- .3 Cross sectional dimensions of precast elements not to vary from design dimensions by more than plus or minus 10 mm.

1.6 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 At least four (4) weeks prior to commencing concrete work submit to EDCJV 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
 - .4 Admixtures.
 - .5 Aggregates
 - .6 Water
- .3 Do not proceed without written approval from EDCJV when deviations from mix design or parameters are found.
 - .1 At least four (4) weeks prior to beginning Work, provide EDCJV Camber.
 - .2 Finishing schedules.
 - .3 Methods of handling and erection.
 - .4 Openings, sleeves, inserts and related reinforcement.

1.7 QUALITY ASSURANCE

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

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle and store precast units according to manufacturer's instructions and CSA A23.1/A23.2-14.
- .2 Protect unit corners from contacting earth to prevent from staining.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Portland cement: to CSA A3001, Type GUb.
- .2 Supplementary cementing materials: Type S, type CI or combination as per CSA A3001 and CSA A23.1/A23.2
- .3 Water: to CSA A23.1 Table 9 and Clause 4.1.1.2.
- .4 Aggregates: to CSA A23.1/A23.2. 20mm Normal density washed coarse aggregates.
- .5 Admixtures:
 - .1 Air entraining admixture: to ASTM C260.
 - .2 Chemical admixture: to ASTM C494. & CAN3-A266.2, Type WN
- .6 Galvanizing: hot dipped galvanizing with minimum zinc coating of 610 g/m² to CAN/CSA-G164.
- .7 Bearing pads: smooth, 9 mm fabric reinforced elastomeric.
- .8 Bearing pads: neoprene, 9 durometer hardness to ASTM D 2240, moulded to size or cut from moulded sheet.

2.2 MIXES

- .1 Provide the following concrete mixes:
 - .1 C-1 (modified) 20 mm aggregate
 - .2 Additional mixes as required for hot weather concreting, cold weather concreting and low heat of hydration mix to meet the requirements of Table 20 and Clause 8.5.5 of CSA A23.1-14.

2.3 FINISHES

- .1 Refer to EDCJV Schedule A - Scope of work for finishes

PART 3 - EXECUTION

3.1 ERECTION

- .1 Do precast concrete work in accordance with latest edition of CSA-A23.4 and CSA-A23.3.
- .2 Erect precast elements within allowable tolerances as indicated in Section 1.4
- .3 Set elevations and alignment between units to within allowable tolerances before connecting

units.

- .4 Do not grout under elastomeric pads.
- .5 The use of eye bolts or hauling holes for hauling operations is not permitted.

3.2 VERIFICATION

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in Part 2 - Products, by EDCJV and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- .1 Specification requirements for the supply, delivery and installation of miscellaneous steel components required, including attachments, welds, studs, stiffeners, anchors, fasteners or other fixtures and hardware as indicated.
- .2 The work includes but is not necessarily limited to the supply and installation of:
 - .1 Stoplog sills
 - .2 Stoplog gains
 - .3 Half Stoplog
 - .4 Aluminum Stoplog gain covers
 - .5 Railings and gates
 - .6 Jacking Brackets
 - .7 Stoplog winch supporting rails
 - .8 Stoplog rests (rail slides).

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .3 ASTM A153/A153M-16a, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .4 ASTM A193 / A193M - 16 Standard Specification for Alloy-Steel and Stainless Steel Bolting
 - .5 ASTM A194 / A194M - 11 Standard Specification for Carbon and Alloy Steel Nuts for Bolts
 - .6 ASTM A325M-14, Standard Specification for Structural Bolts
 - .7 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 CSA International
 - .1 CSA G40.20/G40.21-13 (R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA S16-09, Design of Steel Structures.
 - .3 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .4 CSA W59-13, Welded Steel Construction (Metal Arc Welding) Metric.

.3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for sections, pipe, bolts, plates, tubing and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 43- Environmental Procedures and 01 35 29.06- Health and Safety Requirements.
 - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.

.3 Shop Drawings:

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario.
- .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
 - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
-

.3 Storage and Handling Requirements:

- .1 Store materials in dry location indoors off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 350W.
- .2 Steel pipe: to ASTM A53/A53M standard weight galvanized finish.
- .3 Aluminum sections and bars: Grade 6061 or 6063.
- .4 Welding materials: to CSA W59.
- .5 Welding electrodes: to CSA W48 Series.
- .6 Bolts: to ASTM A325M
- .7 Anchor bolts and studs, and nuts (to concrete): Stainless Steel Type 304, to ASTM 193 Grade B8, and ASTM A194 Grade 8 respectively unless specified otherwise.
- .8 Fasteners: lag screws to be stainless steel Type 304 unless otherwise specified.

2.2 WINCH TROLLEY RAIL AND ASSEMBLY

- .1 Winch trolley rail: ASCE 40-lb/yd. rail, to manufacturer's specifications and tolerances, supplied in 10.6m lengths (minimum). Rails ends to be predrilled for splice bar connection.
- .2 Rail to be supplied with splice bar connectors, fastening bolt, hold down clips and shim, winch stop and stainless steel fastening lag screws.

2.3 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
 - .2 Where possible, fit and shop assemble work, ready for erection.
-

- .3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.4 FINISHES

- .1 Painting: All Steel components will receive a painted protective coating unless noted otherwise, in accordance with Section 09 97 19 - Painting Exterior Metal Surfaces.
- .2 Galvanizing, where specified (Half Stoplog): hot dipped galvanizing with zinc coating 600 g/m2 to ASTM A123/A123M-15.
 - .1 Touch-Up Primer for Galvanized Finish: SPCC - Paint 20 Zinc-Rich Primer Type I Inorganic.
 - .2 Bolts are to be hot dipped galvanized to ASTM A153/A153M-16, unless otherwise specified.
- .3

2.5 HANDRAILS

- .1 Handrails and installation in accordance with Section 05 52 16 - Handrails.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 ERECTION

- .1 Do welding work in accordance with CSA W59 unless otherwise specified.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections. The various elements shall be securely fixed and adequately braced to ensure precise location and to avoid any warpage,

misalignment or deformation during erection.

- .3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Weld field connection or Make field connections with bolts to CSA S16.
- .7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.
- .8 Touch-up field welds, bolts and burnt or scratched surfaces after completion using:
 - .1 Touch-Up Paint per manufacturer specifications.
 - .2 Touch-Up Primer for Galvanized Finish: SPCC - Paint 20 Zinc-Rich Primer Type I Inorganic.
 - .3 Pre-treat damaged surfaces as per manufacturer's instructions.

3.3 CLEANING

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

3.4 PROTECTION

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

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Material fabrication and installation of handrails including gates as shown on the Contract drawings

1.2 RELATED REQUIREMENTS

- .1 Section 05 12 23 - Structural Steel
- .2 Section 05 50 00 - Metal Fabrication
- .3 Section 09 97 19 - Painting Exterior Metal Surfaces

1.3 MEASUREMENT AND PAYMENT PROCEDURES

- .1 No separate measurement for payment shall be made for handrails. Include cost in 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 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .3 ASTM A153/A153M-09a, Standard Specification for Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Hardware.
 - .4 ASTM A193 / A193M - 11a Standard Specification for Alloy-Steel and Stainless Steel Bolting
 - .5 ASTM A194 / A194M - 11 Standard Specification for Carbon and Alloy Steel Nuts for Bolts
 - .6 ASTM E935-00(2006), Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
 - .7 ASTM A325M-09, Standard Specification for Structural Bolts,
 - .8 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 CSA International
 - .1 CSA G40.20/G40.21-13 (R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

	.2	CSA W59M-13, Welded Steel Construction, (Metal Arc Welding)
	.3	National Research Council Canada (NRC)
	.1	National Building Code of Canada (NBC) - 2015.
	.2	Ontario Building Code (OBC) 2016
<u>1.5 ACTION AND INFORMATIONAL SUBMITTALS</u>	.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 handrails and include product characteristics, performance criteria, physical size, finish and limitations.
	.2	Submit manufacturer's installation instructions with project specific annotations to suit project conditions.
	.3	Shop Drawings:
	.1	Submit shop drawings stamped and signed by professional engineer registered or licensed in Province of Ontario.
	.1	Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
	.2	Indicate installation of handrails including but not limited to plans, elevations, sections, details of components, anchorage details and clearances to adjacent assemblies. Indicate critical field dimensions and conflicts.
	.3	Indicate installation conditions at obstructions or at junction with adjacent construction as necessary to provide continuity of protection.
<u>1.6 QUALITY ASSURANCE</u>	.1	Perform welding to CSA W59 by a certified welder.
<u>1.7 DELIVERY, STORAGE AND HANDLING</u>	.1	Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
	.2	Delivery and Acceptance Requirements:
	.1	Deliver products to site in original factory packaging, labelled with manufacturer's name

- and address, and list of contents of each package.
- .2 Inspect products for any damage or deformation. Remove damaged products from site and replace with matching undamaged products.
- .3 Check package contents list against submitted parts list to ensure all components necessary for a complete installation have been delivered.

- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location off ground indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect handrail from all damage. Protect finish from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

- .4 Construction and packaging waste management: in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

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|----------------------------------|----|--|
| <u>2.1 STEEL HANDRAIL SYSTEM</u> | .1 | Rails and Posts: square steel tubing as detailed on Contract drawings. |
| | .2 | Mounting: adjustable brackets and flanges, with steel plates for mounting to steel members and concrete. |
| | .3 | Steel sections and plates: to CSA G40.20/G40.21, Grade 350W. |
| | .4 | Bolts: to ASTM 325/A325M unless otherwise specified. |
| | .5 | Anchor Bolts: to AISI 304 Stainless Steel, complete with epoxy injected adhesive unless otherwise specified. |
| | .6 | Splice Connectors: steel welding collars. |
| | .7 | Paint System - Section 09 97 19 - Painting Exterior Metal Surfaces. |
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2.2 FABRICATION

- .1 Fit and shop assemble components in largest practical sizes for delivery to site.
- .2 Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- .3 Provide anchors bolts, plates, angles required for connecting railings to structure.
- .4 Exposed Mechanical Fastenings: flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
 - .1 Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
 - .2 Continuously seal joined pieces by intermittent welds and plastic filler continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 - .3 Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
 - .4 Accurately assemble components to each other and to building structure as per Shop drawings.
 - .5 Accommodate for expansion and contraction of members and structure movement without damage to connections or members.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- .1 Supply items required to be cast into concrete with setting templates, to appropriate locations.

3.3 INSTALLATION

- .1 Install picket type handrails in accordance with shop drawings.
- .2 Install components plumb and level, in proper alignment with adjacent assemblies.
 - .1 On inclined surfaces, posts and pickets are to be vertical.
- .3 Anchor railing to structure with anchors bolts at concrete and structural bolts at steel members including all plates and angles.
- .4 Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- .5 Assemble with spigots, sleeves and set-screws to produce secure, vibration-resistant installation.

3.4 ERECTION TOLERANCES

- .1 Maximum Variation from Plumb: 6 mm
- .2 Maximum Out-of-Position: 6 mm

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for disposal and recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

3.6 PROTECTION

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 35 43 - Environmental Procedures
- .3 Section 01 61 00 - Common Product Requirements
- .4 Section 01 74 20 - Construction Waste Management
- .5 Section 05 50 00 - Metal Fabrications

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 CSA International
 - .1 CSA B111-74 (R2003), Wire Nails, Spikes and Staples.
 - .2 CAN/CSA O80 Series-08, Wood Preservation.
 - .3 CSA O86-09, Engineering Design in Wood.
 - .4 CAN/CSA-Z809-08, Sustainable Forest Management.
- .3 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
 - .2 FSC-STD-20-002-2004, Structure and Content of Forest Stewardship Standards V2-1.
 - .3 FSC Accredited Certified Bodies
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2014.

1.3 ACTION AND
INFORMATIONAL SUBMITTALS

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

- .1 Submit manufacturer's instructions, printed product literature and data sheets for wood timbers and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 43- Environmental Procedures and 01 35 29.06- Health and Safety Requirements.

.3 Shop Drawings:

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario.

.4 Samples:

- .1 Prepare sample of typical stoplog machined end and U bolt installation for approval of Departmental Representative.

Certifications: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.

1.4 QUALITY ASSURANCE

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Each piece of treated lumber to be identified by CSA 0322 certified stamp

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wood timbers from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Stop logs Timber: Select Structural grade Douglas Fir, rough lumber, full sawn, with lifting "U" bolts. Sizes and Installation as indicated. Stop logs ARE NOT to be treated, with the exception of yellow paint. Timber grading to be in accordance with:
 - .1 Close Grain Select Structural in accordance with National Lumber Grading Association (NLGA)(2014), Standard Grading Rules for Canadian Lumber, Section 5, paragraph 130 and 130a, all to rough lumber, full sawn, and paragraph 711, rough with no wane.
 - .2 Rate of growth to be 10 rings per inch as per paragraph 350.
 - .3 Rough sawn, dimensions as specified;
 - .4 All lumber supplied is to be stamped showing the grade, species and grading agency, authorized by the Canadian Lumber Standards Administration Board;
 - .5 Mill certificate of grade must accompany each shipment;
 - .6 Ends of logs painted yellow to prevent checking;
 - .7 The top of the log is to be painted 300 mm on each end as well as 900 mm in the center of the log.
 - .8 Steel Lifting Bolts to be Cold Rolled Steel conforming to CSA G40.20-04.

PART 3 - Execution

3.1 EXAMINATION

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

3.2 STOP LOGS

- .1 Machine stop log ends and install galvanized U-bolts as detailed.

3.3 PROTECTION

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

END OF SECTION

PART 1- GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00- SUBMITTAL PROCEDURE.
- .2 Section 01 35 29.06- HEALTH AND SAFETY REQUIREMENTS.
- .3 Section 01 35 46- ARCHAEOLOGICAL, CULTURAL & ENVIRONMENTAL PROCEDURE.
- .4 Section 05 50 00 - METAL FABRICATIONS
- .5 Section 05 52 16 - HANDRAILS

1.2 REFERENCES

- .1 American Standard for Testing and Materials (ASTM)
 - .1 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A384 - 07(2013), Standard Practice for Safeguarding Against Warpage and Distortion during Hot-Dip Galvanizing of Steel Assemblies
 - .3 ASTM A385, Standard Practice for Providing High- Quality Zinc Coating (Hot-Dip)
 - .4 ASTM A780 - 09, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
 - .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-85.10-99, Protective Coatings for Metals.
 - .3 Color Chips Standard
 - .1 FED-STD-595C
 - .4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
 - .5 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual.
 - .2 Maintenance Repainting Manual.
 - .6 The Society for Protective Coatings (SSPC)
 - .1 SSPC-Vis 1-89, Visual Standard for Abrasive Blast Cleaned Steel (Standard Reference Photographs) Editorial Changes September 1, 2000 (Steel Structures Painting Manual, Chapter 2 - Surface Preparation Specs.).
 - .2 SSPC-SP 10/NACE No. 2-07, Near White Blast Cleaning.
 - .3 SSPC-PA 2-04, Measurement of Dry Coat Thickness with Magnetic Gauges.
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- .4 SSPC Good Painting Practices, Volume 1, 4th Edition.

1.3 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 painting and galvanizing exterior metal surfaces and including product characteristics, performance criteria, finish and limitations.
 - .2 Submit manufacturer's instructions, printed product literature and data sheets for protective coating for machined surface.
 - .3 Submit colour chips for all paints for color selection by the Departmental Representative, before purchase.
 - .4 Submit colour chips for all paints for color selection by the Departmental Representative, before purchase.
 - .5 Submit certification that the abrasive blast media meets the material requirements.
 - .6 At project completion provide the Departmental Representative an itemized list complete with manufacturer, paint type and color coding for all colors used.
 - .7 Submit qualifications of 3rd party coating inspector.
- .3 Test Reports:
 - .1 Submit test reports showing compliance with specified performance characteristics and physical properties and in accordance with Section 01 45 00 - QUALITY ASSURANCE AND QUALITY CONTROL.

PART 2- PRODUCTS

2.1 PAINTS

- .1 Conform to latest MPI requirements for painting work including preparation and priming.
 - .2 All components used in individual paint systems must be the product of a single manufacturer.
 - .3 Primer: Two components, high solids, low VOC, zinc-rich, epoxy primer.
 - .4 First coat: Two components, high build, high solids, aluminum pigmented surface tolerant, epoxy paint.
 - .5 Second coat: Two components epoxy paint.
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- .6 UV Protective coat: Acrylic polyurethane top coat.
- .7 Abrasive for Blast Cleaning: Non-metallic, non-silica, angular abrasive capable of producing surface profile or 2 mils minimum and to give angular anchor tooth pattern. If recycled blast media is used, maintain an appropriate particle size distribution so that specified profile is consistently obtained. Do not use steel shot or other abrasives that do not produce an angular profile.

PART 3 - EXECUTION

3.1 GENERAL

- .1 Paint or galvanize all permanent equipment to be supplied as specified hereafter.
 - .1 Handrail and Handrail Gates: To be painted black.
 - .2 Embedded Parts (Gains): Paint exposed surfaces black. Don't paint surfaces in contact with the concrete.
 - .3 Rails and Miscellaneous Parts: To be painted black.
- .2 Carry out all surface preparation and painting in the shop.
- .3 Touch-up at the site any area damaged during handling, transportation, and erection.

3.2 SURFACE PREPARATION AND PAINTING

- .1 Surface Preparation
 - .1 Remove weld spatter and smooth by grinding rough welds and sharp edges.
 - .2 Blast clean to SSPC-SP10 and inspect the surface with the help of type SA 2½ visual standard of SSPC-Vis.
- .2 Shop Painting; Required surface coating as follows:
 - .1 Embedded parts (Gains): Two (2) coats of epoxy paint, first coat paint and second coat paint as specified in item 2.1.4 and 2.1.5 respectively.
 - .2 Handrails and Handrail Gates: One (1) coat of primer, followed by two (2) coats of epoxy paints, and finish with one (1) protective UV Coat. Primer, first coat paint, second coat paint and UV protective coat as specified in item 2.1 above.
 - .3 Rails and Miscellaneous Parts: Same coating as for Handrails specified in 3.2.2.2.
 - .4 Paint colors as determined by Departmental Representative.
 - .5 Apply paint in conformity to temperature and

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- humidity application limits established by the manufacturers of the selected paints. Stop applying paint in case of predicted temperature decrease to 10°C.
- .6 Surface coating must be applied within a maximum of 8 hours after surface preparation described in item 3.2.1 above.
 - .7 Follow Manufacturer's recommended dry film thicknesses for the different coatings for their products, but the thicknesses given hereafter are minimums:
 - .1 Primer coat dry film thickness: 50-80 microns (2 to 3.5 mils).
 - .2 Each coats of epoxy paint must be applied in one pass having a dry film thickness of 100-150 micron (4 to 6 mils).
 - .3 UV Protective coat dry film thickness: 50-80 microns (2 to 3.5 mils).
 - .8 Assure uniform coating and avoid any excess of paint due to local accumulations and drips.
 - .9 If problems of excess paint arise and no action is taken to improve the method of application, the Departmental Representative can require removing all paint and repainting at no extra cost.
 - .10 Calibration of instrument, measurement of the dry film thickness and the acceptance criteria to conform to SSPC-PA2 standard.
 - .11 Spray paint contact surfaces of field assembled, bolted, friction type joints with primer coat only. Do not brush primer after spraying.
 - .12 Do not paint metal within 50 mm of edge to be welded. Give unprotected steel one coat of boiled linseed oil or other approved protective coating after shop fabrication is completed. Clean and finish painting after completion of welds in the field.
 - .13 Protect machine finished or similar surfaces that are not to be painted but that do require protection, with coating of rust inhibitive petroleum, molybdenum disulphide, or other approved coating.
- .3 Paint Touch-ups
- .1 Prepare surface by power tool according to the requirements of standard SSPC-SP3 and visually inspect according to the requirements of standard ST-3 of SSPC-Vis 1.
 - .2 In the case of major retouching to be done on site, the Departmental Representative may require sand blasting for the surface preparation.
 - .3 Provide 20 litres supply of the same paint (finishing coat) as the used previously in order to proceed with these touch-ups.
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.4 Inspection

- .1 The contractor is responsible for quality control. Engage the service of 3rd party inspector certified by "NACE International Institute or SSPC" to perform the appropriate inspection.
- .2 Surface preparation inspection to be done immediately prior to paint application in the presence of the 3rd party inspector. The Departmental Representative may also be present to witness the inspection.
- .3 Upon completion of the painting procedures test for dry film reading and evaluate the results as per SSPC- PA 2.
- .4 Submit copies of all inspection reports.

3.3 GALVANIZING

.1 Surface preparation

- .1 Clean all surfaces to be galvanized from all traces of oil, grease or other contaminant with solvent in conformity with SSPC SP1 Standard, then acid treat it in conformity of SSPC-SP8 Standard.
- .2 Remove weld spatter and smooth by grinding rough welds and sharp edges.
- .3 All surfaces must be dry, exempt of oil, rust, grease, weld spatter, dirt, etc. before galvanization.

.2 Galvanizing

- .1 Galvanizing to be performed in conformity to ASTM A123, ASTM A384 and A385 Standards and to the requirements of the present specification.
- .2 No other fabrication is allowed after galvanizing.
- .3 Surfaces must be smooth and clean.
- .4 Zinc coat must be even, and its thickness must be such that the minimum weight of the zinc coat is not less than 610 g/m².

.3 Inspection

- .1 Inspect visually all surfaces after galvanizing to detect any defects and deficiencies.
- .2 Check the Zinc thickness on each component or on representative samples.
- .3 Measure Zinc thickness in conformity of one of the methods stipulated in ASTM A123 Standard.

.4 Touch-ups

- .1 Carry out touch-ups with cold galvanizing compound in conformity to ASTM A780 Standard.

3.4 PROTECTION

- .1 Protect painted surfaces from damage during construction.
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- .2 Protection of surfaces:
 - .1 Protect surfaces not to receive paint.
 - .2 Prevent contamination of cleaned surfaces by salts, acids, alkalis, corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats of paint. Remove contaminants from surface and apply paint immediately.
 - .3 Protect cleaned and freshly painted surfaces from dust.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 This section specifies requirements for both permanent and temporary safety signage for public safety and navigation.

1.2 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 41 00 - Regulatory Requirements
- .3 Section 01 74 20 - Construction / Demolition Waste Management and Disposal
- .4 Section 05 12 23 - Structural Steel

1.3 MEASUREMENT AND
PAYMENT PROCEDURES

- .1 There shall be no separate measurement for payment for temporary and permanent signs. Include cost in the Contract Lump Sum Price.
- .2 Payment shall be made as set out in Section 01 22 01 - Measurement and Payment and shall be included in the applicable item of work for signage.

1.4 REFERENCE STANDARDS

- .1 American Association of State Highway and Transportation Officials (AASHTO)
 - .1 Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals (5th Edition).
 - .2 ASTM International
 - .1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A276-10, Standard Specification for Stainless Steel Bars and Shapes.
 - .3 ASTM B209M-10, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric].
 - .4 ASTM B210M-05, Standard Specification for Aluminum-Alloy Drawn Seamless Tubes [Metric].
 - .5 ASTM B211M-[03], Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire [Metric].
 - .3 Canadian Dam Association (CDA)
 - .1 Signage for Public Safety around Dams.
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- .4 Canadian General Standards Board (CGSB)
 - .1 CGSB 62-GP-9M-80, Prefabricated Markings, Positionable, Exterior, for Aircraft Ground Equipment and Facilities.
 - .2 CGSB 62-GP-11M-78, Marking Material, Retroreflective, Enclosed Lens, Adhesive Backing and Amendment.
- .5 CSA International
 - .1 CSA G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .6 Green Seal Environmental Standards (GS)
 - .1 GS-11-11, Paints and Coatings.
- .7 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for traffic signage, including product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario to Section 01 33 00 - Submittal Procedures.
 - .2 Indicate items as follows:
 - .1 Sign supporting structures
 - .2 Mounting requirements

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Undertake a pre-condition assessment of existing signage. Salvage existing signage as identified by the Departmental Representative. Replace damaged signage to the requirements specified herein. Salvage existing traffic safety signage and store for reuse.
 - .2 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
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- .3 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .4 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .5 Develop Waste Reduction Workplan related to Work of this Section.
- .6 Packaging Waste Management: remove for recycling and reuse of pallets, padding, packaging materials, crates as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/ Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

- .1 Sign supports to be capable of withstanding the combination of following loads:
 - .1 Wind loads in any direction of 1.7 kPa on signboards and on sign supports
- .2 Structural deflections and vibration in accordance with American Association of State Highway and Transportation Officials (AASHTO), "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals".

2.2 MATERIALS

- .1 Sign supports:
 - .1 Temporary Sign Supports:
 - .1 Sawn timber posts:
 - .1 Species: SPF
 - .2 Type: pressure treated CAN/CSA-080
 - .3 Grade and Dimensions: to contractor's specifications
 - .2 Permanent Sign Supports:
 - .1 Steel posts and base:
 - .1 Material: to CSA G40.20/G40.21
 - .2 Anchors and Connecting Bolts: threaded 'U' clamps and miscellaneous hardware to A36.
 - .3 Bolts: to ASTM A325/A325M.
 - .4 Galvanization: to ASTM A123/A123M

- .3 Fasteners: bolts, nuts, washers and other hardware for signs to be galvanized steel.
- .2 Signboards
 - .1 Temporary Signboards
 - .1 Plywood: to CSA O121, 19 mm thick. Overlaid Douglas Fir, Medium Density CAN/CSA-Z809, FSC certified, overlaid one side only with fibre or plastic sheet surfacing material.
 - .2 Primer for plywood: to MPI #5 VOC limit of 350 g/L to SCAQMD Rule 1113.
 - .2 Permanent Signboards
 - .1 Refer to Parks Canada Agency Standards
 - .2 Aluminum sheet: to ASTM B209M, 3 mm thick sheets precut to required dimensions.
 - .3 Aluminum extrusions: 300 mm standard highway extruded panels (shape #73247) using aluminum alloy AA 6061-T5 or AA 6006-T5. Extruded panels to be supplied with all mounted hardware as required for proper assembly and installation.
 - .4 T-shape stiffeners for signboards: to ASTM B210M.
 - .5 Connecting straps and brackets: to ASTM B209M.
 - .6 Aluminum materials: to ASTM B209M.
 - .7 Primer for aluminum: to MPI # 8, VOC limit of GS-11 250 g/L.
 - .8 Reflective sheeting and tape: to CGSB 62-GP-11M. Adhesive, class of reflectivity and colour as indicated.
 - .1 All adhesive sheeting shall be cut using a computer controlled cutting system.

2.3 FABRICATION

- .1 Supports:
 - .1 Connect aluminum support members by welding in accordance with CSA W47.2. Work to be performed by Canadian Welding Bureau qualified members only. Flame cutting of members not permitted.
 - .2 Welds to be of same strength as adjacent member or casting.
 - .3 Reinforce in area of electrical hand holes to equal strength of full section member.
 - .4 Remove sharp edges and burrs.
- .2 Signboards:
 - .1 Plywood blanks:
 - .1 Cut plywood blanks to required shapes

- and dimensions. Fill edges with wood filler suitable for outdoor use and sand smooth.
- .2 Lightly sand surfaces, wipe clean with xylene thinner and allow to dry for 8 hours.
- .3 Spray signboard back and edges with one prime coat maximum VOC content 350 SCAQMD Rule 1113 GS-11 and two white finish coats in the same colour as the sign face.
- .2 Aluminum blanks:
 - .1 Pre-drilled for installation, finish and ensure all exposed edges and corners are de-burred and made smooth.
 - .2 Degrease, etch and bonderize with chemical conversion coating.
 - .3 Clean surfaces with xylene thinner. Dry.
 - .4 Pre-treatment of aluminum panels are to be in accordance to the pre-treatment manufacturer's specifications. Pre-treatment to meet AAMA 2605-05 (American Architectural Manufacturers Association).
 - .5 Power coating of sign surfaces:
 - .1 Electrostatic applied high performance architectural grade retro-reflective fluoropolymer based powder system meeting AAMA 2605-02;
 - .1 Minimum warranty period of 10 years;
 - .2 Maximum change of 5 Hunter units of Colour Integrity ASTM D2244;
 - .3 Minimum Gloss Retention of 50% ASTM D523.
 - .2 Powder coating to provide 100% coverage with a film thickness of 3 to 3.5 mil with 30 degrees of gloss and free of mechanical defects.
 - .6 Reflective background sheeting and lettering:
 - .1 Cut and apply in accordance with manufacturer's instructions.
 - .2 Apply adhesive coated material with heat lamp vacuum applicator or by squeeze roll application method. Apply pressure sensitive material with roller or squeegee.
 - .3 Edge wrap sheeting on each extrusion prior to bolting extrusions. Match pieces of sheeting from different rolls for each signboard to ensure uniform

- appearance and brilliance by day and night.
- .4 Reflective signboard faces may be prepared using silk screen transparent ink.
- .3 Non-reflective lettering and symbols: cut from vinyl film as specified in CGSB 62-GP-9M, or paint using required colour of finish paint maximum VOC of 350 g/L GS-11 or silk screen transparent ink.
- .4 Clean signboards completely and apply transparent tape over top edge and extending 25 mm minimum down back and front of signboard.
- .5 Protect finished signboard faces with one coat of clear varnish with maximum VOC limit of 350 g/L.
- .3 Sign identification:
 - .1 Apply sign number and date of installation with 25 mm high stencil painted black letters on lower left back face of each signboard.

PART 3 - Execution

3.1 INSTALLATION

- .1 Sign support:
 - .1 Erect supports as indicated. Permissible tolerance: 50 mm maximum departure from vertical for direct buried supports. Where separate concrete footings have been placed, erect posts with base plates resting on levelling nuts and restrained with nuts and washers. Permissible tolerance: 12 mm maximum departure from vertical.
 - .2 Coat underside of base plate with corrosion protective paint before installation. Connect shoe base to shaft with inside and outside fillet welds.
 - .3 Close open aluminum tubes and posts with aluminum cap. Cut oblong holes in shoe bases to drain condensation. Install aluminum bolt cover on each base plate restraining nut.
 - .4 Erect posts plumb and square to details as indicated.
- .2 Signboard:
 - .1 Fasten signboard to supporting posts and brackets as indicated.
 - .2 Fasten lane markers to signboard.
 - .3 Use strapping with crimped or bolted connections where signs fastened to utility poles.

.4 Use T-shape aluminum stiffeners to join portions of sign panel on site. Cover face of T-stiffener with material identical to face of sign panel.

.3 Traffic Signage:

.1 Install signage to the requirements of the local authority. As a minimum, install to the same conditions of the original signage.

3.2 CORRECTING DEFECTS

.1 Correct defects, identified by Departmental Representative, in sign message, consistency of reflectivity, colour or illumination. Correct angle of signboard and adjust luminaire aiming angle for optimum performance during night conditions to approval of Departmental Representative.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

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

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

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

.1 Carefully dismantle and salvage wood, aluminum and steel materials for recycling and reuse. Protect installed products and components from damage during construction.

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

.3 Deliver salvaged materials to facility approved by Departmental Representative.

3.4 PROTECTION

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

.2 Repair damage to adjacent materials caused by traffic signage installation and salvage operations.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 35 43 - Environmental Procedures
- .3 Section 01 45 00 - Quality Control
- .4 Section 01 61 00 - Common Product Requirements
- .5 Section 31 23 33.01 - Excavation, Trenching and Backfilling

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM D4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- .2 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 1001 - Material Specification for Aggregate - General (November 2005).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for aggregate materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit 3 samples.
 - .2 Allow continual sampling by Departmental Representative during production.
 - .3 Provide Departmental Representative with access to source and processed material for sampling.
 - .4 Supply new or clean sample bags or containers according appropriate to aggregate materials.
Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .2 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.
-

- .3 Storage: store washed materials or materials excavated from underwater 24 hours minimum to allow free water to drain and for materials to attain uniform water content.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
 - .1 Greatest dimension to exceed 5 times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
 - .1 Screenings produced in crushing of quarried rock, boulders, and gravel.
 - .2 No slag, or reclaimed pavement will be accepted.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
 - .1 Crushed rock.
 - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
 - .3 No slag, or reclaimed pavement will be accepted.
- .5 Class 3 Filter Material:
 - .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to [ASTM C136]. Sieve sizes to [CAN/CGSB-8.1].
 - .3 Table:

Sieve Designation	% Passing
	Class 3
75 mm	-
50 mm	-
37.5 mm	100
25 mm	-
19 mm	90-100

12.5 mm	-
9.5 mm	-
4.75 mm	75-100
1.18 mm	45-80
0.300 mm	10-55
0.150 mm	0-30
0.075 mm	0-5

.4 Coefficient of Uniformity (ASTM D6913) to be between 2 and 6. Coefficient of Curvature (ASTM D6913) to be between 1 and 3.

- 2.2 SOURCE QUALITY CONTROL .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks minimum before starting production.
- .2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.
- .3 Advise Departmental Representative four (4) week minimum in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

PART 3 - EXECUTION

- 3.1 PREPARATION .1 Aggregate source preparation:
- .1 Aggregate material is to be supplied from Ontario Ministry of Transportation approved source or alternative approved by Department Representative.
- .2 If requested by the Departmental Representative, submit Ontario Ministry of Transportation approval certificates/documentation of the proposed source of aggregates.
- .3 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as directed by Departmental Representative.
- .4 Where clearing is required, leave screen of trees between cleared area and roadways as directed.
-

- .5 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
 - .6 Trim off and dress slopes of waste material piles and leave site in neat condition.
 - .7 Provide silt fence or other means to prevent contamination of existing watercourse or natural wetland features.
 - .2 Processing:
 - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
 - .2 Blend aggregates, as required, in order to satisfy gradation requirements for material and, percentage of crushed particles, or particle shapes specified.
 - .1 Use methods and equipment approved in writing by Departmental Representative.
 - .3 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate gradation.
 - .4 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.
 - .1 Use only equipment approved in writing by Departmental Representative.
 - .5 Stockpiling:
 - .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces. Do not stockpile at the top of bank of any shorelines or slopes.
 - .2 Stockpile aggregates in sufficient quantities to meet project schedules.
 - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
 - .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
 - .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
 - .6 Do not use intermixed or contaminated
-

- materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.
- .7 Stockpile materials in uniform layers of thickness as follows:
 - .1 Maximum 1.5 m for coarse aggregate and base course materials.
 - .2 Maximum 1.5 m for fine aggregate and sub-base materials.
 - .3 Maximum 1.5 m for other materials.
 - .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
 - .9 Do not cone piles or spill material over edges of piles.
 - .10 Do not use conveying stackers.
 - .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .4 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.
- .5 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.
- .6 Restrict public access to temporary or permanently abandoned stockpiles by means acceptable to Departmental Representative.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- .1 This section specifies requirements for the clearing and grubbing of the work area as designated by the Departmental Representative.

1.2 RELATED REQUIREMENTS

- .1 Section 01 20 01 - Site Access
- .2 Section 01 33 00 - Submittal Procedures
- .3 Section 01 35 29.06 - Health and Safety Requirements
- .4 Section 01 35 43 - Environmental Procedures
- .5 Section 01 71 00 - Examination and Preparation
- .6 Section 01 74 11 - Cleaning
- .7 Section 01 74 21 - Construction / Demolition Waste Management and Disposal
- .8 Section 31 23 33.01 - Excavation, Trenching and Backfilling
- .9 Section 31 14 13 - Soil Stripping and Stockpiling
- .10 Section 32 01 90.33 - Tree and Shrub Preservation
- .11 Section 32 93 43.01 - Tree Pruning
- .12 Section 32 93 10 - Trees, Shrubs and Ground Cover Planting

1.3 MEASUREMENT AND PAYMENT PROCEDURES

- .1 There shall be no separate measurement for payment for clearing and grubbing or close cut clearing and underbrush clearing. Include cost in Contract Lump Sum Price.
- .2 Payment shall be made as set out in Section 01 22 01 and shall be incidental to all work related to all applicable items of work.

1.4 REFERENCE STANDARDS

- .1 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 201 - Construction Specification for Clearing, Close Cut Clearing, Grubbing and Removal of Surface and Piled Boulders, November 2007.

.2 OPSS 805 - Temporary Erosion and Sediment Control Measures (November 2010).

.2 Stormwater Management Planning and Design Manual, Ontario Ministry of Environment (March 2003).

.3 Erosion & Sediment Control Guideline for Urban Construction (December 2006)

1.5 ACTION AND INFORMATION SUBMITTALS

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

.2 Prepare and submit a Tree Protection Plan in accordance with Section 32 01 90.33

.3 Samples:

.1 Submit 1 sample of each material listed below for approval prior to delivery of materials to project site.

.2 Tree wound paint: one liter can with manufacturer's label.

.4 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Submit manufacturer's installation instructions.

1.6 DEFINITIONS

.1 Clearing consists of cutting off trees and brush vegetative growth to not more than a specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

.2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.

.3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.

.4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of all fallen timber and surface debris.

.5 Grubbing consists of excavation and disposal of stumps and roots, boulders and rock fragments of less than 1.0 m³, to not less than a specified

depth below existing ground surface. Mechanical stump cutting shall be used to avoid damage to adjacent structures.

- .6 Pruning consists of the removal of tree limbs and branches by qualified arborist to maintain a healthy tree.

1.7 QUALITY ASSURANCE

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06.
- .2 Safety Requirements: worker protection.
 - .1 Workers must wear gloves, respirators dust masks, long sleeved clothing, eye protection protective clothing.
 - .2 Clean up spills of preservative materials immediately with absorbent material and safely discard to landfill.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
- .2 All slash left from felling and clearing is to be chipped and stockpiled on site in a location as directed by the Departmental Representative
- .3 Felled timber is to be used for fuel wood.
 - .1 Trim limbs and tops, and saw into logs into lengths 2.4m for fuel wood.
 - .2 Stockpile adjacent to site in a location as directed by the Departmental Representative
- .4 Replace any trees if damaged, as directed by Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Herbicide: herbicide is not permitted on this project
 - .2 Soil Material for Fill:
 - .1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.
 - .2 Remove and store soil material for reuse within grubbed areas.
-

PART 3 - EXECUTION

- 3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL
- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water, runoff or airborne dust to adjacent watercourse, properties and walkways, according to requirements of Lake Simcoe Region Conservation Authority or applicable requirements of other authorities having jurisdiction, whichever is more stringent.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- 3.2 PREPARATION
- .1 Inspect site and verify with Departmental Representative, trees to be relocated and items designated to remain.
 - .2 Locate and protect utility lines. Preserve in operating condition active utilities traversing site.
 - .3 Notify utility authorities before starting clearing and grubbing.
 - .4 Keep roads and walks free of dirt and debris.
- 3.3 CLEARING
- .1 Clearing includes felling, trimming, and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within cleared areas.
 - .2 Clear as designated by Departmental Representative, by cutting at a height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.
 - .3 Cut off branches, by qualified arborist and cut down trees overhanging area cleared as directed by Departmental Representative.
 - .4 Cut off unsound branches by a qualified arborist, on trees designated to remain as directed by Departmental Representative.
-

- .5 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation at location approved by Departmental Representative.
- .6 Remove brush from targeted area by non-chemical means and dispose at a location approved by Departmental Representative.

3.4 CLOSE CUT CLEARING

- .1 Close cut clearing to ground level.
- .2 Cut off branches by a qualified arborist overhanging area cleared as directed by Departmental Representative.
- .3 Cut off unsound branches by qualified arborist on trees designated to remain as directed by Departmental Representative.

3.5 ISOLATED TREES

- .1 Relocate isolated trees in accordance as with Section 32 01 90.33.
- .2 Cut off isolated trees as approved by Departmental Representative at height of not more than 100 mm above ground surface.
- .3 Grub out isolated tree stumps as designated by the Departmental Representative.
- .4 Prune individual trees, by qualified arborist, adjacent to the area which may be affected by the work under this contract.
- .5 Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter by a qualified arborist.
- .6 Cut limbs and branches to be trimmed close to bole of tree or main branches, by a qualified arborist.

3.6 UNDERBRUSH CLEARING

- .1 Clear underbrush from areas as indicated at ground level.

3.7 GRUBBING

- .1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps as approved by the Departmental Representative.
-

- .2 Grub out stumps and roots to not less than 200 mm below ground surface.
- .3 Fill depressions made by grubbing with suitable material and to make new surface conform to existing adjacent surface of ground.

3.8 REMOVAL AND DISPOSAL

- .1 Provide Department Representative with certificate of licensed waste receiving station for approval of receiving site. Alternate non-licensed locations may be considered subject to the contractor having a formal agreement with the related party.
- .2 Remove cleared and grubbed materials off site to disposal area as approved by Departmental Representative.
- .3 Cut timber greater than 150 mm diameter to 2400 mm lengths, and stockpile outside the active work area as directed by the Departmental Representative. Stockpiled timber becomes property of Departmental Representative Contractor and/or property owner.
- .4 Burning and burial of cleared and grubbed materials are not allowed.
- .5 Chip or mulch and place in temporary stockpile. Spread cleared and grubbed vegetative material on site as directed by Departmental Representative.
- .6 Remove diseased trees identified by Departmental Representative and dispose of this material to approval of Departmental Representative

3.9 FINISHED SURFACE

- .1 Leave ground surface of working and staging areas, in condition suitable for topsoil stripping and/or for use by the contractor, to approval of Departmental Representative.

3.10 CLEANING

- .1 Proceed in accordance with Section 01 74 11-Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 This section specifies the environmentally responsible procedures for the stripping and preservation of topsoil.

1.2 RELATED REQUIREMENTS

- .1 Section 01 74 11 - Cleaning
- .2 Section 31 11 00 - Clearing and Grubbing
- .3 Section 31 22 13 - Rough Grading
- .4 Section 01 35 43 - Environmental Procedures
- .5 Section 32 91 20 - Topsoil Placement and Grading
- .6 Section 32 92 23 - Sodding.
- .7 Section 32 93 10 - Trees, Shrubs and Ground Cover Planting

1.3 MEASUREMENT AND PAYMENT PROCEDURES

- .1 There shall be no separate measurement for payment for soil stripping and stockpiling or for any re-handling. Include cost in Contract Lump Sum Price.
- .2 Payment shall be made as set out in Section 01 22 01 and shall be incidental to all work related to soil stripping and stockpiling.

1.4 REFERENCE STANDARDS

- .1 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 201 - Construction Specification for Clearing, Close Cut Clearing, Grubbing and Removal of Surface and Piled Boulders, November 2007.
 - .2 OPSS 182 - Environmental Protection for Construction in Waterbodies and on Waterbody Banks (November 2010).
 - .3 OPSS 805 - Temporary Erosion and Sediment Control Measures (November 2010).
 - .2 Stormwater Management Planning and Design manual, Ontario Ministry of Environment (March 2003).
 - .3 Erosion & Sediment Control Guideline for Urban Construction (December 2006)
-

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

<u>3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL</u>	.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 according to requirements of Erosion & Sediment Control Guideline for Urban Construction (December 2006) and sediment and erosion control drawings, whichever is more stringent.
	.2	Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
	.3	Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
<u>3.2 STRIPPING OF TOPSOIL</u>	.1	Ensure that procedures are conducted in accordance with applicable Provincial Regulatory agencies and Municipal requirements.
	.2	Remove topsoil before construction procedures commence to avoid compaction of topsoil.
	.3	Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation as approved by Departmental Representative.
	.4	Remove brush from targeted area by non-chemical means and dispose as approved by Departmental Representative.
	.5	Strip topsoil as indicated by Departmental Representative. Avoid mixing topsoil with subsoil.
	.6	Pile topsoil in berms in locations as approved by Departmental Representative. Stockpile height not to exceed 2.5 - 3 m.
	.7	Dispose of unused topsoil off-site in location as indicated by Departmental Representative.
	.8	Protect stockpiles from contamination and compaction.

- .9 Cover topsoil that has been piled for long term storage, with trefoil or grass to maintain agricultural potential of soil.
- .10 Carry out clearing and grubbing work in accordance with Section 31 11 00.
- .11 Topsoil that has been piled for long term storage (greater than 4 months) is to be seeded with annual rye grass to maintain agricultural potential of soil and to reduce erosion and sediment

3.3 PREPARATION OF GRADE

- .1 Verify that grades are correct and notify Departmental Representative if discrepancies occur and do not begin work until instructed by Departmental Representative.
 - .1 Grade area only when soil is dry to lessen soil compaction.
 - .2 Grade soil establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

3.4 PLACING OF TOPSOIL

- .1 Place topsoil only after Departmental Representative has accepted subgrade.
- .2 When replacing topsoil by truck, load with a small mechanical hoe (1.15 m3 or less) to allow for aeration of soil.
- .3 Spread topsoil during dry conditions by mechanical hoe in uniform layers not exceeding 150 mm, over unfrozen subgrade free of standing water.
- .4 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.
- .5 Cultivate soil following spreading procedures.

3.5 DISPOSAL

- .1 Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill as approved by Departmental Representative.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 11-Cleaning.
-

- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 All related work for rough grading including subgrade preparation.

1.2 RELATED REQUIREMENTS

- .1 Section 01 35 43 - Environmental Procedures
- .2 Section 01 35 29.06 - Health and Safety Requirements
- .3 Section 01 45 00 - Quality Control
- .4 Section 01 56 00 - Temporary Barrier and Enclosures
- .5 Section 02 41 16 - Structure Demolition
- .6 Section 31 05 17 - Aggregate Materials.
- .7 Section 31 11 00 - Clearing and Grubbing.
- .8 Section 31 14 13 - Soil Stripping and Stockpiling
- .9 Section 31 23 33.01 - Excavation, Trenching and Backfilling
- .10 Section 31 37 10 - Rip-Rap
- .11 Section 31 23 16.26 - Rock Removal.
- .12 Section 32 93 10 - Tree, Shrub and Ground cover Planting

1.3 MEASUREMENT AND PAYMENT PROCEDURES

- .1 There shall be no separate measurement for payment for rough grading including preparation of subgrade. Include cost in Contract Lump sum price.
- .2 Payment shall be made as set out in Section 01 22 01 and shall be incidental to all work related to rough grading.

1.4 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM D698-07e1, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m3).
- .2 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 206 - Construction Specification for

- Grading
- .2 OPSS 212 - Construction Specification for Borrow
- .3 OPSS 1010 - Material Specification for Aggregates - Base, Subbase, Select Subgrade and Backfill Material
- .4 OPSS 1860 - Material Specification for Geotextiles
- .5 OPSS 182 - General Specification for Environmental Protection for Construction in Waterbodies and on Waterbody Banks
- .6 OPSS 501 - Construction specification for Compacting
- .7 OPSS 805 - Construction Specification for Temporary Erosion and Sediment Control Measures
- .8 OPSS 902 - Construction Specification for Excavation and Backfilling - Structures

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

1.6 EXISTING CONDITIONS

- .1 Contractor to establish location of all underground and surface utility lines before commencing work.
- .2 Refer to dewatering in Section 35 20 22 - Dewatering and Diversion.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Fill material: Type Granular in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling and Section 31 05 17 - Aggregate Materials.
 - .2 Excavated or graded material existing on site suitable to use as fill for grading work if approved by Departmental Representative.
 - .3 Imported select clay type material approved by the Departmental Representative may be used for rough grading unless otherwise specified.
-

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 STRIPPING OF TOPSOIL

- .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Departmental Representative.
- .2 Commence topsoil stripping of areas as indicated Departmental Representative after area has been cleared of grasses, brush and weeds.
- .3 Strip topsoil to depths as indicated Departmental Representative. Rototill weeds and grasses and retain as topsoil on site. Avoid mixing topsoil with subsoil.
- .4 Stockpile in locations as indicated by Departmental Representative. Stockpile height not to exceed 3 m.
- .5 Dispose of unused topsoil off site to location as indicated by Departmental Representative.

3.3 GRADING

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2 Rough grade to following depths below finish grades:
 - .1 200 mm for grassed areas.
 - .2 150 mm minimum for stockpiled areas.
 - .3 150 mm for camp area.
 - .4 75 mm for roads and driveway re-surfacing
 - .5 450 mm for gravel roads and parking lots (full restoration).
 - .6 To requirements as identified on contract drawings at other work areas.

- .3 Slope rough grade away from building as indicated 1:50 minimum.
- .4 Grade ditches to capture run-off to depth as indicated.
- .5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm minimum before placing fill over existing ground. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .6 Compact filled and disturbed areas to maximum dry density to ASTM D698, as follows:
 - .1 95% under all surfaces unless specified otherwise.
- .7 Do not disturb soil within branch spread of trees or shrubs to remain.

3.4 TESTING

- .1 Inspection and testing of soil compaction will be carried out by testing laboratory with Canadian Council Independent Laboratories (CCIL) designation. Costs of tests will be paid in accordance with Sections 01 29 83- Payment Procedures for Testing Laboratory Services. Refer to Section 01 45 00- Quality Control.
- .2 Submit testing procedure, frequency of tests to Departmental Representative for review and approval.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

- .1 Identify all above-ground and below-ground works including utilities and services prior to commencement of construction.
- .2 Protect existing trees, fencing, landscaping, natural features, bench marks, buildings, pavement, surface or underground utility lines which are to remain as directed by Departmental Representative. If damaged, restore to original or better condition unless directed otherwise.
- .3 Maintain access roads to prevent accumulation of construction related debris on roads.

3.7 SURPLUS MATERIAL

- .1 Remove surplus material and material unsuitable for fill, grading or landscaping off site as directed by Departmental Representative

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 All work related to rock removal within the construction area.

1.2 PRICE AND PAYMENT
PROCEDURES

- .1 Measurement for payment for Rock Removal will be based on the actual quantities determined for rock removal. The estimated quantity for the unit price item is shown on the Tender Form. The unit price quoted shall be composite Unit Price for all labour, material and equipment necessary to a complete rock excavation work as specified. The unit price item is:
 - .1 Rock excavation
 - .2 There shall be no separate measurement for payment for rock dental excavation by mechanical (hydraulic hammer) or other means.

Payment for rock dental excavation shall be related to the applicable item of work
- .2 Rock quantities measured to bring the area to subgrade will be by actual volume removed within the following limits:
 - .1 Width of trench excavation as approved by Departmental Representative.
 - .2 Width for excavation for structures to be bounded by vertical planes up to 500 mm outside of and parallel to neat lines of footings as indicated.
 - .3 Depth of rock surface elevations immediately prior to excavation, to elevation as indicated.
 - .4 Where design elevation is less than 300 mm below original rock surface, depth will be considered to be 300 mm below original rock surface.
 - .5 Volume of individual boulders and rock fragments will be determined by average measuring of three or greater mutually perpendicular dimensions where the determined volume is 1.0 m³ or greater.
- .3 Preparation of surface to receive concrete by conventional hydraulic excavators with bucket will not be separately measured or paid and shall be incidental to the applicable item of work for concrete.
- .4 Removal of existing rip-rap will not be separately measured or paid and shall be incidental to the applicable item of work for site grading as per

Section 31 23 33.01.

- .5 Payment shall be made as set out in Section 01 22 01 and shall be incidental to / included in the applicable item of work.

1.3 REFERENCE STANDARDS

- .1 Canadian Federal Legislation
 - .1 Fisheries Law - article 32 and 35
- .2 Canadian Standard Association (CSA)
 - .1 CSA Z107.54M85 (R1999) Procedure for Measurement of Sound and Vibration Due to Blast Operations
- .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 182 - Environmental Protection for Construction in Waterbodies and on Water Banks (November 2010)
 - .2 OPSS 206 - Grading

1.4 DEFINITIONS

- .1 Rock: any solid material in excess of 1 m3 and which cannot be removed by means of heavy duty mechanical excavating equipment with minimum operating weight of 26,500 kg and a rock bucket of 1 m3 bucket. Frozen material not classified as rock.
- .2 Rock dental excavation and /or scaling includes the removal of any loose, slabby, fractured, deteriorated, or incompetent rock by mechanical means (hydraulic hammers).
- .3 The "Excavation Limits" are defined as the lines shown on the plans inside which the Departmental Representative measures the conformity of the works with the plans and specifications. No projections must be left inside the limits of excavation.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - Execution

3.1 ROCK REMOVAL

- .1 Perform excavation in accordance with Erosion and Sedimentation Control Plan.
- .2 Co-ordinate this Section with Section 01 35 29.06- Health and Safety Requirements.
- .3 Remove rock to alignments, profiles, and cross sections as indicated.
- .4 Explosive blasting is not permitted on this project.
- .5 Use rock removal procedures to produce uniform and stable excavation surfaces. Minimize overbreak, and to avoid damage to adjacent structures.
- .6 Prepare rock surfaces which are to bond to concrete, by scaling, pressure washing and broom cleaning surfaces.
- .7 Excavate trenches for dam key to width, lines and grades as indicated.
- .8 Cut trenches to widths as indicated.
- .9 Remove boulders and fragments which may slide or roll into excavated areas.
- .10 Correct unauthorized rock removal at no extra cost, in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.
- .11 Excavated rock may be used for rip-rap material provided it meets the requirements of Section 31 05 17 and Section 31 37 10 and is approved by the Department Representative.

3.2 CLEANING

- .1 Clean in accordance with Section 01 74 11- Cleaning.
- .2 Rock Disposal:
 - .1 Dispose of surplus removed rock off site in accordance with Section 01 74 21- Construction/demolition Waste Management and Disposal.
 - .2 Do not dispose removed rock into landfill. Send material to appropriate deposit site as approved by Departmental Representative.
 - .3 Move, transport, and relocate rock to location identified for landscaping purposes.

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

3.3 PROTECTION

- .1 Prevent damage to surroundings and injury to persons in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 35 43 - Environmental Procedures
- .3 Section 01 45 00 - Quality Control
- .4 Section 01 61 00 - Common Product Requirements
- .5 Section 31 23 33.01 - Excavation, Trenching and Backfilling

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM D422 - 63(2007) Standard Test Method for Particle-Size Analysis of Soils
 - .2 ASTM D4318 - 10 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - .3 ASTM D698 - 07e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³).
 - .4 ASTM D5084 - 10 Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
 - .5 ASTM D6938 - 17 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
 - .6 ASTM D4959 - 16 Standard Test Method for Determination of Water Content of Soil by Direct Heating.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 The Contractor shall submit a Work Plan including a list of the intended construction equipment, along with the method to be used to achieve the optimum moisture content, placement and compaction as specified herein.
 - .3 Samples:
 - .1 Submit 3 samples.
 - .2 Allow continual sampling by Departmental Representative during production.
 - .3 Provide Departmental Representative with access to source and processed material for sampling.
 - .4 Supply new or clean sample bags or containers according appropriate to impervious materials.
Pay cost of sampling and testing of
-

impervious which fail to meet specified requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Transportation and Handling: handle and transport impervious fill to avoid segregation, contamination and degradation.
- .2 Storage: store materials to allow free water to drain and for materials to attain uniform water content. Protect material such that it maintains its optimum moisture content.
- .3 Conditioning: If material is not at its acceptable range of moisture content, it may require moisture conditioning prior to final placement.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 The material for use as impervious fill shall consist of low to high plasticity silty clay free from organics, roots, rock, snow, ice or any other deleterious material that would detract from the properties of a low permeability clay soil.
- .2 The impervious fill material shall meet the following requirements:

Parameter	Test Method	Specified Limit
Liquid Limit	ASTM D4318	20% minimum
Plasticity Index	ASTM D4318	8% minimum
Effective Permeability	ASTM D5084	10 ⁻⁵ cm/s maximum
Fines Content	ASTM D422	30% minimum

- .3 The material shall be obtained from the required onsite excavations or offsite borrow locations.

2.2 SOURCE QUALITY CONTROL

- .1 Inform Departmental Representative of proposed source of impervious backfill and provide access for sampling 4 weeks minimum before starting production.
- .2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.
- .3 Advise Departmental Representative four (4) week minimum in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to

requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

PART 3 - EXECUTION

3.1 PREPARATION

.1 General

- .1 Impervious Backfill shall be placed after the foundation has been prepared. No material shall be placed on the foundation until it has been inspected and accepted.
- .2 Fill shall not be placed in a frozen condition and shall not be placed on a surface which is frozen or covered with snow or ice. Placing of fill in freezing weather will not be permitted. The Impervious Backfill shall be placed and managed to promote surface water runoff and minimize the risk of precipitation ponding that could affect the compacted fill already in place. Any portion of the Impervious Backfill which has suffered a reduction in density due to the action of frost, rain, or due to any other reason, shall be scarified and re-compacted, or removed and replaced with suitable material.
- .3 If fill activities are to be discontinued for an extended period of time or when rain is anticipated, the surface of the Impervious Backfill material shall be raised above the adjacent zones, crowned to promote surface runoff, and sealed to minimize infiltration.
- .4 When tying into an existing soil face, all loose, dried or altered fill shall be removed to a suitable depth. For each lift of new Impervious Backfill material placed, the Contractor shall excavate or "step" into the existing clay face by 250 mm to 350 mm horizontally to produce a horizontal and level surface that will be flush with the surface of the new Impervious Backfill material lift being placed, thereby allowing the contact with the existing soil face to be compacted with the new fill.

.2 Placement

- .1 All Impervious Backfill shall be placed in the dry under dewatered conditions to the lines and grades as shown on the Drawings. The material shall be placed in such a manner to achieve a stable and homogeneous fill which is free of horizontal stratifications and lenses or pockets of pervious materials, and from lumps of materials that do not satisfy the requirements of these Specifications. Care shall be taken during placement to prevent contamination by mixing

- with adjacent granular materials.
 - .2 Impervious Backfill shall be deposited and spread in approximately horizontally uniform homogenous layers at maximum 0.15 m thick lifts (uncompacted thickness) for the full width of the zone.
 - .3 At contacts between the fill and the abutments or concrete structures, the fill shall be sloped at approximately 6H:1V within 4 m of the contact to achieve the best possible contact.
 - .4 The allowable fill tolerances shall be within ± 50 mm vertically of the grades shown on the Drawings. Tolerance for the horizontal width and zone thickness of the Impervious Backfill material shall be within ± 150 mm of the dimensions shown on the Drawings.
- .3 Compaction
- .1 Each lift shall be thoroughly compacted for its full depth. The density for an average of any ten consecutive field test samples, shall not be less than 98% of the maximum Standard Proctor Maximum Dry Density with a moisture content between 1% below and 3% above the optimum moisture content. The density of the impervious material, as indicated by any single test, shall not be less than 95% of the Standard Proctor Maximum Dry Density.
 - .2 Impervious Backfill placed immediately over and adjacent to bedrock and concrete shall be conditioned such that the moisture content of the fill is between optimum and 3% above Standard Proctor Optimum moisture content to achieve the best possible contact.
 - .3 Each lift shall be subject to Quality Assurance testing and acceptance by the Departmental Representative prior to placement of successive lifts. Any lifts that have been placed overtop of unapproved material shall be removed. Any such removal will not be separately measured or paid for.

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Leave Impervious Backfill stockpile site in tidy, well drained condition, free of standing surface water.

- .4 Leave any unused Impervious Backfill in neat compact stockpiles as directed by Departmental Representative.
- .5 For temporary or permanent abandonment of Impervious Backfill source, restore source to condition meeting requirements of authority having jurisdiction.
- .6 Restrict public access to temporary or permanently abandoned stockpiles by means acceptable to Departmental Representative.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS
- .1 Section 02 41 16 - Structure Demolition
 - .2 Section 01 35 43 - Environmental Procedures
 - .3 Section 01 35 46 - Archeological and Cultural Procedures
 - .4 Section 31 23 16.26 - Rock Removal
- 1.2 REFERENCES
- .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
 - .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
 - .3 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC 2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package for New Construction and Major Renovations (including Addendum [2007]).
 - .4 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A3000-[13], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-[13], Cementitious Materials for Use in Concrete.
 - .2 CSA-A23.1/A23.2-[14], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- 1.3 DEFINITIONS
- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock: refer to 31 23 16.26 Rock Removal.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
 - .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
 - .3 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top
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dressing, landscaping and seeding.

- .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.

- .4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.

- .5 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

- .6 Unsuitable materials:
 - .1 Weak, chemically unstable, and compressible materials.
 - .2 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422: Sieve sizes to CAN/CGSB-8.1.
 - .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 10
0.02 mm	10 - 80
0.005 mm	0 - 45
 - .3 Coarse grained soils containing more than 20% mass passing 0.075 mm sieve.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Quality Control:
 - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
 - .2 Submit to Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.
 - .3 Submit to Departmental Representative written notice when bottom of excavation is reached.
 - .4 Submit to Departmental Representative testing and inspection results as described in PART 3 of this Section.

- .3 Preconstruction Submittals:
 - .1 Submit to Departmental Representative construction equipment list for major equipment to be used in this section prior to

start of Work.

- .2 Submit to Departmental Representative records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, location plan of relocated and abandoned services, as required.

.4 Samples:

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Inform Departmental Representative at least 2 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
- .3 Ship samples to Departmental Representative, in tightly closed containers, to prevent contamination and exposure to elements.

1.5 QUALITY ASSURANCE

- .1 Do not use soil material until written report of soil test results are approved by Departmental Representative.

1.6 EXISTING CONDITIONS

- .1 Buried services:
 - .1 Before commencing work establish location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
 - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .5 Prior to beginning excavation Work, notify applicable Departmental Representative and authorities having jurisdiction, establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
 - .6 Confirm locations of buried utilities by careful test excavations or soil hydrovac methods.
 - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before re-routing. Costs for such Work to be paid by Subcontractor.
 - .9 Record location of maintained, re-routed and abandoned underground lines.
 - .10 Confirm locations of recent excavations
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adjacent to area of excavation.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Type 1 and Type 2 fill:
 - .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to [ASTM C136]. Sieve sizes to [CAN/CGSB-8.1].
 - .3 Table:

Sieve Designation	% Passing	
	Type 1	Type 2
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
0.075 mm	3-8	0-10
- .2 Type 3 fill: selected material from excavation or other sources, approved by EDCJV for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

PART 3 - EXECUTION

3.1 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.2 PREPARATION/ PROTECTION

- .1 Protect existing features in accordance with Scope of Work.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

- .5 Protect buried services that are required to remain undisturbed.

3.3 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas as indicated after area has been cleared of brush and removed from site.
- .2 Strip topsoil to depths required to reach subsoil.
- .3 Do not mix topsoil with subsoil.
- .4 Stockpile in locations as required.
 - .1 Stockpile height not to exceed 2 m and should be protected from erosion.
- .5 Dispose of unused topsoil off site.

3.4 STOCKPILING

- .1 Stockpile fill materials as required.
 - .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies as per Section 01 35 43 - Environmental Procedures.
- .4 Surround all stockpiled materials with reptile and amphibian exclusion fencing in accordance with Section 01 35 43 - Environmental Procedures.

3.5 EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.
 - .2 Excavate to lines, grades, elevations and dimensions as indicated.
 - .3 Remove concrete, masonry, paving, walks, demolished foundations, rubble and other obstructions encountered during excavation in accordance with Section 02 41 16 - Structure Demolition, Section 01 35 43 - Environmental Procedures, and Section 01 35 46 - Archeological and Cultural Procedures.
 - .4 Excavation must not interfere with bearing capacity of adjacent foundations.
 - .5 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
 - .6 Restrict vehicle operations directly adjacent to
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open trenches.

- .7 Dispose of surplus and unsuitable excavated material in approved location.
- .8 Do not obstruct flow of surface drainage or natural watercourses.
- .9 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .10 Notify Departmental Representative when bottom of excavation is reached.
- .11 Obtain Departmental Representative approval of completed excavation.
- .12 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .13 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings.
 - .2 Fill under other areas with Type 2 fill compacted to not less than 95 % of corrected Standard Proctor maximum dry density.
- .14 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
 - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

3.6 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated or specified on drawings.
- .2 Aggregate fill per 310516 "Aggregate Materials".

3.7 BACKFILLING

- .1 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
 - .2 Departmental Representative has inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of underground utilities.
 - .4 Removal of concrete formwork.
 - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .2 Areas to be backfilled to be free from debris,

snow, ice, water and frozen ground.

- .3 Do not use backfill material which is frozen or contains ice, snow, debris or excess water.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
 - .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 1 m.
 - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative:
 - .2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.
- .6 Install drainage system in backfill as indicated.

END OF SECTION

PART 1 - GENERAL

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|------------------------------------|-----|--|
| <u>1.1 DESCRIPTION</u> | .1 | Materials and installation geotextiles used in erosion protection system for permanent Works, the purpose of which is to: |
| | .1 | Separate and prevent mixing of granular materials of different gradation and type. |
| | .2 | Act as hydraulic filters permitting passage of water while retaining underlying soil structure. |
| <u>1.2 RELATED REQUIREMENTS</u> | .1 | Section 01 22 01 - Measurement and Payment |
| | .2 | Section 01 33 00 - Submittal Procedures |
| | .3 | Section 01 74 20 - Construction/Demolition Waste Management and disposal |
| | .4 | Section 31 23 33.01 - Excavating, Trenching and Backfilling. |
| | .5 | Section 01 61 00 - Common Product Requirements |
| | .6 | Section 31 24 13 - Roadway Excavating, Embankment and Compaction |
| | .7 | Section 31 32 19.20 - Geocells |
| | .8 | Section 31 32 19.13 - Geogrid Reinforcement |
| | .9 | Section 31 37 10 - Rip-rap |
| | .10 | Section 32 91 19.13 - Topsoil Placement and Grading |
| <u>1.3 MEASUREMENT AND PAYMENT</u> | .1 | No separate measurement for payment shall be made for geotextiles. Include cost in the Contract Lump Sum Price. |
| | .2 | Payment shall be made as set out in Section 01 22 01 - Measurement and Payment and shall be incidental to the applicable item of work. |
| <u>1.4 REFERENCE STANDARDS</u> | .1 | Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive. |

- .2 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM D3786M-09, Standard Test Method for Bursting Strength of Textile Fabrics
 - .2 ASTM D4355-07, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat.
 - .3 ASTM D4533-11, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 - .4 ASTM D4491-99a (2009), Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - .5 ASTM D4632-08, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - .6 ASTM D4751-04, Standard Test Method for Determining Apparent Opening Size of Geotextile.
 - .7 ASTM GD4833-07, Standard Test Method for Index Puncture Resistance of Geomembrane and Related Products.
 - .8 ASTM D5261 - 10 Standard Test Method for Measuring Mass per Unit Area of Geotextiles
- .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 1860- Material Specification for Geotextiles (November 2010)

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit following samples 2 weeks prior to beginning Work.
 - .1 Minimum length of 2 m of roll width of geotextile.
 - .2 Methods of joining.
- .4 Test and Evaluation Reports:
 - .1 Submit copies of mill test data and certificate at least 2 weeks prior to start of Work.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.

- .2 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents, and to requirements of OPSS 1860.
 - .3 Store and protect geotextiles from direct sunlight and UV rays.
 - .4 Replace defective or damaged materials with new.
- .3 Packaging Waste Management: remove for recycling and reuse packaging materials as specified in Construction Waste Management Plan in accordance with 01 74 21- Construction / Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIAL

- .1 Geotextile (for permanent Works): non-woven synthetic fibre fabric, supplied in rolls.
 - .1 Width: approved by the Departmental Representative.
 - .2 Length: as indicated on drawings, and to the longest laying length.
 - .3 Composed of: minimum 95% by mass of polypropylene, polyethylene, polyester or other polymers, excluding polyamides, with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 60 days.
 - .4 Physical properties:
 - .1 Mass per unit area: to ASTM D5261, minimum 200 g/m².
 - .2 Grab Tensile strength and elongation (in any principal direction): to ASTM D4632.
 - .1 Tensile strength: minimum 690 N.
 - .2 Elongation at break: minimum 50%.
 - .3 Trapezoid tear strength: to ASTM D4533, minimum 275 N.
 - .4 Puncture resistance: to ASTM D4833, minimum 400 N.
 - .5 Mullen burst: to ASTM D3786, 2.17 MPa
 - .6 Hydraulic properties:
 - .1 Permittivity: to ASTM D4991, 1.6 sec-1.
 - .2 Water flow rate: to ASTM D4991,

4480 l/min/m².

- .3 Apparent opening size (AOS): to ASTM D4751, 0.212 mm.
- .7 UV Stability: to ASTM D4355, 70% at 500h.
- .2 Securing pins and washers: to CAN/CSA-G40.21 Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m2 to CAN/CSA G164.
- .3 Geotextile for temporary sediment and erosion control measures shall be non-woven and as approved by the Departmental Representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with pins as per the geotextile manufacturer's recommendations or to the requirements of the Departmental Representative.
 - .1 Orientation of geotextile shall be: first in the direction of the slope and second, in the direction of channel flow. The orientation shall be approved by the Departmental Representative.
 - .2 The geotextile shall be set, together with geocells where applicable, into an anchor trench (0.5m depth and 0.3m wide) and duly secured along the top edge and upstream edge (flow direction) as approved by the Departmental Representative.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile as approved by the Departmental Representative.
- .4 Overlap each successive strip of geotextile to the manufacturer's recommendation, but to a minimum of 600 mm over previously laid strip. Where overlap joints are perpendicular to the channel flow, the overlap joint shall be in the flow direction.
- .5 Pin successive strips of geotextile with securing pins to the manufacturer's recommendations.
- .6 Protect installed geotextile material from displacement, damage or deterioration before,

during and after placement of material layers.

- .7 After installation, cover with overlying layer within 4 hours of placement.
- .8 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- .9 Place and compact backfill material in accordance with Section 31 23 33.01.

3.2 CLEANING

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

3.3 PROTECTION

- .1 Vehicular traffic or construction machinery is not permitted directly on geotextile.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 35 43 - Environmental Procedures
- .3 Section 01 45 00 - Quality Control
- .4 Section 01 61 00 - Common Product Requirements
- .5 Section 31 23 33.01 - Excavation, Trenching and Backfilling
- .6 Section 03 30 00 - Cast-In-Place Concrete
- .7 Section 31 60 00 - Bedrock Foundation Treatment
- .8 Section 31 05 16 - Aggregate Materials

1.2 REFERENCE STANDARDS

- .1 The following standards are applicable.
 - .1 CSA A23.2-2A "Sieve Analysis of Fine and Coarse Aggregate"
 - .2 ASTM C939 "Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)"
 - .3 ASTM C150 - 07, Standard Specification for Portland Cement
 - .4 CSA A23.1, Concrete Materials and Methods of Concrete Construction
 - .5 CSA 23.2, Methods of Test for Concrete
 - .6 CSA A3000-2008, Cementitious Materials Compendium
 - .7 CSA A82.56M-1976, Aggregate for Masonry Grout

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures
 - .2 Grouting Contractor Qualifications
 - .1 The Contractor or the Contractor's grouting sub-contractor shall be a well-established geotechnical contractor with proven experience and ability in the drilling and grouting of rock and including ground improvement, ground treatment and foundation-related construction.
 - .3 The Contractor shall submit a Work Plan specifying the details of proposed equipment, methods, and procedures for the supply and installation of the grout curtain for review. The Work Plan shall also include the Contractor's environmental plan for the containment and disposal of waste water and grout spillage.
 - .4 The Contractor shall supply the details of the
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grouting progress, including number, location, length of grout holes drilled and amount of cement grout injected on a daily basis.

Calibration records including date of last calibration and expiry date of all flow and pressure gauges.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Cement
 - .1 Cement used in grouting operations shall be Type GU, supplied and stored in an appropriate manner as per the manufacturer's recommendations.
- .2 Water
 - .1 Water shall be clean and free from contaminants including but not limited to sewage, oil, acid, alkali, salts, organic matter, or any foreign solids.
 - .2 Use water having a temperature less than 25°C and greater than 5°C.
- .3 Sand
 - .1 Sand shall consist of hard, dense, durable, uncoated rock fragments with not more than 5 percent of deleterious substances including organic impurities and clay lumps.
 - .2 When tested, in accordance with CSA A23.2-2A "Sieve Analysis of Fine and Coarse Aggregate", sand shall have a fineness modulus from 1.5 to 2.0 and shall fall within the following limits of gradation:

.4 Standard Sieve Size (mm)	.5 Percent Passing by Weight
1.25	100
0.630	45 - 100
0.315	25 - 60
0.160	12 - 30
0.080	0 - 5

- .1 The Departmental Representative will define when and how much sand shall be added to the grout mix.
- .6 Admixtures
 - .1 Grouting additive MasterRheobuild 1000 shall be added to the grout mix.

2.2 SOURCE QUALITY CONTROL

- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks minimum before starting production.
- .2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.
- .3 Advise Departmental Representative four (4) week minimum in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.
- .5 The Contractor shall perform sufficient number of Trial Batches of each planned grout mix, including admixtures, using the proposed equipment to establish base line reference data, as accepted by the Departmental Representative, for the following Quality Assurance tests:
 - .1 Specific Gravity (Mud balance)
 - .2 Flow (Flow Cone)
 - .3 Gel and Set Time (Grout Cubes)
- .6 During the Work, the Specific Gravity shall be tested the greater of once per day, one for every 2 batches of the same grout mix, and every time the grout mix is thickened.
- .7 During the Work, the Flow shall be tested the greater of once per day, one for every 2 batches of the same grout mix, and every time the grout mix is thickened.
- .8 Any batch tested which does not correspond to the established base line reference shall be rejected for placement.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Drilling and pressure grouting will be performed under the technical direction and supervision of the Departmental Representative. This may include, but not be limited to, detailed design and establishment of procedures to be adopted; determination of grout hole locations; orientation and sequence of drilling and washing holes; materials, additives, properties, pressures and pumping rates to be used for grouting; mixture modifications to be made in all aspects of grouting procedures. Such adjustments and modifications required by the Departmental Representative will be

executed by the Contractor without cause for delay in the construction program.

.2 Changes may be necessary in both the layout and number of grout holes necessary to achieve an effective grout curtain, as conditions encountered during the work are evaluated and as directed by the Departmental Representative.

.3 Grout mixes, pressures, pumping rates, and the locations and sequence in which holes are drilled, washed, tested and grouted will be as specified herein or defined by Departmental Representative and as modified by the Departmental Representative to suit actual foundation conditions and grout takes encountered in the field during construction.

.4 Equipment

.1 Any grout hole that is lost or damaged due to mechanical failure of equipment, or inadequacy of grout supply, shall be replaced by the Contractor.

.2 Standard drilling equipment of the rotary and percussion type shall be used to perform the drilling as specified herein.

.5 Rotary type drilling equipment shall be capable of drilling NQ3 size holes with core recovery through plain and reinforced concrete, rock and hardened grout to a maximum depth of 50 m.

.6 Percussion drilling equipment shall be equipped for continuous flushing (water) of holes during drilling, and capable of drilling 48 mm diameter, minimum, holes to a maximum depth of 50 m.

.7 Washing and pressure testing equipment shall include pumps and packer or seal assemblies. The pumps furnished shall be of the gear, centrifugal, or other equivalent types subject to review by the Departmental Representative, with a maximum output of not less than 100 L/min at 1050 kPa, and shall be capable of maintaining constant pressures. There shall be a water supply with storage tanks sufficient for the pumps. An adequate air supply at a maximum pressure of 700 kPa shall be provided for washing operations.

.8 Flow meters and pressure gauges suitable for reading the appropriate working ranges shall be mounted on a suitable header supplied for each pump. If using electronic measuring devices, the Contractor shall make available a means of checking pressure and flow with mechanical measuring devices. Certified testing equipment shall be provided for checking flow and pressure gauges.

.9 The packers or seals shall either be of the mechanically expanded rubber sleeve, multiple leather

cup, pneumatically expanded rubber sleeve types, or other equivalent type subject to review by the Departmental Representative. Packers shall be capable of sealing holes at any specified elevation down to a maximum vertical depth of 10 m in bedrock, and of withstanding, without leakage for a period of 10 minutes, water pressure equal to the maximum grout pressure. The type of packer shall be varied to suit rock conditions, as accepted by the Departmental Representative. It should be possible to use these packers either singly or in pairs separated by up to 6 m of perforated pipe. There shall be sufficient perforations in the pipe to provide negligible obstruction to the flow of water. The diameter of the pipes used for separating the packers and for placing the packers in holes shall be the maximum possible for the size of the hole.

.10 The grouting plant shall be capable of supplying, mixing, agitating, and pumping sanded grout to the proportions as specified under .5.1 under this Section, and to the satisfaction of the Departmental Representative. Mixers shall be of the high speed colloidal type. Each grouting unit shall include at least one pump of the progressive cavity type with a capacity of at least 100 L/min of mixed grout at a maximum discharge pressure of 700 kPa. Batching apparatus shall be capable of accurately measuring quantities of grout materials incorporated into mixes. Mixers, holding tanks and sumps shall be calibrated in litres to facilitate modification of mixes. An adequate supply of grout materials shall be maintained at each grouting unit so that grouting can be performed without interruption.

.11 Mixing time shall be adequate to obtain grout that is uniform and effectively mixed. A sufficient number of mixers shall be available, ready for use, to produce grout at the rates required by the hole or holes being grouted and without interruption due to mixer breakdown.

.12 Grout materials shall be maintained in suspension in a mechanically agitated sump or holding tank, equipped with screens to remove hardened grout which does not pass the 4.75 mm sieve.

.13 A double-line pumping system shall be used, in which one line will supply grout from the pump to the header at the collar of the hole, and the other line will return grout from the header to the sump. The inside diameter of all lines, valves, and connections shall not be less than 25 mm. The number and sizes of obstructions in the lines shall be kept to a minimum. Grout may be mixed in a central plant and pumped to an agitated sump at a second pumping plant which shall be located not more than 50 m from the hole. The distance between the central plant and the agitated sump shall not exceed 60 m.

.14 The grout header shall be provided for feeding

grout into the holes. The header shall include a supply connection, a connection with a valve to the holes, and a return line with a valve. Appropriate pressure gauges for the required pressure range shall be fitted such that one indicates the pressure of the supply of grout at the header and the other indicates the back pressure of grout in the hole.

.15 For grouting with packers, a 25 mm minimum diameter flush jointed pipe shall extend between the ground surface and the level at which the packer assembly is set. The type and selection of packer used shall be as described for water testing or as directed by the Departmental Representative.

.16 When the individual elements of plant are so located that communication by normal voice between the elements is not satisfactory, the Departmental Representative may require the Contractor to install a telephone or radio system or other approved means of communication.

.17 Grout Mixes

.1 The Contractor shall use the following grout mix proportions as directed by the Departmental Representative. The Departmental Representative may direct the Contractor to use additional or varied grout mixes.

Constituent s	A-mix	B-mix	C-mix	D-mix	E-mix
Cement (kg)	20.0	20.0	20.0	20.0	20.0
Water (L or kg)	40.0	26.7	13.3	10.0	9.0
Superplasti cizer (mL)	200.0	200.0	200.0	200.0	200.0
Sand (kg)	0	0	0	0	10.0

- .18 Consolidation Grouting
 - .1 Consolidation grouting consists of the drilling and grouting of a pattern of shallow holes in the foundations. The requirement and extent of this type of grouting will be determined by the Departmental Representative on completion of excavation in the areas.
- .19 Curtain Grouting
 - .1 Curtain grouting will consist of the drilling and grouting a line of holes in the bedrock, as shown on Drawings and as directed by the Departmental Representative.
 - .2 Vertical holes will be required; and the angle of inclination for each hole as shown on Drawings and as directed by the Departmental Representative.
 - .3 Unless otherwise directed, the grouting shall be carried out in sequence whereby the split-spacing procedure, where initial holes (primary) are drilled and grouted prior to drilling and grouting of secondary and tertiary holes, shall be followed. Initial primary holes shall be spaced as shown on the Drawings. Subsequent secondary holes and tertiary holes shall be located midway between primary and secondary holes respectively. Further sequences of holes (quaternary) may be considered, depending on the bedrock conditions and grout takes of the adjacent holes. Grouting of additional holes spaced between the previous holes shall be continued as required to achieve the necessary tightness and seal, as directed by the Departmental Representative.
 - .4 Curtain grouting shall be performed by the stop grouting method (upstage grouting), where each hole is grouted in sections isolated by a packer set at decreasing depths, as directed by the Departmental Representative.
- .20 Grouting Procedure
 - .1 The Contractor shall complete the foundation preparation including dental concrete to the rock surface as per Section 31 60 00 Bedrock Foundation Treatment after completion of the grouting operations.
 - .2 Should grout vent to the rock surface, the Contractor shall hand-clean the rock surface in the vicinity of any surface leak and caulk the leak with oakum or other equivalent methods subject to review by the Departmental Representative. If grout flows from cracks or joints in the rock, these shall be caulked or

- otherwise suitably sealed; or, at the discretion of the Departmental Representative, grouting shall be temporarily discontinued and resumed later when the initial grout has set.
- .3 All grout holes and test holes shall be drilled to the depths, and in the locations, sequence and orientations as shown on the Drawings and as directed by the Departmental Representative.
- .4 All holes shall have a minimum diameter of 48 mm. The use of grease, "rod dope", or other lubricant on drill rods will not be permitted.
- .5 Core recovery will not be required from grout holes.
- .6 Grout in holes shall be allowed to set for at least 12 hours prior to holes within 12 m being drilled or pressure tested (grouted).
- .7 Each hole shall be protected from clogging or obstruction by means of a cap or other suitable means at the collar, and any hole that becomes clogged or otherwise obstructed before completion of the grouting operation shall either be cleaned out or another hole shall be provided by the Contractor at the Contractor's expense.
- .8 Each hole shall be thoroughly washed immediately before pressure testing or pressure grouting of the hole is initiated. Holes shall be washed out by means of alternate applications of air and water. Where percussion drilling equipment is used, washing may be done using the drill rods. Special wash rods shall be used where the drill bit or core barrel, in the opinion of the Departmental Representative, provides sufficient obstruction to the free flow of water and air so as to inhibit the washing operation. Packer seal assemblies shall be used where washing between interconnected holes is required. Holes shall be washed for a minimum of five minutes with the pump operating at full capacity or until fracture filling material ceases to be removed as shown by the clearness of the return water.
- .9 Water pressure testing shall be performed to determine the sequence for grouting and to facilitate selection of the initial grout mix.
- .10 Pressure tests, using clear water and at pressures up to the required grouting pressure, shall follow the pressure washing operation and be done immediately prior to pressure grouting.
- .11 Single packer assemblies shall be utilized to isolate lengths of holes unless, in the

- opinion of the Departmental Representative, testing of any portion of the hole using double packer assemblies is required.
- .12 Water pressure testing shall consist of testing the same length as the grout length. The test shall consist of one step at the required test pressure for 15 minutes with recordings at 5 minute intervals. The timing of the 15 minute duration shall commence after the pressure has stabilized to the required test pressure. The pressure to be used shall be as directed by the Departmental Representative. In general, the test pressure shall be the proposed grouting pressure.
- .13 Where the water pressure test in a single stage indicates a permeability less than 3 Lugeons, the Departmental Representative may recommend that the stage need not be grouted separately but may be grouted with the next above stage.
- .14 Water pressure testing shall not be permitted in any hole where the lower portion of the hole has been grouted until the grout has been allowed to set a minimum of 12 hours.
- .15 Grout mixes shall be varied as directed by the Departmental Representative, to suit conditions encountered during grouting. In general, the grout mix used at the start of any section of a hole shall be A-mix. The starting mix shall be injected at the specified pressure for a ten-minute period with the grout pump operating as nearly as possible at constant speed. If the rate of absorption of grout is observed to drop steadily, the starting mix shall be continued until refusal is reached. If the absorption of solids is high during the initial period, the water-cement ratio shall be gradually decreased (A-mix to B-mix, then B-mix to C-mix, etc.), successively thicker mixes each being injected for ten-minute periods until grout consumption stabilizes or begins to decrease. At the end of each ten-minute period, the Contractor shall continue to inject any remaining grout that has already been mixed, unless directed by the Departmental Representative to waste the remaining grout. A set number of batches as determined by the Department Representative may be substituted for the ten-minute period at the discretion of the Department Representative.
- .16 Grouting pressures shall be varied to suit local conditions, as directed by the Departmental Representative, and shall be controlled to prevent surface upheaval and leakage of grout. In general, the maximum

grouting pressure, as indicated by a gauge at the collar of the hole, shall be 70 kPa plus 10 kPa per metre distance to the nearest rock or concrete surface. The grouting pressure of the final upper stage with the bottom of the packer at a maximum of 200 mm depth from the bedrock surface shall be 35 kPa. Where grouting is performed near bedrock cliffs, under concrete structures, or within 2 m of ground surface, grouting pressures shall, in general, be limited to low values, as directed by the Departmental Representative, that are consistent with the rock conditions and may be in the order of 10 kPa or less per metre distance to the nearest surface.

- .17 During the grouting of a hole, adjacent ungrouted holes shall be left uncapped to facilitate the passage of air, water, etc. If grout is found to flow into adjacent holes, a multiple connection shall be made to the hole or holes affected, so that all such holes are grouted simultaneously. Such connections shall be made to a packer assembly which shall be set in the hole immediately above the points at which grout leaked into the hole.
- .18 Injection of grout into any hole, or portion of any hole isolated by packers, shall continue until the hole, or isolated portion of the hole, absorbs less than 8 L of the grout mix being injected in 10 minutes, at the maximum grouting pressure. Following the grouting of the primary, secondary and tertiary holes, additional holes will be required when a section of a tertiary hole experiences grout take in excess of 10 kg of cement (dry weight) per lineal metre of hole.
- .19 After completion of a grouting operation, back pressure observations shall be made. If back pressure exists, the grout shall be retained in the hole by means of a stop cock or other equivalent device subject to review by the Departmental Representative until the grout has set. After grouting, each hole shall be completely filled by injection or tremieing, where necessary, with a sanded grout.
- .20 Grout which is mixed at the direction of the Departmental Representative and which must be wasted because of its age or for any other reason other than failure of the grouting equipment or negligence on the part of the Contractor will be measured and paid for.
- .21 During grouting operations the Contractor shall take such precautions as may be necessary to prevent drill cuttings,

equipment exhaust oil, wash water, and grout, from entering natural water courses or from defacing or damaging any permanent structures. The Contractor shall dispose of all waste water and grout from the operations in accordance with the Environmental Specifications in Volume 1 of this document and to the satisfaction of the Departmental Representative.

- .22 During grouting operations, the Contractor will keep detailed records of the grouting operations. The Contractor shall submit those detailed records to the Departmental Representative on a daily basis.

- .21 Grouting Temperature

- .1 Grouting shall not be performed in ambient air conditions below minus 5 degrees Celsius or into bedrock below 0 (zero) degrees Celsius. In the case of grouting performed under conditions of freezing or near freezing temperatures, grout materials including water shall be protected from freezing and heated to a suitable temperature, as directed by the Departmental Representative. The temperature of all grout shall be between 5 and 27 degrees Celsius or as directed by the Departmental Representative, throughout the mixing and agitation period up to the time of injection.

- .22 EXPLORATORY HOLE DRILLING

- .1 The Contractor shall perform exploratory drilling with NQ3 size holes through plain and reinforced concrete, rock, and hardened grout, as directed by the Departmental Representative. Exploratory NQ3 size holes of varying depths may be required, but the maximum depth shall not exceed 10 m in bedrock. The number and requirement for exploratory drilling will be as directed by the Departmental Representative.
 - .2 The Contractor shall initially drill through any overburden materials including anything from broken rock, cobbles, gravel, sand, silts or clays or any combination of these materials. The Contractor shall use appropriate drilling methods and equipment such that continuous sampling of the overburden material can be achieved. Holes in overburden material shall be adequately cased to prevent collapse of the hole sidewalls.
 - .3 All exploratory drilling shall be performed with rotary drilling equipment, subject to review by the Departmental Representative. The Contractor shall use a standard ball-
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bearing, swivel-type, triple tube face discharge or wireline core barrel equipped with diamond bits. All exploratory drilling shall be performed in a workmanlike manner by competent and experienced drillers, and special care shall be exercised to obtain cores in as good condition as possible.

- .4 The Contractor shall keep an accurate driller's log of all exploratory holes drilled in a manner satisfactory to the Departmental Representative, and furnished to the Departmental Representative on completion of each hole. The log shall include a description of all materials encountered, their location in the holes and the location of special features such as seams, open cracks, soft or broken rock, points where loss or gain of drill water occurred, and any other item which may contribute to the objectives of the required exploratory drilling.
- .5 The Contractor shall place the core in correct sequence in wooden core boxes furnished by the Contractor. The core shall be separated accurately by wooden blocks according to the measured distances in the holes, and shall be properly labelled. No box shall contain cores from more than one hole. The covers shall be fastened securely to the core boxes and the boxes shall be delivered to a location at Site as directed by the Departmental Representative.
- .6 Exploratory holes shall be water pressure tested at a maximum of 2 depths within each hole using either single or double packer assemblies. Exploratory water pressure testing shall consist of 3 rising and 2 falling steps, with each step at a 5 minute duration. The timing of the 5 minute duration shall commence after the pressure has stabilized to the required test pressure. The test pressures to be used shall be as directed by the Departmental Representative.
- .7 All exploratory holes shall be grouted under pressure to full depth in one operation.

3.2 CLEANING

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

END OF SECTION

PART 1 - GENERAL

<u>1.1 SECTION INCLUDES</u>	.1	Supply and installation of rip-rap for erosion protection.
<u>1.2 RELATED REQUIREMENTS</u>	.1	Section 01 22 01 - Measurement and Payment
	.2	Section 01 33 00 - Submittal Procedure
	.3	Section 01 35 43 - Environmental Procedures
	.4	Section 01 74 20 - Construction / Demolition Waste Management and Disposal
	.5	Section 31 22 13 - Rough Grading
	.6	Section 31 32 19.01 - Geotextiles
	.7	Section 31 32 19.13 - Geogrid Reinforcement
	.8	Section 31 32 19.20 - Geocells
	.9	Section 31 23 33.01 - Excavating, Trenching and Backfilling
	.10	Section 31 05 17- Aggregate Material
<u>1.3 MEASUREMENT AND PAYMENT</u>	.1	Measure rip-rap in tonnes of material placed as set out in Section 01 22 01 - Measurement and Payment.
<u>1.4 REFERENCE STANDARDS</u>	.1	Ontario Provincial Standard Specifications (OPSS) / Ontario Ministry of Transportation
	.1	OPSS 1004, Ontario Provincial Standard Specification, Material Specification for Aggregates - Miscellaneous (November 2006).
	.2	OPSS 1010, Material Specifications for Aggregate-Base, Subbase, Select Subgrade and Backfill Material (April 2004).
	.3	OPSS 511, Construction Specifications for Rip-Rap Rock Protection and Granular Sheetting (April 2011).
<u>1.5 ACTION AND INFORMATIONAL SUBMITTALS</u>	.1	Submit in accordance with Section 01 33 00- Submittal Procedures.
<u>1.6 WASTE MANAGEMENT AND DISPOSAL</u>	.1	Divert left over aggregate materials from landfill to local quarry for reuse as approved by

Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Stone:

- .1 The Contractor shall not stockpile at the top of bank of any shorelines or slopes.
- .2 Hard, with relative density not less than 2.65, durable quarry (shot-rock) stone, free from seams, cracks or other structural defects, clean with no deleterious materials, durable and resistant to weathering by air and water, non-acid generating, acceptable to the Departmental Representative. The Departmental Representative may reject any material at the stockpile, based on visual inspection, which contains excessive fines, dust or other deleterious products.
- .3 The riprap shall be comprised of either limestone, granite, or other quality dense rock. Should the Contractor choose to use limestone, it shall be durable white crystalline limestone. Softer buff to yellow dolomite or dolostone will not be accepted. Rock samples shall be submitted to the Contract Administrator for approval a minimum of five (5) days prior to their use. No rockfill will be permitted without providing the source and supplier. Inspection of the source will be performed by the Contract Administrator prior to written acceptance.
- .4 The rip-rap shall meet following size distribution for the use intended:
- .5 Armour Rip-Rap (Zone 1, rip-rap):

Description	Rock Mass and Size	Percent Passing by Mass
Riprap with D ₅₀ = 300 mm	200 kg or 500 mm	100
	90 kg or 400 mm	50 to 90
	40 kg or 300 mm	20 to 50
	10 kg or 200 mm	5 to 20
	5 kg or 150 mm	0

.6 Heavy Rip-Rap (Zone 2, rip-rap)

Description	Rock Mass and Size	Percent Passing by Mass
Riprap with D ₅₀ = 500 mm	700 kg or 800 mm	100
	300 kg or 600 mm	40 to 80
	200 kg or 500 mm	20 to 50
	90 kg or 400 mm	5 to 30
	40 kg or 300 mm	0

- .2 Geotextile Filter: in accordance with Section 31 32 19.01

PART 3 - Execution

3.1 PLACING

- .1 Where rip-rap is to be placed on slopes, excavate trench at toe of slope to dimensions as indicated on Contract drawings.
- .2 Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.
- .3 Place geotextile on prepared surface in accordance with Section 31 32 19.01 - Geotextiles and as indicated. Avoid puncturing geotextile. Vehicular traffic over geotextile is not permitted.
- .4 Place rip-rap to thickness and details as indicated.
- .5 Place stones in manner approved by Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.
- .6 Rip-rap placement shall occur from the bottom of the slope and proceed upslope.
- .7 The riprap materials shall be gently placed adjacent to existing and new structures in such a manner that will not cause damage to those structures.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 35 43 - Environmental Procedures
- .3 Section 01 45 00 - Quality Control
- .4 Section 01 61 00 - Common Product Requirements
- .5 Section 31 23 33.01 - Excavation, Trenching and Backfilling
- .6 Section 03 30 00 - Cast-In-Place Concrete
- .7 Section 31 23 23 - Impervious Backfill
- .8 Section 31 05 16 - Aggregate Materials

1.2 REFERENCE STANDARDS

- .1 Grouting work shall be performed in accordance with the most current version of the following standards, except where specified otherwise.
 - .1 CSA A23.1 Concrete Materials and Methods of Concrete Construction
 - .2 CSA A23.2 Methods of Test for Concrete
 - .3 ASTM C-827 Test Method for Early Volume Change of Cementitious Mixtures
 - .4 CRD-C611 Test Method for Flow of Grout Mixtures
 - .5 CRD-C619 Corps of Owner's Engineers Specification for Grout Fluidifier
 - .6 CRD-C621 Corps of Owner's Engineers Specification for Non Shrink Grout

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Dental concrete shall be in accordance with Section 03 30 00 Cast-In-Place Concrete.
 - .2 Non-shrink grout, "SikaGrout 212" shall be supplied by the Contractor (25 kg bags) for slush grouting applications.
 - .3 Non-shrink grout, "SikaGrout 212", shall be supplied by the Contractor (25 kg bags) for dry pack applications.
 - .4 Permeable injectable tubing FUKO (SikaFuko Eco 1) Injection System by Sika Canada (or approved alternate) shall be supplied by the Contractor for microfine cement grouting and installed and applied in strict accordance
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with the manufacturer's instructions.

.5 The non-shrink, premixed, sand-cement grout shall be supplied for placement under or around specified parts and shall consist of a material that can be placed at consistencies ranging from dry-pack to flowable and shall be mixed in accordance with the manufacturer's instructions. The unconfined compressive strength of 50 mm cubes, cured under standard conditions of 23±2 °C and 100% relative humidity, shall equal or exceed 42 MPa and 62 MPa at 3 days and 28 days respectively. The grout shall not stiffen rapidly and shall maintain a flowable consistency for at least 20 minutes when batched at a temperature of 23±2 °C.

.6 The Contractor shall provide the Departmental Representative with independent test data that certifies that the pre-mixed grout complies with these requirements. The data shall also indicate the shelf life of the material when stored under dry conditions.

.7 Slush grout shall be used for preparation of the bedrock surfaces that require filling of cracks. Slush grout shall be a plastic mix of SikaGrout 212 and water. Mix ratios shall be within the limits provided by the manufacturer to provide the appropriate flowable consistency. Mixing and application shall be done in accordance with the manufacturer's written instructions.

2.2 SOURCE QUALITY CONTROL

- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks minimum before starting production.
- .2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.
- .3 Advise Departmental Representative four (4) week minimum in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Rock Foundations Under Impervious Backfill and Class 3 Filter Material
 - .1 The Contractor shall take care to minimize dust, debris, etc., created during grouting operations and prevent such materials from
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- fouling or coating the equipment parts.
- .2 Bedrock foundations forming the base for the Concrete Works, Impervious Backfill and Class 3 Filter Material shall be thoroughly cleaned of all soil, weathered rock (loose, broken, or shattered), ice, snow, and other deleterious materials remaining after excavation. All such materials shall be removed from the rock surface and from cavities, faults, potholes, and exposed open joints by barring, hand excavation, jetting with air and/or water, or other effective means, as accepted by the Departmental Representative.
- .3 Joints, cavities, and faults shall be excavated and thoroughly cleaned to a depth equal to at least three times the width of feature, and then backfilled with slush grout or dental concrete, as shown on the Drawings and directed by the Departmental Representative.
- .4 Any overhanging or near vertical rock surfaces shall be filled with dental concrete to a slope of no steeper than 0.5H:1V to permit thorough compaction of earth fill and allow for maximum contact with the excavator bucket during CB Wall trench excavation. Construction and payment for dental concrete will be made under Section 03 30 00 Cast-In-Place Concrete.
- .5 Holes and depressions shall be filled with hand compacted impervious material or dental concrete, as directed by the Departmental Representative. Construction and payment for impervious backfill will be made under the Section 31 23 23 Impervious Backfill. Construction and payment for dental concrete in holes and depressions will be made under Section 03 30 00 Cast-in-Place Concrete.
- .6 Where rock surfaces on the Concrete Works, Impervious Backfill and Class 3 Filter Material contact surface are fractured or undulating / roughened to an extent considered unsatisfactory to the Departmental Representative, a slush grout mixture shall be broomed into the cracks to smooth the final surface to accept the Concrete Works, Impervious Backfill and Class 3 Filter Material placement and result in a tight contact. Care shall be exercised to prevent accumulation of slush grout on unfractured surfaces.
- .7 The Contractor shall ensure that grouting and treatment of joints, cavities, faults, and other defects in the rock will not result in layers of grout, mortar, or concrete, covering areas of sound rock.
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- .8 The Contractor shall maintain the working surface free from water, ice and snow. Immediately prior to placing fill, all water shall be removed from depressions. The surfaces shall be wet, and shall be cleaned sufficiently to ensure satisfactory bond with the Impervious Backfill.
- .9 If any previously prepared foundation surface becomes contaminated with objectionable or deleterious material, that material shall be removed, as directed by the Departmental Representative.

3.2 CLEANING

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

END OF SECTION

PART 1 - GENERAL

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|-----------------------------|----|---|
| <u>1.1 SECTION INCLUDES</u> | .1 | Materials and installation of steel pipe assembly and navigation exclusion zone piles filled with concrete as part of the safety boom assembly and navigation exclusion zone. |
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| <u>1.2 RELATED REQUIREMENTS</u> | .1 | Section 01 22 01 - Measurement and Payment |
| | .2 | Section 01 33 00 - Submittal Procedures |
| | .3 | Section 03 33 00 - Cast-in-Place Concrete |
| | .4 | Section 35 42 15 - Safety Boom |
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| <u>1.3 MEASUREMENT PROCEDURES</u> | .1 | There shall be no separate measurement for payment for tubular steel piles filled with concrete. Include cost in the Contract Lump Sum. |
| | .2 | Payment shall be made as set out in Section 01 22 01 - Measurement and Payment and shall be incidental temporary works and safety boom work. |
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|--------------------------------|----|--|
| <u>1.4 REFERENCE STANDARDS</u> | .1 | American Society for Testing and Materials International (ASTM) |
| | .1 | ASTM A106/A106M-04b, Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service. |
| | .2 | ASTM A6/A6M-09, Standard Specification for General Requirement for Rolled Structural Steel Bar, Plates, Shapes and Sheet Piling. |
| | .3 | ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products. |
| | .4 | ASTM A252-98(2002), Standard Specification for Welded and Seamless Steel Pipe Piles. |
| | .2 | Canadian General Standards Board (CGSB) |
| | .1 | CAN/CGSB-1.171-98, Inorganic Zinc Coating. |
| | .3 | Canadian Standards Association (CSA International) |
| | .1 | CSA-G40.20/G40.21-2009, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel. |
| | .2 | CSA W47.1-09, Certification of Companies for |
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- Fusion Welding of Steel Structures.
- .3 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
- .4 CSA W59-08, Welded Steel Construction (Metal Arc Welding) (metric version).
- .5 CSA-Z245.1-07, Steel Pipe.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheet.
- .3 Submit shop drawings and indicate: pile shoes, splice detail, tip reinforcement, pile cap.
 - .1 Each drawing stamped and signed by professional engineer registered or licensed in Province of Ontario.
- .4 Quality Assurance: test reports:
 - .1 Prior to fabrication, and, if requested, provide Departmental Representative with two copies of steel producer's certificates in accordance with ASTM A252.
 - .2 One Charpy V-notch test, if requested, required per heat and results reported to Departmental Representative by manufacturer.
 - .3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Submit details of pile stock material to be used, as described in PART 3 - EXECUTION, for review by Departmental Representative.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .3 Deliver new, undamaged materials to site, accompanied by certified test reports, with manufacturer's logo and mill identification mark provided on pipe piling.
- .4 Storage and Protection:
 - .1 Store and handle pipe piling in accordance with manufacturer's written instructions to prevent permanent deflection, distortion or

- damage to interlocks.
- .2 Support pipe piling on level blocks or racks spaced not more than 3 m apart and not more than 0.60 m from ends.
- .3 Store pipe piling to facilitate required inspection activities and prevent damage to coatings and corrosion prior to installation.
- .5 Waste Management and Disposal:
 - .1 Separate waste materials for recycling and reuse in accordance with Section 01 74 21-Construction/Demolition Waste Management and Disposal.
 - .2 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
 - .3 Divert unused concrete materials from landfill to local facility as approved by Departmental Representative.
 - .4 Unused touch-up material must be disposed of at an official hazardous material collections site as approved by Departmental Representative.
 - .5 Unused touch-up material must not be disposed of into sewer system, into streams, lakes, onto ground or in any other location where it will pose a health or environmental hazard.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Steel pipe: seamless, straight, sizes and wall thicknesses indicated, plain cut ends, grade 350W.
 - .2 Pipe material to have following minimum properties:
 - .1 Yield strength: 350W
 - .2 Tensile strength: 450W
 - .3 Elongation at rupture: Min. 30%
 - .4 Weldable steel: to ASTM A106/ASTM A106M carbon equivalent less than 0.55%.
 - .3 Pipe chemical composition: to CSA-Z245.1, ASTM A252-98(2002)
 - .4 Pile tip reinforcement: not required
 - .5 Pile driving shoes: not required
 - .6 Shear rings: not required
 - .7 Splices: to CSA-G40.20/G40.21, Grade 350W as per approval of Departmental Representative.
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- .8 Steel pile caps: to CSA-G40.20/G40.21, Grade 350W
- .9 Welding electrodes: to CSA W48 series.
- .10 Exterior protective coating: Galvanizing: hot dipped galvanizing with zinc coating 600 g/m2 to ASTM A123/A123M-15.
 - .1 Touch-Up Primer for Galvanized Finish: SPCC - Paint 20 Zinc-Rich Primer Type I Inorganic.
 - .2 Pre-treat damaged surfaces as per manufacturer's instructions
- .11 Concrete: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

PART 3 - Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 FABRICATION

- .1 Fabricate full length piles to eliminate splicing during installation wherever possible.
 - .1 Pipe wall thickness established for boom anchor loading, and shall be a minimum thickness provided.
 - .2 Provide pipe wall thickness to suit method of pile installation.
 - .2 Full length piles may be fabricated from piling material by splicing lengths together.
 - .1 Use complete joint penetration groove welds.
 - .3 Submit details of planned use of pile material stock to Departmental Representative for approval prior to start of fabrication. Re-use cut-off lengths as directed by Departmental Representative.
 - .4 Allowable tolerance on axial alignment to be 0.25% as measured by 3 m straight edge.
 - .5 Allowable deviation from straight line over total length of fabricated pile to be 10 mm.
 - .6 Repair defective welds as approved by Departmental
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Representative.

- .1 Repairs: to CSA W59.
- .2 Unauthorized weld repairs may be rejected.
- .7 Repair damaged exterior protective coating of piles.

3.3 GALVANIZATION

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m2to ASTM A123/A123M-15.
 - .1 Touch-Up Primer for Galvanized Finish: SPCC - Paint 20 Zinc-Rich Primer Type I Inorganic.
 - .2 Pre-treat damaged surfaces as per manufacturer's instructions.

3.4 INSTALLATION

- .1 If approved by Departmental Representative, splice piles in place during installation by welding.
 - .1 To prevent distortion, tack opposite points first and then weld opposite sections. For pipe walls thinner than 10 mm weld, against a backup ring. Hold members in alignment during splicing operation.
 - .2 Make splice by complete joint penetration groove welds as indicated on shop drawings.
 - .3 Perform internal visual inspection of steel pipe, joints and base prior to placing of concrete.
 - .4 Ensure pipe inside is free from foreign matter.
- .2 Tremie method for concrete placement is not allowed.
- .3 Install concrete in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .4 Fill steel pipe pile with concrete using methods to limit free fall and to prevent segregation. Ensure adequate vibration to completely fill cross section of pipe.
- .5 Touch up scratched or uncoated surfaces with two applications of inorganic zinc coating and coal tar epoxy, as required by Departmental Representative.

3.5 WELDING

- .1 Weld to CSA W59.
 - .2 Welding certification of companies: to CSA W47.1.
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- .3 Welding certification of companies welding steel reinforcing bars placed in reinforced concrete: in accordance with CSA W186.

END OF SECTION

PART 1 - GENERAL

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| <u>1.1 RELATED REQUIREMENTS</u> | .1 | Section 31 11 00 - Clearing and Grubbing |
| | .2 | Section 31 14 13 - Soil Stripping and Stockpiling |
| | .3 | Section 32 93 43.01 - Tree Pruning |
| | .4 | Section 01 35 43 - Environmental Procedures |
|
<u>1.2 REFERENCE STANDARDS</u> | .1 | Health Canada - Pest Management Regulatory Agency (PMRA) |
| | .1 | National Standard for Pesticide Education, Training and Certification in Canada (2004). |
| | .2 | Health Canada/Workplace Hazardous Materials Information System (WHMIS) |
| | .1 | Material Safety Data Sheets (MSDS). |
| | .3 | Department of Justice Canada (Jus) |
| | .1 | Canadian Environmental Protection Act (CEPA), 1999, c. 33. |
| | .2 | Fertilizers Act (R.S. 1985, c. F-10). |
| | .3 | Fertilizers Regulations (C.R.C., c. 666). |
| | .4 | Transportation of Dangerous Goods Act (TDGA), 1992, c. 34. |
|
<u>1.3 DEFINITIONS</u> | .1 | Mycorrhiza: association between fungus and roots of plants. This symbiosis enhances plant establishment in newly landscaped and imported soils. |
|
<u>1.4 ADMINISTRATIVE REQUIREMENTS</u> | .1 | Scheduling: |
| | .1 | Obtain approval from Departmental Representative of schedule indicating beginning of Work. |
|
<u>1.5 ACTION AND INFORMATIONAL SUBMITTALS</u> | .1 | Provide in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 | Product Data: |
| | .1 | Provide manufacturer's instructions, printed |
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product literature and data sheets for tree and shrub preservation materials and include product characteristics, performance criteria, physical size, finish and limitations.

- .2 Tree Preservation Plan must identify isolated and groups of trees to be preserved and provide fencing/hoarding to protect the trees. Contractor is to ensure that in protected areas there is no:
 - .1 Construction.
 - .2 Altering of grade by adding fill, trenching, scraping dumping or disturbance of any kind.
 - .3 Storage of construction materials, equipment, soil, construction waste or debris.
 - .4 No disposal of liquids, e.g. petroleum products, paints etc.
 - .5 Movement or parking of vehicles, machinery and equipment.
- .3 Provide monthly written reports on maintenance during warranty period, 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.
- .4 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.

1.6 DELIVERY, STORAGE AND HANDLING

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

related to Work of this Section in accordance with Section 01 74 21. Separate for reuse and recycling and place in designated containers Steel, Stone, Metal and Plastic waste in accordance with Construction Waste Management Plan.

1.7 MAINTENANCE DURING WARRANTY PERIOD

- .1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.
 - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
 - .2 Apply pesticides in accordance with National Standard for Pesticide Education, Training and Certification in Canada, Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease. Obtain product approval from Departmental Representative prior to application.
 - .3 Apply fertilizer in early spring at manufacturer's suggested rate.
 - .4 Remove dead, broken or hazardous branches from plant material. Dispose of debris through mulching.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Fill:
 - .1 Type (A): clean, natural river sand and gravel material, free from silt, clay, loam, friable or soluble materials and organic matter.
 - .2 Type (B): excavated, pervious soil, free from roots, rocks larger than 75 mm, building debris, and toxic ingredients (salt, oil, etc.). Excavated material shall be approved by Departmental Representative before use as fill.
- .2 Coarse washed stones: 35-75 mm diameter clean round hard stone.
- .3 Peatmoss:
 - .1 Derived from partially decomposed species of Sphagnum Mosses.
 - .2 Elastic and homogeneous.
 - .3 Free of wood and deleterious material which

- could prohibit growth.
- .4 Shredded minimum particle size: 5 mm.
- .5 To have a natural pH and is not to be amended with lime.
- .4 Fertilizer:
 - .1 To Canada Fertilizer Act and Fertilizers Regulations.
 - .2 Complete, commercial, slow release with 35% of nitrogen content in water-insoluble form.
- .5 Anti-desiccant: commercial, wax-like emulsion.
- .6 Filter Cloth:
 - .1 Type 1: 100 % non-woven needle punched polyester, 2.75 mm thick, 240 g/m² mass.
 - .2 Type 2: biodegradable burlap.
- .7 Wood posts: 38x 38 x 2400 mm length, untreated wood.
- .8 Welded wire fabric (WWF): 152 x 152 x 1500 mm, MW 18.7/MW 18.7 to GSA 30.5.
- .9 Board Cladding: to consist of 50 x 100 mm lumber secured around the perimeter of tree trunks with plastic strapping or other means which will not damage the tree.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 IDENTIFICATION AND

- .1 Tree protection to be installed prior to the start of any on site work.

PROTECTION

- .2 Identify plants and limits of root systems to be preserved as approved by Departmental Representative.
- .3 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by Departmental Representative.
- .4 Ensure no root pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Departmental Representative.

3.3 TRUNK PROTECTION

- .1 Install board cladding vertically around the perimeter of designated deciduous trees within the active work zone.

3.4 TRENCHING AND TUNNELING FOR UNDERGROUND SERVICES

- .1 Centre line location and limits of trench/tunnel excavation to be approved by Departmental Representative prior to excavation. Tunnel excavation to extend 2000 mm from edge of trunk on either side.
- .2 Excavate manually within zone of root system. Do not sever roots greater than 40 mm diameter except at greater than 500 mm below existing grade. Protect roots, and cut roots cleanly with sharp disinfected tools.
- .3 Backfill for tunnel and trench to 85% Standard Proctor Density. Avoid damage to trunk and roots of tree.
- .4 Complete tunnelling and backfilling at tree within 1 week of beginning Work.

3.5 PRUNING

- .1 Prune in accordance with Section 32 93 43.01 - Tree Pruning.
- .2 Prune crown to compensate for root loss while maintaining general form and character of plant. Dispose of debris through mulching.

3.6 ANTI-DESICCANT

- .1 Apply anti-desiccant to foliage where applicable and as directed by Departmental Representative.

3.7 VERIFICATION

- .1 Verification requirements in accordance with Section 01 47 17- Sustainable Requirements: Contractor's Verification, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Local/regional materials.
 - .5 Low-emitting materials.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with 01 74 21- Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility approved by Departmental Representative.
- .4 Do not dispose of unused fertilizer, material into sewer system, into streams, lakes, onto ground or in any other location where they will pose health or environmental hazard.

END OF SECTION

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 This section specified topsoil, topsoil amendments, the preparation of existing grades and the placing of topsoil and finish grading.
- 1.2 RELATED REQUIREMENTS .1 Section 01 45 00 - Quality Control
.2 Section 01 33 00 - Submittal Procedures
.3 Section 31 11 00 - Clearing and Grubbing
.4 Section 31 14 13 - Soil Stripping and Stockpiling
.5 Section 31 22 13 - Rough Grading
.6 Section 32 01 90.33 - Tree and Shrub Preservation
.7 Section 32 91 19.13 - Topsoil Placement and Grading
- 1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 There shall be no separate measurement for payment for: (Include cost in Contract Lump Sum Price):
.1 The Preparation of Sub-grade for placing of topsoil at landscape areas;
.2 The Placing of Topsoil removed from stockpiles at landscape areas;
.3 The supply and application of Amendments including fertilizer at landscape areas;
.4 Finish Grading at landscape and other areas;
.2 Testing of topsoil: cost of tests paid for as specified in Section 01 45 00 - Quality Control.
- 1.4 REFERENCE STANDARDS .1 Agriculture and Agri-Food Canada
.1 The Canadian System of Soil Classification, Third Edition, 1998.
.2 Canadian Council of Ministers of the Environment
.1 PN1340-2005, Guidelines for Compost Quality.
.3 Canadian Nursery Landscape Association (CNLA)
.1 Canadian Standards for Nursery Stock, Eighth Edition, 2006
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1.5 DEFINITIONS

- .1 Compost:
 - .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
 - .2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
 - .3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below (25) (50)), and contain no toxic or growth inhibiting contaminants.
 - .4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Quality control submittals:
 - .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - PRODUCTS.
 - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 32 16.07.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling and reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Divert unused soil amendments from landfill to official hazardous material collections site approved by Departmental Representative.
 - .3 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.
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PART 2 - PRODUCTS

2.1 TOPSOIL

- .1 Topsoil for seeded areas and planting beds`:
mixture of particulates, microorganisms and organic matter which provides suitable medium for supporting intended plant growth.
 - .1 Soil texture based on The Canadian System of Soil Classification, to consist of consist of 4% organic matter for clay loams and 2% for sandy loams to a maximum of 20% by weight.
 - .2 Contain no toxic elements or growth inhibiting materials.
 - .3 Finished surface free from:
 - .1 Debris and stones over 50 mm diameter.
 - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
 - .4 Consistence: friable when moist.

2.2 SOIL AMENDMENTS

- .1 Fertilizer:
 - .1 A complete commercial synthetic slow release fertilizer with maximum 40% insoluble nitrogen.
 - .2 Formulation ratio as recommended by plant supplier.
 - .3 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
 - .4 Ph value: 6.5 to 8.0.
- .2 Peatmoss:
 - .1 Derived from partially decomposed species of Sphagnum Mosses.
 - .2 Elastic and homogeneous, brown in colour.
 - .3 Free of wood and deleterious material which could prohibit growth.
 - .4 Shredded particle minimum size: 5mm.
- .3 Sand: washed coarse silica sand, medium to course textured.

SPEC NOTE: Composted bio-solids are an excellent and environmentally responsible amendment to raise soil organic matter levels. The potential for pathogen carry-over to the site, however, suggests that use around residences and other high-traffic sites be restricted to products meeting CCME category A requirements.

- .4 Organic matter: compost Category A in accordance with CCME PN1340 or BNQ AA unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- .5 Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications.
- .6 Limestone:
 - .1 Ground agricultural limestone.
 - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- .7 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

2.3 SOURCE QUALITY CONTROL

- .1 Advise Departmental Representative of sources of manufactured topsoil to be utilized with sufficient lead time for testing.
- .2 Contractor is responsible for amendments to supply topsoil as specified.
- .3 Soil testing by recognized testing facility for PH, P and K, and organic matter.
- .4 Testing of topsoil will be carried out by testing laboratory designated by Departmental Representative.
 - .1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

PART 3 - EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control drawings or requirements of authorities having jurisdiction, whichever is more stringent.
 - .2 Inspect, repair, and maintain erosion and
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sedimentation control measures during construction until permanent vegetation has been established.

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

3.2 STRIPPING OF TOPSOIL

- .1 Soil stripping is to be carried in accordance with Section 31 14 13 - Soil Stripping and Stockpiling.

3.3 PREPARATION OF EXISTING GRADE

- .1 Verify that grades are correct.
 - .1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
 - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
 - .2 Remove debris which protrudes more than 75 mm above surface.
 - .3 Dispose of removed material off site.
- .4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.
 - .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

- .1 Place topsoil after Departmental Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 For sodded areas keep topsoil 15 mm below finished grade.
- .4 Spread topsoil as indicated to following minimum depths after settlement.
 - .1 150 mm for seeded areas.
 - .2 135 mm for sodded areas.

- .3 300 mm for flower beds.
- .4 500 mm for shrub beds.

- .5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.5 SOIL AMENDMENTS

- .1 For planting beds: apply and thoroughly mix soil amendments into full specified depth of topsoil at following rates:
 - .1 5 part topsoil;
 - .2 1 part peatmoss;
 - .3 1 part organic matter.

3.6 FINISH GRADING

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
 - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.
 - .1 Leave surfaces smooth, uniform and firm against deep footprinting.

3.7 ACCEPTANCE

- .1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.8 SURPLUS MATERIAL

- .1 Dispose of materials except topsoil not required off site where directed by Departmental Representative.

3.9 CLEANING

- .1 Proceed in accordance with Section 01 74 11-Cleaning.

END OF SECTION

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 This Section specifies sod, sod placement, preparation and maintenance.
- 1.2 RELATED REQUIREMENTS .1 Section 01 45 00 - Quality Control
.2 Section 01 33 00 - Submittal Procedures.
.3 Section 01 74 20 - Construction / Demolition Waste Management and Disposal
.4 Section 31 14 13 - Soil Stripping and Stockpiling
.5 Section 31 22 13 - Rough Grading
.6 Section 32 91 19.13 - Topsoil Placement and Grading
- 1.3 MEASUREMENT AND PAYMENT .1 There shall be no separate measurement for payment for the supply and placement of Sod and watering at landscape areas. Include cost in 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 for landscaping.
- 1.4 ADMINISTRATIVE REQUIREMENTS .1 Scheduling:
.1 Schedule sod laying to coincide with preparation of soil surface.
.2 Schedule sod installation when frost is not present in ground.
.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 31 19 - Project Meetings.
- 1.5 ACTION AND INFORMATIONAL SUBMITTALS .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for sod, geotextile and fertilizer and include product

characteristics, performance criteria,
physical size, finish and limitations.

- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 43- Environmental Procedures and 35 29.06- Health and Safety Requirements.

.3 Samples.

- .1 Obtain approval of samples by Departmental Representative.

- .4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements of seed mix, seed purity, and sod quality.

- .5 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties of seed mix, seed purity, and sod quality.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

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

- .3 Deliver and unload sod on pallets.

- .4 Deliver sod within 24 hours of being lifted and lay sod within 36 hours of being lifted.

- .5 Dry, frozen, dead, irregular or broken sod will not be accepted.

.6 Storage and Handling Requirements:

- .1 Store materials in accordance with supplier's recommendations.
- .2 Replace defective or damaged materials with new.

- .7 Packaging Waste Management: remove for recycle and reuse of pallets, padding, crates, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/ Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
 - .1 Turf Grass Nursery Sod types:
 - .1 Number One Kentucky Bluegrass Sod: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.
 - .2 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.
 - .3 Number One Named Cultivars: Nursery Sod grown from certified seed.
 - .2 Turf Grass Nursery Sod quality:
 - .1 Not more than 1 broadleaf weed and up to 1% native grasses per 40 square metres.
 - .2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
 - .3 Mowing height limit: 35 to 65 mm.
 - .4 Soil portion of sod: 6 to 15 mm in thickness.
- .2 Commercial Grade Turf Grass Nursery:
 - .1 Mow sod at height directed by Departmental Representative within 36 hours prior to lifting, and remove clippings.
 - .2 Not more than 5 broadleaf weeds and up to 20% native grasses per 40 square metres.
- .3 Sod establishment support:
 - .1 Biodegradable starch pegs: 17 x 8 x 200 mm.
- .4 Fertilizer:
 - .1 To Canada "Fertilizers Act" and Fertilizers Regulations.
 - .2 Complete, synthetic, slow release with 65% of nitrogen content in water-insoluble form.

- 2.2 SOURCE QUALITY CONTROL .1 Obtain written approval from Departmental Representative of sod at source.
- .2 When proposed source of sod is approved, use no other source without written authorization from Departmental Representative.

PART 3 - EXECUTION

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

- 3.2 PREPARATION .1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13- Topsoil Placement and Grading. If discrepancies occur, notify Departmental Representative and commence work when instructed by Departmental Representative.
- .2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .3 Fine grade surface free of humps and hollows to smooth, even grade, to contours elevations indicated, to tolerance of plus or minus 15 mm for Commercial Grade Turf Grass Nursery and plus or minus 8 mm, for Turf Grass Nursery Sod, surface to drain naturally.
- .4 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site in location as directed by Departmental Representative in accordance with Section 01 74 21- Construction/Demolition Waste Management And Disposal.

3.3 SOD PLACEMENT

- .1 Ensure sod placement is done under supervision of certified Landscape Planting Supervisor.
- .2 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.
- .3 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.
- .4 Roll sod as directed by Departmental Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.4 SOD PLACEMENT ON SLOPES AND PEGGING

- .1 Install and secure geotextile fabric in areas indicated, in accordance with manufacturer's instructions.
- .2 Start laying sod at bottom of slopes.
- .3 Peg sod on slopes steeper than 3 horizontal to 1 vertical, within 1 m of catch basins and within 1m of drainage channels and ditches to following pattern:
 - .1 100 mm below top edge at 200 mm on centre for first sod sections along contours of slopes.
 - .2 Not less than 3-6 pegs per square metre.
 - .3 Not less than 6-9 pegs per square metre in drainage structures. Adjust pattern as directed by Departmental Representative.
 - .4 Drive pegs to 20 mm above soil surface of sod sections.

3.5 FERTILIZING PROGRAM

- .1 Fertilize during establishment and warranty periods to the requirements of the requirements of the certified landscape contractor and to the following program: Place fertilizer on topsoil prior to laying sod.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
 - .1 Clean and reinstate areas affected by Work.
- .3 Waste Management: separate waste materials for recycling, compost and reuse in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling and compost containers and bins from site and dispose of materials at appropriate facility.
 - .2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Departmental Representative.

3.7 PROTECTION BARRIERS

- .1 Protect newly sodded areas from deterioration with snow fence on rigid frame as directed by Departmental Representative.
- .2 Remove protection after inspection as directed by Departmental Representative.

3.8 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following operations from time of installation until acceptance.
 - .1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100mm.
 - .2 Cut grass to 50mm when or prior to it reaching height of 75mm.
 - .3 Maintain sodded areas weed free to 95% of surfaces.
 - .4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.
 - .5 Temporary barriers or signage to be maintained where required to protect newly established sod.

3.9 ACCEPTANCE

- .1 Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:
 - .1 Sodded areas are properly established.
 - .2 Sod is free of bare and dead spots.
 - .3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50mm.
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- .4 Sodded areas have been cut minimum 2 times prior to acceptance.
- .2 Sodded Commercial Grade Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:
 - .1 Sodded areas are properly established.
 - .2 Extent of surface soil visible when grass has been cut to height of 60 mm is acceptable.
 - .3 Sod is free of bare or dead spots and extent of weeds apparent in grass is acceptable.
 - .4 Sodded areas have been cut minimum 2 times prior to acceptance.
 - .5 Fertilizing in accordance with fertilizer program has been carried out at least once.
- .3 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.
- .4 When environmental conditions allow, all sodded areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the original.
- .5 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

3.10 MAINTENANCE DURING
WARRANTY PERIOD

- .1 Perform following operations from time of acceptance until end of warranty period:
 - .1 Water sodded Turf Grass Nursery Sod and Commercial Grade Turf Grass Nursery Sod areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100mm.
- .2 Repair and re-sod dead or bare spots to satisfaction of Departmental Representative Consultant.
- .3 Cut grass and remove clippings that will smother grass as directed by Departmental Representative to height as follows:
 - .1 Turf Grass Nursery Sod:
 - .1 50 mm during normal growing conditions.
 - .2 Commercial Grade Turf Grass Nursery Sod:
 - .1 60 mm during normal growing conditions.
 - .3 Cut grass at 2 week intervals or as directed by Departmental Representative but at intervals so that approximately one third of growth is removed in single cut.
 - .4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and

- .5 remainder at right angles and water in well.
Eliminate weeds by mechanical chemical means
to extent acceptable to Departmental
Representative.

END OF SECTION

PART 1 - GENERAL

<u>1.1 RELATED REQUIREMENTS</u>	.1	Section 01 45 00 - Quality Control.
	.2	Section 01 33 00 - Submittal Procedures
	.3	Section 01 74 20 - Construction / Demolition Waste Management and Disposal.
	.4	Section 31 11 00 - Clearing and Grubbing
	.5	Section 32 01 90.33 - Tree and Shrub Preservation.
	.6	Section 32 91 19.13 - Topsoil Placement and Grading.
<u>1.2 REFERENCE STANDARDS</u>	.1	Agriculture and Agri-Food Canada (AAFC).
	.1	Plant Hardiness Zones in Canada-2000.
	.2	Canadian Nursery Landscape Association (CNLA)
	.1	Canadian Standards for Nursery Stock-2006.
	.3	Health Canada/Workplace Hazardous Materials Information System (WHMIS)
	.1	Material Safety Data Sheets (MSDS).
<u>1.3 DEFINITIONS</u>	.1	Mycorrhiza: association between fungus and roots of plants. This symbiosis enhances plant establishment in newly landscaped and imported soils.
<u>1.4 ADMINISTRATIVE REQUIREMENTS</u>	.1	Scheduling: obtain approval from Departmental Representative of schedule 7 days in advance of shipment of plant material.
	.2	Schedule to include:
	.1	Date for selection of plant material or representative sample at source by Departmental Representative.
	.2	Quantity and type of plant material.
	.3	Shipping dates.
	.4	Arrival dates on site.
	.5	Planting Dates.
	.6	Removal for replanting of collected (transplanted) native stock
	.3	Undertake inspection with the Departmental

Representative to identify existing trees and shrubs to be removed, stored and transplanted.

- .1 Contractor shall retain a licensed arborist to inspect plant materials, to oversee removal to storage area, including establishing storing conditions, confirming condition and quality prior to transplanting, and transplanting operation.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for trees, shrubs, ground cover, fertilizer, mycorrhiza, anti-desiccant, anchoring equipment, and mulch and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 43- Environmental Procedures and 01 35 29.06- Health and Safety Requirements.
- .3 Samples:
 - .1 Submit samples of mulch.

1.6 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Contractor shall retain a licensed arborist to inspect plant materials, to oversee removal to storage area, including establishing storing conditions, confirming condition and quality prior to transplanting, and transplanting operation.
 - .2 Provide name of plant material supplier and obtain approval from Departmental Representative of plant material at source prior to shipping to site.
 - .3 Provide documentation from source, but not limited to:
 - .1 Authenticating seed source from which nursery stock was grown.
 - .2 Region from which stock has been imported.
 - .4 Arrange for inspection of plant stock upon arrival to site. All rejected plant material shall be
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removed from project site immediately upon rejection by the Departmental Representative. Replace any damaged stock with new undamaged material as directed by Departmental Representative.

- .5 Collected stock: Only trained individual may collect wild stock. Collected native plant material use is acceptable only upon written approval of the Department Representative. Provide documentation regarding source of stock to include but not limited to:

- .1 Collecting Agent qualifications
- .2 Source of stock
- .3 Date of collection
- .4 Number of transplants prior to planting in final location

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .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 day in accordance with supplier's written recommendations and after arrival at site in storage location approved by Departmental Representative.
 - .2 Protect stored plant material from frost, wind and sun and as follows:

- .1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in sand or topsoil and watering to full depth of root zone.
- .2 For pots and containers, maintain moisture level in containers. Heel-in fibre pots.
- .3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.

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

1.8 WARRANTY

- .1 For plant material as itemized on plant list the 12 months warranty period is extended to 24 months.
- .2 End-of-warranty inspection will be conducted by Departmental Representative.
- .3 Departmental Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.
- .4 The Contractor will provide warranty equal to the initial warranty on any material that fails within the warranty period and is replaced.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- .1 Type of root preparation, sizing, grading and quality: comply with Canadian Standards for Nursery Stock.
 - .1 Source of plant material: grown in Zone 4b 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.
 - .2 Plant material: free of disease, insects, defects or injuries and structurally sound with strong
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fibrous root system.

- .3 Trees: with straight trunks, well and characteristically branched for species.
- .4 Trees larger than 200 mm in caliper: half root pruned during each of two successive growing seasons, the latter at least one growing season before arrival on site.
- .5 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or container grown.
- .6 Collected stock: maximum 40 mm in caliper, with well-developed crowns and characteristically branched; no more than 40% of overall height may be free of branches.
 - .1 During collection, ensure 10% maximum seed crop (or plants) are collected from healthy population of many individuals, and from several plants of same species.
 - .2 Leave remainder for natural dispersal and as food for dependent organisms.

2.2 WATER

- .1 Free of impurities that would inhibit plant growth.

2.3 STAKES

- .1 T-bar, steel, 40 x 40 x 5 x 2440 mm or Wood, pointed one end, 38 x 38 x 2300 mm.

2.4 WIRE TIGHTENER

- .1 Type 1: galvanized steel.
- .2 Type 2: turnbuckle, galvanized steel, 9.5 mm diameter with 270 mm open length.

2.5 GUYING WIRE

- .1 Type 1: steel, 3 mm wire.
- .2 Type 2: 1.5 mm diameter multi-wire steel cable, minimum 3 strands for trees 150 - 50 mm caliper

2.6 CLAMPS

- .1 U-bolt: galvanized, 13 mm diameter, c/w curved retaining bar and hex nuts.
 - .2 Crimp type.
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|------------------------------------|----|--|
| <u>2.7 ANCHORS</u> | .1 | Wood Stake: 38 x 38 x 500 mm. |
| | .2 | Steel Stake: 40 x 40 x 5 x 500 mm. |
| <u>2.8 GUYING COLLAR</u> | .1 | Tube: rubber 13 mm diameter. |
| <u>2.9 MULCH</u> | .1 | Shredded wood: varying in size from 25 to 125 mm in length, from coniferous trees. |
| <u>2.10 FERTILIZER</u> | .1 | Synthetic commercial type as recommended by soil test report. |
| | .1 | Ensure new root growth is in contact with mycorrhiza. |
| | .2 | Use mycorrhiza as recommended by manufacturer's written recommendations. |
| <u>2.11 ANTI-DESICCANT</u> | .1 | Wax-like emulsion. |
| <u>2.12 FLAGGING TAPE</u> | .1 | Fluorescent, orange colour. |
| <u>2.13 SOURCE QUALITY CONTROL</u> | .1 | Obtain approval from Departmental Representative of plant material prior to planting. |
| | .2 | Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations. |
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<u>PART 3 - EXECUTION</u> | | |
| <u>3.1 EXAMINATION</u> | .1 | Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sod installation in accordance with manufacturer's written instructions. |
| | .1 | Visually inspect substrate in presence of Departmental Representative. |
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- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PRE-PLANTING PREPARATION

- .1 Proceed only after receipt of written acceptability of plant material from Departmental Representative.
- .2 Remove damaged roots and branches from plant material.
- .3 Apply anti-desiccant to conifers and deciduous trees in leaf in accordance with manufacturer's instructions.
- .4 Locate and protect utility lines.
- .5 Notify and acquire written acknowledgement from utility authorities before beginning excavation of planting pits for trees and shrubs.

3.3 EXCAVATION AND PREPARATION OF PLANTING BEDS

- .1 Establishment of sub-grade for planting beds in accordance with Section 31 22 13- Rough Grading.
- .2 Preparation of planting beds in accordance with Section 32 91 19.13- Topsoil Placement and Grading.
- .3 For individual planting holes:
 - .1 Stake out location and obtain approval from Departmental Representative prior to excavating.
 - .2 Excavate to depth and width as indicated.
 - .3 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
 - .4 Scarify sides of planting hole.
 - .5 Remove water which enters excavations prior to planting. Notify Departmental Representative if water source is ground water.

3.4 PLANTING

- .1 For bare root stock, place 50 mm backfill soil in
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bottom of hole.

- .1 Plant trees and shrubs with roots placed straight out in hole.
- .2 For jute burlapped root balls, cut away top one third of wrapping and wire basket without damaging root ball.
 - .1 Do not pull burlap or rope from under root ball.
- .3 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.
- .4 Plant vertically in locations as indicated.
 - .1 Orient plant material to give best appearance in relation to structure, roads and walks.
- .5 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.
- .6 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.
- .7 Water plant material thoroughly.
- .8 After soil settlement has occurred, fill with soil to finish grade.

3.5 TRUNK PROTECTION

- .1 Install trunk protection on deciduous trees as indicated.
- .2 Install trunk protection before installation of tree supports.

3.6 TREE SUPPORTS

- .1 Install tree supports as indicated.
 - .2 Use single stake tree support for deciduous trees less than 3 m in height and evergreens less than 2
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m in height.

- .1 Place stake on prevailing wind side and 150 mm minimum from trunk.
 - .2 Drive stake 150 mm minimum into undisturbed soil beneath roots.
 - .1 Ensure stake is secure, vertical and unsplit.
 - .3 Install 150 mm long guying collar 1500 mm above grade.
 - .4 Thread Type 1 guying wire through guying collar tube.
 - .1 Twist wire to form collar and secure firmly to stake. Cut off excess wire.
 - .3 Use 3 guy wires and anchors for deciduous trees greater than 3m in height and evergreens greater than 2 m in height.
 - .1 Use Type 2 guying wire with clamps for trees less than 75 mm in diameter and Type 3 guying wire with clamps for trees greater than 75 mm in diameter.
 - .2 Use Type 1 anchors for trees less than 75 mm in diameter and Type 2 anchors for trees greater than 75 mm in diameter.
 - .3 Install guying collars above branch to prevent slipping at approximately 2/3 height for evergreens and 1/2 height for deciduous trees. Collar mounting height not to exceed 2.5 m above grade.
 - .4 Guying collars to be of sufficient length to encircle tree plus 50 mm space for trunk clearance. Thread guy wire through collar encircling tree trunk and secure to lead wire by clamp or multi-wraps; cut wire ends close to wrap. Spread lead wires equally proportioned about trunk at 120 degrees.
 - .5 Install anchors at equal intervals about tree and away from trunk so guy wire will form 45 degree angle with ground. Install anchor at angle to achieve maximum resistance for guy wire.
 - .6 Attach guy wire to anchors. Tension wire and secure by installing clamps.
 - .7 Install wire tightener ensuring that guys are secure and leave room for slight movement of tree.
 - .8 Saw tops off wooden anchors which extend in excess of 100 mm above grade or as directed by Departmental Representative.
 - .9 Install flagging tape to guys as indicated.
 - .4 After tree supports have been installed, remove broken branches with clean, sharp tools.
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3.7 MULCHING

- .1 Ensure soil settlement has been corrected prior to mulching.
- .2 Spread mulch as indicated.

3.8 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following maintenance operations from time of planting to acceptance by Departmental Representative.
 - .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
 - .1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
 - .2 Remove weeds monthly.
 - .3 Replace or re-spread damaged, missing or disturbed mulch.
 - .4 For non-mulched areas, cultivate as required to keep top layer of soil friable.
 - .5 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.
 - .6 Remove dead or broken branches from plant material.
 - .7 Keep trunk protection and guy wires in proper repair and adjustment.
 - .8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

3.9 MAINTENANCE DURING WARRANTY PERIOD

- .1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.
 - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
 - .2 Reform damaged watering saucers.
 - .3 Remove weeds monthly.
 - .4 Replace or re-spread damaged, missing or disturbed mulch.
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- .5 For non-mulched areas, cultivate monthly to keep top layer of soil friable.
- .6 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.
- .7 Apply fertilizer in early spring as indicated by soil test.
- .8 Remove dead, broken or hazardous branches from plant material.
- .9 Keep trunk protection and tree supports in proper repair and adjustment.
- .10 Remove trunk protection, tree supports and level watering saucers at end of warranty period.
- .11 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
- .12 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.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
 - .3 Waste Management: separate waste materials for reuse and recycling in accordance with 01 74 21- Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Divert discarded burlap, wire and plastic plant containers materials from landfill to plastic recycling facility approved by Departmental Representative.
 - .3 Dispose of unused fertilizer at official hazardous material collection site approved by Departmental Representative.
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- .4 Dispose of unused anti-desiccant at official hazardous material collections site approved by Departmental Representative.
- .5 Divert unused wood and mulch materials from landfill to recycling or composting facility approved by Departmental Representative.

3.11 CLOSEOUT ACTIVITIES

- .1 Submit maintenance reports for trees, shrubs, and other plantings.

END OF SECTION

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Work under this covers tree pruning of existing trees that are to remain, but where branches and limbs may be damaged due to the undertaking of the work under this contract.
- 1.2 MEASUREMENT PROCEDURES .1 There shall be no separate measurement for payment for Pruning to prevent damage or as a result of damage caused by operations within other sections of the contract. Include cost in Contract Lump Sum Price
- .2 Payment for tree pruning shall be incidental to the Work being undertaken.
- 1.3 REFERENCE STANDARDS .1 American National Standard Institute (ANSI)
- .1 ANSI A300 (Part 1)-2001, Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices (revision and re-designation of ANSI A300-1995) (includes supplements).
- .2 ANSI A300 (Part 2)-1998, Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance - Standard Practices - Part 2 - Fertilization.
- .3 ANSI A300 (Part 3)-2000, Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance: Standard Practices - Part 3 - Tree Support Systems (a. Cabling, Bracing, and Guying) (supplement to ANSI A300-1995).
- .2 Canadian Nursery Landscape Association (CNLA)
- .1 Canadian Standards for Nursery Stock, 8th Edition, 2006.
- .3 International Society of Arboriculture (ISA)
- .4 Ontario Ministry of Agriculture, Food and Rural Affairs
- .1 Publication 483-2004, Pruning Ornamentals.
- 1.4 DEFINITIONS .1 Crown Cleaning: consists of selective removal of one or more of following items: dead, dying or
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diseased branches, weak branches and water sprouts.

- .2 Crown Thinning: consists of selective removal of branches to increase light penetration, air movement and reduce weight.
- .3 Crown Raising: consists of removal of lower tree branches to provide clearance.
- .4 Crown Reduction or Crown Shaping: decreases tree height and/or spread.
- .5 Vista Pruning: is selective thinning of framework limbs or specific crown areas to improve views.
- .6 Crown Restoration: improves structure, form and appearance of trees that have been severely headed or vandalized.

1.5 QUALITY ASSURANCE

- .1 Certification: provide International Society of Arboriculture for people performing pruning operations.
- .2 Regulatory requirements: provide safety certificate as approved by local hydro utility where pruning work will take place within 1 metre of overhead energized conductors.
- .3 Acceptance of Work will be determined by Departmental Representative from field sample.
- .4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06- Health and Safety Requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Dispose of unused disinfectant at official hazardous material collections site approved by Departmental Representative.
- .4 Ensure emptied containers are sealed and stored safely.
- .5 Divert wood materials from landfill to facility for

recycling or composting as directed by Departmental Representative.

1.7 TOOL MAINTENANCE

- .1 Ensure that tools are clean and sharp throughout pruning operation: do not use tools that crush or tear bark.
- .2 Disinfect tools before each tree is pruned.
- .3 On diseased plant material disinfect tools before each cut.

1.8 WARRANTY

- .1 For seeding, 12 months warranty period is extended to 24 months [1 full growing season].
- .2 End-of-warranty inspection will be conducted by Departmental Representative.

PART 2 - PRODUCTS

2.1 DISINFECTANT

- .1 20% solution of sodium hypochlorite or 70% solution of ethyl alcohol.

PART 3 - Execution

3.1 APPLICATION

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

3.2 GENERAL

- .1 Prune in accordance with Pruning Ornamentals and ANSI A300, and as directed by Departmental Representative. Where discrepancies occur between standard and specifications, specifications govern.
- .2 Notify immediately Departmental Representative conditions detrimental to health of plant material or operations.
- .3 Prune during plant dormant period or after leaves have matured. Avoid pruning during leaf formation, at time of leaf fall, or when seasonal temperature drops below minus 10 degrees C.

- .4 Prune trees that are heavy bleeders, Acer, Betula, Gleditsia, Tilia, Ulmus and Populus when in full leaf.
- .5 Minimize pruning work in order to retain natural form and shape of plant species.
- .6 Do not:
 - .1 Flush cut branches.
 - .2 Crush or tear bark.
 - .3 Cut behind branch bark ridge.
 - .4 Damage branch collars.
 - .5 Damage branches to remain.

3.3 PRUNING

When approved by the Departmental Representative:

- .1 Remove dead, dying, diseased and weak growth from plant material to provide Departmental Representative in order to promote healthy growth.
- .2 Remove live branches that:
 - .1 Interfere with healthy development and structural strength including branches crossed or rubbing more important branches.
 - .2 Are of weak structure including narrow crotches.
 - .3 Obstruct development of more important branches.
 - .4 Are broken.
- .3 Remove live branches to re-establish natural species form including:
 - .1 One or more developing leaders.
 - .2 Multiple growth due to previous topping.
 - .3 Branches extending outward from natural form.
 - .4 Undesirable sucker growth.
- .4 Remove loose branches, twigs and other debris lodged in tree.
- .5 Remove vines.
- .6 For branches under 25 mm in diameter:
 - .1 Locate branch bark ridge and make cuts smooth and flush with outer edge of branch collar to ensure retention of branch collar. Cut target area to bottom of branch collar at angle equal to that formed by line opposite to

- branch bark ridge.
- .2 Make cuts on dead branches smooth and flush with swollen callus collar. Do not injure or remove callus collar.
- .3 Do not cut lead branches unless directed by Departmental Representative.
- .7 For branches greater than 25mm in diameter:
 - .1 Make first cut on lower side of branch 300 mm from trunk, one third diameter of branch.
 - .2 Make second cut on upper side of branch 500 mm from trunk until branch falls off.
 - .3 Make final cut adjacent to and outside branch collar.
- .8 Ensure that trunk bark and branch collar are not damaged or torn during limb removal.
 - .1 Repair areas which are damaged, or remove damaged area back to next branch collar.
- .9 Remove additional growth designated by Departmental Representative.
- .10 For branches and/or roots damaged by construction activity provide clean cuts to near undamaged portion of healthy material to satisfaction of the Departmental Representative.

3.4 ROOT GIRDLING

- .1 For girdling roots one-quarter size of trunk diameter or larger, V-cut girdling root one-half way through at point where root is crossing.
- .2 Remove exposed portion of girdling root as directed by Departmental Representative after cleanly cutting root flush with grade on each side of parent root. Do not injure bark or parent root.

3.5 CARE OF WOUNDS

- .1 Shape bark around wound to oblong configuration ensuring minimal increase in wound size. Retain peninsulas of existing live bark.

3.6 CLEAN-UP

- .1 Proceed in accordance with Section 01 74 11-Cleaning.
- .2 Collect and dispose of pruned material and remove from site.

- .3 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS
- .1 Section 01 11 00 - Summary of Work.
 - .2 Section 01 14 00 - Work Restrictions.
 - .3 Section 01 22 01 - Measurement and Payment
 - .4 Section 01 33 00 - Submittals Procedures.
 - .5 Section 01 35 29.06 - Health and Safety Requirements
 - .6 Section 01 35 43 - Environmental Procedures.
 - .7 Section 01 35 46 - Archaeological and Cultural Procedures.
 - .8 Section 01 41 00 - Regulatory Requirements.
 - .9 Section 01 48 00 - Construction Control and Monitoring
 - .10 Section 01 71 00 - Examination and Preparation.
 - .11 Section 01 74 20 - Construction / Demolition Waste Management and Disposal.
 - .12 Section 02 41 16 - Structure Demolition
 - .13 Section 31 23 33.01 - Excavation, Trenching and Backfilling
 - .14 Section 35 62 16 - Cofferdams
- 1.2 SECTION INCLUDES
- .1 This section specifies requirements for Dewatering and Water Diversion Works described by drawings and specifications.
 - .2 These temporary measures shall be designed to accommodate:
 - .1 Seasonal navigation of the waterway and adjoining lock;
 - .2 Navigation operating levels
 - .3 Seasonal flows and winter conditions
 - .3 Work includes but is not limited to:
 - .1 Engaging a Professional Engineer licensed in the Province of Ontario to design and oversee the implementation of the following:
-

- .1 All temporary dewatering frames and structures upstream and downstream of the existing dam;
- .2 A flow diversion system and related structures;
- .3 Methodology and related structures to control flows and water levels upstream of the Work in response to varying seasonal conditions;
- .4 The systems used to remove the water at the Work space (site);
- .5 The monitoring and maintenance programs for the stability of the existing dam and Lock during the progress of the installation and removal of the Dewatering and Diversion Works;
- .6 Methodology for maintaining the work spaces in a dry state (task area);
- .7 Methodology for removal of temporary works and for maintaining stability of new and existing Works during the recharging (filling) of the waterway;
- .8 Methodology for maintaining navigation in the adjoining Lock;
- .9 Methodology to maintain water supplies to residences impacted by dewatering works;
- .10 Producing a risk analysis for Dewatering and Diversion Works.
- .2 Implementation of dewatering and diversion works according to the Professional Engineer's design.
- .3 Constructing and maintaining dewatering and diversion structures for the duration of the Work.
- .4 Providing and maintaining all dewatering equipment for the duration of the Work.
- .5 Removing water from Work spaces and maintaining these spaces in the dry state for the duration of the Work.
- .6 Supply of standby equipment to replace dewatering equipment which malfunctions.
- .7 Removing temporary dewatering and diversion structures at the end of the Work.
- .8 Complying with the approved SSEMP, provisions of Section 01 35 43 - Environmental Procedures, and Section 01 35 46- Archaeological and Cultural Procedures with respect to turbidity and pollution control at all times.

1.3 MEASUREMENT AND PAYMENT .1
PROCEDURES

No separate measurement for payment shall be made for the structure demolition. All work shall be included in the Contract Lump Sum price. Install

stabilized entrances at equipment access points to dewatered watercourses.

- .2 Payment shall be made as set in Section 01 22 01 - Measurement and Payment for all work related to Dewatering and Diversion work.

1.4 REGULATORY REQUIREMENTS

- .1 Adhere to local, provincial and federal requirements relating to:
 - .1 Protection of environment
 - .2 Safety of construction;
 - .3 Protection of workers
- .2 The design, details for the construction and installation and removal of cofferdams and temporary water control structures must be in accordance with Fisheries Act.
- .3 Pumping water out of cofferdam enclosure: to Section 01 35 43 - Environmental Procedures.
- .4 Obtain and pay costs of all required permits.
- .5 Sediment and erosion control measures must be in conformance with related contract plans as a minimum.
- .6

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Shop drawings of all cofferdams, flow diversion, and other dewatering systems, including seepage control, stability of structures and slopes within the work area.
 - .1 Shop drawings shall be complete with Professional Engineer's seal & signature.
 - .2 Submit design criteria and calculations of (for each stage of construction):
 - .1 Flow capacity of diversion works to maintain navigable water levels and seasonal operating levels;
 - .2 Flow characteristics at intake, conveyance and outlet of diversion works to mitigate scouring and erosion, and to address environmental and public boating safety concerns;
 - .3 Stability of cofferdams and existing structures and slopes during dewatering and of the new

- structure during surcharging;
- .4 Flow diverters and related structures; Provide methodology, details (including sequencing) and shop drawings for the removal of cofferdams, shoring, bracing and underpinning, and for site restorations at areas disturbed by the removal of these temporary works including areas of Surface Protection as set out on the contract drawings.
- .5 Measures to control seepage, and surface drainage into the Work area, to maintain existing slope and new embankment stability during the Work, and to keep the Work area in a dry state.
- .3 Provide risk analyses for Dewatering and Diversion Works, seepage control and embankment stability based on the design criteria:
 - .1 During the installation of the temporary works;
 - .2 During the progress of the Work;
 - .3 During the removal until final acceptance.
- .4 Provide methodology, details (including sequencing) and shop drawings for the removal of cofferdams, shoring, bracing and underpinning, and for site restoration at areas disturbed by the removal of these temporary works.
- .2 Submit detail drawings to Regulatory Agencies, as required to satisfy conditions for granting of permits.
 - .1 Modify detail drawings to meet Regulatory Agency Requirements.
 - .2 Revise details to address site conditions encountered during construction.

1.6 TEMPORARY WORKS AND ENGINEERING SERVICES

- .1 Designer of cofferdam, flow diversion and other related dewatering structures, including seepage control and treatment, and stability of excavated embankment including protection of existing Works, must be a Professional Engineer, licensed to practice in the Province of Ontario, with considerable expertise and experience in design of similar structures and systems, and be acceptable to the Departmental Representative.
- .2 Designer must: make, check and sign all calculations; check, seal and sign all drawings and

related reports; weekly inspection of dewatering and diversion structures and systems on site during construction; verify their adequacy and safety; provide a written notice to the Departmental Representative stating that the temporary works have been constructed as per design requirements and that they are ready for safe operation.

- .3 The Designer for the Dewatering and Diversion Works, and associated works shall undertake monthly inspections to ensure the performance of these Works are in accordance with the design criteria and provide written reports of these inspections to the Departmental Representative.
- .4 Assist/participate in the surveillance and monitoring of the lock structures, adjacent abutments, slopes and surrounds in accordance with Section 01 48 00 – Construction Control and Monitoring.

1.7 DESIGN CRITERIA

- .1 Design cofferdams to ensure maintenance of work spaces in a dry state for duration of work.
 - .1 The Contract drawings show a location for the cofferdam to undertake the Works.
 - .2 The Contractor shall undertake their own evaluation as to the adequacy of this location to undertake the Works.
- .2 Design flow diversion to pass river flow around the work area to below the Lock works.
 - .1 The Contract drawings show a location for the Diversion Works on the north half of the dam. This location has been approved by Parks Canada Agency.
 - .2 The Contractor shall undertake their own evaluation as to the adequacy of this location to undertake the Works.
 - .3 The Contractor may choose an alternative location for the water diversion to be able to undertake Work subject to the approval of the Departmental Representative.
- .3 Ensure that neither the cofferdam structures or the Diversion Works nor any other portion of the Work interfere with the operation of the Lock.
- .4 Ensure that neither the cofferdam structures nor the Diversion Works interfere with the passage of river flow past the construction site without causing flooding either upstream or downstream which would not have occurred without the

dewatering structures at the site.

- .1 Upstream water levels which exceed an elevation of 234.68 metres are regarded as flooding.
 - .5 At all times, provide Diversion Works with adequate capacity to discharge the river flows for each stage of dewatering, to ensure the achievement of all water control requirements.
 - .1 Provide safe access for operations.
 - .2 Provide training for operating staff.
 - .3 Provide measures to protect Parks Canada Agency employees and public from temporary works (inlet, outlet and open conveyance), including warning and advisory signage, safety boom and buoys, and fencing as required by the Departmental Representative.
 - .4 Provide erosion control measures at the inlet, conveyance and outlet works as necessary.
 - .5 Provide measures to prevent blockage by debris at inlet works.
 - .6 The contractor is responsible for designing the diversion system to have the capacity for conveying an inflow design flood (IDF) of the 1:40 year runoff corresponding to 65 cms.
 - .6 At no times during the project can the existing Lock works be used to divert or assist with the diversion of the river flow.
 - .7 Plan and design dewatering and diversion systems considering:
 - .1 Access to cofferdams and diversion works and access to reach any portion of Work.
 - .2 Site constraints including stability and protection of the Lock, the existing dam structure, and excavated embankment for the work. Do not operate heavy construction equipment within the immediate vicinity of the lock, upper lock entrance wall and Works.
 - .3 Space required for crews to work in dewatered areas.
 - .4 Sequence of Work.
 - .5 The river flow records, flood levels and winter conditions.
 - .6 The foundation level for the Works.
 - .7 The continued operation of the Lock works during navigation season.
 - .8 Parks Canada Agency operator access to the Lock and the dam.
 - .9 Parks Canada Agency operators and general public and boating public safety
-

- .10 Protection of existing residential water supply wells or river intake.
- .8 At all times, maintain environmental quality of water to Section 01 35 43 - Environmental Procedures. Maintain permits and approval stipulation as set out in Section 01 41 00 - Regulatory Requirements.
- .9 Ensure that no phase of Work threatens safe performance of cofferdam.
- .10 Design dewatering systems capable of removing the water from the work spaces without causing instability of excavated embankments or foundation soils due to the seepage pressure of infiltration water.
- .11 Provide operating rule curves for the diversion control structure including tables identifying ~~the~~ relative discharge of incremental operation of the temporary structure. Records of control structure settings are to be maintained throughout the duration of the project.

1.8 WATER LEVELS AND FLOW RECORDS

- .1 Seasonal operating levels are identified in Section 01 14 00 - Work Restrictions. Parks Canada Agency will direct the manipulation of stop logs at the dam to maintain the seasonal operating levels.
- .2 The Lock is not used for water level control.
- .3 The dam is operated to maintain navigation and other seasonal levels and for fisheries during the spawning season as set out in Section 01 14 00 - Work Restrictions. Operation entails the removal and replacement of stop logs.
- .4 Contractor must be able to pass flow safely through the construction site during the course of the work.

1.9 ENVIRONMENTAL REQUIREMENTS

- .1 Dispose of water so it does not create a safety or health hazard; or cause damage to environment, to adjacent property or to any portion of Work, or cause erosion of river banks or channel banks.
- .2 Prior to dewatering the work area, remove any aquatic species (fish and turtles) according to approved environmental plan. Work to be supervised by a knowledgeable and competent fishery expert.

- .3 Install environmental systems to capture sedimentation prior to release of water into waterways in accordance with Section 01 35 43 - Environmental Procedures.
 - .1 Prevent additional erosion when discharging water.

1.10 PROTECTION

- .1 Protect cofferdam and dewatered work spaces from damage due to floods, rain, ice, snow or other adverse climatic conditions
- .2 Do not interfere with the Lock operation. Provide stability measures as necessary to protect the Lock from damage during construction adjacent to the Lock.
- .3 The stacked stone wall upstream of the dam must be removed by hand in order to install the upstream cofferdam and to repair the stacked stone slumped area as shown on the drawings. The arrangement of the stones must be numbered in a layout plan, identifying the exact location of each stone relative to others. The stones must be stored in a location which protects their condition such that they can be placed back in the same arrangement.
- .4 Train staff for safe operation of dewatering and diversion works.
- .5 Provide monitoring measures to ensure a timely response to waterway flow adjustment requests by Parks Canada and any emergency conditions.
- .6 Provide back-up equipment as necessary to maintain a dry working area. Provide measures to monitor dewatering equipment.
- .7 Where construction activities impact residential well water supplies, or residential river intake supplies, revise construction methodology to protect these water supplies. Alternatively, provide and maintain another supply source to the satisfaction of the Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Only use material in good condition, approved by Departmental Representative and suitable for their use in Work.
-

- .2 Do not use materials which may cause environmental damage to waterway or to land at or near site. This includes materials which would cause turbidity in excess of limits specified in Section 01 35 43 - Environmental Procedures and Section 01 41 00 - Regulatory Requirements.

The Plan (shop drawings) shall clearly demonstrate the materials to be employed and the methodology of installation, operation, maintenance, and removal along with restoration where applicable.

- .3 If using sand bags for an interim measure, sand must be washed of fines before placing in the water. Bags are to be made of a synthetic reinforced material suitable for the purpose intended. The Departmental Representative may request a demonstration to confirm the filled bags can be installed and removed without any resulting turbidity. Sand bags are not to be used for long term solution for cofferdam or water diversion works.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Evaluate, plan and execute Work to the design criteria, in a professional and prudent manner giving due consideration to:
- .1 Climatic conditions which may occur at work location during period of doing work in its entirety.
 - .2 Safety of personnel and of general public including boating traffic.
 - .3 Safety of Work and of adjacent property and structures.
 - .4 Safety of removals.
 - .5 Safe operation (including training of staff) of operation of diverters and other equipment to maintain navigation and seasonal water levels.
 - .6 Maintaining navigation at the Lock.
 - .7 Environmental requirements.
 - .8 Clearance requirements for Work.
 - .9 Irregularities of adjacent surfaces.
 - .10 Residential water supplies in the vicinity of the Work area.
 - .11 Changes in water levels.
 - .12 Minimize and manage risk associated with temporary Works including, monitoring and recording site conditions on a daily basis.
 - .13 Resolving site issues in a timely manner.
-

3.2 WATER MANAGEMENT AND DIVERSION CONTROL OPERATIONS

- .1 Provide a communication protocol with Parks Canada Agency acceptable to all parties including the Departmental Representative.
- .2 Do not make adjustments in flow diversion without notifying Agency and Lock operators. Provide estimated quantity of flow for diversion to Agency. Wait for confirmation and instructions from Agency.
- .3 Maintain a record of date/ time/ setting/ calculated flow/ river stage and submit to Agency and Departmental Representative weekly.
- .4 Operator of diversion system is to be on call at all times during construction period commencing when the diversion works are functional until project assumption.
- .5 Operate diversion structure to maintain water levels within the operating range as given in Section 01 14 00 - Work Restrictions.
- .6 Confirm diversion system setting does not impact the safe ingress and egress at the lock both upstream and downstream. Document any incidents with boaters and advise Agency and Departmental Representative.
- .7 Do not make adjustments in flow at the diversion works if boating public is in the immediate area of the inlet and outlet works.

3.3 DEWATERING

- .1 Dewater work spaces for the various tasks involved with the Work and maintain them in a fully dewatered state until Work is finished. Dewatering will require 24 hour maintenance and supervision including electronic monitoring of the dewatered area with automated alarms. As a minimum, maintenance will include;
 - .1 Preventive maintenance and refuelling of generators normally performed during any shift.
 - .2 Emergency repairs of minor complexity.
 - .3 Placing standby items in service.
- .2 Continue dewatering operations to enable Work to proceed in the dry for duration of Work.
- .3 Repeat entire dewatering procedure as often as may be necessary if flooding or other damage occurs before completion of Work, while ensuring adequate

capacity in the staging facility for treatment of brown water.

- .4 Maintain the dewatered state by pumping from well-points and/or sumps.
- .5 Ensure that any drawdown of the water surface due to pumping does not affect:
 - .1 The safety or quality of the Work.
 - .2 The stability of adjacent structures and embankments.
 - .3 Adjacent property in an adverse manner including domestic and other water supplies (wells).

3.4 EQUIPMENT

- .1 General:
 - .1 Provide equipment in safe operating condition and maintain it in a safe operating condition for entire period of use and/or standby for use on Work.
 - .2 Provide skilled operators for equipment.
 - .3 Undertake service and maintenance of equipment according to approved environmental procedures.
- .2 Standards and Performance:
 - .1 Provide equipment of such quality and in such quantity as to provide sufficient capability to perform essential functions of Work to the approved schedule.
 - .2 Equipment that is working in channel / river shall meet all environmental requirements.
 - .3 Equipment shall be inspected and serviced regularly. Provide copies of equipment inspection and service records when requested by the Departmental Representative.
 - .4 Provide emergency equipment for spills of hazardous substances.
 - .1 Provide standby replacement for pumps and other essential dewatering equipment which may break down during Work.
 - .2 Keep this replacement equipment available on site for immediate use.

3.5 REMOVAL OF COFFERDAMS, FLOW DIVERTER AND STABILITY WORKS

- .1 At approved stages in Work, remove all cofferdams, temporary improvements, and dewatering systems to original bottom level. No cofferdam removals are to commence until the water up dam leak test has been conducted and repairs have been accepted.

- .2 Remove all cofferdam materials to the founding soils (below erosion control measures) to the satisfaction of the Departmental Representative.
- .3 Remove entirely all flow diverters. Restore the site to the original condition or better.
- .4 Remove all stability works other than those approved to remain in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling. Restore the site to the original condition or better.
- .5 Remove all temporary measures. Restore the site to the original condition or better to the satisfaction of the Departmental Representative.
- .6 Dispose of all unwanted materials off-site as approved by the Departmental Representative.
- .7 Do not dispose of any materials in river.
- .8 Undertake removals to the requirements of the regulatory permits and approvals, and to Section 01 35 43 - Environmental Procedures.

3.6 REMOVAL OF DEWATERING
WELL POINTS, TEST WELL,
MONITORING WELLS AND
PIEZOMETRES

- .1 Undertake removal and decommissioning of dewatering well points, test wells, monitoring wells and piezometers to the requirements of O.Reg 903 (OWRA).
 - .1 Retain a licensed driller to undertake the work.
 - .2 Fully remove all wells and piezometers outside the Parks Canada right-of-way.
 - .3 Decommission piezometers within Parks Canada lands by installing a bentonite mixture to the full depth, removing upper 0.2 m of conduit, and backfilling to finished grade.

END OF SECTION

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 This section specifies requirements for safety booms as part of the safety requirements for navigation as set out by Transport Canada Navigable Waters.
- 1.2 RELATED REQUIREMENTS .1 Section 01 35 43 - Environmental Procedures
.2 Section 01 33 00 - Submittal Procedures
.3 Section 01 41 00 - Regulatory Requirements
.4 Section 01 74 21 - Construction / Demolition Waste Management and Disposal
.5 Section 01 56 00 - Temporary Barriers and Enclosures.
.6 Section 05 50 00 - Metal Fabrications
.7 Section 03 33 00 - Cast-in-Place Concrete
.8 Section 31 62 16.19 - Filled Tubular Steel Pipes
.9 Section 35 49 25 - Turbidity Curtain (Silt Curtain)
- 1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no separate measurement for payment for safety booms anchors, assembled safety boom and navigation warning marking for in-water anchors used as part of the temporary works. Include cost in Contract Lump sum Price. Units shall be installed as indicated on the Contract Drawings with graphics in English and French.
.2 Payment shall be made as set out in Section 01 22 01 and shall be included in applicable item of work for safety booms and temporary works.
.3 Include costs in Contract Lump sum Price for:
.1 Seventeen (17) units with the English graphics and seventeen (17) units with French graphics shall be installed as indicated on Contract drawings.
.2 Two(2) spare units with English graphics are units with French graphic shall be delivered to Parks Canada yard in Peterborough
- 1.4 REFERENCES .1 American Society for Testing and Materials

International (ASTM)

- .1 ASTM D1505-68, Standard Test Method for Density of Plastics by the Density-Gradient Technique
- .2 ASTM A572, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
- .3 ASTM C578, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

1.5 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Submit manufacturer's instructions, printed product literature and data sheets for the floatation logs, and associated hardware and include product characteristics, performance criteria, physical size, finish and limitations
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by Professional Engineer registered or licensed in Province of Ontario, Canada.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
 - .3 Provide floating unit assembly details including log to log connection, shore and in-water anchor connections.
 - .4 Provide drawing of total assembly indicating number of units required between each anchor.

1.6 DESCRIPTION OF SAFETY
BOOM SYSTEM

- .1 Floatation units shall be new units not previously used.
- .2 Floatation units shall consist of an external encasement, internal foam fill and internal structural steel channel through which all external inter boom connections are attached.
- .3 Each floatation unit shall be approximately cylindrical in shape.
- .4 The nominal diameter, length minimum buoyancy as indicated.
- .5 Each floatation log shall be designed to have a minimum buoyancy of 317kg.
- .6 Each floatation unit shall be designed to maintain

its original buoyancy even if it is structurally damaged or punctured.

PART 2 - PRODUCTS

2.1 FLOATATION UNIT ENCASEMENT

- .1 The encasement shall be rotationally molded using rotationally molding grade linear low density polyethylene or linear medium grade polyethylene.
- .2 Polyethylene encasement shall have a minimum density of 0.935 g/cm³ as determined by ASTM D1505-68. The polyethylene shall be manufactured with antioxidants incorporated into the process and be UV-stabilized for long-term environmental exposure.
- .3 The nominal wall thickness of the polyethylene encasement shall be a minimum of 4.3 mm.
- .4 The standard encasement color shall be yellow (FS-13655) per Transport Canada requirements unless alternate colors are requested.
- .5 Message /graphic, integrally molded into floatation unit polyethylene encasement and:
 - .1 Be black in colour;
 - .2 Lettering shall be 100 mm high Arial font or approved alternative;
 - .3 Message to be centered on the front face.
 - .4 Message to read:
 - .1 "DANGER - DAM AHEAD - KEEP OUT" for 50% of the boom units, and
 - .2 "DANGER - BARRAGE DEVANT - NE PAS APPROACHER" for 50% of the boom units;
 - .5 Parks Canada Agency logo shall be 75 mm high and located on the left of the unit, on opposite face.

2.2 FLOATATION UNIT INTERNAL CORE

- .1 The internal core of the floatation log shall be polystyrene foam meeting the requirements of ASTM C-578 and shall have a minimum in-place density of 14.4 kg/m³ and a maximum in-place density of 19.2 kg/m³.
- .2 Water absorption of polystyrene shall not exceed 3% by volume as tested.
- .3 Polystyrene fill shall take up a minimum of 95% of

the interior volume of the boom. Under no circumstances will the percentage of foam fill be less than 90% of the interior of the boom.

2.3 FLOATATION UNIT BALLAST .1

Each floatation unit shall be reinforced and ballasted with a steel channel. Size and steel grade of the channel shall be in accordance to the manufacturer's recommendation.

.2 The channel shall be located on the interior of each floatation unit, and positioned on the bottom interior surface to provide anti-rolling features to the boom unit.

.3 Each channel must be secured to the floatation unit encasement with galvanized ASTM A325 bolts and a heavy wall external galvanized flat plate.

2.4 INNER BOOM AND ANCHOR CONNECTION HARDWARE .1

All connecting hardware between floatation units and anchor shall consist of:

- .1 Bottom steel connector plate,
- .2 Load-rated safety clevis (shackle) and
- .3 Load-rated welded links (chain).

.2 The connections between floatation units shall be engineered to minimize wear and maximize load-bearing capacity.

.3 Structural steel: ASTM 572, Grade 50 steel or approved equivalent.

.4 Galvanizing: all fabricated component and hardware under this section are to have hot dipped galvanizing to ASTM A123/A123M. Galvanization grade and weight to be in accordance with the manufacturer's recommendation.

.5 Bolts, nuts and washers: to ASTM A325/A325M, hot dipped galvanized to ASTM A153/A153M, unless otherwise approved.

.6 Connection clevis (shackle) shall:

- .1 Have a minimum pin diameter of 3/4-inch, be of a safety type with a heavy-hex style castle nut, lock washer and cotter pin.
- .2 Have a Working Load Limit of not less than 4.3 tonnes. The Working Load Limit rating shall be clearly identified on the body of each clevis.

.7 Chain: Hot dipped galvanized, grade 30 proof coil, size as indicated on the contract drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 The Contractor shall be responsible to place and align all field placed shoreline and in-water anchors.
- .2 Install in accordance with manufacturer's instructions and as indicated on the Contract drawings.
- .3 Do not make alteration to system components without written permission of Departmental Representative.
- .4 Individual section of boom shall be connected to shoreline anchor or in-water anchor with separate clevis (shackle), unless otherwise indicated.
- .5 Ensure the warning message facing upstream for the upstream boom, and facing downstream for the downstream boom. Alternatively place boom units with English and French warning message.

3.2 CONSTRUCTION

- .1 Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
- .2 For installation of anchors, provide sediment control measures acceptable to the Departmental Representative. Do not spill concrete into open water.

3.3 TEMPORARY SAFETY BOOM

- .1 The requirements for the temporary safety boom for the construction purpose shall be the same as the permanent boom.
- .2 The Departmental Representative will allow the use of the permanent safety booms for temporary use during the construction phase.
- .3 Any unit used as part on the temporary boom that is damaged at the end of the construction stage shall be replaced at the Contractors expense.

3.4 NAVIGATION WARNING
MARKING

- .1 Install one Parks Canada standard buoy attached to the concrete filled galvanized steel pile in-water anchor as indicated on the Contract drawings and to

the approval of the Departmental Representative.

3.5 FIELD QUALITY CONTROL

.1 Site Tests / Inspections.

- .1 Provide Departmental Representative with minimum of 10 days' notice of date of beginning Work on safety boom assembly and provide access to Work for inspection.
- .2 Safety boom constructed in whole or in part without inspection will not be accepted.
- .3 Final inspection of safety boom will be made in place. Contractor to assist with access for inspection.
- .4 Evidence of units having a lack of buoyancy, or are damaged, as determined by the Departmental Representative will be cause for rejection.

END OF SECTION

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Installation of a turbidity curtain as part of the preservation of the water course.
- 1.2 RELATED REQUIREMENTS .1 Section 01 14 00 - Work Restrictions.
- .2 Section 01 22 01 - Measurement and Payment
- .3 Section 01 33 00 - Submittal Procedures
- .4 Section 01 41 00 - Regulatory Requirements
- .5 Section 01 35 43 - Environmental Procedures
- .6 Section 01 61 00 - Common Product Requirements
- .7 Section 35 20 22 - Dewatering and Diversion
- 1.3 MEASUREMENT AND PAYMENT .1 There shall be no separate measurement for payment for the supply, installation and maintenance of a Turbidity Curtain within a water course. Include cost in Contract Lump Sum Price.
- .2 Payment shall be made as set out in Section 01 22 01 - Measurement and Payment and shall be incidental to applicable item of work for environmental controls and dewatering and diversion 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 the monitoring specifications
- 1.4 REFERENCE STANDARDS .1 American Society for Testing and Materials (ASTM)
- .1 ASTM D4491-99a (2009), 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 D4716-08, Standard Test Method for Determining the (In-Plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
- .4 ASTM D4751-16, Standard Test Method for Determining Apparent Opening Size of a
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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.
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel.
 - .2 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 Ontario Provincial Standard Drawings (OPSD)
 - .1 OPSD 219.260 Turbidity Curtain (November 2015)
 - .2 OPSD 219.261 Turbidity Curtain, Seam Detail (November 2015)
- .5 Ontario Provincial Standard Specification (OPSS)
 - .1 OPSS 577 - Construction Specification for Temporary Erosion and Sediment Control Measures (November 2010)

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit details of the temporary turbidity curtain system to the Departmental Representative prior to the start of the Work.
- .3 Submit to Departmental Representative details of geotextile material and seam at least 2 weeks prior to commencing work.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.
- .2 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive

heat, mud, dirt, dust, debris and rodents.

- .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Geotextile: woven synthetic fibre fabric, supplied in rolls.
 - .1 Width: approved by the Departmental Representative.
 - .2 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.
- .2 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/m².
 - .3 Tensile strength and elongation (in any principal direction): to ASTM D4595.
 - .1 Tensile strength: minimum 1350N, wet condition.
 - .2 Elongation at break: minimum maximum 25%.
 - .3 Seam strength: minimum 1350N equal to or greater than tensile strength of fabric.
 - .4 Mullen burst strength: to CAN/CGSB-4.2, method 11.2, minimum 4000N, equal to or greater than tensile strength of fabric.
- .3 Hydraulic properties:
 - .1 Apparent opening size (AOS): to ASTM D4751.
- .4 Seams: sewn in accordance with manufacturer's recommendations
- .5 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile
- .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 600g/m² to ASTM A123/A123M Coating Grade 85.

PART 3 - EXECUTION

3.1 GENERAL

- .1 Ensure compliance of the sediment control plan throughout the project.
- .2 Supply, install, maintain and remove silt curtains when instructed by the Departmental Representative.
- .3 Monitoring of water turbidity outside the silt curtain will be carried out by the Contractor as set out in Section 01 35 43 - Environmental Procedures

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 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 flotation 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 Adjustment lines shall be placed at maximum intervals of 10 m, and are to encircle the turbidity curtain from top to bottom.
 - .6 The turbidity curtain shall be prepared for installation by furling and tying with furling ties every 1.5 m for the entire length of the curtain.
 - .7 Anchor locations shall be established as is necessary to maintain the turbidity curtain in place and functioning.
 - .8 Provide buoys or other navigation markers to identify the location of the turbidity
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curtain to boaters to Transport Canada standards.

- .9 Place turbidity curtain to maintain a clear navigation channel as set out in the contract drawings and approved by the Departmental Representative.

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.
- .2 Equipment is permitted in the work area enclosed by the turbidity curtain.
- .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 floatation collar shall be regularly monitored and freed of collected sediment.
- .6 Monitor and maintain the turbidity curtain 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 debris trapped by the turbidity curtain regularly and dispose at an approved location.
- .10 Remove turbidity curtain when authorized by the Departmental Representative after completion of the work in accordance with Section 01 14 00 - Work Restrictions.
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PART 4 - CLEANING

4.1 CLEANING

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

END OF SECTION

PART 1 - GENERAL

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|---------------------------------|----|---|
| 1.1 <u>RELATED REQUIREMENTS</u> | .1 | Section 01 35 42 - Environmental Procedures |
| | .2 | Section 31 23 16 Rock Removal |
| | .3 | Section 35 20 22 Dewatering and Diversion |
| | .4 | Section 35 01 40 Preservation of Watercourse |
| | .5 | Section 35 49 25 Turbidity Curtain (Silt Curtain) |
| 1.2 <u>GENERAL REQUIREMENTS</u> | .1 | Acknowledge all laws, regulations, guidelines and safety codes applicable to work involved in this section and comply strictly. |
| 1.3 <u>REGULATIONS</u> | .1 | Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive. |
| | .2 | The cofferdam construction, operation, monitoring and demolition must comply with all applicable laws, especially and not limited to: <ul style="list-style-type: none">.1 Ministry of Labour, Ontario - Occupational Health and Safety Act and Regulations for Construction Projects..2 Environmental Protection for Construction in Waterbodies and on Waterbody Banks (OPSS 182). |
| 1.4 <u>PERMITTING</u> | .1 | The Contractor is responsible to obtain all required permits and approvals necessary to construct, operate and demolish cofferdams. |
| | .2 | The Parks Canada Agency is responsible for attaining the Department of Fisheries and Oceans Authorization. |
| 1.5 <u>SCOPE OF WORK</u> | .1 | Cofferdams will be required to allow construction of concrete structures and the excavation of rock in the dry. |
| | .2 | The work described in this section includes: <ul style="list-style-type: none">.1 Stage 1 Upstream Cofferdam.2 Stage 1 Downstream Cofferdam.3 Stage 2 Upstream Cofferdam.4 Stage 2 Downstream Cofferdam.5 Stage 3 Upstream Cofferdam.6 Stage 3 Downstream Cofferdam.7 Construction, maintenance, and demolition of |

the cofferdams.

- .3 Work to be in accordance with the latest editions of all government laws and regulations.

1.6 DESIGN REQUIREMENTS

- .1 The cofferdams shall be designed for the minimum of one in forty year flood and 500 mm freeboard allowance. In no case shall the minimum crest elevation of the cofferdam be less. The expected flow for the 1:40 year flood is 68 m³/s.
- .2 Cofferdam is subject to dynamic hydraulic loads due to the staged construction, which includes operation of the existing dam. Dynamic loads to be included in the design of the cofferdam.
- .3 The Contractor shall become familiar with the historical minimums, maximums, averages and daily levels. If the Contractor believes the proposed minimum cofferdam crest elevations are not adequate, they shall budget at the time of the tender any necessary modifications to raising and strengthening the cofferdams. No claims will be considered at the time of construction for inadequacy of cofferdams to maintain the work area dry.
- .4 The Contractor shall submit, at least 14 days prior to commencement of construction activities, the approved final drawings of the cofferdams for construction signed and sealed by a Professional Engineer licensed in Ontario.
- .5 The Contractor is responsible for the stability and water tightness of the cofferdams under all loading conditions. Further, brown water and blue water separation/isolation must ensure that the brown water evacuated from the site not exceed 3785 liters per minute (LPM) or 1000 US gallons per minute (USGPM).
- .6 The contract drawings only provide a schematic of the proposed construction staging and shall not be used by the Contractor in any manner for the design of the cofferdams. Cofferdams must be within the work area and limits of construction. The maximum dewatered footprint must not exceed the limits shown on the contract drawings.
- .7 Contractor is fully responsible for the design and installation of the cofferdams that can include cellular cofferdam, structural steel with drilled post or embedded post, diaphragm cofferdam, or any other design to be approved by the Departmental Representative.

- .8 Rockfill/backfill with waterproof barrier cofferdam is not acceptable for this project.
- .9 The cofferdam design engineer shall be on site to witness all of the following activities applicable to the project and provide individual signed and sealed letters confirming that they were completed with accordance to the design drawings:
 - .1 Anchor installation
 - .2 Post installation
 - .3 Steel/sheetpile installation
 - .4 Backfill/rock fill installation
 - .5 Membrane installation
 - .6 Sealing of cofferdam bottom
 - .7 Sealing of cofferdam sides
 - .8 Adequacy of cofferdam stability
- .10 No dewatering or demolition work shall commence until all necessary signed and sealed letters in order to certify the cofferdam have been submitted by the Contractors cofferdam design engineer.
- .11 Erosion and sediment control and water quality monitoring shall be in compliance with all regulations.
- .12 Any bedrock sealing requirements for the cofferdams is the responsibility of the contractor and must first employ non-cementitious products as a first option, including plastic and sandbags. In the event these approaches are unsuccessful, additional means including grouting and tremie concrete use may be explored however their use is subject to approval of the Departmental Representative.

1.7 INSPECTION

- .1 The Contractor and its engineers shall maintain a quality control program throughout the construction and service life of the cofferdams. The Contractor and its engineers are responsible for all aspects of the cofferdam including but not limited to approval of foundation bedrock conditions, site preparation and construction and materials quality control and monitoring of the cofferdams.
- .2 All observations must be compiled in a daily inspection report, with copies sent on a weekly basis to the Departmental Representative.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

END OF SECTION