



Public Works and
Government Services
Canada

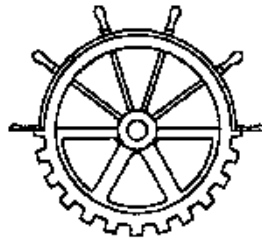
Travaux publics et
Services gouvernementaux
Canada

**SPECIFICATIONS FOR
RIDEAU CANAL
OTTAWA WALLS REPAIRS
2015**

**(Dows Lake, South of Bronson Bridge and along Queen
Elizabeth Drive, north for 588m)**

Project No. R.079197.001
September 4th, 2015

Prepared by:



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END

1.1 TIME OF
COMPLETION

- .1 Commence work in accordance with notification of acceptance of contract offer and complete the work within the dates outlined in the contract.
- .2 Comply with the dewatering, drawdown schedule, and spring water levels as described in paragraph 1.9 of this section.
- .3 Comply with the work schedule restriction imposed at Site 1, as described in paragraph 1.27 of this section.

1.2 ACCESS TO THE
SITES

- .1 The site is located in Ottawa, Ontario, along the Rideau Canal at Queen Elizabeth Drive between the Bronson bridge and Bank Street.
- .2 Within the Canal and NCC lands, access to the work, limits of the work and staging areas to be as shown on the plans or as directed by the Departmental Representative. Limit of work are within Canal is limited to a width of 4m from the existing wall vertical face for the full length of the site.
- .3 An access permit from the NCC will be required before using any NCC land.
- .4 Remove any temporary access structures and restore the access and work areas to the original condition upon completion of the work, at the contractor's expense, except where noted otherwise.
- .5 For the portion of the access by public roads, make all arrangements, obtain any required permits and confine activities to such routes and load limits as the authorities having jurisdiction may require.
- .6 Secure the work areas in an approved manner. This includes using a minimum 1.8 m high welded-wire construction fence to prevent public access to any areas where construction activities occur and construction material is stored. For the winter period, when the Canal is used as a skating rink, a 1.8 m welded-wire construction fence on the ice surface will also be required to separate the work area from the skating public. Fence is to be located maximum 4 m from the canal wall.
- .7 Refer to Section 01 35 30 for traffic control details.

1.3 CANAL
REGULATIONS

- .1 The "Canal Regulations" apply to and govern the work of this Contract. Copies may be obtained from the Rideau Canal Office, 34A Beckwith St. S., Smiths Falls, Ontario, K7A 2A8, tel: 613-283-7199.

1.4 RELICS AND
ANTIQUITIES

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

1.5 MINIMUM
STANDARD

- S.1 Materials shall be new and work shall conform to the minimum applicable standards of the Canadian General Standards Board, the Canadian Standards Association, the National Building Code of Canada 2010 (NBCC), ASTM, applicable Provincial and Municipal codes, and all other national and international standards. In the case of conflict or discrepancy the most stringent requirement shall apply.

1.6 ABBREVIATIONS

- .1 Abbreviations used are:
- .1 ASTM - American Society for Testing and Materials.
 - .2 ACI - American Concrete Institute.
 - .3 ANSI - American National Standards Institute.
 - .4 CSA - Canadian Standards Association.
 - .5 CWB - Canadian Welding Bureau.
 - .6 NBCC - National Building Code of Canada.
 - .7 CPM - Critical Path Method.
 - .8 CGSB - Canadian General Standards Board.
 - .9 CAN2, CAN3 - national standards of Canada published by CGSB.
 - .10 GC - General Conditions.
 - .11 MNR - Ministry of Natural Resources
 - .12 MOE - Ministry of the Environment
 - .13 NCC - National Capital Commission
 - .14 OPSS - Ontario Provincial Standard Specifications
 - .15 PWGSC - Public Works and Government Services Canada.

1.7 DEFINITIONS

- .1 Unless the context clearly indicates otherwise, the following definitions apply:

1.7 DEFINITIONS
(Cont'd)

- .1 (Cont'd)
 - .1 Canal - the Rideau Canal.
 - .2 Plans and/or Specifications:
 - .1 Plans - the drawings listed in the "List of Drawings".
 - .2 Specification - the subject matter listed in the "List of Contents", addenda to the specification, and all relative written communications sent by the Departmental Representative to the Contractor in connection with the work.

1.8 BENCH
MARK/DATUM

- .1 Contractor shall complete a complete vertical survey of the project site in accordance to Natural Resources Canada, Geodetic Survey requirements.
- .2 Refer to plans for station marker information and location.

1.9 WATER LEVELS

- .1 Information on the control of water levels and canal flows may be obtained from Departmental Representative.
- .2 The contractor will be required to work in areas where water is present. Where repairs are required below water, the work is to be performed after a dewatering system is installed to facilitate wall repairs. Refer to Section 35 20 22 for dewatering.
- .3 The normal range of water levels during the navigation period, which runs approximately from May 15 through October 16, ranges from 64.03 m to 64.08 m.

1.9 WATER LEVELS
(Cont'd)

- .4 The normal water level during the drawdown period is 61.92 m. Operations to lower the water level starts on October 19, 2015 and, under normal circumstances, a drawdown level of 61.92 m is attained by October 23, 2015. The duration of the initial drawdown period is two weeks. Water levels start to rise by about noon on November 9 until a water level of 62.83 m is attained. This level is maintained until the end of the NCC skating season. Depending on weather conditions, skating season usually ends by mid-March. The Spring drawdown water level of 61.92 m is usually achieved by the month of April until the water level is raised for the navigation season starting on April 25, 2016. Since weather conditions affect water levels in the canal during the month of April, the contractor is to assume that the duration of the drawdown level in April is 10 calendar days.
- .5 Dates indicated in subsections 9.3 and 9.4 are not firm commitments and approximations only and are based on previous years practice. Exact dates for the 2015/2016 season will be provided to the Contractor, as soon as Rideau Canal Operations establish a schedule for the upcoming season.
- .6 If the water level rises above or drops below these ranges because of precipitation, operating problems or any other cause, it shall be brought back within described range as soon as reasonably possible.
- .7 The Departmental Representative endeavors to control the water level. However, the Departmental Representative cannot be held responsible for events, or the results of events that are not under its control.

1.10 REQUIREMENTS
OF REGULATORY
AGENCIES

- .1 Adhere to City of Ottawa noise by-laws.
- .2 Dispose of all unwanted materials at a location off Canal lands approved by the Ontario Ministry of the Environment.

1.11 PROTECTION OF
EXISTING
UNDERGROUND
FACILITIES.

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

1.11 PROTECTION OF
EXISTING
UNDERGROUND
FACILITIES.
(Cont'd)

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

1.12 DEPARTMENTAL
REPRESENTATIVE
SITE OFFICE

- .1 Provide and maintain a secure construction office area for the exclusive use of the Departmental Representative as follows:
 - .1 Of sound, lockable, insulated, weather-proof construction.
 - .2 Equipped with electric light, 4 electrical outlets, heat, desk, 900 mm x 1200 mm reference table, 4 chairs, 1 drafting stool, and 1 lockable 4-drawer filing cabinets; not less than 12 square metres in floor area.
 - .3 Maintain a minimum temperature of 20 degrees C during hours of work.
- .2 Pay all costs, including heating and lighting.
- .3 Office is to remain the property of the Contractor.
- .4 Contractor may provide office trailer with separate and individually lockable office segments to minimize space usage on site upon acceptance of Departmental Representative.

1.13 CONTRACTOR'S
OFFICE

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

1.14 EXPLOSIVES

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

1.15 EXAMINATIONS

- .1 Examine site and conditions likely to affect work and be familiar and conversant with existing conditions.
- .2 Provide photographs of surrounding properties, objects and structures liable to be damaged or be the subject of subsequent claims.

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- 1.16 CLEAN-UP
- .1 Clean and tidy the premises including the bed of the Canal on a daily basis, do not permit the accumulation of debris, trash and/or garbage.
 - .2 Rubbish, debris and garbage from all construction activities is to be removed off site on a weekly basis.
 - .3 At the completion of the work remove all surplus materials, tools, plant, rubbish and debris and dispose of them in an approved manner off Canal property.
- 1.17 TAXES
- .1 Pay all taxes properly levied by law (including Federal, Provincial and Municipal).
- 1.18 FEES, PERMITS, AND CERTIFICATES
- .1 Pay all fees and obtain all permits. Provide authorities with plans and information for acceptance certificates. Provide inspection certificates as evidence that work conforms to requirements of Authority having jurisdiction.
- 1.19 FIRE SAFETY REQUIREMENTS
- .1 Comply with the National Building Code of Canada 2010 (NBCC) for fire safety in construction and the National Fire Code of Canada 2010 (NFC) for fire prevention, fire fighting and life safety in building in use.
 - .2 Comply with the following Human Resources and Social Development Canada (HRSDC), Fire Commissioner of Canada (FCC) standards. These are available from HRSDC or may be downloaded from the internet at: www.hrsdc.gc.ca.
 - .1 No. 301: Standard for Construction Operations
 - .2 No. 302: Standard for Welding and Cutting
 - .3 No. 374: Fire Protection Standard for General Storage (Indoor and Outdoor)
 - .3 Welding and cutting:
 - .1 A fire watcher as described in FC 302 shall be assigned when welding or cutting operations are carried out in areas where combustible materials within 10 m may be ignited by conduction or radiation.
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1.20 FIELD QUALITY CONTROL .1 Carry out Work using qualified licensed workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification.

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

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

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

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

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

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

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

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

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

1.25 CUT, PATCH AND
MAKE GOOD

- .1 Repair, replace and refinish, to the Departmental Representative's approval, existing surfaces and items damaged in connection with the work, at the contractor's expense.
- .2 The repaired, replaced and refinished items to be at least equal to those that existed immediately before damage occurred.

1.26 SIGNS AND
SAFETY DEVICES

- .1 Provide common-use signs and safety devices related to traffic control, information, instruction, use of equipment, public safety devices, etcetera, in both official languages or by the use of commonly-understood graphic symbols to the Departmental Representative's approval.
- .2 Detour/warning signs and temporary fencing blocking existing bike path shall be luminated.
- .3 No advertising will be permitted on this project.
- .4 Coordinate with Section 01 35 30 - TRAFFIC CONTROLS.

1.27 USE OF SITE
AND FACILITIES

- .1 Execute work with least possible interference or disturbance to the normal use of premises and traffic flow on Queen Elizabeth Drive. This includes vehicular, pedestrian and cyclist traffic. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 The Canal must remain free of obstruction during the navigation season.
- .3 Existing access points to the Canal during the winter skating period located near or adjacent to the work areas must remain open with no interference from construction activities.
- .4 Within the work area the existing pedestrian pathways will be closed to all users, but alternate pedestrian routes will be provided. Refer to the drawings showing pedestrian detours and Section 01 35 30 - TRAFFIC CONTROLS for details.

1.27 USE OF SITE
AND FACILITIES
(Cont'd)

- .5 The NCC provides public access to the ice surface via a staircase installed during the fall drawdown period at the south end of the construction site limit and remove it during spring drawdown. Public access to the staircase shall be maintained throughout the skating season.
 - .1 Contractor to coordinate construction work with the NCC, and provide access for installation and removal of equipment and components and/or facilitate relocation of gate and staircase outside of construction limit.
- .6 Contractor will be responsible for any snow removal required in the area of the work, including snow removal against the base of the walls where required. Contractor will not be allowed to dump snow onto the ice surface or build snow banks against the canal walls.
 - .1 This will include Snow removal along the entire length of the pedestrian pathway detour.
- .7 During snow clearing activities performed by the N.C.C., which fall outside the area of work, the N.C.C. will do their best not to push snow onto the work areas, but it is possible that under large snowfall events that snow will be pushed into the Contractor's work area. Under such events, the Contractor will be responsible to clear this additional snow.
- .8 Where security is reduced by work, provide temporary means to maintain security.

1.28 TEMPORARY
FACILITIES

- .1 Provide and maintain suitable storage facilities, of type and location approved by the Departmental Representative.
 - .2 Observe and enforce all construction safety measures required by authorities having jurisdiction.
 - .3 Provide and maintain all necessary enclosures, guards, guardrails, hoardings, barricades, warning signs and similar items.
 - .4 Provide sufficient chemical toilet conveniences in a sanitary condition for use of all persons at the site in a location approved by the Departmental Representative.
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| <u>1.28 TEMPORARY FACILITIES
(Cont'd)</u> | .5 | Enclose the work and storage area with secure fencing as directed by the Departmental Representative. |
| <u>1.29 ACCESS AND EGRESS</u> | .1 | Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations. |
| <u>1.30 SCAFFOLDS AND WORK PLATFORMS</u> | .1 | Design, install, and inspect scaffolds and work platforms required for work in accordance with relevant municipal, provincial and other regulations. |
| | .2 | Provide design drawings, signed and sealed by qualified Professional Engineer licensed in the province of Ontario, where prescribed. |
| | .3 | Additions or modifications to scaffolding must be approved by a licensed Professional Engineer in the province of Ontario in writing. |
| <u>1.31 GUARANTEES AND WARRANTIES</u> | .1 | Before completion of work collect all manufacturer's guarantees and warranties and deposit with Departmental Representative. |
| <u>1.32 CLEAN-UP</u> | .1 | Clean up work area as work progresses. At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally. |
| | .2 | Upon completion remove scaffolding, temporary protection and surplus materials. Make good defects noted at this stage. |
| | .3 | Clean areas under contract to a condition at least equal to that previously existing and to approval of Departmental Representative. |
| <u>1.33 CONTRACT DOCUMENTS</u> | .1 | Drawings and specifications are complementary, items shown or mentioned in one and not in the other are deemed to be included in the contract work. |
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1.33 CONTRACT
DOCUMENTS
(Cont'd)

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

1.34 TESTING
LABORATORY SERVICES

- .1 The Departmental Representative will appoint and pay for costs of inspection and testing services, unless indicated otherwise.
- .2 Provide safe working areas and assist with testing procedures, including provisions for materials or services and co-ordination, as required by testing agency and as authorized by Departmental Representative.
- .3 Where tests indicate non-compliance with specifications, contractor to pay for initial test and all subsequent testing of work to verify acceptability of corrected work.

1.35 SCHEDULING

- .1 Submit the construction progress schedule, (in CPM format) within 10 days of award of contract. Progress schedule must include the quantity of work to be accomplished within each 2 week time frame. No progress payments will be made until the construction progress schedule is approved. Submit together with the progress schedule a cost breakdown for each lump sum payment item.
- .2 When requested by the Departmental Representative, resubmit the schedule with all revisions made to show the progress of the work and to show any changes which are required to meet the approved completion dates, within 10 working days.
- .3 Take all necessary measures to complete the work within the scheduled times approved by the Departmental Representative.
- .4 Do not make changes to the approved schedule, without the Departmental Representative's approval.
- .5 The requirements of Section 01 33 00 - SUBMITTAL PROCEDURES, apply to the construction progress schedule.
- .6 Carry out work during "regular hour" Monday to Friday from 07:00 to 18:00 hours.

1.35 SCHEDULING
(Cont'd)

- .7 Notify and request from the Departmental Representative 48 hours in advance, for work to be carried out during "off hours".
- .8 All work which is affected by the water level being raised to navigational level must be completed by April 25, 2016.

1.36 LAYOUT OF THE
WORK

- .1 The Departmental Representative will locate the project, establish a bench mark, and set the initial line. The Contractor will be responsible for all other layout and control survey work, and checking plan dimensions against field measurements.
- .2 Lay out the work according to the elevations and dimensions shown on the plans and verified in the field, or determined in the field.
- .3 Notify the Departmental Representative immediately of any discrepancies between field measurements and dimensions shown on the plans.
- .4 Be responsible for rectification of errors resulting from failure to verify dimensions, elevations and other pertinent data shown on the plans.

1.37 COST BREAKDOWN

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

PART 1 - GENERAL

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|--|----|---|
| <u>1.1 SECTION INCLUDES</u> | .1 | This section provides a list of work items that needs to be 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. |
| <u>1.2 APPLICATIONS FOR PROGRESS PAYMENT</u> | .1 | Make applications for payment on account as provided in Agreement as Work progresses. |
| | .2 | Date applications for payment last day of payment period and ensure amount claimed is for value, proportional to amount of Contract, of Work performed and products delivered to place of work at that date. |
| | .3 | Submit to Departmental Representative, at least two weeks (14 Calendar days) before first application for payment. Schedule of values for parts of Work, aggregating total amount of Contract Amount, so as to facilitate evaluation of applications for payment. |
| <u>1.3 SCHEDULE OF VALUES</u> | .1 | Make schedule of values out in such form and supported by such evidence as Departmental Representative may reasonably direct and when accepted by Departmental Representative, be used as basis for applications for payment. |
| | .2 | Include statement based on schedule of values with each application for payment. |
| | .3 | Support claims for products delivered to place of work but not yet incorporated into Work by such evidence as Departmental Representative may reasonably require to establish value and delivery of products. |
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- 1.4 PREPARING SCHEDULE OF UNIT PRICE TABLE ITEMS
- .1 Submit separate schedule of unit price items of Work requested in Bid and Acceptance Form.
 - .2 Make form of submittal parallel to Schedule of Values, with each line item identified same as line item in Schedule of Values. Include in unit prices only:
 - .1 Cost of material.
 - .2 Delivery and unloading at site.
 - .3 Sales taxes.
 - .4 Installation, overhead and profit.
 - .3 Ensure unit prices multiplied by quantities given equal material cost of that item in Schedule of Values.

- 1.5 MEASUREMENT AND PAYMENT PROCEDURES
- .1 Lump Sum Price - For the work which is not designated in the Unit Price Table there shall be no measurement and shall be paid at the contract Lump Sum Price. These items include all costs associated to perform the work including but not limited to material, equipment, personnel, overhead, etc. It is the Contractor's responsibility to ensure that all items of work not covered under the Unit Price Table are covered in the Contract Lump Sum Price. Items considered to be included in the Lump Sum Price are:
 - .1 Mobilization
 - .2 Demobilization
 - .3 Connecting to existing services.
 - .4 Designing/installing/removal of all temporary access routes and temporary ramp required to access the Work areas.
 - .1 Public/Residential Access Areas - sidewalk approach protection on Queen Elizabeth Driveway. Temporary Construction to be in accordance with municipal standards.
 - .2 Maintenance and repair as required due to heavy machinery use.
 - .5 Construction Control - Condition surveys and monitoring of temporary works including temporary bench marks.
 - .6 Providing construction fence and perimeter security measures around work area.
 - .7 Supplying, installing and maintaining luminated detour/warning signs.
 - .8 Maintaining the work/storage area for the duration of the work.
 - .1 Site security;
 - .2 Snow removal;
 - .3 Contractor's Site Office;
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- 1.5 MEASUREMENT AND .1 (Cont'd)
PAYMENT PROCEDURES .8 (Cont'd)
(Cont'd)
- .4 Dust, privacy, and noise management.
 - .5 Protection, maintenance, relocation and reconnecting of existing services and utilities, as required.
 - .6 Preparation, clearing and grubbing, rough grading, geotextile and granular backfill, drainage of area etc. as required;
 - .9 Traffic Control - Temporary measures for vehicle and navigation traffic control provisions and maintenance.
 - .10 Removal of the temporary access routes and temporary ramp.
 - .11 Environmental Procedures, including control work to provide effective environmental, waterbody, and fish habitat protection.
 - .1 Sediment, erosion and Turbidity control measures;
 - .12 Temporary utilities.
 - .13 Removal, Salvage and reinstallation of:
 - .1 All benches and existing signage as required to complete work. Work includes but is not limited to removal, salvaging, and reinstallation of all existing benches, garbage containers and existing signs. This includes bench concrete base.
 - .14 Progressive and final Site cleaning.
 - .15 Design/Build/maintenance/deconstruction of Cofferdam and dewatering system.
 - .16 Landscaping.

- 1.6 UNIT PRICE .1
ITEM MEASUREMENT .1
AND PAYMENT .1
PROCEDURES .1
- .1 Item No.1 - Post Removal.
 - .1 Item No.1 shall be paid at the contract unit price EACH for each post. This item shall include all the work described in Section 02 41 21 related to removal, salvaging and disposal of line and expansion posts. All line posts are to be disposed unless otherwise noted by Departmental Representative on site. All expansion posts are to be disposed of.
 - .2 Item No.2 - Pipe Railing Removal.
 - .1 Item No.2 shall be paid at the contract unit price by the unit LINEAR METER of pipe railing removed. This item shall include all the work described in Section 02 41 21 related to removal and disposal of existing pipe railings.

1.6 UNIT PRICE
ITEM MEASUREMENT
AND PAYMENT
PROCEDURES
(Cont'd)

- .3 Item No. 3 - Lamp Removal.
 - .1 Item No.3 shall be paid at the contract unit price EACH for each lamp. This item shall include all the work described in Section 02 41 21, including but not limited to removal, salvaging and reinstallation of all existing lamp posts. This includes concrete base, lamp post extension, and all associated electrical work.
 - .4 Item No.4 - Concrete Excavation.
 - .1 Item No.4 shall be paid at the contract unit price by the unit CUBIC METER (Cu.M). This item shall include all the work described in Section 31 23 15 related to removal and disposal of existing concrete, including but not limited to, concrete sawcutting for the surface refacing of the Canal Walls.
 - .1 No payment will be made for concrete excavation beyond the limits shown on the drawings, which has not been authorized by the Departmental Representative; any overbreak beyond these limits shall be replaced by concrete at the Contractor's expense.
 - .5 Item No.5 - Reinforcement.
 - .1 Item No.5 shall be paid at the contract unit price by the unit KILOGRAM. This item shall include all the work described in Section 03 25 13. GFRP lengths and sizes of bars as indicated on drawings or authorized in writing by Departmental Representative.
 - .6 Item No.6 - Class I Concrete.
 - .1 Item No.6 shall be paid at the contract unit price by the unit Cu.M. This item shall include all the work described in Section 03 30 00 related to concrete in the refacing of the existing Canal walls and Copings.
 - .7 Cast-in-place concrete: All classes of concrete shall be paid at the Contract unit price by the cubic metre calculated from neat dimensions indicated on Contract drawings or authorized in writing by Department Representative. Concrete
-

1.6 UNIT PRICE
ITEM MEASUREMENT
AND PAYMENT
PROCEDURES
(Cont'd)

- .7 Cast-in-place concrete:(Cont'd)
placed beyond dimensions indicated will not be measured.
- .1 No deductions will be made for volume of concrete displaced by reinforcement.
- .2 Include in the prices of concrete the bonding agent.
- .3 Include in the price of concrete the work described in Section 03 10 00 and Section 03 25 13.
- .4 Include in the price of concrete the heating, cooling, hot and cold weather protection, curing, and finishing, including pre-heating of substrate.
- .5 Include in the price of concrete the supply and installation of waterstops.
- .6 Include in the prices of concrete the supply and installation of joint filler, bond breaker and joint sealer.
- .7 Include in the prices of concrete the supply and application of reinforcement fibers.
- .8 Item No.7 - Anchors - Type D1.
- .1 Item No.7 shall be paid at the contract unit price EACH for each anchor. This item shall include all the work described in Section 05 05 20 related to supplying and installation of Type 1 dowels.
- .9 Item No.8 - Anchors - Type D2.
- .1 Item No.8 shall be paid at the contract unit price EACH for each anchor. This item shall include all the work described in Section 05 05 20 related to supplying and installation of Type 2 dowels.
- .10 Item No.9 - Line Posts.
- .1 Item No.9 shall be paid at the contract unit price EACH for each line post. This item shall include all the work described in Section 05 52 20 related to supplying and installation of new line posts.
- .11 Item No.10 - Expansion Posts.
- .1 Item No.10 shall be paid at the contract unit price EACH for each expansion post. This item shall include all the work described in Section 05 52 20 related to supplying and installation of new expansion posts.
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1.6 UNIT PRICE
ITEM MEASUREMENT
AND PAYMENT
PROCEDURES
(Cont'd)

- .12 Item No.11 - Expansion Lamp Posts.
 - .1 Item No.11 shall be paid at the contract unit price EACH for each expansion post. This item shall include all the work described in Section 05 52 20 related to supplying and installation of new expansion lamp posts.
 - .13 Item No.12 - Pipe Railing.
 - .1 Item No.12 shall be paid at the contract unit price by the unit linear meter of pipe railing in place. This item shall include all the work described in Section 05 52 20 related to supplying, installation and painting of new pipe railings.
 - .14 Item No.13 - Asphalt Excavation.
 - .1 Item No.13 shall be paid at the contract unit price by the unit CUBIC METER. This item shall include all the work described in Section 31 23 15 related to removal and disposal of existing asphalt pathway, including but not limited to, asphalt sawcutting.
 - .15 Item No.14 - Common Excavation.
 - .1 Item No.14 shall be paid at the contract unit price by the unit CUBIC METER. This item shall include all the work described in Section 31 23 15 related to common excavation of existing native backfill.
 - .1 Excavation, removal, hauling and disposal of debris, sediment in work area to allow for new refacing and repairs to concrete Canal walls and coping. This includes watercourse sediment and debris removal from the Canal channel.
 - .2 Excavation of Granular native soil (if required).
 - .16 Item No.15 - Backfilling.
 - .1 Item No.15 shall be paid at the contract unit price by the unit CUBIC METER. This item shall include all the work described in Section 31 23 15 related to backfilling, including but not limited to, surface preparation prior to general landscaping work.
 - .1 Quantities will be taken from cross section base on approved dimensions and actual grade lines set by Departmental Representative.
-

1.6 UNIT PRICE
ITEM MEASUREMENT
AND PAYMENT
PROCEDURES
(Cont'd)

- .16 (Cont'd)
 - .1 (Cont'd)
 - .2 supplying, hauling, placement and compaction of site and imported materials within work area.

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

1.7 PROGRESS
PAYMENT

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

1.8 SUBSTANTIAL
PERFORMANCE OF WORK

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

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

 - .3 Departmental Representative will, no later than 10 days after receipt of an application for final payment, review Work to verify validity of application. Departmental Representative will give notification that application is valid or
-

- | | | |
|---|----|---|
| <u>1.8 SUBSTANTIAL
PERFORMANCE OF WORK
(Cont'd)</u> | .3 | (Cont'd)
give reasons why it is not valid, no later than
7 days after reviewing Work. |
| | .4 | Departmental Representative will issue a
Certificate of Completion and a Certificate of
Measurement when application for final payment
is found valid. |

PART 2 - PRODUCTS

- | | | |
|---------------------|----|-----------|
| <u>2.1 NOT USED</u> | .1 | Not used. |
|---------------------|----|-----------|

PART 3 - EXECUTION

- | | | |
|---------------------|----|-----------|
| <u>3.1 NOT USED</u> | .1 | Not used. |
|---------------------|----|-----------|

END

PART 1 - GENERAL

- 1.1 ADMINISTRATION
- .1 This section specifies general requirements and procedures for contractors submissions of shop drawings, product data and samples to Site Representative for review. Additional specific requirements for submissions are specified in individual sections.
 - .2 Do not proceed with work until relevant submissions are reviewed by Departmental Representative.
 - .3 Present shop drawings, product data and samples in SI Metric units.
 - .4 Where items or information is not produced in SI Metric units converted values are acceptable.
 - .5 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submissions.
 - .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
 - .7 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
 - .8 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative's review of submission, unless Departmental Representative gives written acceptance of specific deviations.
 - .9 Make any and all changes in submissions which Departmental Representative may require consistent with Contract Documents and resubmit as directed by Departmental Representative.
 - .10 Notify Departmental Representative, in writing, when resubmitting, of any revisions other than those requested by Departmental Representative.
 - .11 Contractor to keep one reviewed copy of each submission on site.
-

1.2 SUBMISSION
REQUIREMENTS

- .1 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available.
- .2 Allow five (5) working days for Departmental Representatives review of each submission.
- .3 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date,
 - .2 Project title and number,
 - .3 Contractor's name and address,
 - .4 Identification and quality of each shop drawing, product data and sample,
 - .5 Other pertinent data.
- .4 Submissions shall include:
 - .1 Date and revision dates,
 - .2 Project title and number,
 - .3 Name and address of:
 - .1 Subcontractor,
 - .2 Supplier,
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractors authorized Representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of work as applicable:
 - .1 Fabrication,
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances,
 - .3 Setting or erection details,
 - .4 Capacities,
 - .5 Performance characteristics,
 - .6 Standards,
 - .7 Operating weight,
 - .8 Relationship to adjacent work.
- .5 After Departmental Representative's review, distribute copies.

1.3 SHOP DRAWINGS

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

- 1.3 SHOP DRAWINGS (Cont'd)
- .2 Submit drawings stamped and signed by Professional Engineer registered or licensed in the Province of Ontario, Canada, where required.
 - .3 Maximum sheet size: 850 x 1050 mm.
 - .4 Submit shop drawings as follows:
 - .1 Electronic format - PDF, JPEG or Word, transmitted on either USB flash drive, CD/DVD, shared FTP site (or similar) or by email.
 - .5 Indicate cross-references to design, shop drawings, specifications, and/or applicable portions of Contract Documents.
 - .6 All shop drawings to properly and clearly indicate: materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed.
 - .7 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of work. state such in writing to Departmental Representative for review, prior to proceeding with work.
 - .8 Co-ordinate, each submission, with requirements of work and Contract documents. Individual submissions will not be reviewed until all related and relevant information is available.
- 1.4 PRODUCT DATA
- .1 Product data: manufacturers catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products.
 - .2 Submit 2 copies of product data.
 - .3 Sheet size: 215 x 280 mm, maximum of 3 modules.
 - .4 Delete information not applicable to project.
 - .5 Supplement standard information to provide details applicable to project.
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- 1.4 PRODUCT DATA (Cont'd)
- .6 Cross-reference product data information to applicable portions of Contract Documents.
 - .7 Submit product data for but not limited to the following items:
 - .1 Concrete Mix.
 - .2 Epoxy adhesive system.
 - .3 Waterstops.
 - .4 Joint Sealant.
 - .5 Joint Filler.
 - .6 Concrete Fibre.
- 1.5 SAMPLES
- .1 Samples: examples of materials, equipment, quality, finishes, workmanship.
 - .2 Reviewed and accepted samples will become standard of workmanship and material against which installed work will be verified.
- 1.6 SHOP DRAWINGS REVIEW
- .1 The review of shop drawings by Public Works and Government Services of Canada (PWGSC) is for the sole purpose of ascertaining conformance with the general concept.
 - .1 This review shall not mean that PWGSC approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and contract documents.
 - .2 Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to the confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of the work of all sub-trades.
 - .2 Submit shop drawings for but not limited to the following work:
 - .1 Reinforcement Steel.
 - .2 Metal Fabrication.
 - .3 Expansion and Line Post fabrication.
 - .4 Cofferdam & Dewatering System.
 - .5 Pedestrian Detour Pathway Construction.
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PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION .2 Not Used.

END

PART 1 - GENERAL

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|--|----|---|
| 1.1 GENERAL
<u>REQUIREMENTS</u> | .1 | Comply with Ontario Occupational Health and Safety Act, Canada Labour Code Part II, and Canada Occupational Safety and Health Regulations. |
| | .2 | Develop written site-specific Health and Safety Plan based on hazard assessment prior to commencing any site work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications. |
| | .3 | Relief from or substitution for any portion or provision of minimum Health and Safety Guidelines specified herein or reviewed site-specific Health and Safety Plan must be submitted to Departmental Representative in writing. Departmental Representative will respond in writing, either accepting or requesting improvements. |
| 1.2 MEASUREMENT AND
<u>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 - MEASUREMENT AND PAYMENT and shall be included in the applicable item of work. |
| 1.3 REFERENCES | .1 | Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations |
| | .2 | Canadian Standards Association (CSA):
.1 CSA S350-M1980 (R2003), Code of Practice for Safety in Demolition of Structures. |
| | .3 | National Building Code 2010 (NBCC):
.1 NBC 2010, Division B, Part 8 Safety Measures at Construction and Demolition Sites. |
| | .4 | Province of Ontario:
.1 Occupational Health and Safety Act, R.S.O. 1990 (Updated 2005).
.2 Ministry of Labour Publication "Silica on Construction Sites", 2004.
.3 Workplace Safety and Insurance Act, 1997.
.4 Municipal Statutes and Authorities. |

- 1.3 REFERENCES (Cont'd) .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS):
- .1 Material Safety Data Sheets (MSDS).
- 1.4 SUBMITTALS .1 Make Submittals in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES.
- .2 Submit site-specific Health and Safety Plan: Within seven (7) days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of Safety and health risk or hazard analysis for site tasks and operation found in work plan.
 - .3 Measures and controls to be implemented to address identified safety hazards and risks.
 - .4 Company Health and Safety Policy.
 - .3 Submit Construction Safety Checklists after completion.
 - .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
 - .5 Submit copies of incident and accident reports.
 - .6 Submit to Departmental Representative Material Safety Data Sheets (MSDS).
 - .7 Personnel training requirements including as follows:
 - .1 Names of personnel and alternates responsible for site Safety and Health, hazards present on site, and use of personal protective equipment.
 - .8 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within five (5) days after receipt of plan. Revise plan as appropriate and resubmit plan to appropriate and resubmit plan to Departmental Representative within five (5) days after receipt of comments from Departmental Representatives.
 - .9 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
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|--------------------------------|-----|---|
| 1.4 SUBMITTALS
(Cont'd) | .10 | On-site Contingency and Emergency Response Plan:
Address standard operating procedures to be
implemented during emergency situations.
Coordinate plan with existing Emergency Response
requirements and procedures provided by
Departmental Representative. |
| 1.5 FILING OF
NOTICE | .1 | File Notice of Project with Provincial
authorities prior to commencement of Work. |
| | .2 | Keep copy of Notice of Project on site at all
times. |
| 1.6 SAFETY
ASSESSMENT | .1 | Perform site specific safety hazard assessment
related to project. |
| 1.7 MEETINGS | .1 | Pre-construction meetings: Schedule and
administer Health and Safety meeting with
Departmental Representative prior to commencement
of work. |
| | .2 | Complete Parks Canada Attestation and Proof of
Compliance with Occupational Health and Safety
(OHS) Form. |
| 1.8 REGULATORY
REQUIREMENTS | .1 | Comply with specified Acts, Standards and
Regulations to ensure safe operations at site. |
| 1.9 PROJECT/SITE
CONDITIONS | .1 | Work at site will involve but not be limited to
contact with: <ul style="list-style-type: none"> .1 Silica dust in concrete, from concrete
demolition/excavation. .2 Corroded metals. .3 Benzene in fuel oil, paints and adhesives
(new Materials). .4 Arsenic and acrylonitrile in adhesives. .5 Fresh concrete, concrete admixtures and
bonding agents. |
| | .2 | Hazards on-site include but are not limited to: <ul style="list-style-type: none"> .1 Working around moving equipment. .2 Working near vehicular traffic. .3 Work near water. .4 Icy and slippery surfaces. |

- 1.9 PROJECT/SITE .2 (Cont'd)
- CONDITIONS
- (Cont'd)
- .5 Working in adverse and cold weather conditions.
- .6 Working around and with electrical power lines.
- 1.10 RESPONSIBILITY .1 Be responsible for safety of persons and property on site and for protection of persons off site and environment to extent that they may be affected by conduct of work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable Federal, Provincial, and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- .3 Where applicable the Contractor shall be designated "Constructor", as defined by Occupational Health and Safety Act for the Province of Ontario.
- 1.11 COMMUNICATION .1 Comply with Ontario Health and Safety Act, Canada Labour Code Part II, and Canada
- REQUIREMENTS
- Occupational Safety and Health Regulations.
- 1.12 UNFORESEEN .1 Should any unforeseen or peculiar safety-related
- HAZARDS
- factor, hazard, or condition become evident during performance of Work, immediately stop work and advise Departmental Representative verbally and in writing.
- .2 Follow procedures in place for Employees Right to Refuse Work as specified in the Occupational Health and Safety Act for the Province of Ontario.
- 1.13 POSTED .1 Provide documents as follow and post on site at
- DOCUMENTS
- all time:
- .1 Contractor's Health and Safety Policy.
- .2 Contractor's name.
- .3 Notice of Project.
- .4 Name, trade, and employer of Contractor's Health and Safety Representative (Safety Coordinator or Joint Health and Safety Committee member list, if applicable).
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|-------------------------------------|-----|---|
| 1.13 POSTED DOCUMENTS
(Cont'd) | .1 | (Cont'd) |
| | .5 | Workplace Safety and Insurance Board (WSIB) of Ontario - Poster 82C titled "In case of Injury". |
| | .6 | Workplace Safety and Insurance Board for Ontario-Regulation 1101. |
| | .7 | Ministry of Labour Regulations for the Province of Ontario. |
| | .8 | Occupational Health and Safety Act for Province of Ontario. |
| | .9 | Material Safety Data Sheets. |
| | .10 | Written Emergency response plan and Site Specific Health and Safety Plan. |
| | .2 | Comply with Provincial general posting requirements. |
| 1.14 CONSTRUCTION SAFETY CHECKLISTS | .1 | Review and implement applicable health and safety checklists in collaboration with Departmental Representative. |
| 1.15 CORRECTION OF NON-COMPLIANCE | .1 | Immediately address health and safety non-compliance issues identified by authorities having jurisdiction or by Departmental Representative. |
| | .2 | Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified. |
| | .3 | Departmental Representative may stop work if non-compliance of health and safety regulations is not corrected. |
| 1.16 BLASTING | .1 | Blasting or other use of explosives is not permitted on this project. |
| 1.17 POWDER ACTUATED DEVICES | .1 | Use powder actuated devices and fastening tools only after submittal of full justification for requirement of their use and receipt of written permission from Departmental Representative. Application and use of mentioned devices to be in conformance with Occupational Health and Safety Act and Regulations for Construction Projects, O.Reg. 145/00, S.30. |
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- 1.18 WORK STOPPAGE .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.
- .2 Assign responsibility and obligation to Health and Safety Officer to stop or start Work when, at the Health and Safety Officer's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative may also stop work for health and safety considerations.
- 1.19 EQUIPMENT LOCK-OUT/TAG-OUT .1 The contractor shall coordinate and comply with Parks Canada (PCA) and PWGSC lock-out/tag-out procedures for equipment at site. The more stringent of Provincial Safety Regulations shall take precedence. PCA/PWGSC procedure involves multi-lock systems.
- .2 Lock-out/Tag-out procedures are to be followed when working with PWGSC on existing o new installations.

PART 2 - PRODUCTS

- 2.1 NOT USED .1 Not used.

PART 3 - EXECUTION

- 3.1 NOT USED .1 Not used.

END

PART 1 - GENERAL

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|---|----|--|
| <u>1.1 SECTION INCLUDES</u> | .1 | Informational and Warning Devices. |
| | .2 | Protection and Control of Public Traffic. |
| | .3 | Operational Requirements. |
| | .4 | Pedestrian Pathway Detours. |
| <u>1.2 REFERENCES</u> | .1 | Ensure that all traffic control measures are in accordance with: |
| | .1 | Manual of Uniform Traffic Control Devices (UTCD), Ministry of Transportation, Ontario and the Ontario Ministry of Labour. |
| | .2 | Ontario Traffic Manual, Book 7: Temporary Conditions (2014). |
| <u>1.3 TRAFFIC PLAN</u> | .1 | The contractor must fill out and submit a Traffic Management Plan to the City of Ottawa which can obtain at the following location: |
| | .1 | Permit Issuing Counter, 560 Rochester St., 5th Floor Ottawa, Ontario |
| | .2 | Telephone No. 613-580-2424 ext 16000 |
| | .2 | Indicate method and implementation schedule, and include all signage, equipment and personnel to be used for the traffic control. |
| | .3 | Traffic Management Plan must be submitted prior to commencing work. Provide adequate time to allow City to review Plan and submit permit. |
| | .4 | Copies of plans & permit are to be submitted to the Departmental Representative and one copy to be kept on-site at all time. |
| | .5 | Submit in accordance with Section 01 33 00. |
| <u>1.4 PROTECTION OF PUBLIC TRAFFIC</u> | .1 | Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out work or haul materials or equipment. |

1.4 PROTECTION OF
PUBLIC TRAFFIC
(Cont'd)

- .2 When working on travelled way:
 - .1 Place equipment in position to present minimum of interference and hazard to traveling public.
 - .2 Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.
 - .3 Do not leave equipment on travelled way overnight.
- .3 Do not close any lanes of road without receipt of written approval from Departmental Representative and/or City of Ottawa. Before re-routing traffic erect suitable signs and devices in accordance with instructions contained in the UTCD manual and Ontario Traffic Manual, Book 7.
 - .1 Short-term duration single-lane closure will be permitted between 9:30 hrs and 15:00 hrs during weekdays.
 - .2 Lane closure at any other time, except as specified above in paragraph 1.4.3.1, must be approved by the Departmental Representative a minimum of 24 hours prior to any closure.
 - .3 Provide specific schedule and traffic plan options prior to start of work for concrete deliveries within construction limits that parallel the Queen Elizabeth Driveway that requires long-term single lane closures and traffic detours.
- .4 Provide and maintain road access and egress to property fronting along Work site under Contract and in other areas as indicated, except where other means of road access exist that meet approval of Departmental Representative.

1.5 INFORMATIONAL
AND WARNING DEVICES

- .1 Provide and maintain signs, flashing warning lights and other devices required to indicate construction activities or other temporary and unusual conditions resulting from project work which requires road user response.
 - .2 Provide adequate lumination to all detour/warning signs and temporary fencing blocking existing bike paths.
 - .3 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified in the UTCD and Ontario Traffic Manual Book 7.
-

1.5 INFORMATIONAL
AND WARNING DEVICES
(Cont'd)

- .4 Place signs and other devices in locations recommended in UTCD and Ontario Traffic Manual Book 7.
- .5 Meet with Departmental Representative prior to commencement of Work to prepare list of signs and other devices required for project. All traffic signs and devices must conform to the approved Traffic Management Plan. If situation on site changes, revise list to approval of Departmental Representative and City of Ottawa.
- .6 Continually maintain traffic control devices in use:
 - .1 Check signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.
 - .2 Remove or cover signs which do not apply to conditions existing from day to day.

1.6 CONTROL OF
PUBLIC TRAFFIC

- .1 Provide competent flag persons, trained in accordance with, and properly equipped as specified in, UTCD and Ontario Traffic Manual Book 7 in following situations:
 - .1 When public traffic is required to pass working vehicles or equipment which block all or part of travelled roadway.
 - .2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.
 - .3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.
 - .4 Where temporary protection is required while other traffic control devices are being erected or taken down.
 - .5 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.
 - .2 Delays to public traffic due to contractor's operators: maximum 5 min.
-

1.7 OPERATIONAL
REQUIREMENTS

- .1 Maintain existing conditions for traffic throughout period of contract except that, when required for construction under contract and when measures have been taken as specified and approved by Departmental Representative to protect and control public traffic as stated in paragraph 1.4.3 of this section.
- .2 The asphalt pathways located within the limits of work will be closed-off fully to the public. Sufficient signage is to be provided at both ends informing all users of the pathway closure and to use alternate detour route/pathway provided. Signage indicating no pedestrian access within the limits of the work area are also to be provided at both ends of the work site.
 - .1 Additional signage is to be located near the Bank street bridge area as indicated on the Contract drawings, such that use of the asphalt pathway leading to the construction site from the north end is fully closed off and not in-use.
- .3 A temporary steel construction fence is to be erected to separate all construction working areas from the public.
- .4 The Contractor is responsible for supplying, installing and removing a granular bed plus asphalt cover along the pedestrian detour pathway, as shown on the drawings.
 - .1 Install a geotextile fabric over the grassed area, minimum 3.6 m wide.
 - .2 Supply and compact stone dust over geotextile, 150 mm thick, 2.5 m wide, with 2H:1V side slopes.
 - .3 Supply, place and compact 50mm thick, HL3 asphalt within detour pathway for sections not already paved.
 - .4 Fabricate and install a pedestrian friendly ramp access and catwalk with handrails in the location as indicated on the contract drawings.
 - .5 Maintain detour pathway adding granular fill to potholes and depressions and re-grading as required.
 - .6 Snow removal outside of Work area will be the responsibility of the NCC.
 - .7 At the end of the Work, remove and dispose of all granular fill and geotextile, and re-sod/ vegetate areas in accordance with Section 32 94 00 - General Landscaping.

1.7 OPERATIONAL REQUIREMENTS (Cont'd)	.5	Refer to the drawings showing alternate pedestrian detour access and layout detail, where applicable.
<u>PART 2 - PRODUCTS</u>		

<u>2.1 NOT USED</u>	.1	Not used.
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PART 3 - EXECUTION

<u>3.1 NOT USED</u>	.1	Not used.
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1.0 GENERAL

- 1.1 DESCRIPTION
- .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 to ensure environmental, waterbody and fish habitat protection.

- 1.2 DEFINITIONS
- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
 - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.
 - .3 "Deleterious Material" - any substance that, if added to a waterbody, could degrade water quality or impact fish, fish habitat and aquatic wildlife. This includes, but is not limited to:
 - .1 Concrete dust.
 - .2 Soils (clay, silt, sand).
 - .3 Oil, diesel, or gasoline.
 - .4 Chipped or fresh concrete and admixtures.
 - .5 Alkali water resulting from fresh concrete or cementitious grout.
 - .6 Salt.
 - .7 Solvents.
 - .4 "Dripline" - means the location on the ground surface directly beneath a theoretical line
-

1.2 DEFINITIONS
(Cont'd)

- .4 (Cont'd)
described by the tips of the outermost branches
of the trees.
- .5 "Barrier" - means fence consisting of approved
material, supported by steel posts and being a
minimum of 1.8 m high, without breaks or
unsupported sections.

1.3 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00
- .2 Prior to commencing construction activities or
delivery of materials to site, submit
Environmental Protection Plan for review and
approval by Departmental Representative
Environmental Protection Plan is to present
comprehensive overview of known or potential
environmental issues which must be addressed
during construction.
- .3 Address topics at level of detail commensurate
with environmental issue and required
construction tasks.
- .4 Environmental protection plan to include:
 - .1 Names of persons responsible for ensuring
adherence to Environmental Protection Plan.
 - .2 Names and qualifications of persons
responsible for manifesting hazardous waste
to be removed from site.
 - .3 Names and qualifications of persons
responsible for training site personnel.
 - .4 Descriptions of environmental protection
personnel training program.
 - .5 Erosion and sediment control plan which
identifies type and location of erosion and
sediment controls to be provided including
monitoring and reporting requirements to
assure that control measures are in
compliance with erosion and sediment control
plan, Federal, Provincial, and Municipal
laws and regulations.
 - .6 Provisions for protection of stockpile
material.
 - .1 For stockpile material that shall be
inactive for periods exceeding 30 days,
are to form part of the erosion and
sediment control plan.
 - .7 Drawings showing locations of proposed
temporary excavations or embankments for
haul roads, material storage areas,

1.3 SUBMITTALS
(Cont'd)

- .4 (Cont'd)
- .7 (Cont'd)
- structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
- .8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.
- .9 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .10 Spill Prevention Plan: including location/procedures for storage and refuelling of all fuel and fuel operated equipment located near waterways. Fuel containers are to have secondary containment, overfill and spill protection. Fueling area is to be contained to address potential spillage.
- .11 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
- .12 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.
- .13 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- .14 Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, concrete tremie displaced water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
- .15 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological,

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|---|-----|---|
| <u>1.3 SUBMITTALS</u>
(Cont'd) | .4 | (Cont'd) |
| | .15 | (Cont'd) |
| | | cultural resources, biological resources and wetlands. |
| | .16 | Pesticide treatment plan: to be included and updated, as required. |
| | .17 | Noise Control Plan: including notifying local residents in advance of potential disruption from noise inducing activities. Establish a communications protocol/plan acceptable to Departmental Representative. |
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| <u>1.4 EXPLOSIVES</u> | .1 | The use of explosives is prohibited. |
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| <u>1.5 FIRES</u> | .1 | Fires and burning of rubbish on site is not permitted. |
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 | | |
| <u>1.6 DISPOSAL OF WASTES</u> | .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. |
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 | | |
| <u>1.7 TURBIDITY CONTROL AND DRAINAGE WATER</u> | .1 | Control turbidity of all water released during the Work. |
| | .1 | Do not pump water directly into the waterway. Send all discharge to a settling pond or filtration area before being released into the waterway. |
| | .2 | Where any in-water work is required and pre-approved by Departmental Representative, the work area shall be enclosed by a turbidity curtain (Silt curtain) to prevent sediment escape from enclosed work area. |
| | .1 | The Ministry of Environment has set a criteria wherein the allowable increase in total suspended solids (TSS) beyond background levels is 25mg/l for short-term exposure (24-hr period) and or maximum average increase of 5mg/l for long term exposures (>24-hr to 30d). |
| | .2 | Contractor shall provide protocol and methodologies for monitoring the TSS from any discharge point (treated or |
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- 1.7 TURBIDITY
CONTROL AND
DRAINAGE WATER
(Cont'd)
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- .1 (Cont'd)
.2 (Cont'd)
.2 (Cont'd)
untreated) to the watercourse, if
required.
.3 Turbidity curtain to be anchored or
weighted down along its length to form a
continuous seal on the canal bed with
adequate flotation at water surface to
prevent over spills of turbid water.
Mechanical filtration of turbid water is
also acceptable.
.4 In the event of significant silting or
debris caused by construction activities,
contractor must take appropriate measures to
confine work and install additional
turbidity curtains.
- .2 Control disposal or runoff of water containing
other harmful substances in accordance with local
authority requirements.
- .3 Sediment, debris and erosion control measures
must be inspected daily to ensure that they are
functioning properly and are maintained and
upgraded as required.
.1 If the sediment, debris or erosion control
measures are not functioning properly, no
further work will be permitted until the
sediment/erosion problem has been rectified.
- .4 If the sediment, debris or erosion control
measures are not functioning properly, no further
work will be permitted until the sediment/erosion
problem has been rectified.
- .5 Sediment, debris and erosion control measures
must be left in place until all disturbed areas
within the work area has been stabilized and any
sediments in the water have settled. Removal will
be permitted only after written approval from the
Departmental Representative.
- 1.8 SITE CLEARING
AND PLANT
PROTECTION
-
- .1 Protect trees and plants on site and adjacent
properties where indicated.
.2 Wrap in burlap, trees and shrubs adjacent to
construction work, storage areas and trucking
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1.8 SITE CLEARING .2
AND PLANT
PROTECTION
(Cont'd)

- (Cont'd)
- lanes, and encase with protective wood framework from grade level to height of two (2) m.
- .1 Maintain Barriers in good repair throughout the duration Work. Remove these upon completion of Work.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Damage to trees as a result of Contractor's operations:
- .1 Broken branches 25 mm or greater in diameter: cut back cleanly at the break, or to within 10 mm of their base, if a substantial portion of the branch is damaged. Departmental Representative will direct.
- .2 Exposed roots 25 mm or larger: cut back cleanly to the soil surface within five calendar days of exposure.
- .3 Damaged bark: neatly trim back to uninjured bark, without causing further injury, within five calendar days of damage.
- .5 Minimize stripping of topsoil and vegetation.
- .6 Reduce soil displacement and compaction by using heavy machinery in designated areas and on existing vehicle paths. Replace damaged lawn to pre-construction state with topsoil and sod.
- .7 Avoid using heavy machinery on saturated ground.
- .8 Use equipment of low bearing weight and low psi tires wherever possible.

1.9 AQUATIC ANIMALS .1

- Contractor to salvage and release outside of the work area any fish an/or amphibians observed within the work area. Moving of animals to be carried out as per the Ministry of Natural Resources and Forestry License to Collect Fish for scientific Purposes guidelines.
- .1 If unforeseen negative impacts to fish, wildlife or cultural resources are present, all work shall cease and the Contractor is to contact Departmental Representative immediately and or PCA (Shaun McIntosh,

1.9 AQUATIC ANIMALS .1
(Cont'd)

- (Cont'd)
.1 (Cont'd)
Environmental Assessment Officer, tel:
613-283-7199, ext:272).

1.9 WORK ADJACENT TO.1
WATERWAYS

- Do not release any Deleterious Material into waterway.
- .2 Do not use salt as a deicer near canal. In areas where ice is a safety concern, the use of sand will be permitted, but it must not be allowed to enter the watercourse.
- .3 Ensure all equipment and temporary access structures such as scaffolding placed in waterbodies is free of earth material, and excess, loose or leaking fuel, lubricants, coolant and other deleterious material that could enter the waterbody.
- .4 Do not use waterway beds for borrow material.
- .5 Do not dump excavated fill, waste material or debris in waterways.

1.10 SEDIMENT, DUST,.1
AND EROSION
PROTECTION

- Before starting work that will create dust or debris, (such as improvements to access, concrete sawing and removal, excavation, backfilling, etc.), install effective mitigation techniques for sediment, dust, debris and erosion control to the satisfaction of Departmental Representative. Maintain these protective measures at all times, including shut down periods.
- .2 Provide a 1 metre high silt fence barrier in all areas where, due to construction activities, silt or debris may enter the canal or water. This includes, but is not limited to, a silt barrier installed around staging and work areas, and on the canal bed (or ice surface) parallel to the canal concrete retaining wall. Install silt curtain approximately 2 m to 3 m from wall for refacing work only.
- .3 Maintain a standby supply of pre-fabricated silt fence barrier, or an equivalent ready-to-install sediment control device.
- .4 Excavation to cease during periods of heavy rainfall, unless runoff is contained from entering waterway.

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- 1.10 SEDIMENT, DUST, AND EROSION PROTECTION
(Cont'd)
- .5 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
- .6 Stockpile excavated or fill materials must be stored and stabilized away from the water. Runoff from the excavated or fill material must be contained from entering the waterway.
- 1.11 OPERATION AND MAINTENANCE OF EQUIPMENT
- .1 Do not operate heavy equipment in waterway, except when operated from a barge or during full drawdown.
- .2 Provide drip trays to prevent the discharge of oil, grease, antifreeze, or any other materials into the ground.
- .3 Equipment and heavy machinery used to meet or exceed all applicable emission requirements.
- .4 Leave machinery running only while in actual use, except where extreme temperatures prohibit shutting machinery down.
- .5 All vehicle/equipment maintenance and refueling must be conducted over impermeable/absorptive material situated at a designated site that is located at least 30 m away from the nearest water body. In the case of fuel heaters that will be located nearer than 30 m from the canal, a large drip pan to contain any leakage from heater or refueling operations. Absorptive material must also be placed at the bottom of drip pan for added measure.
- .1 Refueling areas will have a spill containment kit immediately accessible.
- 1.12 REMOVED MATERIALS
- .1 Unless otherwise specified, materials designated for removal become the Contractor's property. Remove these from site.
- 1.13 HAZARDOUS MATERIALS
- .1 Place materials defined as hazardous or toxic waste in designated containers.
- .1 Where applicable, store Hazardous Materials in secure areas on impermeable pads, provide berms if necessary.
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- 1.13 HAZARDOUS MATERIALS
(Cont'd)
- .2 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and the provision of Material Safety Data Sheets (MSDS) acceptable to Human Resources Development Canada, Labour Program.
- 1.14 CLEAN UP
- .1 Clean up work area as work progresses. At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.
- .2 Permit no undue amounts of debris, trash or garbage to accumulate.
- .3 Separate and recycle all materials that can be recycled.
- .4 Dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner by taking them to a special designated waste facility. Do not dump these into waterways, storm or sanitary sewers.
- .5 Ensure all emptied containers are sealed and stored safely for disposal away from children.
- .6 Spills:
- .1 Report all spills immediately to the Departmental Representative and to the Ontario Spills Action Centre (Telephone No. 1-800-268-6060).
- .2 Using appropriate safety precautions, collect liquid or solidify liquid with an inert, noncombustible material and remove for disposal.
- .3 Be responsible for all costs of cleaning up any spills to the satisfaction of the Departmental Representative.
- .4 Must have an environmental emergency response plan in place and a spill kit readily available.
- .5 Further information on dangerous goods, emergency clean-up and precautions including a list of companies performing this type of work can be obtained from Transport Canada's (TC) 24-hr collect phone number 613-996-6666.
- .7 Remove all scaffolding, temporary protection and surplus materials, tools, plant, rubbish and
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- 1.14 CLEAN UP
(Cont'd)
- .7 (Cont'd)
debris and dispose of them in an approved manner off Crown property at the following times:
.1 By April 25, 2016 for items in the Rideau Canal/River.
.2 At the completion date of the work for all other areas.
- .8 Clean areas under contract to a condition at least equal to that previously existing and to approval of Departmental Representative.
- 1.15 CLEANING OF
CONCRETE EQUIPMENT
- .1 Use trigger operated spray nozzles for water hoses.
- .2 the Contractor to submit and obtain Departmental Representative approval for designated cleaning area on-site for equipment and tools to limit water use and runoff. The cleaning area will be sufficiently far away from the watercourse to prevent contamination. Where no safe cleaning area is available, contractor will be required to provide a settling pond where the equipment can be cleaned. All alkali water is to be disposed of in accordance with federal, provincial, and local authority requirements.
- 1.16 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.
- 1.17 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 Comply with the City of Ottawa's Noise By-Law No. 2004-253: By-law to Regulate Noise for residential areas.
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- 1.18 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 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.
 - .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.

END

1.1 SECTION
INCLUDES

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Tests and mix designs.

1.2 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 instructions, 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 may order any 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.

1.3 INDEPENDENT
INSPECTION AGENCIES

- .1 Departmental Representative will engage, as required, independent Inspection/Testing Agencies for purpose of Quality Assurance only, that is, verifying Contractor's Quality Control processes for timber, concrete, environmental protection, waste disposal, etc.
 - .2 Contractor is responsible for all Quality Control. Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
 - .3 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
-

- 1.3 INDEPENDENT INSPECTION AGENCIES (Cont'd) .3 (Cont'd)
Representative. Pay costs for retesting and reinspection.
- 1.4 ACCESS TO WORK .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants. Provide equipment required for access and executing inspection and testing by appointed agencies such as (but not limited to) ladders, lights.
- .2 Co-operate to provide reasonable facilities for such access.
- 1.5 PROCEDURES .1 Notify appropriate agency and Departmental Representative 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 an orderly sequence so as not to cause delay in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.
- 1.6 REJECTED WORK .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative may deduct from Contract Amount difference in value between
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PART 1 - GENERAL

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|---|----|--|
| <u>1.1 SECTION INCLUDES</u> | .1 | Temporary utilities. |
| | .2 | Temporary Heating. |
| | .3 | Temporary Power and Lighting. |
| | .4 | Temporary pumping for dewatering. |
| <u>1.2 RELATED SECTIONS</u> | .1 | Section 01 52 00 - Construction Facilities. |
| | .2 | Section 01 56 00 - Temporary Barriers and Enclosures. |
| <u>1.3 MEASUREMENT AND PAYMENT PROCEDURES</u> | .1 | There shall be no separate measurement for payment for the work under this Section. Include costs in the Contract Lump Sum Price. |
| | .2 | Payment Shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work. |
| <u>1.4 SUBMITTALS</u> | .1 | Provide submittals in accordance with Section 01 33 00. |
| | .2 | Heating Plan including: <ul style="list-style-type: none">.1 heater numbers, types, locations and capacity..2 Ventilation fans, numbers, location and capacities..3 Emergency fire equipment type, numbers and location. |
| | .3 | Location, type and service provider for sanitation facilities. |
| <u>1.5 INSTALLATION AND REMOVAL</u> | .1 | Provide temporary utilities controls in order to execute work expeditiously. |
| | .2 | Remove from site all such work after use. |
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- 1.6 DEWATERING
- .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water as required. Refer to Section 35 20 22.
 - .2 Provide standby equipment (generators and pumps) to ensure continuous and safe operation of dewatering system.
- 1.7 WATER SUPPLY
- .1 Contractor is responsible to arrange for supply of potable water for construction use and for potable water.
 - .2 Arrange for connection with appropriate utility company and pay all costs for installation, maintenance and removal.
- 1.8 TEMPORARY HEATING AND VENTILATION
- .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
 - .1 Heating equipment type to be approved by Departmental Representative.
 - .2 Construction heaters used inside enclosures must be vented to outside or be 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 within enclosed areas as specified in individual Sections for the 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
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- 1.8 TEMPORARY HEATING AND VENTILATION (Cont'd)
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- .5 Ventilating:(Cont'd)
- .2 (Cont'd)
- 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 with 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 30 00 - CAST-IN-PLACE CONCRETE.
- .2 For other Sections where heating is required for cold-weather protection, heating requirements shall be in accordance to applicable codes, standards, regulations or manufacturer's recommendations elated to Work completed.
- 1.9 TEMPORARY POWER AND LIGHT
-
- .1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools.
- .2 Arrange for connection with appropriate utility company. Pay all costs for installation, maintenance and removal.
- .1 Provide meters and switching for connections to existing power supply.
- .3 Provide and maintain temporary lighting to approximately match existing lighting conditions on the Canal pathway along the narrow stretch of
-

1.9 TEMPORARY POWER.3
AND LIGHT
(Cont'd)

(Cont'd)
the canal between sta. 51+32.562 and sta.
46+58.290.
.1 Contractor to submit lighting setup,
equipment list prior to installation for
review.

1.10 TEMPORARY .1
COMMUNICATION
FACILITIES

Provide and pay for temporary data hook up
(Wireless internet access), and associated
equipment necessary for own use and use of
Departmental Representative.

1.11 FIRE .1
PROTECTION

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

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

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

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 costs in the Contract Lump Sum Price.
 - .2 Payment Shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work.

- 1.3 REFERENCES
- .1 Canadian General Standards Board (CGSB)
 - .2 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 CSA/CAN -S269.3-M92 (2013), Concrete Formwork.
 - .3 CSA-0121-M-08, Douglas Fir Plywood.
 - .4 CSA Z797-09 (R2014), Code of practice for Access Scaffold.
 - .5 CAN/CSA-Z321-96(R2006), Signs and Symbols for the Occupational Environment, withdrawn but still available from CSA, CCOHS and Techstreet.
 - .6 CAN/CSA-S269.2-M87(R2003), Access Scaffolding for Construction Purposes, withdrawn but still available from CSA, CCOHS and Techstreet.
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- 1.4 SUBMITTALS .1 Provide submittals in accordance with Section 01 33 00.
- 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.
.1 includes layout, location of Pedestrian detour.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Remove from site all such work after use.
- 1.6 SCAFFOLDING .1 Scaffolding in accordance with CSA Z797.
- .2 Provide and maintain scaffolding, ramps, ladders and temporary stairs.
- 1.7 HOISTING .1 Provide, operate and maintain hoists/cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.
- .2 Hoists/cranes shall be operated by qualified operator.
- 1.8 SITE STORAGE/LOADING .1 Confine work and operations of employees to areas defined by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.
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1.9 CONSTRUCTION
PARKING

- .1 Parking will be permitted on site provided it does not disrupt performance of Work.
 - .1 Contractor to designate specified parking area on site plan for approval by Departmental Representative.
- .2 Provide and maintain adequate access to project site.
- .3 Build and maintain temporary roads where indicated or as required and provide snow removal during period of Work.
- .4 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.
- .5 Clean construction runways and taxi areas where used by Contractor's equipment.

1.10 SECURITY

- .1 Pay for responsible and suitable security measures and methods to guard site and contents of site after working hours and during holidays. To be submitted and approved by Department Representative.
- .2 Contractor shall pay for monitoring of the site during periods of no construction activity and to maintain and service dewatering and heating systems.

1.11 OFFICES

- .1 Provide office heated to 22°C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
 - .1 Provide Additional Lock and Key for Departmental Representative and Client/Owner (PCA).
 - .2 Provide a clearly marked and fully stocked first-aid case in a readily available location.
 - .3 Subcontractors may provide their own offices as necessary. Direct location of these offices.
 - .4 Departmental Representative's Site office.
 - .1 Provide temporary office for Departmental Representative which is independent from Contractor's site trailer.
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|--|----|--|
| 1.11 OFFICES
(Cont'd) | .4 | (Cont'd) |
| | .2 | Inside dimensions minimum 3.6 m long x 3 m wide x 2.4 m high, with floor 0.3 m above grade, complete with 4 - 50% opening windows and one lockable door. |
| | .3 | Insulate building and provide heating system to maintain 22° C inside temperature at -20° 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, 4 chairs, 4 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 a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials. |
| | .2 | Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities. |
| 1.13 SANITARY
FACILITIES | .1 | Provide sanitary facilities for work force in accordance with governing regulations and ordinances. |
| | .2 | Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition. |
| 1.14 CONSTRUCTION
SIGNAGE | .1 | Provide and erect, within three (3) weeks of signing Contract, a project sign in a location designated by Departmental Representative. |
| | .2 | Construction sign 1.2 x 2.4 m, of wood frame and plywood construction painted with exhibit |

- 1.14 CONSTRUCTION SIGNAGE (Cont'd)
- .2 (Cont'd)
lettering produced by a professional sign painter.
 - .3 Indicate on sign, name of Owner, Contractor and Subcontractor with logo, name of project, project identification reference, of a design style approved by Departmental Representative..
 - .4 No other signs or advertisements, other than warning signs, are permitted on site.
 - .5 Provide project identification site sign comprising foundation (as required), framing, and one 1200 x 2400 mm signboard as detailed and as described below.
 - .1 Foundations: 15 MPa concrete to CAN/CSA-A23.1/A23.2 minimum 200 mm x 900 mm deep.
 - .2 Framework and battens: SPF, pressure treated minimum 89 x 89 mm.
 - .3 Signboard: 19 mm Medium Density Overlaid Douglas Fir Plywood to CSA O121.
 - .4 Paint: alkyd enamel to CAN/CGSB-1.59 over exterior alkyd primer to CGSB 1-GP-189.
 - .5 Fasteners: hot-dip galvanized steel nails and carriage bolts.
 - .6 Vinyl sign face: printed project identification, self adhesive, vinyl film overlay, supplied by Departmental Representative.
 - .6 Locate project identification sign as directed by Departmental Representative and construct as follows:
 - .1 Build concrete foundation, erect framework, and attach signboard to framing.
 - .2 Paint all surfaces of signboard and framing with one coat primer and two coats enamel. Colour white on signboard face, black on other surfaces.
 - .3 Apply vinyl sign face overlay to painted signboard face in accordance with installation instruction supplied.
 - .7 Signs and notices for safety and instruction shall be in both official languages. Graphic symbols shall conform to CAN/CSA-Z321.
 - .8 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

- 1.15 PROTECTION AND MAINTENANCE OF TRAFFIC
- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
 - .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
 - .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
 - .4 Protect travelling public from damage to person and property.
 - .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
 - .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
 - .7 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
 - .8 Dust control: adequate to ensure safe operation at all times.
 - .9 Provide snow removal during period of Work as required to facilitate access and continuous work progress.

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

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

PART 1 - GENERAL

1.1 SECTION
INCLUDES

- .1 Barriers.
- .2 Environmental Controls.
- .3 Traffic Controls.
- .4 Fire Routes.

1.2 DESCRIPTION

- .1 This section relates to temporary construction measures to facilitate the work and specifies requirements for designing, supplying, installing, inspecting, maintaining, and removing:
 - .1 Cold weather protection, consisting of temporary housing and supplementary heating for the workspaces and the work, as described by the specifications. The requirements of this section apply to all sections of specifications that call for cold weather protection.
- .2 Work not included in this Section:
 - .1 Provision of separate air supply for workers which is part of Contractor's responsibility under Health & Safety regulations for construction.
- .3 Intent: Housing; heating and ventilating must be sufficient to:
 - .1 ensure safe working environment.
 - .2 facilitate progress of work in an efficient manner during extreme temperature/weather conditions.
 - .3 protect areas adjacent to work during procedures which may damage surrounding areas.
 - .4 protect work and products against dampness and cold.
 - .5 provide suitable and ambient temperature conditions for storage, installation and curing of materials.

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

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

1.4 RELATED SECTIONS .1 Section 01 33 00 -Submittal Procedures.

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

.3 Section 01 35 43 - Environmental Procedures.

.4 Section 01 51 00 -Temporary Utilities.

.5 Section 01 52 00 - Construction Facilities.

1.5 REFERENCES .1 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.189-2000, Exterior Alkyd Primer for Wood.

.2 CAN/CGSB-1.59-97, Alkyd Exterior Gloss Enamel.

.2 Canadian Standards Association (CSA):

.1 CSA-O121-08, Douglas Fir Plywood.

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

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

.5 Province of Ontario

.1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990 as amended, O. Reg. 213/91 as amended.

.2 Air Pollution - Local Air Quality (O. Reg. 419/05)

- 1.6 INSTALLATION AND REMOVAL
- .1 Provide temporary controls in order to execute Work expeditiously.
 - .2 Remove from site all such work after use.
- 1.7 WORK AREA DELINEATION
- .1 Erect and maintain temporary site enclosure and barriers to delineate the work area as identified on the drawings and other measures as necessary to define the Work area and restrict access to the public.
 - .1 refer to Section 01 11 00, point 1.2.6.
 - .2 Provide and maintain temporary barriers to define the Work area within the Canal once the drawdown period is completed and the canal is frozen to restrict access to dewatering Works, as indicated on the drawings and as set in Section 35 20 22.
 - .3 Provide a construction Traffic Control Plan for both work related and local vehicular traffic as set out in Section 01 35 00.
 - .4 Provide two lockable truck entrance gates and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.
 - .5 Erect and maintain pedestrian walkways complete with signs and electrical lighting as required by law.
- 1.8 INSTALLATION AND REMOVAL
- .1 Provide temporary controls in order to execute Work expeditiously.
 - .2 Remove from site all such work after use.
- 1.9 ACCESS TO SITE
- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.
-

- 1.10 PUBLIC TRAFFIC FLOW .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public.
- 1.11 FIRE ROUTES .1 Maintain access to property including overhead clearances for use by emergency response vehicles.
- 1.12 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

PART 2 - PRODUCTS

- 2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

- 3.1 NOT USED .1 Not Used.

END

PART 1 - GENERAL

- 1.1 CONSTRUCTION & DEMOLITION WASTE
- .1 Carefully deconstruct and source separate materials/equipment and divert, from waste destined for landfill to maximum extent possible. Target for this project is 60% diversion from landfill. Reuse, recycle, compost, anaerobic digest or sell material for reuse except where indicated otherwise. On site sales are not permitted.
 - .2 Source separate waste and maintain waste audits in accordance with the Environmental Protection Act, Ontario Regulation 102/94 and Ontario Regulation 103/94.
 - .1 Provide facilities for collection, handling and storage of source separated wastes.
 - .2 Source separate the following waste:
 - .1 Portland cement concrete.
 - .2 Asphalt.
 - .3 Steel.
 - .4 Existing fill.
 - .3 Submit a waste reduction workplan indicating the materials and quantities of material that will be recycled and diverted from landfill.
 - .4 Submit proof that all waste is being disposed of at a licensed land fill site or waste transfer site. A copy of the disposal/waste transfer site's license and a letter verifying that said landfill site will accept the waste must be supplied to Departmental Representative prior to removal of waste from the demolition site.
- 1.2 WASTE PROCESSING SITES
- .1 Province of: Ontario.
 - .1 Ministry of Environment and Energy, 135 St. Clair Avenue West, Toronto, ON, M4V 1P5.
 - .2 Telephone: 800-565-4923 or 416-323-4321.
 - .3 Fax: 416-323-4682.
 - .2 Recycling Council of Ontario: 215 Spadina Avenue, #407, Toronto, ON, M5T 2C7.
 - .1 Telephone: 416-657-2797
 - .2 Fax: 416-960-8053
 - .3 Email: rco@rco.on.ca.
-

1.2 WASTE .2 Recycling Council of Ontario:(Cont'd)
PROCESSING SITES .4 Internet: <http://www.rco.on.ca/>.
(Cont'd)

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 CANADIAN .1 Government Chief Responsibility for the
GOVERNMENTAL Environment.
DEPARTMENTS CHIEF
RESPONSIBILITY FOR
THE ENVIRONMENT

Province	Address	General Inquiries	Fax
Ontario	Ministry of Environment and Energy 135 St Clair Avenue West Toronto, ON M4V 1P5 Environment Canada Toronto, ON	(416) 323-4321 (800) 565-4923 (416) 734-4494	(416) 323-4682

END

PART 1 - GENERAL

- 1.1 RECORD DRAWINGS .1 Maintain project record drawings and record accurately all deviations from the Contract documents. Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .2 Record changes in red ink. Mark ongoing changes on one set of prints. Then, at the completion of the project and before final inspection, neatly transfer notations to the second set. Submit both sets to the Departmental Engineer.
- 1.2 INFORMATION TO BE RECORDED .1 Record the following information:
- .1 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
- .2 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
- .3 Field changes of dimension and detail.
- .4 Changes made by Change Order or Field Order.
- .5 Details not on original Contract Drawings.
- .6 References to related shop drawings and modifications.
- .7 Additional Requirements: as specified in individual specifications sections.
- 1.3 REVIEW .1 Be prepared to review As-Built Drawings with Departmental Representative at least weekly, to ensure that level of detail being recorded is acceptable. Be advised that during periods of high activity, Departmental Representative may review As-Built Drawings even more frequently than weekly.
-

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 This section covers but is not limited to the removal and disposal of the following existing components and such other items as may be directed by the Department Representative:
- .1 Removal, salvaging and disposal of line and expansion posts. All expansion posts are to be disposed of.
 - .2 Removal and disposal of existing pipe railings.
 - .3 Removal, salvaging, and reinstallation of all existing lamp posts, Types I, II and III. This includes concrete base, lamp post extension, and all associated electrical work.
 - .1 Type I: Line Post
 - .2 Type II: Expansion Post
 - .3 Type III: Expansion Post with Integrated Lamp
 - .4 Removal, salvaging and reinstallation of stone pavers, as indicated on the drawings.
 - .5 Removal, salvaging and reinstallation of public benches with the work area, as required.
- .2 This section includes the removal of all other items that must be removed to complete the work as described in the specification.
- 1.2 MEASUREMENT AND PAYMENT PROCEDURES .1 Measurement Procedures: in accordance with Section 01 22 01.
- .2 Work covered by this section will be paid for under payment items included in the Unit Price Table:
- .1 Item No.1 - Removal, salvaging and disposal of line and expansion posts. All expansion posts are to be disposed of.
 - .2 Item No.2 - Removal and disposal of existing pipe railings.
 - .3 Item No. 3 - Removal, salvaging, and reinstallation of all existing lamp posts. This includes concrete base, lamp post extension, and all associated electrical work.
- .3 All other work of this section, which is not identified as a unit price item, is to be

1.2 MEASUREMENT AND PAYMENT PROCEDURES (Cont'd) .3 (Cont'd)
included in the Lump Sum Price stated in the Tender Form.

1.3 RELATED SECTIONS.1 Handrail System: Section 05 52 20
.2 Excavating and Backfilling: Section 31 23 15

1.4 PROTECTION .1 Protect existing structures or parts of structures designated to remain. In the event of damage, make repairs and replacements to the approval of, and at no additional cost, to the Departmental Representative.
.2 Protect all exposed electrical wiring and conduits during the concrete excavation, forming, heating and placement of concrete.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 PREPARATION .1 Inspect the site and verify with the Departmental Representative objects designated to be removed and objects to be preserved.
.2 Survey, record and tag all elements of existing lighting system for ease of future re-installation, including element location and orientations.
.3 Notify utility authorities before starting excavation, clearing and grubbing.

3.2 REMOVALS .1 Do not disturb adjacent work designated to remain in place.
.2 Items not designated to be salvaged are to be disposed of in a manner approved by the Departmental Representative.

- 3.2 REMOVALS
(Cont'd)
- .3 Remove pipe railing at nearest pipe expansion joint or cut pipe at locations identified by the Departmental Representative.
 - .4 Coordinate lamp post electrical work with the NCC. Breakers must be turned off, locked out and tagged out (as required) while conducting any electrical work. Refer to drawings for location of junction boxes and cable layout.
 - .1 Lamp posts located on site are to be disconnected, with the live wires capped off. Power supply to remainder of lamp posts on the parallel circuit is to be kept on.
 - .1 Departmental Representative will provide contact information for current NCC electrical Contractor to aid in identify parallel circuit origin and junction box location.

- 3.3 SALVAGE
- .1 Carefully dismantle materials designated to be salvaged and stockpile at locations designated by the Departmental Representative.
 - .2 The Departmental Representative will identify line posts and expansion lamp posts to be salvaged. Salvaged items are to be delivered to the NCC warehouse located at 1740 Woodroffe Avenue. All items not to be salvaged are to be disposed off the site.
 - .1 All existing bulbs on expansion lamp posts are to be removed and salvaged with care and stored and transported safely to the NCC warehouse. Replacement cost will be covered by Contractor if bulbs are damaged during removals and require replacement.

- 3.4 REINSTALLATION
- .1 None of the line posts, expansion posts or pipe railing will be reinstalled. Refer to Handrail System - Section 05 52 20 for installation of new posts and pipe railing.
 - .2 Lamp Posts are to be reinstalled as shown on the reference drawings, including associated electrical work.
 - .3 As an alternative, the contractor may choose to temporarily support lamp posts while carrying out the construction work.
-

- 3.4 REINSTALLATION .4 Reinstall stone pavers in accordance with
(Cont'd)
- Departmental Representative will record general installation pattern, bedding material type and thickness, etc, so that the contractor can reinstall pavers as per original installation. Supply, place, and compact all granular material necessary to complete the work.
- .5 Reinstall all other items which were removed as a result of construction activities to the Departmental Representative's approval.
-
- 3.5 DISPOSAL OF .1 Dispose of materials not designated for salvage
MATERIALS

END

PART 1 - GENERAL

- | | | |
|-----------------------------|----|---|
| <u>1.1 RELATED SECTIONS</u> | .1 | Section 03 25 13 - GFRP REINFORCING. |
| | .2 | Section 03 30 00 - CAST-IN-PLACE CONCRETE |
-
- | | | |
|---|----|--|
| <u>1.2 MEASUREMENT AND PAYMENT PROCEDURES</u> | .1 | There shall be no separate measurement for payment for the work under this Section. Include costs in the Contract Lump Sum Price.
.1 Include costs in concrete items of work for which concrete formwork, falsework and accessories are required. |
| | .2 | Payment Shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work. |
-
- | | | |
|-----------------------|----|---|
| <u>1.3 REFERENCES</u> | .1 | Canadian Standards Association (CSA)
.1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
.2 CAN/CSA-O86.1-01(R2006), Engineering Design in Wood (Limit States Design).
.3 CAN/CSA-O86.1S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood (Limit States Design).
.4 CSA O121-08, Douglas Fir Plywood.
.5 CSA O151-09, Canadian Softwood Plywood.
.6 CSA O153-M1980(R2008), Poplar Plywood.
.7 CSA O437 Series-93(R2006), Standards for OSB and Waferboard.
.8 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
.9 CAN/CSA-S269.3-M92(R2008), Concrete Formwork. |
| | .2 | Council of Forest Industries of British Columbia (COFI)
.1 COFI Exterior Plywood for Concrete Formwork. |
-
- | | | |
|--------------------------|----|--|
| <u>1.4 SHOP DRAWINGS</u> | .1 | Submit shop drawings for formwork and falsework in accordance with Section 01 33 00. |
|--------------------------|----|--|
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- | | | |
|---|----|---|
| 1.4 SHOP DRAWINGS
(Cont'd) | .2 | Indicate method and schedule of construction, shoring, stripping, arrangement of joints, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings. Comply with CAN/CSA-S269.3 for formwork drawings. |
| | .3 | Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms. |
| | .4 | Indicate sequence of erection and removal of formwork/falsework to minimize exposure time to adverse weather conditions. |
| | .5 | Each shop drawing submission shall bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada. |
| 1.5 REQUIREMENTS
OF REGULATORY
AGENCIES | .1 | Conform to municipal, provincial and national codes relating to design and construction of formwork and falsework. |
| 1.6 WASTE
MANAGEMENT AND
DISPOSAL | .1 | To Section 01 35 43 - Environmental Procedures. |
| | .2 | Separate and recycle waste material in accordance with section 01 74 20 and Section 01 35 43. |
| | .3 | Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOC's. |
| | .4 | Divert wood materials and plastic from landfill to a recycling facility. |

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CAN/CSA-086.1 CSA-0153.
 - .2 Sheathing: use only form ply plywood.
 - .3 Form ties: use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.
 - .4 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 15 sq.mm/s to 24 sq.mm/s at 40°C, flashpoint minimum 150°C, open cup.
 - .5 Falsework materials: to CSA S269.1.

PART 3 - EXECUTION

- 3.1 FABRICATION AND ERECTION
- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
 - .2 Hand trim sides and bottoms and remove loose earth and/or rock from earth/bedrock forms before placing concrete (if applicable).
 - .3 Fabricate and erect falsework in accordance with CSA S269.1.
 - .4 Fabricate and erect formwork in accordance with CAN/CSA-S269 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1/A23.2.
 - .5 Do not place shores and mud sills on frozen ground.
 - .6 Align form joints and make watertight. Keep form joints to minimum.

- 3.1 FABRICATION
AND ERECTION
(Cont'd)
- .7 Use 20 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless matching original profiles or specified otherwise.
- .8 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .9 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
- .10 Line forms for following surfaces:
.1 Exposed faces of abutments, wingwalls. Do not stagger joints of form lining material. Align joints to obtain uniform pattern.
- .11 Clean formwork in accordance with CAN/CSA-A23.1/A23.2, before placing concrete.
- 3.2 FORM RELEASE
AGENT
- .1 Surface preparation:
.1 Protect adjacent surfaces not designated to receive concrete form release.
.2 Clean and prepare surfaces to receive form release in accordance with manufacturer's instructions.
.3 Clean form surfaces thoroughly prior to application.
.4 Remove all rust, scale and/or previously used form release agents from the forms in accordance with good concrete practices.
.5 When using new wooden forms, 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.
.2 Avoid puddling of form release.
- 3.3 REMOVAL AND
RESHORING
- .1 Leave formwork in place for seven days after placing concrete.
- .2 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 required.
-

3.3 REMOVAL AND
RESHORING
(Cont'd)

- .3 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

3.4 FORMWORK AT
DRAIN OUTLETS

- .1 Form circular openings where existing drain pipes are located within the areas of concrete refacing.
- .2 Sawcut, remove and replace existing pipe at line of excavation; Alternatively, sound pipes may be conserved during the concrete excavation and incorporated in the new cast-in-place concrete.

END

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 This section specifies the requirements for concrete reinforcement as described by the drawings and the specification.
- 1.2 RELATED WORK .1 Section 01 33 00 - Submittal Procedures. Procedures.
- .2 Section 03 10 00 - Concrete Forming and Accessories.
- .3 Section 03 30 00 - Cast-in-Place Concrete.
- 1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 Measurement Procedures: in accordance with Section 01 22 01.
- .2 Work covered by this section will be paid for under payment items included in Unit Price Table:
- .1 Item No.5 - Glass Fiber Reinforced Polymer (GFRP) Reinforcement:
- .1 For concrete work related to canal wall refacing as indicated.
- .3 Epoxy coated wire/plastic ties and spacers to be considered incidental to supply and placement of reinforcement.
- .4 Other work of this section, not identified as unit price items, to be included in Lump Sum Price stated in Tender Form.
- 1.4 REFERENCE STANDARDS .1 Canadian Standards Association (CSA International)
- .1 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA-A23.3-04, Design of Concrete Structures.
- .3 CAN/CSA-S806-12, Design and construction of building structure with fibre-reinforced polymers.
-

1.4 REFERENCE
STANDARDS
(Cont'd)

- .1 (Cont'd)
 - .4 CAN/CSA-S6-06 (R2007), Fibre Reinforced Structures, "Canadian Highway Bridge Design Code".
 - .5 CSA-S807-10 (2015) Specification for fibre-reinforced polymers.
 - .6 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles, A National Standard of Canada.
 - .7 CSA W186-M1990(R2002), Welding of Reinforcing Bars in Reinforced Concrete Construction.
 - .8 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
 - .9 CSA G30.3-M1983(R1998), Cold Drawn Steel Wire for Concrete Reinforcement.
 - .10 CSA-G40.20-04(R2009)/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .11 CSA W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .2 ASTM International
 - .1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - .2 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .3 ASTM D7205 (2011), Standard test Method for Tensile Properties of Fiber Reinforced Polymer Matrix Composite Bars.
 - .4 ASTM D7337 (2012), Standard test Method for Tensile Creep Rupture of Fiber Reinforced Polymer Matrix Composite Bars.
 - .5 ASTM D7617 (2011), Standard test Method for Transverse Shear Strength of Fiber Reinforced Polymer Matrix Composite Bars.
- .3 American Concrete Institute (ACI)
 - .1 SP-66-04, ACI Detailing Manual 2004.
 - .1 ACI 315-99, Details and Detailing of Concrete Reinforcement.
 - .2 ACI 315R-04, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.
 - .2 ACI 350-06 Code Requirements for Environmental Engineering Concrete Structures and ACI 350.1-10 Specification for tightness of Environmental Engineering Concrete Containment Structures & Commentary.

- 1.4 REFERENCE STANDARDS
(Cont'd)
- .3 (Cont'd)
- .3 ACI 440R-07 (2007), "Report on Fiber Reinforced Polymer (FRP) Reinforcement for Concrete structures"
- .4 ACI 440.5-08(2008), Specification for Construction with Fiber-Reinforced Polymer Bar".
- .4 Reinforcing Steel Institute of Canada (RSIC)
- .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.
- 1.5 SUBMITTALS
- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare reinforcement Shop drawings in accordance with RSIC Manual of Standard Practice.
- .3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .1 Indicate placing of reinforcement and:
- .1 Bar bending details.
- .2 Lists.
- .3 Quantities of reinforcement.
- .4 Sizes, spacings, locations of reinforcement and mechanical splices if accepted by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
- .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
- .4 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.
- .1 Provide type 'B' tension lap splices unless otherwise indicated.
- .5 Detail placement of reinforcing where special conditions occur.
- .6 Quality Assurance: Upon Request, provide Departmental Representative with certified copy of test report of FRP reinforcing, minimum 3 weeks prior to beginning reinforcing work.
- .1 Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.
-

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- 1.5 SUBMITTALS
(Cont'd)
-
- .6 Quality Assurance:(Cont'd)
- .2 Substitute different size bars only if permitted in writing by Departmental Representative.
- 1.6 QUALITY
CONTROL
-
- .1 Manufacturing process to be in accordance with ISO 9001 Certified from delivery of raw materials to shipping of bars.
- .2 A control plan for monitoring sampling procedures and testing of raw materials and final products along with production documentation shall be made readily available upon request from Departmental Representative.
- .1 Manufacturer to keep records of :
- .1 Raw materials and approvals,
- .2 Polymer Mixture proportions,
- .3 Inspection dates and findings,
- .4 Certificates of Compliance.
- .3 Each production lot shall be tested in accordance with but not limited to following standards:
- .1 CSA S806 - Annex C,L & G,
- .2 ASTM D7914,
- .3 ASTM D2584,
- .4 ASTM D3171 - procedure G,
- .5 ASTM D570,
- .6 ASTM D3418,
- .7 ASTM E831.
- .4 Manufacturer to confirm and provide upon request, all qualification test results and documents carried out by third party testing firm.
- .1 Certificates of Compliance to be signed by manufacturer and include:
- .1 Bar size,
- .2 Grade,
- .3 Type of Resin,
- .4 Type of Fibre,
- .5 Type of Manufacturing Process,
- .6 Production Lot definition (Lot #),
- .7 Linear Meter length produced per Lot,
- .8 Start and End date of production run,
- .9 Number of Samples Tested and results of each test including averages, Standard deviations, minimum tensile strengths, and modulus of elasticity,
- .10 Deviations from standardized testing methods and explanations,
- .11 Final statement of product acceptance based on design criteria,
-

1.7 TESTING

- .1 Number of test samples to be in accordance to the requirements of each test methods listed in "QUALITY CONTROL" of this Section.
- .2 Minimum Tensile Strength is defined as average minus three times standard deviation. Minimum Requirements:
 - .1 Straight Bars - 1000 MPa
 - .2 Bent Bars - 450 MPa (bent portions)
- .3 Minimum Modulus of Elasticity to be defined as specified modulus of elasticity if coefficient of variation is smaller than 5%. If greater than 5%, then specified modulus of elasticity to be taken as average minus three times standard deviation. Minimum Requirements:
 - .1 Straight Bars:
 - .1 Low Modulus (LM): < 50GPa
 - .2 Standard (std) Modulus: >50 GPa & <60GPa
 - .3 High Modulus (HM): >60GPa
 - .2 Bent Bars: >46 GPa (bent portions)
- .4 Voids: No continuous voids as per ASTM D5117

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name, address and lot numbers on a durable label..
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .1 Prevent any coating or material build up on reinforcement bars that would adversely affect bond.
 - .2 Replace defective or damaged materials with new.
 - .3 GFRP is very flexible in comparison to steel bars; use appropriate equipment and support method when moving bundles of bars.
- .4 At any time, the bars shall be protected from direct sunlight (or any other significant UV radiation source), and any other cause of damage.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Glass Fiber Reinforced Polymer (GFRP) Bars:
Polymer Matrix reinforced by one type of reinforcement fibers - Glass.
 - .1 Polymer: Vinylester resin and homogeneous throughout cross-section. Blended polymers of different resins are not permitted.
 - .2 Reinforcement fibres: Fibres shall be supplied from continuous roving and be E-glass or ECR (Electrical/Chemical Resistance) glass fibres.
 - .3 Surface Finish: GFRP reinforcement bars to have sand coated finish or deformed surface.
 - .4 Fillers: Use of inorganic fillers is not permitted.
 - .5 Additives: May be used in manufacturing of the GFRP polymer and be appropriate to resin system used and specified application as indicated. Any additives used are to be submitted and accepted by Departmental Representative.
 - .6 GFRP bars to be of standard or higher tensile and modulus mechanical properties as indicated, (Std or HM).
- .2 Wire ties:
 - .1 Galvanized wire ties to ASTM A1060/A1060M-14 or ASTM A525.
 - .2 Epoxy Coated Wire Ties to ASTM A884.
 - .3 Nylon Ties.
- .3 Form Ties: Use plastic or Nylon form ties.
- .4 GFRP reinforcing bars to have equivalent or longer development length than standard black steel reinforcement.
 - .1 Minimum overlap length of 40 diameters of bar is required when overlapping bars to obtain longer lengths.
- .5 Contractor to not substitute GFRP reinforcing bars for steel reinforcing bars on an equal area basis without consultation with manufacturer and Departmental Representative.

2.2 FABRICATION

- .1 Fabricate GFRP reinforcing bars in accordance with CAN/CSA-S806-12, CAN/CSA-S6-06, CSA-S807-10 and reference Reinforcing Steel manual of Standard Practice by the Reinforcing Steel Institute of Ontario where applicable.

- 2.2 FABRICATION (Cont'd)
- .2 Obtain Departmental Representative's approval for locations of reinforcement splices.
 - .3 packaging and shipping:
 - .1 Identification:
 - .1 GFRP straight bars to be individually marked so that size, lot number and name of manufacturer are easily identified on bundles and bars.
 - .2 GFRP bent bars to be bundled by type and dimension and each bundle properly identified with durable labels. Bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
 - .4 Shop Bending:
 - .1 All GFRP Bars are made of thermoset resin. Bending must be carried out before full curing of uncured bars. Alterations after setting is not possible.
 - .2 Shape bent bars with gradual transitions and in accordance to allowable bend angles as per manufacturers requirements.

PART 3 - EXECUTION

- 3.1 FIELD BENDING
- .1 Do not field bend GFRP reinforcement.
- 3.2 PLACING REINFORCEMENT
- .1 Place GFRP reinforcing bars as indicated on reviewed placement drawings and in accordance with CSA-A23.1/A23.2 and RSIC, unless otherwise indicated.
 - .2 Field cutting: field cut GFRP bars with high speed grinding cutter or saw. Do not shear bars.
 - .3 Secure GFRP bars in formwork to prevent displacement by concrete placement or workers.
 - .4 Use plastic or non-corrosive chairs to place GFRP bars as indicated. Verify with manufacturer regarding support distance between chairs as GFRP is more flexible than standard steel reinforcement.
 - .5 Splicing:
 - .1 Use Lap splices, whenever continuity is required in reinforcement.

3.2 PLACING
REINFORCEMENT
(Cont'd)

- .5 Splicing:(Cont'd)
 - .2 All lap splices to be Class B, unless otherwise noted.
- .6 Prior to placing concrete, obtain Departmental Representative's acceptance of reinforcement bars and position.
- .7 Ensure appropriate concrete cover for reinforcement is maintained throughout reinforcement placement as indicated.
- .8 Ensure concrete cover for reinforcement is maintained during concrete placement.
- .9 Protect GFRP portion of bars with covering during handling and placement.
- .10 Do not exceed placing tolerances as specified in CSA A23.1/A23.2 and A23.3.

END

PART 1 - GENERAL

- 1.1 DESCRIPTION
- .1 This section specifies the requirements for Cast-in-Place concrete placed as described by the drawings and the specifications.
 - .2 Blended hydraulic cement type GU for cast-in-place concrete is specified for use at all non-mass concrete pours at all reinforced concrete structures.
- 1.2 MEASUREMENT AND PAYMENT PROCEDURES
- .1 Measurement Procedures: in accordance with Section 01 22 01.
 - .2 Work covered by this section will be paid for under payment items included in the Unit Price Table:
 - .1 Item No.6 - Class I Concrete:
 - .1 Concrete for the vertical and coping refacing portions of the existing Canal walls.
 - .3 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.
 - .4 Cast-in-place concrete will be measured in cubic metres calculated from neat dimensions indicated on drawings or authorized in writing by Departmental Representative. Concrete placed beyond dimensions indicated will not be measured.
 - .5 No deductions will be made for volume of concrete displaced by reinforcing steel.
 - .6 Include in the prices of concrete the bonding agent.
 - .7 Include in the prices of concrete the installation of all items embedded therein.
 - .8 Include in the prices of concrete the work described in Section 03 10 00.
 - .9 Include in the prices of concrete the heating, cooling, hot and cold weather protection, curing, and finishing.
 - .1 Includes the provision for pre-heating of existing substrate prior to casting.
-

1.2 MEASUREMENT AND PAYMENT PROCEDURES (Cont'd)	.10	Include in the prices of concrete the supply and installation of waterstops.
	.11	Include in the prices of concrete the supply and installation of joint filler, bond breaker/backer rod and joint sealer.
	.12	Include in the prices of concrete the supply and installation of waterstops.
	.13	Include in the prices of concrete the reinforcing fibre content.
	.14	All other work, necessary to the completion of the work of this Section, will not be measured separately for payment, but will be considered incidental to the work.
1.3 RELATED WORK	.1	Section 03 10 00 - Concrete Forming and Accessories.
	.2	Section 03 20 00 - Concrete Reinforcement.
	.3	Section 31 23 15 - Excavating and Backfilling.
1.4 REFERENCE STANDARDS	.1	Abbreviations and Acronyms: .1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement. .1 Type GU, GUb and GUL - General use cement. .2 Type LH, LHb and LHL - Low heat of hydration cement. .2 Fly ash: .1 Type F - with CaO content less than 15%. .2 Type CI - with CaO content ranging 15 to 20%. from .3 Type CH - with CaO greater than 20%. .3 GGBFS - Ground, granulated blast-furnace slag. .4 FRC - Fiber-Reinforced Concrete. .1 GFRC - Glass Fiber-Reinforced Concrete. .5 PVAf - Polyvinyl Alcohol Fibers.
	.2	Canadian Standards Association (CSA International) .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

- 1.4 REFERENCE STANDARDS (Cont'd)
- .2 (Cont'd)
- .2 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .1 CAN/CSA-A3001-03, Cementitious Materials for Use in Concrete.
- .3 CAN/CSA-S806-12, Design and Construction of Building Structures with Fiber-Reinforced Polymers".
- .4 CAN/CSA-S807-10 (2010), Specification for Fiber-Reinforced Polymers.
- .3 American Society for Testing and Materials International (ASTM)
- .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
- .2 ASTM C494/C494M-11, Standard Specification for Chemical Admixtures for Concrete.
- .3 ASTM C1017/C1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- .4 ASTM C1116/C1116M-10a (2015), Standard Specification for Fiber-reinforced Concrete.
- .5 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers- Tension.
- .6 ASTM D570-98(2005), Standard Test Method for Water Absorption of Plastics.
- .7 ASTM D624-00(2007), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
- .8 ASTM D638-08, Standard Test Method for Tensile Properties of Plastics.
- .9 ASTM D746-07, Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
- .10 ASTM D747-08, Standard Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam.
- 1.5 SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Shop Drawings:
- .1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and necessary details of reinforcing.
- .2 Submit drawings showing formwork and falsework design to: CSA A23.1/A23.2.
- .3 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

1.5 SUBMITTALS
(Cont'd)

- .3 At least two (2) weeks prior to commencing the work, provide the Departmental Representative a concrete design mix that meets the specifications. Include submittals for:
 - .1 curing compound,
 - .2 joint filler,
 - .3 fibers,
 - .4 waterstop.
- .4 At least two (2) weeks prior to commencing concrete work submit to the Departmental Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that the following materials will meet specified requirements and are compatible:
 - .1 Portland cement.
 - .2 Supplementary cementing materials.
 - .3 Shrinkage compensating grout for concrete repairs.
 - .4 Admixtures.
 - .5 Aggregates
 - .6 Water.
- .5 At least two (2) weeks prior to beginning Work, provide Departmental Representative a cold weather protection plan for concrete.
- .6 Concrete Pours: Provide accurate records and documentation of poured concrete items indicating date, location, quality, air temperature and test samples taken.
- .7 Provide testing inspection results and reports for review by Department Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .8 Provide two copies of WHMIS MSDS in accordance with Sections 01 35 29 - Health and Safety and 01 35 43 - Environmental Procedures.

1.6 QUALITY CONTROL
AND ASSURANCE

- .1 3 weeks prior to starting concrete work, provide valid and recognized certificate from plant delivering concrete.
- .2 Quality Control Plan: Provide written report, minimum 3 weeks prior to starting concrete work, to Departmental Representative verifying compliance that concrete in place meets

1.6 QUALITY CONTROL .2
AND ASSURANCE
(Cont'd)

Quality Control Plan:(Cont'd)
performance requirements. Provide proposed
quality control procedures for review by
Departmental Representative on following items:

- .1 Falsework erection.
 - .2 Hot weather concrete.
 - .3 Cold weather concrete.
 - .4 Curing.
 - .5 Finishes.
 - .6 Formwork removal.
 - .7 Maintaining an environment for concrete curing.
 - .8 Preparing works to receive concrete including achieving an acceptable environment and substrate temperature.
-
- .3 Ensure that mix design is adjusted suitably to prevent alkali aggregate reactivity problems.
 - .4 Manufacturer's Qualifications:
 - .1 Ready mix concrete supplier: member in Good standing of Ready Mix Concrete Association of Ontario (RMCAO). Batching plant facilities are required to maintain RMCAO special Seal of Quality.
 - .2 Batching and delivery facilities: Facilities capable of producing minimum of 50m³/h, conforming to requirements of CAN/CSA A23.1/A23.2.
 - .5 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1/A23.2, and that mix design is adjusted to prevent alkali aggregate reactivity problems.
 - .6 Defective concrete:
 - .1 Strength acceptance criteria from cylinder tests will be in accordance with CAN/CSA A23.1/A23.2 except as follows:
 - .1 Concrete shall be considered defective for concrete placements less than 200 m³ when a cylinder test fails to meet specified strength. In such cases concrete in that section may be checked by Departmental Representative by core specimens drilled and tested in accordance with CAN/CSA A23.2. All concrete core extraction and testing shall be conducted by a third party inspection company with a CSA certified testing laboratory with Category I certification.

1.6 QUALITY CONTROL .6
AND ASSURANCE
(Cont'd)

Defective concrete:(Cont'd)

- .1 (Cont'd)
- .2 Strength acceptance criteria from core specimens will be in accordance with CAN/CSA A23.1/A23.2.
- .3 Consider concrete defective if it is structurally unsound, lacks moisture resistance, honeycombed or improperly finished, as determined by the Departmental Representative.
- .4 The Departmental Representative has the right to require replacement, strengthening or correction of impacted portions of defective concrete structure to acceptance of the Departmental Representative.
 - .1 Bear all cost of rectifying defective concrete including inspections, design, coring, testing, strengthening, demolishing, and replacement. Bear investigation and evaluation cost even if further evaluation of design allows unit to be classed as acceptable concrete.

.7 Records:

- .1 Before unloading at Site, have concrete producer submit to the Departmental Representative a delivery ticket (with each batch of concrete) on which is printed, stamped or written the following information:
 - .1 Name and location of batching plant.
 - .2 Date and serial number of ticket.
 - .3 Name of Contractor.
 - .4 Specific designation of job (name and location).
 - .5 Approved mix code, specified strength, and specific class or designation of concrete indicated in Concrete Mixes article specified.
 - .6 Amount of concrete in cubic meters.
 - .7 Truck number, cumulative total, and/or load number.
 - .8 Time loaded or time of first mixing of cement and water/aggregate.
 - .9 If water added on site, show amount and have this information initialed by the Departmental Representative.
- .2 Include the following information, which is to be registered by producer's representative on at least two copies of the

1.6 QUALITY CONTROL .7
AND ASSURANCE
(Cont'd)

Records:(Cont'd)

.2 (Cont'd)

delivery ticket, after discharge has been completed:

.1 Time that load arrived on Site.

.2 Time that discharge of load was started.

.3 Time that discharge of load was completed.

.4 Type and amount of admixtures, if added on Site.

.5 Amount of water, if added on Site.

.6 Location of placed concrete and any issues encountered.

.7 Volume of concrete returned.

.3 Maintain accurate records of cast-in-place concrete elements. Include in records the following information:

.1 Date of placing concrete element.

.2 Location of concrete element.

.3 Specified strength of concrete.

.4 Air and form temperature when concrete was placed.

.5 Temperature of concrete when placed in the form.

.6 Test samples taken and results of test samples.

.8 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.

1.7 DELIVERY,
STORAGE AND
HANDLING

.1 Delivery and Acceptance Requirements: Concrete hauling time: maximum allowable time limit for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.

.1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative, laboratory representative and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by Department Representative.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

.3 Packaging Waste Management:

.1 remove for reuse and return by manufacturer of pallets, crates, padding and packaging

- | | | |
|--|----|---|
| 1.7 DELIVERY,
STORAGE AND
HANDLING
(Cont'd) | .3 | Packaging Waste Management:(Cont'd) |
| | .1 | (Cont'd)
materials in accordance with Section
01 74 20. |
| | .2 | Provide an appropriate area on the job site
where concrete trucks can be safely washed. |
| | .3 | Unused admixtures and additive materials
must not be disposed of into sewer systems,
onto ground or in other location where it
will pose health or environmental hazard. |
| | .4 | Prevent admixtures and additive materials from
entering drinking water supplies or streams.
Using appropriate safety precautions, collect
liquid or solidify liquid with inert,
noncombustible material and remove for disposal.
Dispose of waste in accordance with applicable
local, Provincial/Territorial and National
regulations |
| 1.8 WASTE
MANAGEMENT AND
DISPOSAL | .1 | Separate waste materials for reuse and recycling
in accordance with Section 01 74 20. |
| | .2 | Ensure emptied containers are sealed and stored
safely. |
| | .3 | Divert unused concrete materials from landfill
to approved facility, as reviewed by Departmental
Representative. |
| 1.9 REQUIREMENTS OF
REGULATORY AGENCIES | .1 | Conform to municipal, provincial and national
codes relating to design and construction of
formwork. |

PART 2 - PRODUCTS

- | | | |
|-----------------------------|----|--|
| 2.1 DESIGN CRITERIA | .1 | Performance: to CSA A23.1/A23.2, and as
described in MIXES of PART 2 - PRODUCTS |
| 2.2 PERFORMANCE
CRITERIA | .1 | Quality Control Plan: ensure concrete supplier
meets performance criteria of concrete as
established by Departmental Representative and
provide verification of compliance as described
in PART 1 - QUALITY CONTROL AND ASSURANCE. |
-

2.3 APPROVALS

- .1 All concrete mixes to be approved by the Departmental Representative.

2.4 MATERIALS

- .1 General:
 - .1 Do not use calcium chloride or compounds, or admixtures containing calcium chloride.
 - .2 Use consistent concrete ingredients, uniformly proportioned from batch to batch.
 - .2 General Use hydraulic Cement: to CAN/CSA-A3001, Type GU or GUB for use at all non-mass concrete pours at all reinforced concrete structures..
 - .3 Supplementary cementing materials: with 20% to 30% hydraulic slag, by mass of total cementitious materials to CAN/CSA-A3001 and CAN/CSA-A363.
 - .4 Water: to CAN/CSA-A23.1/A23.2.
 - .5 Aggregates: to CAN/CSA-A23.1/A23.2 hard, dense, well graded aggregates of normal mass-density, approved by the Departmental Representative both as to quality and source:
 - .1 Aggregates to be free from materials identified as having deleterious reactions with certain constituents of cements. Minimal amounts of these reactive materials will be given consideration for inclusion - the basis of consideration will be:
 - .1 Conformance to the requirement of CAN/CSA-A23.1/A23.2; and/or
 - .2 The performance criteria as given in Clause 5.9 of CAN/CSA-A23.1/A23.2.
 - .6 Admixtures:
 - .1 Air entraining admixture: to ASTM C260.
 - .2 Chemical admixture: to ASTM C494/C494M, Specification for Chemical Admixtures for Concrete.
 - .3 Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
 - .7 Non premixed dry pack grout for formwork cone packing: composition of non metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing a minimum compressive strength of 35 MPa at 28 days.
 - .8 Curing compounds and other curing materials: to CAN/CSA-A23.1/A23.2.
-

2.4 MATERIALS
(Cont'd)

- .9 Bonding agent: to ASTM C1059.
- .10 Other concrete materials: to CSA-A23.1/A23.2.
- .11 Fibers: to ASTM C1116/C1116M-10a and CAN/CSA-S807-10.
 - .1 13mm-50mm polypropylene Monofilament Macro - fibers with large Denier.
 - .2 The following is a list of acceptable products:
 - .1 TUF-STrand SF, manufactured by The Euclid Chemical Company, 1-800-321-7628.
 - .2 Strux 90/40 , Manufactured by Grace Construction Products, 1-877-423-6491.
 - .3 Nycon-XL-Plus, 100 or 200, Manufactured by Nycon Corp., 1-800-456-9266.
 - .4 Or equivalent product upon approval of Departmental Representative.
- .12 Joint sealer: to CAN/CGSB-19.13 Sealing Compound, two component, elastomeric, chemical curing. Type I for horizontal joints, Type II for vertical joints.
- .13 Polyethylene foam: use as bond breaker between joint filler and sealer as shown on drawings.
- .14 Premoulded joint fillers: ASTM D7174-05 - New Standard Specification for Preformed Closed-Cell Polyolefin Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .15 Waterstop:
 - .1 To be a flexible PVC (polyvinyl chloride) waterstop extruded from an elastomeric plastic material of which the basic resin is prime virgin polyvinyl chloride. The PVC compound shall not contain any scrapped or reclaimed material or pigment whatsoever.
 - .1 Performance requirements to meet:
 - .1 Tensile strength (ASTM D638) - 13.79 MPa (2000 psi) minimum.
 - .2 Tear resistance (ASTM D624) - 43.78 N/mm (225 lb/in).
 - .3 Hardness shore A 15 (ASTM D2240) - 76 to 81.
 - .4 Ultimate elongation (ASTM D638) - minimum 300%.
 - .5 Water absorption (ASTM D570) - 0.02% maximum.

2.4 MATERIALS
(Cont'd)

.15 Waterstop: (Cont'd)

.1 (Cont'd)

- .6 Low temperature brittleness (ASTM D746) - Passed @ -35°F/-37°C.
- .7 Cold bend test at -45°C for 2 hours - no cracking.
- .8 Stiffness in flexure (ASTM D747) - 4.82 MPa (700 psi).
- .9 Specific gravity (ASTM D792) - 1.4.
- .10 Accelerated extraction (CRD-C 572): tensile strength - 12.75 MPa (1850 psi), elongation - 350%
- .11 Effect of Alkali (CRD-C 572): weight change - +0.1%, hardness change - +1 point.
- .2 Waterstop type:
 - .1 For all vertical surfaces at construction and expansion joints of the new wall: ribbed with center bulb type having the following dimensions:
 - .1 Width: 152 mm.
 - .2 Thickness: 9.5 mm
- .3 The following is a list of acceptable products:
 - .1 Greenstreak PVC waterstop: model Type 706 manufactured by Greenstreak Inc., tel:800-325-9504.
 - .2 DuraJoint PVC waterstop: model Type 9 manufactured by Durajoint Concrete Accessories, tel:888-833-8308.
- .2 Hydrophilic waterstop:
 - .1 For all construction joints.
 - .2 Rectangular profile measuring 7 mm thick x 25 mm wide and incorporating hollow longitudinal compression openings.
 - .3 Comprised of non-bentonite synthetic chloroprene rubber.
 - .4 Co-extruded hydrophilic and non-hydrophilic composition.
 - .5 Hardness exceeding 50 (ASTM-D2240).
 - .6 Tensile strength exceeding 30 kg/cm².
 - .7 Elongation of synthetic chloroprene rubber exceeding 600% (ASTM-D412).
 - .8 Elongation of chloroprene rubber only exceeding 400% (ASTM-D412).
 - .9 Volume expansion capability exceeding 3.0 times original size.
 - .10 Adhesive and sealant as recommended by waterstop manufacturer.

- 2.4 MATERIALS
(Cont'd)
- .16 Wire/nylon Ties for Concrete Reinforcement:
Refer to Section 03 20 00 - Concrete reinforcement.
- .17 Chairs, Bolsters, Bar Supports, Spacers:
Adequate for strength and support of reinforcing construction conditions. Use non-corrodible materials for all concrete work which will be exposed to view in the finished work to CAN/CSA-A23.1.
- 2.5 CONCRETE MIX
- .1 Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
- .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
- .2 Provide concrete mix to meet following plastic state requirements:
- .1 Uniformity: no segregation.
- .2 Placeability: provide the lowest slump compatible with the conditions of placement. Slump shall be measured at the point of discharge;
- .1 For vertical formwork such as walls: 100 mm +/- 30 mm.
- .2 For flat sections such as slabs: 80 mm +/- 20 mm.
- .3 Workability: free of surface blemishes loss of mortar colour variations segregation.
- .4 Finishability: to satisfaction of the Departmental Representative.
- .5 Set time: to conditions of pour and to acceptance of the Department Representative.
- .3 Provide concrete mix to meet following hard state requirements:
- .1 Durability and class of exposure: C-1
- .2 Compressive strength at 28 days age: 35 MPa minimum.
- .3 Intended application: water retaining structure (Canal Wall).
- .4 Surface texture: all deformities repaired including tie-rods; sack rubbed to provide a uniform texture and colour.
- .5 Nominal size of coarse aggregate: 20 mm maximum.
- .6 Air content: 5-8%
- .7 Maximum water Cement ratio: 0.4
-

- 2.5 CONCRETE MIX (Cont'd)
- .1 (Cont'd)
 - .3 (Cont'd)
 - .8 Fibers: minimum application rate of 1.8kg/Cu.M of concrete unless otherwise.
 - .1 In Accordance to Manufacturer's recommendations for application rate.
 - .2 Time of fibre application to be in accordance with manufacturer's recommendations.
 - .9 Volume stability: acceptable volume change range due to shrinkage, creep and freeze thaw cycle.
 - .2 Admixtures: to approval of Department Representative and to the quantities in accordance to manufacturer's recommendation. Use admixtures to correct deficiencies in the mix or improve placement of concrete.
 - .1 Department Representative may withdraw prior approval of admixture if conditions encountered during course of work indicate unsatisfactory results.
 - .2 Do not use calcium chloride or materials containing calcium chloride.
 - .3 Weigh aggregates, cement, water and admixture separately when batching. No alternative method of measuring will be permitted.
 - .4 Concrete pumpability characteristic shall be sufficient for the selected equipment and shall be co-ordinated between the Contractor and the concrete supplier.
 - .5 Provide quality management plan to ensure verification of concrete quality to specified performance.

PART 3 - EXECUTION

- 3.1 GENERAL
- .1 Ensure that reinforcement bars and anchors, and other necessary items are in-place, clean and undamaged.
 - .2 Notify the Departmental Representative at least 2 working days in advance of each proposed concrete placement.
 - .3 Use proper and timely placing, finishing and curing practices.

3.2 PREPARATION

- .1 Provide Departmental Representative 24 hours notice confirmation before each concrete placement.
- .2 Pumping of concrete will be permitted only after confirmation and approval of equipment and mix by concrete supplier.
- .3 Ensure formwork, reinforcement and inserts are not disturbed during concrete placement.
- .4 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .5 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.
- .6 Protect previous Work from staining.
- .7 Construct mortar-tight formwork in accordance with reviewed formwork drawings, maintain tolerances of finished concrete work as specified in CAN/CSA A23.1/A23.2.
- .8 Clean and remove stains prior to application of concrete finishes.

3.3 CONSTRUCTION

- .1 In Locations where new concrete is dowelled to existing work, drill holes in existing Place GFRP reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as ambient air within enclosure to temperature, and for duration of curing period recommended by manufacturer.
- .2 Concrete Substrate: For concrete placed when air temperature is at or below 5°C, pre-heat existing concrete substrate for a minimum period of 3 days, to a temperature of not less than 15°C but not more than 27°C at concrete substrate surfaces, prior to placing concrete. A minimum substrate temperature of 5°C is required 36 hours prior to placing concrete, and must be maintained until the concrete is placed.

3.3 CONSTRUCTION
(Cont'd)

- .3 Fibres:
 - .1 Comply with manufacturer's recommendations for adding and mixing requirements.
 - .2 Finished Concrete surface shall be a smooth surface with no exposed fibers.
 - .
 - .4 Joint fillers:
 - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
 - .2 Locate and form construction and expansion joints as indicated. Location of expansion joints, for refacing part of work, to coincide with existing joints. Install joint filler, bond breaker and sealer.
 - .5 Waterstops:
 - .1 Install waterstops at the locations shown on the drawings and to CAN/CSA-A23.1/A23.2-09. Follow manufacturer's recommendations.
 - .1 Install waterstops to provide continuous water seal.
 - .2 Do not distort or pierce waterstop in anyway as to hamper performance.
 - .3 Do not displace reinforcement when installing waterstop.
 - .4 As required, tie waterstops rigidly in place.
 - .5 Use only straight heat welded/sealed butt joints in field.
 - .6 Use factory welded corners and intersections unless otherwise approved by the Departmental Representative.
 - .7 Use adhesive and sealant as recommended by manufacturer for installation.
 - .6 Embedded parts:
 - .1 set other embedded parts and openings as indicated or specified elsewhere (as required).
 - .2 Check locations and sizes of embedded parts and openings shown on drawings.
-

- 3.4 FORMWORK
- .1 Construct mortar-tight formwork in accordance with reviewed formwork drawings, Maintain tolerances of finished concrete work as specified in CAN/CSA-A23.1/A23.2.
 - .2 Where forms appear to be unsatisfactory stop work until defects corrected.
 - .3 Strip forms to CAN/CSA-A23.1/A23.2.
- 3.5 CONCRETE REFACING BELOW WATER/ICE LEVEL
- .1 Some of the concrete repairs extend below the water/or ice level. In these areas the contractor will be allowed to make a horizontal construction joint 100 mm above ice level. All concrete work below water/ice level is to be completed during the fall drawdown period as outline in Section 01 11 00.
 - .2 During drawdown, local dewatering will not be required, but the formwork may extend into the water for part of the work.
 - .3 Contractor should expect that water will be against the wall or within 0.5 m from the wall during drawdown.
- 3.6 PLACING CONCRETE
- .1 Place concrete continuously from start to finish:
 - .1 At such rates as to permit satisfactory placing and compaction - plan the work and use such methods and performance rates as to allow no cold joints and/or honeycomb;
 - .2 During clement weather or with protection;
 - .3 During daylight hours;
 - .4 Without unscheduled construction joints.
 - .2 When pumping of concrete is authorized by Departmental Representative:
 - .1 Arrange equipment so that no vibrations result which might damage freshly placed concrete. Use reversible pumps.
 - .2 Operate pump so that a continuous stream of concrete without air pockets is produced.
 - .3 When pumping is discontinued and concrete remaining in pipe line is to be used, void pipe line in a manner that prevents contamination of concrete or separation of ingredients.
 - .3 Consolidate concrete with high speed internal vibrators.
-

3.6 PLACING
CONCRETE
(Cont'd)

- .4 Do not commence placing concrete until the Departmental Representative has inspected and approved forms, falsework, reinforcing steel, conveying, spreading consolidation and finishing equipment, and curing and protective methods.
- .5 Structural items:
 - .1 Do not place load upon finished structural items or any portions thereof until authorized by Departmental Representative.
 - .2 Except as approved by Departmental Representative on the basis of tests, the minimum time to be 7 days.

3.7 INSERTS

- .1 Cast in drains, sleeves, ties, anchors, reinforcement, waterstops, pipes, joint fillers and other inserts required to be built-in.
 - .1 Sleeves and openings greater than 100mm X 100mm not indicated, must be reviewed by the Departmental Representative.
 - .2 Do not permit penetrations, sleeves, or other openings to pass through walls, except where approved by the Departmental Representative.
 - .3 Do not eliminate or displace reinforcement to accomodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from the Departmental Representative before placement of concrete.

3.8 FINISHING

- .1 Initial finishing to CAN/CSA-A23.1/A23.2 clause 22.3 screed unformed surfaces true to grade and free of surface irregularities exceeding 5 mm under a 3 m straightedge placed in any direction on the plane surface.
- .2 Final finishing: float and trowel to CAN/CSA A23.1/A23.2 clause 7.5.4.2 & 7.5.4.3.
- .3 Use procedures in accordance to CSA A23.1/A23.2 to remove excess bleed water, where required.
- .4 Unformed surface concrete tolerance to conventional classification in accordance with straight edge method, in accordance to A23.1/A23.2, Clause 7.1.4.2..
- .5 Apply sack-rubbed finish on all surfaces where bug-holes are greater than 6 mm in diameter. Sack-rubbed finish shall be undertaken as soon as

- 3.8 FINISHING
(Cont'd)
- .5 (Cont'd)
the surface is accessible, that, upon stripping the forms. Do work in accordance with CSA 23.1/CSA A23.2, clause 7.7.4.4 "Sack-Rubbed Finish".
- .6 Do patching of form-tie holes, cutout areas, and cavities to CAN/CSA A23.1 Clause 24.2. use materials that match in colour with concrete surface.
- 3.9 PROTECTION AND CURING
- .1 For concrete placed when air temperature is at or below 5°C, in addition to cold weather requirements of CAN/CSA-23.1/A23.2:
- .1 Protect concrete by windproof shelter of canvas or other material to allow free circulation of inside air around fresh concrete. At no point let walls of shelter or any point of shelter touch formwork or concrete surface. Supply approved heating equipment. Vent the products of combustion outside the protective shelter. Equipment shall be capable of keeping inside air at a constant temperature sufficiently high to maintain concrete at following curing temperatures:
- .1 For an initial 3 days, at a temperature of not less than 15°C not more than 27°C at concrete surfaces.
- .2 Cure at not less than 10°C for an extra 4 days.
- .2 Keep concrete surfaces moist continuously while protected.
- .3 Reduce temperature at a rate not exceeding 10 degrees Celsius per day until outside temperature has been reached.
- .2 For concrete placed when the air temperature is at or above 27°C, provide the hot weather protection and protection from drying required by Clause 7.4.1.2 and 7.4.1.4 of CAN/CSA-23.1-09. Ensure concrete temperatures at placing meet the requirements of Table 14, Page 131: take suitable control measures when mixing ingredients.
- .3 Unformed surfaces: cure with burlap and water. Carefully place two layers of damp burlap on the surface of the concrete. Overlap each strip by at least 75 mm and secure against displacement by wind. Maintain burlap in place and keep thoroughly wet for 7 days after day of placing.

- 3.9 PROTECTION AND CURING
(Cont'd)
- .4 Formed surfaces: if formwork is left in place for 7 days or more, no additional curing will be required. If formwork is removed in less than 7 days, cure in manner specified for unformed surfaces for remainder of seven day period.
 - .5 During curing period uncover only such areas that are immediately needed for finish treatment. Recover and continue curing.
 - .6 Contractor to provide max/min temperature devices to monitor ambient enclosure temperature control during initial seven (7) day curing period per new casting.

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

- 3.11 EXPANSION JOINTS
- .1 Install premoulded joint filler in expansion joints full depth, as indicated in Contract documents and to CSA A23.1/A23.2.

- 3.12 FIELD QUALITY CONTROL
- .1 Concrete testing: to CSA-A23.1/A23.2 by testing laboratory designated and paid for by Departmental Representative.
 - .2 If tests do not meet requirements of the Departmental Representative, take such measures as indicated in CAN/CSA-23.1/23.2, and approved by the Departmental Representative.
 - .3 Inspection or testing by Departmental Representative or third party service provider will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

- 3.13 CLEANING
- .1 Use trigger operated spray nozzles for water hoses.
 - .2 Designate cleaning area for tools to limit water use and runoff.
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3.13 CLEANING (Cont'd)	.3	Cleaning of concrete equipment to be done in accordance with Section 01 35 43.
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END

PART 1 - GENERAL

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| <u>1.1 DESCRIPTION OF WORK</u> | .1 | This section specifies the requirements for repointing existing stone masonry in place and replacing existing expansion joint sealant, as described by the drawings and the specification. |
| | .2 | The work includes but is not limited to: <ul style="list-style-type: none">.1 Repointing of masonry joints as shown on drawings, including horizontal and vertical surfaces..2 Where voids are encountered in joints mortar fill is to be installed. This method of filling voids will be the preferred method over grouting..3 Removing old sealant from existing expansion joint, cleaning joint and installing new backer rod and sealant. |
| <u>1.2 MEASUREMENT AND PAYMENT PROCEDURES</u> | .1 | There shall be no separate measurement for payment for the work under this Section. Include costs in the Contract Lump Sum Price. |
| | .2 | Payment Shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work. |
| <u>1.3 RELATED WORK</u> | .1 | Section 01 35 29 - Health and Safety Requirements. |
| | .2 | Section 01 56 00 - Temporary Barriers and Enclosures. |
| <u>1.4 QUALIFICATIONS</u> | .1 | Repointing work to be performed by qualified stone masons. |
| | .2 | One thoroughly experienced, reliable and competent workman shall be in charge of all mortar mixing for the duration of the job. |
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- 1.5 DEFINITIONS
- .1 Repointing: raking and cleaning of unsound joints and the filling, compacting and finishing of masonry joints which are void or from which the mortar has been raked out or omitted.
 - .2 Tooling: finishing for masonry joints to provide final contour.

- 1.6 STANDARDS
- .1 All masonry restoration to be to CSA A371-04 (R2009), "Masonry Construction for Buildings" and as augmented by these specifications.
 - .2 "Mortar and Grout for Unit Masonry" to be in accordance with CSA A179-04(R2009) and as augmented by these specifications.

- 1.7 INSPECTION AND TESTING
- .1 Routine testing of materials, of proposed mortar mix and of final work for compliance with the specification, will be carried out by the Departmental Representative. Mortar samples shall be taken from time to time for testing. Cooperate fully with the Departmental Representative in obtaining these samples.
 - .2 If test results show that performance criteria are not met, removal and repair of rejected work shall be performed at no additional cost to the Owner. All work must be done to the original specification. Work which is suspected to be completed in a similar manner to the tested work, which has been rejected, may also be rejected.

- 1.8 SAMPLE
- .1 Submit mortar samples in quantity and size to the requirements of CSA A179-04(R2009).
 - .2 Clearly labelled samples of all materials to be used on the job shall be submitted to the Departmental Representative for approval before work starts.
 - .3 The approved samples shall become the standard for the materials used on the job. Substitutions shall not be permitted without written approval from the Departmental Representative.
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1.9 STORAGE AND
HANDLING OF
MATERIALS

- .1 Store cementitious materials in accordance with CAN/CSA A3000-98 A5-98. Store aggregates in accordance with CAN/CSA A23.1-09/A23.2-09.
- .2 All materials are to be kept dry and protected from weather and contamination.
- .3 Manufacturers' labels and seals must be intact upon delivery.

1.10 ENVIRONMENTAL
REQUIREMENTS

- .1 When the air temperature is less than 5°C, sand and mixing water shall be heated to produce mortar at a temperature of not less than 5°C or more than 27°C. Contractor to supply max/min thermometer and record temperatures.
- .2 No mortar may be placed when the temperature is below 0°C (32°F), or below 4°C (40°F) and falling.
- .3 All newly laid masonry mortar placed during cold weather, shall be protected and heated in a manner that will maintain an air temperature above 5°C for a minimum of 10 days beyond the required curing period, by means of a covering or enclosure and, where necessary, by supplementary heat, all to the satisfaction of the Departmental Representative. During cold weather and prior to placing new masonry mortar, area is to be heated for a minimum of 24 hours so that the masonry mortar or base materials to which the new masonry mortar is to be placed is completely free of frost and above a temperature of 5°C.

1.11 EXISTING
CONDITION

- .1 Report to the Departmental Representative, in writing, all areas of severely deteriorated masonry revealed during the work, and shall await instruction regarding repair or replacement of masonry units.
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PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Water: to CAN/CSA-A23.1/A23.2.
 - .2 Cements:
 - .1 White Portland cement, Type GU. An acceptable product is that manufactured by Federal Cement Ltd., Ingersoll, Ontario.
 - .2 Masonry cement to CSA-A3002, Type N.
 - .3 Aggregate shall be free of salt and other impurities, well-graded sand (concrete sand conforming to CSA A-179) matching the texture and range of sizes found in both the test sample and the joints that will not be repaired in the surrounding area. The colour of the sand shall match that of the surrounding mortar; a blending of sands may be required to achieve a satisfactory colour match. The colour of the mortar should ideally be achieved through the mixing of colours of sand. Colour match using pigments must only be done after approval is given by the Departmental Representative.
 - .4 Coarse aggregate (should it be required) to be used in wide joints and mortar shall be 6 mm (maximum) washed sand with no fines passing a 1.18 mm sieve.
 - .5 Air entrainment of the final mix shall be between 8% to 12% as measured in accordance with CSA A23.2-4c. If this can not be achieved by mixing, an air entrainment agent shall be used with an acceptable product being "AIREXTRA", by Euclid Admixture Canada Inc. Dosage to be as recommended by the Manufacturer.
- 2.2 MORTAR MIX FORMULA
- .1 Repointing Mortar - Type M to CSA A179.
 - .1 Proportion specifications by volume:
 - .1 White Portland Cement: 1 part
 - .2 Masonry Cement: 1 part
 - .3 Aggregate: not less than 2.25 and not more than 3 times the sum of the volumes of the cements used.
 - .4 Air Entrainment: (8% to 12%). Add air entraining agent as required to achieve this level of air entrainment.
 - .5 Minimum compressive strength, at 28 days, to be not less than 17.5 MPa.

- 2.2 MORTAR MIX FORMULA
(Cont'd)
- .2 Joint sealer: to CAN/CGSB-19.13 Sealing compound, two component, elastomeric, chemical curing. Type I for horizontal joints (self-levelling), Type II for vertical joints (non-sag).
 - .3 Polyethylene foam: use as bond breaker between joint filler and sealer. If joint filler not encountered, use closed cell polyethylene foam backer rod, size to suit the gap.

PART 3 - EXECUTION

- 3.1 GENERAL
- .1 Provide tools and equipment in good workable condition and of approved types.
 - .2 Tool and compact using a jointing tool to force the mortar into the joint.
 - .3 Finish joints to match the existing. Repoint sample area at the beginning of the job, to the Departmental Representative approval. Approved sample to be standard of quality for the entire work.

- 3.2 REPOINTING
- .1 Prior to raking the joints, sawcut mortar joints as required to avoid damaging the edges of the adjacent stones.
 - .2 Rake all joints to depth as shown on drawings using light chipping hammers, maximum weight 2 kg. Clean joints, and all voids and cavities encountered, free of deteriorated and loose mortar, dirt and other undesirable material.
 - .3 Flush all open joints and voids clean with water under pressure and if not free draining blow clean with compressed air.
 - .4 Filling, compacting, finishing:
 - .1 Ensure that all joints are thoroughly clean - obtain the Departmental Representative approval prior to filling any joints.
 - .2 Dampen joints and completely fill with mortar. Pack mortar solidly into all voids and joints.
 - .3 Keep masonry damp while filling is being performed.
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- 3.2 REPOINTING
(Cont'd)
- .4 Filling, compacting, finishing:(Cont'd)
.4 Finish masonry joints to match existing mortar joints. Leave all stone work clean and free of mortar droppings.
- 3.3 CLEANING
- .1 Clean all surfaces of all mortar droppings, stains and other blemishes resulting from the work of this contract as the work progresses.
- .2 Clean exposed stone surfaces by washing with a stiff fibre brush and water, and/or low pressure wash.
- 3.4 CURING
- .1 Cover all finish pointing with burlap. The burlap shall be hung approximately 50 mm or less in front of the wall but, shall not be in contact with the wall since this could lead to unacceptable discoloration. The burlap shall be covered with white plastic tarps to reduce evaporation of the water.
- .2 Cure mortar joints by applying water with a portable pressurized sprayer a minimum of three times a day for three days. Note, more frequent misting, to maintain adequate humidity levels, may be needed if housing and heating is required. Maintain humidity levels to satisfaction of the Departmental Representative.
- 3.5 EXPANSION JOINT
- .1 Remove old sealant and bond breaker from the existing expansion joint thoroughly.
- .2 Install backer rod and sealer as per manufacturer's instructions and to achieve a slightly concaved surface.
- .3 Prepare all surfaces as required to ensure a proper bond between the sealant and stone/or concrete surface.

PART 1 - GENERAL

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| <u>1.1 DESCRIPTION</u> | .1 | This section specifies requirements for drilling dowel anchor holes, and supply and installation of dowel anchors, including grouting, as indicated on drawings and in specifications. |
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| <u>1.2 MEASUREMENT AND PAYMENT PROCEDURES</u> | .1 | Measurement Procedures: in accordance with Section 01 22 01. |
| | .2 | The work of the anchor installation will be paid for under payment item included in the Unit Price Table: <ul style="list-style-type: none">.1 Item No. 7 - "Type D1 - GFRP headed Anchors " - per unit anchor installed..2 Item No. 8 - "Type D2 - GFRP Bent Dowel Anchors " - per unit anchor installed |
| | .3 | Payment for dowel anchors includes: drilling hole in concrete base material; supplying and placing reinforcement bars; and supplying and placing the anchor grout, as per manufacturer's recommendations and requirements. |
| | .4 | Housing and heating are included in the unit price for each anchor. |
| | .5 | All other work, necessary for the completion of the work of this section, will not be measured separately for payment, but will be considered as incidental to the work of this section. |
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| <u>1.3 RELATED SECTIONS</u> | .1 | Section 03-25-13 - GFRP Reinforcement. |
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| <u>1.4 SEQUENCE OF WORK</u> | .1 | Dowels shall be installed, after the excavation of the existing concrete, but before placing the new concrete. |
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PART 2 - PRODUCTS

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| <u>2.1 MATERIALS-
GENERAL</u> | .1 | Use materials approved by the Departmental Representative. |
| | .2 | Anchors to be complete with all accessory parts as specified by the manufacturer, and additional accessories indicated on the drawings or described in the specification. |
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| <u>2.2 DOWEL ANCHORS</u> | .1 | GFRP - Glass Fiber Reinforced Polymer with a minimum guaranteed tensile strength (T) and minimum tensile modulus of elasticity (E) as follows: <ul style="list-style-type: none">.1 15M - High modulus (HM) (Equivalent to #5 GFRP) - 249 kN (Tu) and 64.1 GPa (E).2 15M - HM rebar anchor with anchor head shall have a minimum guaranteed pull out strength (Fp) of 80kN. |
| | .2 | Adhesive type anchors with epoxy acrylate resin. Polyester resins will not be accepted. |
| | .3 | GFRP bars shall have a sand coating and a development length equal to an equivalent steel reinforcing bar. |
| | .4 | Size and location: <ul style="list-style-type: none">.1 Type D1 - 15M (#5 GFRP) bars with GFRP anchor head, for all 200 mm deep vertical resurfacing..2 Type D2 - 15M (#5 GFRP) bent dowel bars, Supplier/factory bend to suit, for all 200 mm deep vertical resurfacing. |
| | .5 | Refer to drawings for minimum specified embedment depth. |
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| <u>2.3 EPOXY GROUT</u> | .1 | Acrylic Epoxy Adhesive: winter-grade, pre-packaged, two component adhesive consisting of base resin and fast set hardener, mixed when dispensed from dual chamber cartridge. |
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PART 3 - EXECUTION

- 3.1 GENERAL
- .1 Except as specified in this section, install to the manufacturer's recommendations.
 - .2 For all dowel anchors: provide housing and heating for anchors as required. Maintain concrete substrate and ambient air within enclosure to temperature, and for duration of curing period recommended by manufacturer.
 - .3 Minimum substrate temperature shall be maintained at 5° Celsius minimum, prior to grouting.
 - .4 Drilled holes must be completely filled with epoxy grout. Use appropriate mixer filler tube and extensions to ensure proper installation of adhesive.
 - .5 Twist during installation and slowly insert fastener ensuring that enough adhesive was used. Some adhesive should overflow.
 - .6 Do not disturb anchor between specified gel time and cure time.
- 3.2 CONTROL PLAN
- .1 Contractor to provide documentation from supplier related to sampling and testing of raw materials and final products. Monitoring of the manufacturing process shall be done in a way that ensures consistent performance of the product throughout the production run.
 - .1 Manufacturer shall keep records of:
 - .1 raw material approvals,
 - .2 polymer mixture proportions,
 - .3 inspection at varying stages of production,
 - .4 certificates of compliance.
 - .2 Departmental Representative may request testing and inspection of bars to confirm that the products comply with the requirements in this document.
- 3.3 MANUFACTURERS' SPECIFICATIONS
- .1 Keep a manual of manufacturer's specifications and installation procedures at the work site.

PART 1 - GENERAL

1.1 DESCRIPTION .1 This section specifies requirements for the fabrication and installation of the Canal channel handrail system and includes:

- .1 supply and installation of new line posts;
- .2 supply and installation of new expansion posts;
- .3 supply and installation of new Lamp expansion posts;
- .4 Supply, surface coating and installation of handrail, epoxy anchors, and all associated components including one access gate.

1.2 RELATED WORK .1 Section 02 41 21 - REMOVALS.

1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 Measurement Procedures: in accordance with Section 01 22 01.

.2 Work covered by this section will be paid for under payment items included in the Unit Price Table:

- .1 Item No.9 - Line Posts: This item covers the work described in subsection 1.1.1.1.
- .2 Item No.10 - Expansion Posts: This item covers the work described in subsection 1.1.1.2.
- .3 Item No.11 - Lamp Expansion Posts: This item covers the work described in subsection 1.1.1.3.
- .4 Item No.12 - Pipe Railing: This item covers the work described in subsection 1.1.1.4.

.3 All other work, necessary to the completion of the work of this section, will not be measured separately for payment, but will be considered as incidental to the work of this section.

1.4 SUBMITTALS .1 Submit in accordance with Section 01 33 00.

.2 Shop Drawings:

- 1.4 SUBMITTALS .2 Shop Drawings:(Cont'd)
- (Cont'd)
- .1 Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
- 1.5 REFERENCES .1 American Society for Testing and Materials International, (ASTM).
- .1 ASTM A123/A123M-13, Standard Specification for Zinc (Hot Dip Galvanized) coatings on Iron and Steel Products.
- .2 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .3 ASTM A90/A90M-09, Standard Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
- .4 ASTM A653/A653M-08, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .5 ASTM D7803-12, Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating.
- .2 CSA International
- .1 CAN/CSA-G40.20-G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels..
- .2 CAN/CSA-S16-09. Limit States Design of Steel Structures.
- .3 CAN/CSA-S136-07, Cold Formed Steel Structural Members.
- .4 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
- .5 CSA W48-06 (R2011) Filler Metals and Allied Materials for Metal Arc Welding.
- .6 CSA W55.3-08, Certification of companies for resistance welding of steel and aluminum
- .7 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding) Metric Version.
- .3 Health Canada/ Workplace Hazardous Materials Information System (WHMIS)
- .1 Materials Safety Data Sheets (MSDS)
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| 1.5 REFERENCES
(Cont'd) | .4 | Canadian General Standards Board (CGSB) |
| | .1 | CAN/CGSB-19.24-M90, Multicomponent,
Chemical-Curing Sealing Compound. |
| 1.6 DELIVERY,
STORAGE AND
HANDLING | .1 | Deliver, store and handle materials in
accordance with manufacturer's recommendations. |
| | .2 | Delivery and Acceptance Requirements: deliver
materials to site in original factory packaging,
labelled with manufacturer's name and address. |
| | .3 | Storage and Handling Requirements: |
| | .1 | Store materials off ground and in
accordance with manufacturer's
recommendations. |
| | .2 | Replace defective or damaged materials
with new. |
| 1.7 SAMPLES | .1 | Submit 2 - 300mm long finished samples of each
finish. |

PART 2 - PRODUCTS

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| 2.1 CONCRETE POSTS | .1 | Cement: to CAN/CSA-A3001, Type GU. |
| | .2 | Supplementary cementing materials: to
CAN/CSA-A3001. |
| | .3 | Water: to CAN/CSA-A23.1. |
| | .4 | Aggregates; to CAN/CSA-A23.1/A23.2. |
| | .5 | Air-Entraining admixtures: to ASTM C260. |
| | .6 | Chemical admixtures: to ASTM C494. |
| | .7 | Superplasticizer: to ASTM C1017. |
| | .8 | Anchor bolt for line and expansion posts:
high-strength bolts to ASTM A325M-97, hot dip
zinc coating. |
| | .9 | Adhesive type anchors with epoxy acrylate
resin. Polyester resins will not be accepted. |
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- 2.1 CONCRETE POSTS (Cont'd)
- .10 Reinforcing steel: billet steel, grade 400W, deformed bars to CAN/CSA-G30.18, unless indicated otherwise, Galvanized.
 - .11 Cold-drawn annealed steel wire ties: to CSA G30.3.
 - .12 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
 - .13 Galvanized reinforcement: in accordance to
 - .1 ASTM A123/A123M-09.
 - .2 ASTM A767/A767M-09
- 2.2 CONCRETE MIX
- .1 The concrete mix will be in accordance with CAN/CSA-A23 and as per the following
 - .1 Exposure class: C-1.
 - .2 Aggregates: No. 2 Green Madoc aggregate with river wash sand or mortar sand.
 - .3 Minimum compressive strength: 35 MPa @ 28 days.
 - .4 Minimum cement content: 360 kg/m3
 - .5 Maximum Water/Cement ratio: 0.4.
 - .6 Slump: 70 (+-) 20 regardless of location of placement.
 - .7 Air content: 6.5% (+-) 1.5%.
 - .8 Admixtures subject to Departmental Representative's approval.
 - .9 Cement: type GU Portland cement.
- 2.3 STEEL PIPE HANDRAIL
- .1 Steel pipe to ASTM A53/A53M and ASTM A501, seamless, carbon steel, schedule 40.
- 2.4 STEEL PIPE GALVANIZATION
- .1 For all pipe: minimum 600 g/m2 to ASTM A90 and ASTM A123/A123M.
 - .1 Galvanized finish surfaces to have a uniform appearance with no protuberances and blemishes.
 - .2 Touch-Up primer for galvanized surfaces: SPCC 20 Type I Inorganic zinc rich.
- 2.5 PAINT SYSTEM - PIPE HANDRAIL
- .1 Powder Coating:
 - .1 All handrail pipe and other components shall be finished with black enamel by powder coat application.
 - .2 Prior to powder coating, all surfaces to be chemically cleaned and treated and
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- 2.5 PAINT SYSTEM - .1 Powder Coating:(Cont'd)
- PIPE HANDRAIL .2 (Cont'd)
- (Cont'd)
- prepared in accordance to ASTM D7803 and ASTM F1664. Powder coating must be a polyester 2000 series applied to a dry film thickness of 0.05mm minimum by electrostatic coat and oven cured to a smooth and even surface.

PART 3 - EXECUTION

- 3.1 FABRICATION OF .1 The mold to fabricate precast concrete posts
- CONCRETE POSTS will be supplied by Departmental Representative.
- .2 The new line and expansion posts are shorter than those previously fabricated by 150 mm and 40 mm at the base, respectively. Also, an embedded anchor bolt has been added. Refer to the drawings for details.
- .3 The aggregates shall be exposed aggregate and the texture of the required finish will be inspected prior to casting. The fabricator will submit two sample panels (300x300x25) to the Departmental Representative for approval to compare them with the texture of the cast units.
- .4 The reinforcing shall be galvanized, 4-#15M vertical and #10M tie bars @ 300 c/c minimum, plus 2 extra ties at bottom . Refer to drawing No. 103 for details. Ensure that 50 mm of concrete cover is maintained.
- .1 Bar bending shall be done prior to galvanizing and conform to standard ASTM A767/A767M-09.
- .2 Zinc coating thickness shall be a minimum mass of 610g/m2 per surface coated.
- .3 All galvanized reinforcement must receive a chromate treatment.
- .4 Provide PVC cast-in-place insert openings through posts as shown on drawings to accept 40 mm (1.5" standard pipe) diameter used as handrail.
- .5 All edges shall be chamfered as provided for in the mold supplied.
- .6 Touch up reinforcing bars with Organic zinc rich paint prior to casting, as required to ASTM A780 and CAN/CGSB-1.181.
- .7 Texturing: Should be normally accomplished using a chemical retardent and pressure wash; other methods of exposing the aggregate will

- 3.1 FABRICATION OF CONCRETE POSTS (Cont'd) .7 Texturing:(Cont'd)
only be allowed on special approval by the Departmental Representative.
- 3.2 SURFACE PREPARATION AND PAINTING OF PIPE HAND RAIL .1 Sweep blast cleanliness in accordance with SSPC-SP16 or treat galvanized pipe with a zinc phosphate solution bath as per ASTM D7803. Particle size for sweep blasting should range between 200-500 microns. Surface must be free of grit dust, oil.
- .2 All surface preparation and painting to be performed in accordance to ASTM D7803 and ASTM F1664.
- 3.3 WELDING .1 Supplier to be qualified under CSA W47.1-92.
- .2 Weld to CSA W59 and CSA W48.
- 3.4 INSTALLATION .1 Install line and expansion posts along centreline of coping with the base flush with coping surface. Grind base of post or surface of coping as required to ensure full contact and prevent posts from rocking after installation. Maintain same number of line posts between expansion posts, and space them equidistance. New expansions posts to be installed in the same location as existing posts.
- .1 For line and expansion posts: install and provide housing and heating for anchors as per epoxy grout manufacturer's recommendations.
- .2 Install anchor to minimum embedment shown on the drawings.
- .3 Take appropriate steps during installation of anchor to ensure that there are no trapped air bubbles in the epoxy adhesive.
- .2 Weld steel pipe railing sections using a butt weld all around, ground flush with the surface. Refer to drawings for expansion joint and collar connection details.
- .3 Touch all pipe railings as required, and in accordance with paint manufacturer's instructions.
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3.4 INSTALLATION .3 (Cont'd)
(Cont'd)

PART 1 - GENERAL

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| <u>1.1 DESCRIPTION</u> | .1 | This section specifies the requirements for partial demolition of the existing structure to complete work as indicated by drawings and specifications. |
| | .2 | Work includes but is not limited to: <ul style="list-style-type: none"> .1 Removal and disposal of asphalt pathway as required to allow for all wall and coping repairs, including all required asphalt sawcuts. .2 Removal and disposal of common material as required to allow for all wall and coping repairs. .3 Supply and placing rip-rap and granular backfill in the excavated areas listed in sub-section 1.1.2.2, to subgrade. .4 Saw-Cuts to a minimum of 75mm depth required to remove the concrete as shown on the Contract Drawings. .5 Excavation and disposal off site of the concrete material from vertical surfaces and coping of gravity retaining wall, as shown on the drawings. .6 Excavation, stock piling and placement of channel bed sediments and debris from canal side of the vertical concrete wall, to allow for concrete wall repairs. .7 Preparation of all concrete surfaces against which new concrete is to be cast. .8 Disposing of surplus material. |
| <u>1.2 RELATED SECTIONS</u> | .1 | Section 02 41 21 - Removals. |
| | .2 | Section 32 12 16 - Asphalt Concrete Paving. |
| | .3 | Section 03 30 00 - Cast-in-Place Concrete. |
| <u>1.3 MEASUREMENT AND PAYMENT PROCEDURES</u> | .1 | Measurement Procedures: in accordance with Section 01 22 01. |
| | .2 | Payment for these items shall be included in the Unit Price Table. Excavated materials will be measured in cubic metres in their original location: <ul style="list-style-type: none"> .1 Item No.13 - Asphalt Excavation: This item covers the work described in subsection 1.1.2.1. |

1.3 MEASUREMENT
AND PAYMENT
PROCEDURES
(Cont'd)

- .2 (Cont'd)
 - .2 Item No.4 - Concrete Excavation: This item covers the work described in subsections 1.1.2.4 and 1.1.2.5.
 - .3 Item No.143 - Common Excavation: This item covers the work described in subsection 1.1.2.2 and 1.1.2.6.
 - .4 Item No.15 - Backfilling: This item covers the work described in subsection 1.1.2.3, 1.1.2.6 and 1.1.2.8.
- .3 Saw-cuts: as required for concrete excavation. This item is to be included in the price of Concrete Excavation.
- .4 Include in the price of the concrete removal, the preparation of all surfaces which are to accept new concrete.
- .5 No payment will be made for concrete excavation beyond the limits shown on the drawings, which has not been authorized by the Departmental Representative; any overbreak beyond these limits shall be replaced by concrete at the Contractor's expense.
- .6 Placing and spreading of topsoil will not be measured for payment and will be considered as part of the LUMP SUM price item for landscaping and is covered in Section 32 94 00.

1.4 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
 - .2 Federal Legislature.
 - .1 Canadian Environmental Assessment Act (CEAA), 1992, c. 37.
 - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
 - .3 Ontario Occupational Health and Safety Act (OHSA).
-

- 1.5 DEFINITIONS
- .1 "Common excavation" includes all materials, excluding rock and concrete, which must be removed to complete the work including boulders and rock fragments less than 0.5 m3 in volume, and soil of whatever nature encountered. Work shall also include, but not be limited to:
 - .1 Providing shoring and sheeting required to protect trees and other site objects.
 - .2 Disposing of surplus material.
 - .2 "Backfilling" includes:
 - .1 Supplying, placing, grading and compacting granular material (Granular A, Granular B, native fill, rip-rap).
 - .2 Backfilling includes filling.
 - .3 "Rock": any solid material in excess of 0.5 m3 which cannot be removed by means of heavy duty mechanical excavating equipment. Concrete and frozen material are not classified as rock.
- 3 Topsoil:
- .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
 - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- 1.6 REQUIREMENTS OF REGULATORY AGENCIES
- .1 Adhere to municipal and provincial requirements relating to safety of excavations and protection of workers.
- 1.7 QUALITY ASSURANCE
- .1 Ensure Work is performed in compliance with CEPA, CEAA, TDGA, and applicable provincial regulations.
- 1.8 SOURCE QUALITY CONTROL
- .1 Sieve Series: MTO OPSS 1010 April 2004 Sieve Series or ASTM E11-13 Series equivalents.
 - .2 Samples and sampling: to ASTM D75/D74M-14.
 - .3 Maximum density and optimum moisture: to ASTM D698-12e1.
-

- 1.9 ENVIRONMENTAL REQUIREMENTS .1 Do Work in accordance with Section 01 35 43.
- 1.10 MATERIALS HANDLING .1 Transport, store and handle granular materials in such a manner as to eliminate segregation.
- 1.11 SUBMITTALS .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit copies of certified bills of lading from authorized disposal sites and reuse and recycling facilities for material removed from site to Departmental Representative upon request.
- .3 Prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Section 01 74 20 and indicate:
- .1 Descriptions and anticipated quantities of materials to be recycled and landfilled.
- .2 Number and location of dumpsters.
- .3 Anticipated frequency of tipping.
- .4 Name and address of haulers and waste facilities.
- .4 Prior to excavation of vertical surfaces and coping of the existing structure, establish reference points (minimum of 4) that will allow the transference of the coordinates and elevations of the existing geodetic bench marks to the new geodetic bench mark on the new structure or such other approach as approved by the Departmental Representative. Provide all data regarding the reference points to the Departmental Representative. Survey work shall be undertaken by an Ontario Legal Surveyor.
- .5 Provide details of:
- .1 Proposed excavation methods and equipment.
- 1.12 PROTECTION OF EXISTING FEATURES .1 Existing buried utilities and structures:
- .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
- .2 Prior to commencing excavation work, notify Departmental Representative or authorities having jurisdiction, establish location and state of use of buried
-

- 1.12 PROTECTION OF EXISTING FEATURES (Cont'd)
- .1 (Cont'd)
 - .2 (Cont'd)
 - utilities and structures. Departmental Representative or authorities having jurisdiction to clearly mark such locations to prevent disturbance during work.
 - .3 Confirm locations of buried utilities by careful test excavations.
 - .4 Maintain and protect from damage, steam, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .5 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before re-routing or removing. Costs for such work will be paid as an extra to the contract.
 - .6 Record location of maintained, re-routed and abandoned underground lines.
- .2 Existing surface features:
- .1 Conduct, with Departmental Representative, condition survey of existing trees, bushes and other plants, lawns, light poles, pavement, benches, garbage containers which may be affected by work.
 - .2 Protect existing surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Departmental Representative.
 - .3 Where required for excavation, cut roots or branches as approved by Departmental Representative.
- 1.13 DESIGN OF TEMPORARY WORKS
- .1 Engage services of a Professional Engineer registered in the Province of Ontario to design and inspect shoring, sheeting and bracing, as required for work.
 - .2 Have drawings and supporting data checked, signed and sealed by the Professional Engineer, licensed in the Province of Ontario responsible for their design.
 - .3 At least four (4) weeks prior to commencing work, submit checked, signed and sealed design drawings and supporting data for review.
- 1.14 BLASTING
- .1 Blasting is not permitted.
-

PART 2 - PRODUCTS

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|---------------------------|----|--|
| 2.1 BACKFILL
MATERIALS | .1 | Granular backfill: to Ontario Provincial Standard Specification 1010, April 2004 for:
.1 Granular A. Maximum size 19.0 mm.
.2 Granular B, Type II. Maximum size 150 mm |
| | .2 | Native fill: clean fill taken from canal bed adjacent to wall section to be replaced. |
| | .3 | Rip-Rap: Hard, dense , durable, quarry stone, free from seams, cracks or other structural defects, with relative density not less than 2.65, to meet following size distribution:
.1 Not more than 10% of total volume of stones with individual volume less than 4 dm3.
.2 Not more than 10% of total volume of stones with individual volume of 10 dm ³ or more.
.3 Remaining percentage of total volume to have uniform distribution of stones between 4 and 10 dm3 size. |

PART 3 - EXECUTION

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|----------------------------|----|---|
| 3.1 SITE
PREPARATION | .1 | Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated. |
| | .2 | Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly. |
| 3.2 CONCRETE
EXCAVATION | .1 | Saw cut to lines and depths indicated on drawings. |
| | .2 | Remove existing concrete by hand-held jackhammers (chipping hammers or other means approved by Departmental Representative) to minimum depths indicated on the drawings or as directed by the Departmental Representative. Excavation exceeding the limits indicated on the drawings will only be paid if authorized by the Departmental Representative in writing.
.1 Take special care not to damage the layer of concrete beyond depth of excavation by |

- 3.2 CONCRETE EXCAVATION
(Cont'd)
- .2 (Cont'd)
- .1 (Cont'd)
using jackhammers of appropriate weights
(maximum 10 kg).
- .2 Contractor must maintain jackhammer
chipping bits sharp, so as to minimize
micro-cracking in the concrete layer behind
the area of excavation.
- .3 Retain structural integrity of the
remaining adjacent portion of the wall
surfaces intact.
- .3 Excavate in a manner to minimize dusting.
Wetting of materials is to be conducted to the
extent that there is no surface runoff from the
structure surfaces being excavated. Provide
other temporary measures to prevent the
migration of air-borne particulate.
- .4 Stockpile materials in a safe manner for
workers and equipment until removed from the
work area. Remove all stockpiled materials from
the construction area at the end of each day.
- .5 Dispose the excavated material in an approved
manner off Canal land.
- 3.3 TEMPORARY EROSION AND SEDIMENTATION CONTROL
- .1 Provide temporary erosion and sedimentation
control measures to prevent soil erosion and
discharge of soil-bearing water runoff or
airborne dust to adjacent properties and
walkways, according to sediment and erosion
control plan, specific to site, that complies
with requirements of authorities having
jurisdiction.
- .2 Inspect, repair, and maintain erosion and
sedimentation control measures during
construction until permanent vegetation has been
established.
- .3 Remove erosion and sedimentation controls and
restore and stabilize areas disturbed during
removal.
- 3.4 PREPARATION OF CONCRETE SURFACES
- .1 Use a stiff broom to remove loose concrete from
excavated surfaces, and a high pressure water
jet to clean the surfaces after the excavation
has been completed.
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- 3.4 PREPARATION OF CONCRETE SURFACES
(Cont'd)
- .2 Keep the surfaces clean until new concrete is cast.
 - .3 Do not exceed 1000 kPa water jet pressure.
 - .4 Do not discharge the water from cleaning directly to the water course. Direct the water to a settling pond, or filter before releasing to the water course. See Section 01 35 43.
 - .5 Undertake saw-cutting at concrete exposed surfaces where new concrete is cast against existing concrete.
- 3.5 ASPHALT REMOVAL
- .1 Remove asphalt full depth and to full width of pathways and to the width required to perform the work.
 - .2 Sawcut asphalt to depth required to achieve a clean straight edge between asphalt to remain in place and new asphalt. Minimum depth of sawcut is 50 mm.
 - .3 Dispose of excavated asphalt in an approved landfill site off Canal lands.
- 3.6 SAFETY OF EXCAVATIONS AND PROTECTION OF WORKERS
- .1 Construct shoring and sheeting to depths, heights and locations as designed as part of the work of this section and accepted by Departmental Representative on the basis of accepted drawings (If Required).
 - .2 During backfill operation:
 - .1 Except as approved or directed by Departmental Representative, remove sheeting and shoring from excavations. Remove at an approved stage of construction.
 - .2 Do not remove bracing until backfilling has reached approved levels.
 - .3 Where shoring and/or sheeting is required to remain in place, cut off at elevations approved by Departmental Representative.
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3.7 COMMON
EXCAVATION

- .1 Excavate materials to lines, elevations and dimensions indicated or directed by Departmental Representative.
- .2 Correct over-excavation below proposed bottom of excavation elevation with granular material compacted to 98% maximum dry density or 20 MPa lean concrete.
- .3 Shore, sheet or otherwise protect excavations in accordance with approved shop drawings.
- .4 Hand trim, make firm and remove loose material and debris from excavations immediately prior to placing concrete or granular backfill. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

3.8 BACKFILLING
WITH GRANULAR
BACKFILL

- .1 Do not proceed with backfilling operations until Departmental Representative has inspected and approved work in place.
- .2 Backfill material under paved areas is covered under Section 32 12 17 - Asphaltic Concrete Paving.
- .3 Backfill spaces excavated and not occupied by parts of substructure or other permanent works, with the specified backfill material placed up to the approved elevations, and between the approved limits.
- .4 Do not backfill adjacent to structure until it has sufficient strength to withstand earth and compaction pressures and approval has been obtained from Departmental Representative.
- .5 Place backfill material in uniform layers not exceeding 200 mm for granular 'B', and 150 mm for granular 'A' loose thickness and simultaneously on sides of structures or other item so that loading is equalized.
- .6 Compact each layer to minimum 98% of maximum dry density in accordance with ASTM D698-12e1.
- .7 When using hand operated tamping devices, deposit backfill material in uniform layers not exceeding 100 mm loose thickness.

3.8 BACKFILLING
WITH GRANULAR
BACKFILL

(Cont'd)

- .8 The stockpiling and re-use existing granular fill will be permitted only upon approval of Departmental Representative.

3.9 CLEANING AND
RESTORATION

- .1 Keep site clean and organized throughout deconstruction.
- .2 Upon completion of project, remove debris, trim surfaces and leave work site clean.
- .3 Upon completion of project, reinstate areas affected by Work to condition which existed prior to beginning of Work.

END

PART 1 - GENERAL

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| <u>1.1 RELATED SECTIONS</u> | .1 | Section 31 23 15 - Excavating and Backfilling. |
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| <u>1.2 REFERENCES</u> | .1 | American Society for Testing and Materials International, (ASTM) |
| | .1 | ASTM D698-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³)). |
| | .2 | Government of Québec, Minister of Transport |
| | .1 | Cahier des charges et devis généraux (CCDG). |
| | .3 | Canadian General Standards Board (CGSB) |
| | .1 | CAN/CGSB-1.74-2001, Alkyd Traffic Paint. |
| | .4 | Ontario Provincial Standard Specifications (OPSS) |
| | .1 | OPSS 310-November 2008, Construction Specification for Hot Mix Asphalt. |
| | .2 | OPSS 314-November 2004, Construction Specification for Untreated Granular, Subbase, Base, Surface Shoulder, and Stockpiling. |
| | .3 | OPSS 1150-November 2008, Material Specification for Hot Mix Asphalt. |
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|-----------------------|----|--|
| <u>1.3 PROTECTION</u> | .1 | Protect all structures and site features that may be damaged by paving machinery, equipment or personnel. Make good property damaged due to paving operations. |
| | .2 | Take necessary precautions to protect workmen and public from hazards of paving operations. |
| | .3 | Keep all traffic off newly paved areas until paving properly cured. |
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|---|----|--|
| <u>1.4 MEASUREMENT AND PAYMENT PROCEDURES</u> | .1 | Measurement Procedures: in accordance with Section 01 22 01. |
|---|----|--|
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- 1.4 MEASUREMENT AND PAYMENT PROCEDURES
(Cont'd)
- .2 Payment for these items shall be included in the Unit Price Table:
- .1 Item No.16 - Asphalt HL3: This item covers all the work described in this section, including but not limited to, line painting and supply/regrading/leveling/compacting additional granular material for the bike/pedestrian pathway.
- .2 Primer is considered included in the asphalt surface course and will not be measured separately for payment.
- .3 Cleaning pavement surfaces is considered included in the asphalt surface course and will not be measured separately for payment.
- .4 Granular materials will be paid for under payment items in Section 31 23 15.
- .3 This section does not include the following:
- .1 Asphalt Removal, which is described in Section 31 23 15.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Asphalt concrete: to OPSS 1150 .
- .2 Prime coat: SS-1 to OPSS 1103.
- .3 Tack Coat: SS-1 to OPSS 1103
- .4 Granular A Aggregate to: OPSS 1010.
- .5 Traffic paint: yellow to CGSB 1.74M.
- .6 Paint thinner: to CGSB 1.5.

PART 3 - EXECUTION

- 3.1 GRANULAR BASE
- .1 Regrade existing granular base where needed and add granular 'A' material as required to eliminate depressions in the new asphalt and bring the granular base 50 mm below final asphalt grade. Compact granular material to 98% Standard Proctor Modified Dry Density to ASTM D1557.
- .2 Provide new granular base where needed. Place minimum 300 mm compacted thickness of granular 'A' material sub-base and bring the granular base 50 mm below final asphalt grade.
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3.1 GRANULAR BASE .2 (Cont'd)
(Cont'd)
Compact granular material to 98% Standard Proctor
Modified Dry Density to ASTM D1557.

3.2 PAVEMENT .1 Apply tack coat along cold asphalt joints and
CONSTRUCTION exposed concrete surfaces as per with OPSS 310.

.2 Application of prime coat: OPSS 302.

.3 Apply asphalt emulsion primer at 0.38 to 0.54
litres per square metre and allow to cure to
sticky or tacky condition. Apply asphalt before
primer becomes hard.

.4 Pavements thickness for pathway: 50 mm HL 3.

.5 Construction of asphalt concrete: OPSS 310 and
CCDG.

3.3 LINE PAINTING .1 Apply line paint 100 mm wide along centreline of
pathway.

.2 Paint to be applied on a smooth, clean, dust
free, dry surface with an approved applicator.

.3 Apply paint in accordance with manufacturer's
recommendation.

END

PART 1 - GENERAL

- 1.1 MEASUREMENT AND PAYMENT PROCEDURES
- .1 There shall be no separate measurement for payment for the work under this Section. Include costs in the Contract Lump Sum Price.
 - .2 Payment Shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work.
- 1.2 DESCRIPTION
- .1 This section specifies the requirements for reinstating damaged landscaped areas within the work and staging areas, access route and areas disturbed by the work and consists of:
 - .1 Supplying, placing, and finish grading of a topsoil bed.
 - .2 Supplying and placing nursery sod.
 - .3 Supplying and placing plant material, accessories, mulch, planting, and tree support as required.
 - .4 maintain sodded areas until acceptance.
 - .2 All disturbed sodded areas, including outside the work area limits, including the pedestrian detour, to be covered with topsoil, smoothed to the finish grade, and re-sodded at Contractor's expense.
 - .3 Work specified elsewhere:
 - .1 Protection of mature trees and other plant materials during construction: to Section 01 35 43 - Environmental Procedures.
- 1.3 RELATED SECTIONS
- .1 Section 01 11 00 - General Instructions.
 - .2 Section 01 35 43 - Environmental Procedures.
 - .3 Section 02 41 21 - Removals.
- 1.4 REFERENCES
- .1 Definitions:
 - .1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.
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- 1.4 REFERENCES .2 Reference Standards:
(Cont'd)
- .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).
- 1.5 PRELIMINARY .1 Establish the condition of sodded areas and
INSPECTION planting beds to be disturbed by completion of work in conjunction with Departmental Representative prior to starting work.
- 1.6 SOURCE QUALITY .1 At least 2 weeks before starting final topsoil
CONTROL work, advise Departmental Representative of proposed sources of topsoil and sod. Provide Departmental Representative with access to the sources for inspection, sampling and testing.
- .2 When proposed sources are approved, use no other sources without written authorization from Departmental Representative.
 - .3 Landscape work to be done in accordance with: Ontario Horticultural Trades Association.
 - .4 Obtain approval from Departmental Representative of plant material prior to planting.
 - .5 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations.
- 1.7 DELIVERY AND .1 Schedule deliveries in order to keep storage at
STORAGE the job site to a minimum without causing delays.
- .1 Schedule to include:
 - .1 Quantity and type of plant material.
 - .2 Shipping dates.
 - .3 Arrival dates on site.
 - .4 Planting Dates.
 - .2 SOD:
 - .1 Deliver, unload and store rolled sod on pallets only.
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1.7 DELIVERY AND
STORAGE
(Cont'd)

- .2 SOD:(Cont'd)
 - .2 Schedule sod laying to coincide with preparation of soil surface.
 - .3 Schedule sod installation when frost is not present in ground.
 - .4 Deliver sod to site within 24 hours of being lifted and lay sod within 36 hours of being lifted.
 - .5 Do not deliver small, irregular, or broken pieces of sod. Departmental Representative will reject these.
 - .6 During wet weather, allow sod to dry sufficiently to prevent tearing during lifting and handling.
 - .7 During dry weather, protect sod and from drying. Water sod as necessary to ensure its vitality and prevent dropping soil in handling. The Departmental Representative will reject dried-out sod.
 - .8 Supply sod in standard-sized units and of a uniform thickness, rolled for easy handling.
- .3 PLANT MATERIAL:
 - .1 Protect plant material from frost, excessive heat, wind and sun during delivery.
 - .2 Protect plant material from damage during transportation:
 - .1 Delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
 - .2 Delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
 - .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.
 - .3 Storage and Handling Requirements:
 - .1 Immediately store and protect plant material which will not be installed within 1 hour in accordance with supplier's written recommendations and after arrival at site in storage location approved by Departmental Representative.
 - .2 Protect stored plant material from frost, wind and sun and as follows:
 - .3 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in topsoil and watering to full depth of root zone.

- 1.7 DELIVERY AND STORAGE (Cont'd) .3 PLANT MATERIAL: (Cont'd)
- .3 (Cont'd)
- .4 For pots and containers, maintain moisture level in containers.
- .5 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.

- 1.8 WARRANTY .1 For plant material over 75 mm caliper the 12 months warranty period is extended to 24 months.
- .2 Departmental Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

- 1.9 SCHEDULING OF SODDING WORK .1 Schedule sod laying to coincide with final topsoil operations.
- .2 Obtain Departmental Representative's approval of the schedule for sodding before proceeding.

PART 2 - PRODUCTS

- 2.1 TOPSOIL .1 New topsoil to be a friable sandy-clayish loam of good humus content, suitable for supporting sod growth, free from:
- .1 Debris and stones over 50 mm diameter.
- .2 Coarse vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
- .2 Approval of topsoil material subject to soil testing and analysis. Testing of topsoil will be carried out by testing laboratory designated by Departmental Representative. Departmental Representative will pay for cost of tests.

- 2.2 SOD .1 Nursery sod: Quality and source to comply with standards outlined in "Guide Specification for Nursery Stock", Section 17, 1978 edition, published by Canadian Nursery Trades Association.
- .1 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed

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- 2.2 SOD
(Cont'd)
- .1 Nursery sod:(Cont'd)
.1 (Cont'd)
mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.
- .2 Sod establishment support:
.1 Geotextile fabric: biodegradable, 25 mm square mesh.
.2 Biodegradable starch pegs: 17 x 8 x 200 mm.
- 2.3 PLANT MATERIAL
- .1 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.
- .2 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.
.1 Source of plant material: grown in Zone 1 in accordance with Plant Hardiness Zones in Canada.
.2 Plant material must be planted in zone specified as appropriate for its species.
.3 Plant material in location appropriate for its species.
- .3 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.
- .4 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or container grown.
- 2.4 WATER
- .1 Free of impurities that would inhibit plant growth.
- 2.5 STAKES
- .1 Wood, pointed one end, 38 x 38 x 2300 mm, as required.
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| 2.6 TRUNK PROTECTION | .1 | Plastic: perforated spiralled strip. |
| 2.7 MULCH | .1 | Bark chip: varying in size from 25 to 50 mm in diameter, from bark of coniferous trees. |
| | .2 | Wood chip: varying in size from 50 mm to 75 mm and 5 to 20 mm thick, free of bark, small branches and leaves. |
| | .3 | Shredded wood: varying in size from 25 to 125 mm in length, from coniferous trees. |
| 2.8 FERTILIZER | .1 | Synthetic commercial type as recommended by manufacturer, as required. |

PART 3 - EXECUTION

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|--------------------------------------|----|--|
| 3.1 PREPARATION OF TOPSOIL SUB-GRADE | .1 | SOD: |
| | .1 | Verify that grades are correct. If discrepancies occur, notify Departmental Representative and do not start other landscape work in that area until instructed to do so in writing by Departmental Representative. |
| | .2 | Grade soil, eliminating uneven areas and low spots, ensuring that new sodded surface will be faired-off to the existing sodded areas with no sharp transition. |
| | .3 | Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials. Remove debris which protrudes more than 75 mm above surface. Dispose of removed material off site. |
| | .4 | Coarse cultivate entire area which is to receive topsoil to depth of 100 mm. Coarse cultivate those areas where equipment used for hauling and spreading has compacted soil. |
| | .5 | Fine grade surface free of humps and hollows to smooth, even grade, to tolerance of plus or minus 10 mm, for Turf Grass Nursery Sod, surface to drain naturally. |
| | .2 | PLANTING MATERIAL: |
| | .1 | Verification of Conditions: verify conditions of substrate are acceptable for |

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|---|----|---|
| 3.1 PREPARATION OF TOPSOIL SUB-GRADE (Cont'd) | .2 | PLANTING MATERIAL:(Cont'd) |
| | .1 | Verification of Conditions:(Cont'd)
planting installation in accordance with manufacturer's written instructions. |
| | .2 | Visually inspect substrate in presence of Departmental Representative. |
| | .3 | Inform Departmental Representative of unacceptable conditions immediately upon discovery. |
| | .4 | Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative. |
| 3.2 PLACING AND SPREADING OF TOPSOIL | .1 | Place topsoil after Departmental Representative has accepted sub-grade. |
| | .2 | Spread topsoil to 150 mm minimum depth after settlement and 80% compaction. Keep final elevation 15 mm below finished grade to allow room for sod. |
| | .3 | Manually spread topsoil around trees, shrubs and obstacles. |
| | .4 | Grade to eliminate rough spots and low areas and ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking. |
| | .5 | Consolidate topsoil to required bulk density using equipment approved by Departmental Representative. Leave surfaces smooth, uniform and firm enough to resist deep footprints. |
| 3.3 ACCEPTANCE OF TOPSOIL GRADING | .1 | Departmental Representative will inspect topsoil in place and determine acceptance of depth of topsoil and finish grading. |
| 3.4 SURPLUS TOPSOIL MATERIAL | .1 | Dispose of materials not required off site. |

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- 3.5 SODDING .1 Obtain Departmental Representative's approval of topsoil grade and depth before starting sodding.
- .2 Loosen surface of topsoil where it has become compacted.
- .3 Protect all sodded areas against any damage until sod has been fully established. Supply and install required protective apparatus.
- 3.6 SOD PLACEMENT .1 Lay sod within 18 hours of being lifted if air temperature exceeds 20 degrees C.
- .2 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .3 Roll sod as directed by Departmental Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.
- 3.7 MAINTENANCE OF SODDED AREAS .1 Maintain sodded and seeded areas until accepted by Departmental Representative.
- .2 Apply water to ensure establishment and continuous growth of grass. Apply sufficient water to ensure moisture penetration of 200 mm into soil below sod.
- .3 Cut grass when it reaches a height of 80 mm. Cut grass thereafter frequently enough to be kept at a height of 80 to 100 mm. Allow clippings to remain.
- 3.8 ACCEPTANCE OF SOD MATERIAL .1 Approval of material at its source does not prevent subsequent rejection on job site.
- .2 Perform following operations from time of installation until acceptance.
- .1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 150 mm.
- .2 Cut grass to 80 mm when or prior to it reaching height of 100 mm.
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- 3.8 ACCEPTANCE OF SOD MATERIAL
(Cont'd)
- .3 Sod will be approved when:
- .1 Growth of sodded areas has been properly established;
 - .2 Turf is free of bare and dead spots;
 - .3 No surface soil is visible from height of 1500mm when grass has been mowed to a height of 80 mm; and,
 - .4 Grass has been cut a minimum of 2 times prior to acceptance.
- 3.9 MAINTENANCE DURING WARRANTY PERIOD
- .1 Perform following operations from time of acceptance until end of warranty period:
- .1 Water sodded Turf Grass Nursery Sod areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.
 - .2 Repair and resod dead or bare spots to satisfaction of Departmental Representative.
 - .3 Cut grass and remove clippings that will smother grass to height as follows:
 - .1 Turf Grass Nursery Sod:
 - .1 80 mm during normal growing conditions.
- 3.10 SODDING ON SLOPES GREATER THAN THREE TO ONE
- .1 Lay sod sections perpendicular to slopes greater than 3:1 (run/rise) and secure with stakes. Place stakes 3 per m², 100 mm below top edge to prevent shifting of sod and drive stakes flush with top of sod soil.
- 3.11 EXCAVATION AND PREPARATION OF PLANTING BEDS
- .1 For individual planting holes:
- .1 Stake out location and obtain approval from Departmental Representative prior to excavating.
 - .2 Excavate to depth and width as recommended by Manufacturer.
 - .3 Remove rocks, roots, debris from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
 - .4 Scarify sides of planting hole.
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- 3.12 PLANTING
- .1 For bare root stock, place 50 mm backfill soil in bottom of hole.
 - .1 Plant shrubs with roots placed straight out in hole.
 - .2 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.
 - .3 Plant vertically in locations as indicated.
 - .1 Orient plant material to give best appearance in relation to structure, roads and walks.
 - .4 For trees and shrubs:
 - .1 Backfill soil in 150 mm lifts.
 - .1 Tamp each lift to eliminate air pockets.
 - .2 When two thirds of depth of planting pit has been backfilled, fill remaining space with water.
 - .3 After water has penetrated into soil, backfill to finish grade.
 - .2 Form watering saucer as indicated.
 - .5 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.
 - .6 Water plant material thoroughly.
 - .7 After soil settlement has occurred, fill with soil to finish grade.
- 3.13 MULCHING
- .1 Ensure soil settlement has been corrected prior to mulching.
 - .2 Spread mulch as required.
- 3.14 MAINTENANCE DURING ESTABLISHMENT PERIOD FOR PLANTS
- .1 Perform following maintenance operations from time of planting to acceptance by Departmental Representative.
 - .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
 - .1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
 - .2 Replace or respread damaged, missing or disturbed mulch.
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- 3.14 MAINTENANCE .1 (Cont'd)
DURING .1 (Cont'd)
ESTABLISHMENT .3 For non-mulched areas, cultivate as
PERIOD FOR PLANTS required to keep top layer of soil
(Cont'd) friable.
.4 If required to control insects, fungus
and disease, use appropriate control
methods in accordance with Federal,
Provincial and Municipal regulations.
Obtain product approval from
Departmental Representative prior to
application.
.5 Remove dead or broken branches from
plant material.
.6 Remove and replace dead plants and
plants not in healthy growing
condition. Make replacements in same
manner as specified for original
plantings.
-
- 3.15 MAINTENANCE .1 From time of acceptance by Departmental
DURING WARRANTY Representative to end of warranty period, perform
PERIOD FOR PLANTS following maintenance operations.
.1 Water to maintain soil moisture conditions
for optimum growth and health of plant
material without causing erosion.
.2 Replace or respread damaged, missing or
disturbed mulch.
.3 If required to control insects, fungus and
disease, use appropriate control methods in
accordance with Federal, Provincial and
Municipal regulations.
.4 Apply fertilizer in early spring as
indicated by soil test.
.5 Remove and replace dead plants and plants
not in healthy growing condition.
.6 Submit monthly written reports to
Departmental Representative identifying:
.1 Maintenance work carried out.
.2 Development and condition of plant
material.
.3 Preventative or corrective measures
required which are outside Contractor's
responsibility.
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3.16 CLEANING .1 Upon completion remove surplus materials,
rubbish, tools and equipment.

END

PART 1 - GENERAL

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|---|----|--|
| <u>1.1 DESCRIPTION</u> | .1 | This section specifies requirements for dewatering Work spaces described by drawings and specifications. |
| | .2 | The work includes but is not limited to: <ul style="list-style-type: none">.1 The design, construction and maintenance of a dewatering system and cofferdam as required to facilitate excavation and refacing of the Canal wall as indicated on the drawings..2 Design, provision and maintenance of a dewatering systems for removal of water from the work spaces and to maintain these spaces in the dry state..3 Removal of water from the work spaces and the continued maintenance of these spaces in the dry state for the duration of the work to meet work requirements and environmental regulations..4 Supply of standby equipment to replace dewatering equipment which malfunctions. |
| <u>1.2 MEASUREMENT AND PAYMENT PROCEDURES</u> | .1 | There shall be no separate measurement for payment for the work under this Section. Include costs in the Contract Lump Sum Price. |
| | .2 | Payment Shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work. |
| <u>1.3 RELATED WORK</u> | .1 | Section 01 35 43 - ENVIRONMENTAL PROCEDURES. |
| | .2 | Section 35 49 25 - TURBIDITY CURTAIN |
| | .3 | Section 31 23 33 - EXCAVATING AND BACKFILLING. |
| <u>1.4 REGULATORY REQUIREMENTS</u> | .1 | Adhere to local, provincial & federal requirements relating to: <ul style="list-style-type: none">.1 Protection of environment;.2 Safety of construction; and.3 Protection of workers. |
| | .2 | Installation of cofferdams must be approved by Departmental Representative and PCA in accordance with Fisheries Act. |
-

1.4 REGULATORY
REQUIREMENTS
(Cont'd)

- .3 Sediment and erosion control measures must be in conformance with related contract plans as a minimum, MOE, MNR and DFO permit approval requirements (as required and where applicable) and be acceptable to the Departmental Representative.
- .4 Pumping water out of cofferdam enclosure: to Section 01 35 43 - ENVIRONMENTAL PROCEDURES.
- .5 Obtain and pay costs of, all required permits.

1.5 SUBMITTALS

- .1 Shop drawings of water-tight cofferdam and other dewatering systems.
 - .1 Shop drawings shall be complete with Professional Engineer's seal & signature.
 - .2 Submit design calculations of stability of cofferdam & dewatering systems used.
- .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 QUALIFICATIONS
OF DESIGNER

- .1 Designer of cofferdam and other related dewatering structures must be a Professional Engineer with considerable expertise and experience in design of similar structures and systems.
- .2 Designer must: make, check and sign all calculations; check, seal and sign all drawings; inspect dewatering structures and systems on site and verify their adequacy and safety.

1.7 DESIGN CRITERIA

- .1 Design cofferdams to ensure maintenance of work spaces in a dry state for duration of work.
 - .2 Plan and design dewatering systems considering:
 - .1 Access to cofferdams and access to reach any portion of Work.
 - .2 The Contract drawings show general limits allowed for the cofferdam placement to undertake the Works.
 - .3 The Contractor may choose an alternative location for cofferdams to be able to undertake Work.
-

- 1.7 DESIGN CRITERIA (Cont'd)
- .2 (Cont'd)
 - .4 Space required for crews to work in dewatered areas.
 - .5 Sequence of Work.
 - .6 Water levels.
 - .7 Environmental regulations and requirements.
 - .3 At all times, maintain environmental quality of water to Section 01 35 43 - ENVIRONMENTAL PROCEDURES.
 - .4 Ensure that no phase of Work threatens safe performance of cofferdam.
 - .5 Provide a minimum of 300 mm freeboard above the ice level.
 - .6 Provide measures to protect public from temporary works including warning and advisory signage and fencing.
 - .7 Ensure that dewatering system and cofferdam does not exceed the maximum four (4) meter construction limit within the Canal channel.

- 1.8 WATER LEVELS
- .1 Refer to Section 01 11 00 - GENERAL INSTRUCTIONS.

- 1.9 ENVIRONMENTAL REQUIREMENTS
- .1 Dispose of water so that it does not create a safety or health hazard; or cause damage to environment, to adjacent property or to any portion of Work.
 - .2 Turbidity limit: to Section 01 35 43 - ENVIRONMENTAL PROCEDURES and Section 35 49 25 - TURBIDITY CURTAIN.
 - .3 Do not release any silt or other materials into watercourse during construction or removal of cofferdams.

- 1.10 PROTECTION
- .1 Protect cofferdam and dewatered work spaces from damage due to floods, rain, ice, snow or other adverse climatic conditions.
 - .2 For the winter period, when the Canal is used as a skating rink, a 1.8 m high welded wire construction fence on the ice surface will be required to separate the work area from the skating public. Fence is to be located 1.0 m from the cofferdam structure.
-

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.
 - .3 Materials & methods proposed for use in cofferdams must be approved by all of the following (as applicable):
 - .1 Ontario Ministry of Natural Resources
 - .2 Ontario Ministry of the Environment
 - .3 Federal Department of Fisheries & Oceans
 - .4 Earth or granular materials with sand and fines is not acceptable.
 - .5 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.
 - .6 If using bulk bags with granular material, granular material to be clean/neat/washed stone.
 - .7 Note that Fisheries & Oceans prefers gravel/rockfill dams with rubber membrane, caissons, interlocking concrete blocks, rubber dams, sand bags and bulkbags, bolted pre-engineered frame-type structures or other types of cofferdams which do not generate turbidity.

PART 3 - EXECUTION

- 3.1 GENERAL
- .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.
 - .3 Safety of Work and of adjacent property and structures.
-

- 3.1 GENERAL (Cont'd) .1 (Cont'd)
- .4 Safety of removals.
 - .5 Environmental requirements.
 - .6 Clearance requirements for Work.
 - .7 Irregularities of adjacent surfaces.
 - .8 Changes in water levels.
 - .9 Resolving site issues in a timely manner.
- 3.2 DEWATERING .1 Dewater work spaces and maintain them in a fully dewatered state until Work is finished.
- .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.
 - .4 Maintain the dewatered state by pumping from well-points and/or sumps.
- 3.3 WATCHKEEPER .1 Ensure continuity of dewatering by designating a Watchkeeper to make periodic checks at times when Work is not in progress. Watchkeeper's qualifications under this Section are to be sufficient to perform, on dewatering equipment, such duties as:
- .1 Preventive maintenance and refuelling of generators normally performed during any shift.
 - .2 Emergency repairs of minor complexity.
 - .3 Placing standby items in service.
- 3.4 EQUIPMENT .1 General:
- .1 Provide equipment in safe operating condition & 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-water shall meet all environmental requirements.
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|-----------------------------------|----|---|
| 3.4 EQUIPMENT
(Cont'd) | .2 | (Cont'd) |
| | .3 | Equipment shall be inspected and service regularly. Provide copies of equipment inspection and service records when requested by the Departmental Representative. |
| | .4 | Provide emergency equipment for spills of deleterious substances. |
| | .5 | Provide standby replacement for pumps and other essential dewatering equipment which may break down during Work. |
| | .6 | Keep this replacement equipment available on site for immediate use. |
| 3.5 COFFERDAM
REMOVAL | .1 | At approved stages in Work remove all cofferdam, temporary structures, and dewatering systems to original bottom level. |
| | .2 | Dispose of all unwanted materials in approved manner off Site. |
| | .3 | Remove all temporary measures. Restore the site to the original condition or better to the satisfaction of the Departmental Representative. |
| | .4 | Do not dispose of any materials in canal. |
| | .5 | Turbidity curtain is to be removed once cofferdam is removed. |
| 3.6 CLEAN-UP AND
RECTIFICATION | .1 | To cleaning provisions of Section 01 11 00 - GENERAL INSTRUCTIONS. |

PART 1 - GENERAL

1.1 RELATED
SECTIONS

- .1 Section 01 33 01 - Submittal Procedures.
- .2 Section 01 35 43 - Environmental Procedures.
- .3 Section 35 20 22 - Dewatering.

1.2 MEASUREMENT AND
PAYMENT PROCEDURES

- .1 There shall be no separate measurement for payment for the work under this Section. Include costs in the Contract Lump Sum Price.
- .2 Payment Shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work.
- .3 There shall be no further compensation for modifications to the sediment and erosion control plan including the turbidity curtain should this plan need to be modified to meet the permitting requirements and/or specifications.

1.3 REFERENCES

- .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 D4595-09, 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 D4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 - .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2, Textile Test Methods.
 - .2 CAN/CGSB-148.1, Methods of Testing Geosynthetics.
 - .1 No.2-M85, Mass per Unit Area.
 - .2 No.3-M85, Thickness of Geotextiles.
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- 1.3 REFERENCES .2 (Cont'd)
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- (Cont'd) .2 (Cont'd)
- .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.
- .4 Ontario Provincial Standard Drawings (OPSD)
- .1 OPSD 219.260 November 2006, Turbidity Curtain.
 - .2 OPSD 219.261 November 2006, Turbidity Curtain, Seam Detail.
- .5 Ontario Provincial Standard Specification (OPSS)
- .1 OPSS 577 November 2006, Construction Specification for Temporary Erosion and Sediment Control Measures.
- 1.4 SUBMITTALS .1 Submit details of the temporary turbidity curtain system to the Departmental representative prior to the start of the Work.
- .2 Submit to Departmental representative details of geotextile material and seam at least 2 weeks prior to commencing work.
- .3 Complete the submission of a Sediment Control Plan as described in the Ministry of Natural Resources Technical Note, TN-20, Sediment Control Plans: Reducing Sediment concerns at Water Crossings, dated 1992, to the Departmental Representative to meet the requirements of all review agencies. Ensure compliance of the sediment control plan throughout the project.
- 1.5 DELIVERY AND STORAGE .1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.
-

PART 2 - PRODUCTS

- 2.1 MATERIAL
- .1 Geotextile: woven synthetic fibre fabric, supplied in rolls.
 - .1 Width: as specified on Contract Drawings.
 - .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 Securing pins and washers: to CAN/CSA-G40.20/G40.21, Grade 300W, minimum 30% recycled content, hot-dipped galvanized with minimum zinc coating of 600 g/m² to CAN/CSA-G164.
 - .5 Seams: sewn in accordance with manufacturer's recommendations.
 - .6 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.
-

PART 3 - EXECUTION

- 3.1 GENERAL
- .1 Complete the submission of a Sediment Control Plan as described in the Ministry of Natural Resources Technical Note, TN-20, Sediment Control Plans; Reducing Sediment concerns at Water Crossings, dated 1992, to the Departmental Representative. Where directed by the Departmental Representative, submit to the review agencies as part of any permit requirements. Modify the sediment and erosion control plan to address the review agency comments. Ensure compliance of the sediment control plan throughout the project.
 - .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 done by the Departmental Representative. As per the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Total Particulate Matter, the maximum increase of total suspended solids above background levels permitted is of 5 MTUs (Nephelometric turbidity units, mg/L).
- 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,

3.2 INSTALLATION (Cont'd)

- (Cont'd)
- .2 (Cont'd)
- 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 10m, 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 1.5m 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.

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 curtains booms both during and outside normal working shifts as required. Provide all personnel,

3.3 OPERATION AND
MAINTENANCE
(Cont'd)

- .6 (Cont'd)
materials and equipment necessary to maintain,
repair or relocate the silt curtain system.
- .7 Carry out construction operations to minimize
impact on fish habitat from both disturbed
sediments and fill materials.
- .8 Replace damaged or deteriorated geotextile to
approval of Departmental representative.
- .9 Remove turbidity curtain when authorized by the
Departmental representative after completion of
the work.

END
