



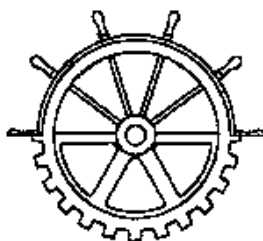
Public Works and
Government Services
Canada

Travaux publics et
Services gouvernementaux
Canada

SPECIFICATIONS FOR
Rideau Canal
Black Rapids Lock 13
Upgrades

Project No. R.078218.001
Sept 2, 2015

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1.1 TIME OF
COMPLETION

- .1 Commence work in accordance with notification of acceptance of your 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 1.11 of this section.

1.2 MEASUREMENT
AND PAYMENT
PROCEDURES

- .1 There will be no measurement of General Instructions.
- .2 Payment will be included in the Lump Sum Price.

1.3 DESCRIPTION

- .1 General
 - .1 These detailed specifications cover requirements for furnishing of labour, materials, tools, equipment, power plant, systems, transportation and supervision necessary to completely perform work, as described by the drawings and specifications.
- .2 Description of Work:
 - .1 Project consists of work as described below, as detailed on drawings and these specifications, but is not limited to the following:
 - .1 Providing access to site for conveyance of materials and equipment. Developing staging areas and facilities in order to undertake work. Cleaning-up staging area to satisfaction of Departmental Representative.
 - .2 Designing, supplying, installing, maintaining and dismantling all scaffolding access required to complete work. Provide complete scaffold staircase to bottom of lock. Provide scaffolding as required to complete all upgrades as indicated on drawings and described in specifications.
 - .3 Designing, supplying, installing, maintaining and dismantling a temporary guardrail around lock for prevention of accidental fall into the lock in compliance with applicable safety standards. Such measures shall be designed by an Engineer registered in the Province of Ontario. Submissions shall be

1.3 DESCRIPTION
(Cont'd)

.2 Description of Work:(Cont'd)
.1 (Cont'd)

stamped and delivered in accordance with
Section 01 33 00.

.4 Supplying, installing, maintaining
and dismantling security fence as shown
on the drawings.

.5 Supplying, installing and removing
stoplogs at the lock lower end.

.6 Dewatering the site.

.7 Removing and disposing off site all
debris, silt, mud etc. accumulated on the
bottom of the lock as required for
completion of this project. Contractor is
not required to clean bottom of the
entire lock.

.8 Removing and proper disposing off
the site, of upper and lower
stacked-timber gates including all
embedded parts. Salvaging existing
walkway access steps and handrail, as
well as upper gate heel casting, pintle
and base plate.

.9 Removing and re-installing
expansion joint sealant, as shown on the
drawings.

.10 Removal, repainting and
re-installation of ladders.

.11 Performing stone masonry repairs,
as shown on the drawings, including joint
repointing.

.12 Concrete repairs to upper
breastwall as indicated on the drawings.

.13 Demolishing and rebuilding existing
lower east and west quoins, as shown on
drawings.

.14 Demolishing and rebuilding existing
lower and upper sill nosings, including
embedded hardware, as shown on drawings.

.15 Demolishing and rebuilding existing
lower east and west hydraulic cylinder
pits, as shown on drawings.

.16 Designing, fabricating, supplying
and installing lower steel gates.

.17 Fabricating, supplying and
installing upper timber gates.

.18 Complete general clean-up to the
satisfaction of Departmental
Representative.

.19 Restoring landscaping to prior
construction state.

.20 Demolishing existing hydraulic and
electrical/controls system. Removing
obsolete relays and equipment from

1.3 DESCRIPTION
(Cont'd)

.2 Description of Work:(Cont'd)
.1 (Cont'd)

existing MCC. Working around some electrical cables, equipment which must remain.

.21 Removing all hydraulic oil from existing reservoirs, lines, cylinders and other equipment.

.22 Cleaning existing trenches.

.23 Fabricating/assembling and installing new hydraulic system, including skid (reservoir, pumps, and related equipment), control valve bank, lines, fittings, cylinders and all associated hardware.

.24 Fabricating/assembling and installing new electrical and controls systems including main control panel, two local HMI panels, sensors, all associated cables/wires and devices. Tying into power connection point(s) in existing MCC.

.25 Commissioning system for turn-key hand over to Parks Canada. As a minimum, commissioning will include: cleaning, priming, cycling, tuning, testing of all hydraulic components; programming, testing, tuning of electrical/controls system; verification of all controls and functionality of safety circuit(s); inspection, support as required for training of operations and maintenance staff; and adjustment and maintenance as required for a period of one year following hand-over to Parks Canada.

.26 Performing all other electrical and mechanical upgrades as per electrical/mechanical drawings and specifications.

1.4 ACCESS TO THE
SITE

.1 The site is located in Ottawa, Ontario, at 2453 Prince of Wales Drive.

.2 Within the Black Rapids Lock area, access to the work, limits of the work and staging areas to be as shown on the plans or as directed by Departmental Representative.

.3 Remove any temporary access structures and restore the access and work areas to the original condition upon completion of the

1.4 ACCESS TO THE
SITE
(Cont'd)

- .3 (Cont'd)
work, at the contractor's expense, except
where noted otherwise.
- .4 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.
- .5 Secure the work areas in an approved manner.
This includes using a minimum 1.8 m high
welded-wire construction fence to prevent
public access to any areas where construction
activities occur and construction material is
stored.

1.5 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.

1.6 RELICS AND
ANTIQUITIES

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

1.7 MINIMUM
STANDARDS

- .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 (NBC), 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.

1.8 ABBREVIATIONS

- .1 Abbreviations used are:
.1 ASTM - American Society for Testing and
Materials.
.2 ACI - American Concrete Institute.

1.8 ABBREVIATIONS .1
(Cont'd)

- (Cont'd)
- .3 ANSI - American National Standards Institute.
 - .4 CSA - Canadian Standards Association.
 - .5 CWB - Canadian Welding Bureau.
 - .6 NBC - 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.

1.9 DEFINITIONS .1

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

1.10 BENCH MARK .1

- Shall be included in the Natural Resources Canada, Geodetic Survey Division data report.
- .2 Refer to plans for station marker information and location.

1.11 WATER LEVELS .1

- Information on control of water levels and river flows may be obtained from Departmental Representative.
 - .2 Contractor required to work in areas where water is present. Dewatering system is required to perform the work. Refer to Section 35 20 22 - Dewatering.
 - .3 The normal range of water levels during navigation period, which runs approximately
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- 1.11 WATER LEVELS (Cont'd)
- .3 (Cont'd)
from May 19 through October 12, ranges from 77.78 m to 77.83 m on upstream side of lock and 74.90 m to 74.94 m on downstream side of lock.
- .4 Normal water level during drawdown period is 75.44 m on upstream side of lock, and 72.71 m on downstream side of lock. Operations to lower water level starts on October 20, 2015 and, under normal circumstances, drawdown levels are attained by first week of November, 2015. This level is maintained until end of April, 2016, when in preparation for navigation season, water levels are adjusted to navigation levels. During drawdown period, water levels might rise occasionally, depending on weather conditions. There is no data available regarding water levels during those times. Contractor should assume that fluctuation of water may reach navigational levels, as described in paragraph 1.11.3 of this section.
- .5 Dates indicated in subsections 1.11.3 and 1.11.4 are not firm commitment and approximation only based on previous years practice. Exact dates for 2015/2016 season will be provided to Contractor, as soon as Rideau Canal Operations establish schedule for season.
- .6 If water level rises above or drops below these ranges because of precipitation, operating problems or any other cause, it is brought back within range as soon as reasonably possible.
- .7 Departmental Representative endeavours to control water level. However, Departmental Representative cannot be held responsible for events, or results of events not under his control.
- 1.12 REQUIREMENTS OF REGULATORY AGENCIES
- .1 Adhere to City of Ottawa noise by-laws.
- .2 Dispose of unwanted materials at location off Canal lands approved by Ontario Ministry of the Environment.
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- 1.13 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 these protective devices are ordered removed by Departmental Representative.
 - .2 Repair, restore and/or replace to Departmental Representative's approval any and all utilities damaged due to the work, or activities in connection with the work.
- 1.14 DEPARTMENTAL REPRESENTATIVE SITE OFFICE
- .1 Provide and maintain a secure construction office for the exclusive use of Departmental Representative as follows:
 - .1 Of sound, lockable, insulated, weather-proof construction.
 - .2 Not less than 12 square metres in floor area.
 - .3 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;
 - .4 Maintain minimum temperature of 20 degrees C during hours of work.
 - .2 Pay all costs, including heating and lighting.
 - .3 Office to remain property of Contractor.
- 1.15 CONTRACTOR'S OFFICE
- .1 Provide an office at site location, open during regular working hours and large enough to accomodate site meetings for up to 10 people.
- 1.16 EXPLOSIVES
- .1 Use of explosives is not permitted on this project.
- 1.17 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
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|-----------------------------------------------------|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>1.17 EXAMINATIONS
(Cont'd)</u> | .2 | (Cont'd)
be damaged or be the subject of subsequent claims. |
| <u>1.18 CLEAN-UP</u> | .1 | Clean and tidy premises including bottom of lock on daily basis, do not permit accumulation of debris, trash and/or garbage. |
| | .2 | Rubbish, debris and garbage from construction activities to be removed off site on weekly basis. |
| | .3 | At completion of the work remove surplus materials, tools, plant, rubbish and debris and dispose of them in an approved manner off Canal property. |
| <u>1.19 TAXES</u> | .1 | Pay all taxes properly levied by law (including Federal, Provincial and Municipal). |
| <u>1.20 FEES,
PERMITS, AND
CERTIFICATES</u> | .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. |
| <u>1.21 FIRE SAFETY
REQUIREMENTS</u> | .1 | Comply with National Building Code of Canada 2010 (NBC) for fire safety in construction and National Fire Code of Canada 2010 (NFC) for fire prevention, fire fighting and life safety in building in use. |
| | .2 | Comply with following Human Resources and Skills Development Canada (HRSDC), Fire Commissioner of Canada (FCC) standards. These are available from HRSDC or may be downloaded from 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 Fire watcher as described in FC 302 to be assigned when welding or cutting operations |
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|-------------------------------------------|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.21 FIRE SAFETY REQUIREMENTS
(Cont'd) | .3 | Welding and cutting:(Cont'd)
.1 (Cont'd)
are carried out in areas where combustible materials within 10 m may be ignited by conduction or radiation. |
| 1.22 FIELD QUALITY CONTROL | .1 | Carry out work using qualified licenced workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification. |
| | .2 | Permit employees registered in Ontario apprenticeship program to perform specific tasks only if under direct supervision of qualified licenced workers. |
| | .3 | Determine permitted activities and tasks by apprentices, based on level of training attended and demonstration of ability to perform specific duties. |
| 1.23 HAZARDOUS MATERIALS | .1 | Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and the provision of Material Safety Data Sheets (MSDS) acceptable to Human Resources Development Canada, Labour Program. |
| 1.24 TEMPORARY UTILITIES | .1 | Make required arrangements with utility providers to provide temporary light, telephone, power and water to fulfill requirements of construction. |
| | .2 | Power can be supplied by Parks Canada for construction purposes at no charge to Contractor. |
| 1.25 REMOVED MATERIALS | .1 | Unless otherwise specified, materials for removal become Contractor's property and to be taken from site. |
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| <u>1.26 PROTECTION</u> | .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. |
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| <u>1.27 CUT, PATCH AND MAKE GOOD</u> | .1 | Repair, replace and refinish, to Departmental Representative's approval, existing surfaces and items damaged in connection with the work, at Contractor's expense. |
| | .2 | The repaired, replaced and refinished items to be at least equal to those that existed immediately before damage occurred. |
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| <u>1.28 SIGNS AND SAFETY DEVICES</u> | .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 Departmental Representative's approval. |
| | .2 | No advertising will be permitted on this project. |
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| <u>1.29 USE OF SITE AND FACILITIES</u> | .1 | Execute work with least possible interference or disturbance to the normal use of premises and traffic flow on Prince of Wales 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 | Contractor will be responsible for any snow removal required in the area of the work, including access road and parking area. |
| | .4 | Where security is reduced by work provide temporary means to maintain security. |
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|------------------------------------------|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>1.30 TEMPORARY FACILITIES</u> | .1 | Provide and maintain suitable storage facilities, of type and location approved by 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 Departmental Representative. |
| | .5 | Enclose the work and storage area with secure fencing as directed by Departmental Representative. |
| <u>1.31 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>1.32 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 Professional Engineer in writing. |
| <u>1.33 GUARANTEES AND WARRANTIES</u> | .1 | Before completion of work collect all manufacturer's guarantees and warranties and deposit with Departmental Representative. |
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- 1.34 CLEAN-UP .1 Clean up work area as work progresses. At the end of each work period, and more often if ordered by Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.
- .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.
- 1.35 CONTRACT DOCUMENTS .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.
- .2 Contractor responsible for printing/duplicating required drawings or specifications for:
- .1 Suppliers;
 - .2 Sub-contractors;
 - .3 On-Site drawings & specifications;
 - .4 Project Record drawings.
- 1.36 TESTING LABORATORY SERVICES .1 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.
- 1.37 SCHEDULING .1 Submit the construction progress schedule, (in CPM form) within 10 days of award of contract. Progress schedule must include the quantity of work to be accomplished within each 2 week timeframe. No progress payments will be made until the construction progress schedule is approved. Submit together with the
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1.37 SCHEDULING
(Cont'd)

- .1 (Cont'd)
progress schedule a cost breakdown for each lump sum payment item.
- .2 When requested by 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 Departmental Representative.
- .4 Do not make changes to the approved schedule, without Departmental Representative's approval.
- .5 The requirements of Section 01 33 00 apply to the construction progress schedule.
- .6 Carry out work during "regular hour" Monday to Friday from 07:00 to 18:00 hours.
- .7 Give Departmental Representative 48 hours notice for work to be carried out during "off hours".
- .8 All work which is affected by water level being raised to navigational level to be completed by April 30, 2016.

1.38 LAYOUT OF THE
WORK

- .1 Departmental Representative will locate project, establish bench mark, and set initial line. Contractor responsible for all other layout and control survey work, and checking plan dimensions against field measurements.
- .2 Lay out the work according to elevations and dimensions shown on plans and verified in field, or determined in field.
- .3 Notify 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.

1.39 COST BREAKDOWN .1 Before submitting first progress claim submit breakdown of Contract Amount in detail as directed by Departmental Representative and aggregating Contract Amount. After approval by Departmental Representative cost breakdown will be used as basis for progress payments.

PART 1 - GENERAL

- 1.1 DESCRIPTION
- .1 Black Rapids lock vehicular access to the work area is possible from the west side of the navigational lock only. Refer to Drawing No. 101 for site plan, locations of access paths, as well as restricted vehicular access.
 - .2 The work of this Section includes but is not limited to:
 - .1 Protecting surfaces of designated access paths.
 - .1 Use temporary access paths, as shown on drawings, for the conveyance of all materials, equipment and labour to the work area.
 - .2 Providing construction fence and perimeter security measures around work area.
 - .3 Maintaining the access paths and the work/storage area for the duration of the work, including snow removal.
 - .4 Restoration of access paths to condition found before start of work.
 - .5 Installing a temporary scaffolding staircase from the coping level to all levels of the lock where work will take place.
 - .3 This section does not include the following:
 - .1 Repairs to the lawned (grassed) areas affected by the storage and access provisions, which is described in Section 32 94 00 - General Landscaping.
- 1.2 MEASUREMENT AND PAYMENT PROCEDURES
- .1 There will be no measurement of Site Access.
 - .2 Payment will be included in the Lump Sum Price.
- 1.3 RELATED WORK
- .1 Section 01 11 00 - General Instructions.
 - .2 Section 01 35 29 - Health and Safety Requirements.
 - .3 Section 01 35 43 - Environmental Procedures.
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1.4 DELINEATING
THE WORK/STORAGE
AREA

- .1 Supply, install, and maintain for the duration of the work a minimum 1.8 m welded-wire construction fence to prevent public access to any areas where construction activities occur and construction material is stored. Obtain Departmental Representative's approval on "securing" measures for post stability before proceeding with work.
- .2 Provide secure coverings to all openings to prevent Public access to the work areas at all times during construction.
- .3 Remove the fences in their entirety from the site after work is completed. Make good all damage.

1.5 PARKING

- .1 Parking within the work/storage area should be limited to vehicles frequently entering and leaving the site. Workers commuting to the site are to park in parking spaces allocated West of the Lock.

1.6 SNOW CLEARING

- .1 Be responsible for snow clearing within the road access, work area, the work/storage area and all parking areas, designated for contractor's use. Included in these areas is all snow removal to access these areas or to complete the work.
- .2 Road to parking lot, leading from Prince of Wales Drive to lockmaster residence (white house) is cleaned by Owner (Parks Canada).
- .3 Piling of cleared snow that may contain deleterious materials, will not occur within 30m of a waterbody.

1.7 SECURITY

- .1 Secure the work area in an approved manner. This includes fencing off the construction site to prevent public access to all areas where construction activities occur.
 - .2 Take appropriate security precautions to safeguard equipment, tools, and materials on site from vandalism and theft.
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PART 2 - PRODUCTS

2.1 CONVEYANCE SYSTEMS	.1	Materials: new or used, in good condition.
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PART 3 - EXECUTION

3.1 REQUIREMENTS OF REGULATORY AGENCIES	.1	Obtain approvals from and pay all fees to Federal or Provincial agencies for works as may be required by this Contract.
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3.2 SHOP DRAWINGS	.1	Be responsible for the conceptual and detail design of all access systems.
	.2	Submit three sets of shop drawings showing layout and details of access systems to the Departmental Representative for review.

3.3 SCAFFOLDING, HOARDING AND BARRIERS	.1	Design and construct a scaffolding staircase in accordance with CSA S269.2. The contractor shall not use the existing scramble ladders (lock ladders) to access the Work.
	.2	Be responsible for removal of all anchors from concrete walls and ensure that all holes are filled to the satisfaction of the Departmental Representative as scaffolding staircase is dismantled.
	.3	No holes to be drilled into stone masonry.
	.4	Install, maintain and remove all barriers around the site to prevent access by the Public to the immediate work areas. All barriers to be in accordance with the Occupational Health and Safety Act.
	.5	Securely brace and fasten to resist all wind loads.

PART 1 - GENERAL

1.1 SECTION <u>INCLUDES</u>	.1	This section covers the measurement of work for payment purposes, and the scope of work included in the pay items in the Unit Price Table.
1.2 MEASUREMENT AND PAYMENT <u>PROCEDURES</u>	.1	<p>Lump Sum Price - For the work which is not designated in the Unit Price Table there shall be no measurement and shall be paid at the contract Lump Sum Price. This item includes all costs associated to perform the work including but not limited to material, equipment, personnel, overhead, etc. Items included in the Lump Sum Price are, but are not limited to:</p> <ul style="list-style-type: none"> .1 Mobilization .2 Demobilization .3 Connecting to existing utilities. .4 Designing and installing temporary access route. .5 Providing construction fence and perimeter security measures around work area. .6 Removal, salvaging, and reinstallation of all existing benches, garbage containers, existing signs and historical winches. .7 Removal, salvaging, repainting and reinstallation of lock ladders. .8 Removing and proper disposing off the site, of lower and upper stacked-timber gates including all embedded parts. Salvaging existing walkway access steps and handrail, including upper gate heel casting, pintle and bearing plate. .9 Maintaining the work/storage area for the duration of the work. .10 Removal of the temporary access routes. .11 Environmental Procedures, including control work to provide effective environmental, waterbody, and fish habitat protection including turbidity curtain (silt curtain). .12 Designing, supplying, installing and dismantling of all temporary barriers and enclosures. .13 Temporary utilities. .14 Fabrication and installation of upper timber gate, including all hardware. .15 Structural lower steel gates including design, fabrication, installation and commissioning.

1.2 MEASUREMENT
AND PAYMENT
PROCEDURES
(Cont'd)

- .1 (Cont'd)
 - .16 Flow control sluice gates including design, fabrication, installation and commissioning.
 - .17 Metal fabrications.
 - .18 Painting steel surfaces.
 - .19 Progressive and final Site cleaning.
 - .20 Design/build and maintenance of dewatering system.
 - .21 Landscaping.
 - .22 Precast concrete slabs to cover lower gates hydraulic pits.
 - .23 Performing all electrical and mechanical upgrades as per electrical/mechanical drawings and specifications.
- .2 All work that is not specifically addressed and covered in the Unit Price Item but is indicated to be completed or required to be completed in order to complete the work, shall be included in the Contract Lump Sum.
- .3 The following Item titles, units and their respective associated sections list work included in each item. Further description of the work can be found in the sections referenced.
- .4 Item No.1 - Reinforcing Steel.
 - .1 Item No.1 shall be paid at the contract unit price by the unit kilogram (kg). This item shall include all the work described in Section 03 20 00. Mass of reinforcing steel shall be computed from the theoretical unit mass specified in CAN/CSA- G30.18 for lengths and sizes of bars as indicated on drawings or authorized in writing by Departmental Representative.
- .5 Item No.2 - Concrete.
 - .1 Item No.2 shall be paid at the contract unit price by the unit cubic meter. This item shall include all the work described in Section 03 30 00 related to concrete in the refacing of the upper breastwall and the construction of the new quoins, pits and bottom sill.
 - .2 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.
 - .3 No deductions will be made for volume of concrete displaced by reinforcing steel.

1.2 MEASUREMENT
AND PAYMENT
PROCEDURES
(Cont'd)

- .5 (Cont'd)
 - .4 Include in the prices of concrete the bonding agent.
 - .5 Include in the prices of concrete the installation of all items embedded therein.
 - .6 Include in the prices of concrete the work described in Section 03 10 00.
 - .7 Include in the prices of concrete the heating, cooling, hot and cold weather protection, curing, and finishing.
 - .6 Item No.3 - Masonry Anchors.
 - .1 Item No.3 shall be paid at the contract unit price EACH for each anchor. This item shall include all the work described in Section 04 43 02 related to supplying and installation of stainless steel anchors for stone installation.
 - .7 Item No.4 - General Repointing.
 - .1 Item No.4 shall be paid at the contract unit price by the unit linear meter. This item shall include all the work described in Section 04 43 04 related to repointing of the existing stone masonry in place. This item will be measured in linear meters calculated from neat dimensions indicated on drawings or authorized in writing by Departmental Representative.
 - .8 Item No.5 - Expansion Joint.
 - .1 Item No.5 shall be paid at the contract unit price by the unit linear meter. This item shall include all the work described in Section 04 43 04 related to replacing existing expansion joint sealant . This item will be measured in linear meters calculated from neat dimensions indicated on drawings or authorized in writing by Departmental Representative.
 - .9 Item No.6 - Stone Masonry Removals
 - .1 Item No.6 shall be paid at the contract unit price by the unit cubic meter. This item shall include all the work described in Section 04 43 05 related to the removal and disposal of existing deteriorated stones, as required to complete dutchman repairs shown on drawings.
 - .10 Item No.7a - Dutchman Stone Supply
 - .1 Item No.7a shall be paid at the contract unit price by the unit cubic meter. This item shall include all the work described in
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1.2 MEASUREMENT
AND PAYMENT
PROCEDURES
(Cont'd)

- .10 (Cont'd)
 - .1 (Cont'd)
Section 04 43 06 related to the supply,
delivery and cutting of new stones to be used
for dutchman repairs on this project.
 - .11 Item No.7b - Lock Wall Stone Supply
 - .1 Item No.7b shall be paid at the contract
unit price by the unit cubic meter. This item
shall include all the work described in
Section 04 43 06 related to the supply,
delivery and cutting of new stones to be used
for lock wall stones on this project.
 - .12 Item No.7c - Coping Stone Supply
 - .1 Item No.7c shall be paid at the contract
unit price by the unit cubic meter. This item
shall include all the work described in
Section 04 43 06 related to the supply,
delivery and cutting of new stones to be used
for coping stones on this project.
 - .13 Item No.8a - Dutchman Repairs
 - .1 Item No.8a shall be paid at the contract
unit price by the unit cubic meter. This item
shall include all the work described in
Section 04 43 07 related to the installation
of stone masonry (Dutchman Repairs) on the
lower right and left gate pilasters as
indicated on the drawings and as directed by
the Departmental Representative.
 - .14 Item No.8b - Lock Wall Stone Installation
 - .1 Item No.8b shall be paid at the contract
unit price by the unit cubic meter. This item
shall include all the work described in
Section 04 43 07 related to the installation
of stone masonry on the lock wall as indicated
on the drawings and as directed by the
Departmental Representative.
 - .15 Item No.8c - Coping Stone Installation
 - .1 Item No.8c shall be paid at the contract
unit price by the unit cubic meter. This item
shall include all the work described in
Section 04 43 07 related to the installation
of stone masonry on the coping as indicated on
the drawings and as directed by the
Departmental Representative.
 - .16 Item No.9a - Anchor Dowel.
 - .1 Item No.9a shall be paid at the contract
unit price EACH for each anchor. This item
shall include all the work described in
-

1.2 MEASUREMENT
AND PAYMENT
PROCEDURES
(Cont'd)

- .16 (Cont'd)
.1 (Cont'd)
Section 05 05 20 related to supplying and installation of anchor dowels.
- .17 Item No.9b - Anchor Type B.
.1 Item No.9a 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 horizontal anchors in the breastwall.
- .18 Item No.10 - Concrete Excavation.
.1 Item No.10 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 concrete, including but not limited to, concrete sawcutting.
- .19 Item No.11 - Common Excavation.
.1 Item No.11 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.
- .20 Item No.12 - Close Drilling.
.1 Item No.12 shall be paid at the contract unit price, by the unit square meter, of clean cut face. This item shall include all the work described in Section 31 23 15 related to removal/demolition of existing lower gates concrete quoins by means of vertical close drilling.
- .21 Item No.13 - Backfilling.
.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 backfilling.
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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 DEFINITIONS

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
 - .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
 - .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
 - .4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
 - .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
 - .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
 - .7 Milestone: significant event in project, usually completion of major deliverable.
 - .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
 - .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable
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|------------------------------------|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>1.1 DEFINITIONS</u>
(Cont'd) | .9 | (Cont'd)
monitoring of project work in relation to
established milestones. |
| <u>1.2 REQUIREMENTS</u> | .1 | Ensure Master Plan and Detail Schedules are
practical and remain within specified Contract
duration. |
| | .2 | Plan to complete Work in accordance with
prescribed milestones and time frame. |
| | .3 | Limit activity durations to maximum of
approximately 10 working days, to allow for
progress reporting. |
| | .4 | Ensure that it is understood that Award of
Contract or time of beginning, rate of
progress, Certificate of Substantial
Performance and Certificate of Completion as
defined times of completion are of essence of
this contract. |
| <u>1.3 SUBMITTALS</u> | .1 | Provide submittals in accordance with Section
01 33 00. |
| | .2 | Submit to Departmental Representative within
10 working days of Award of Contract Bar
(GANTT) Chart as Master Plan for planning,
monitoring and reporting of project progress. |
| | .3 | Submit Project Schedule to Departmental
Representative within 5 working days of
receipt of acceptance of Master Plan. |
| | .4 | Submit structural steel gates shop drawings
and calculations within 25 working days of
Award of Contract. |
| | .5 | Submit timber gate shop drawings within 25
days of Award of Contract. |
| | .6 | Submit mechanical and electrical shop
drawings within 20 working days of Award of
Contract. |
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<u>1.4 PROJECT KEY DATES</u>	<p>.1 The following critical dates must be considered by the Contractor in the preparation of the Construction Schedule.</p> <p>.1 Waterway closed for navigation: October 13, 2015.</p> <p>.2 Start of Rideau Canal spring maintenance operations: May 1, 2016.</p> <p>.3 Waterway open to navigation: May 20, 2016.</p>
<u>1.5 MASTER PLAN</u>	<p>.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).</p> <p>.2 Departmental Representative will review and return revised schedules within 5 working days.</p> <p>.3 Revise impractical schedule and resubmit within 5 working days.</p> <p>.4 Accepted revised schedule will become Master Plan and be used as baseline for updates.</p>
<u>1.6 PROJECT SCHEDULE</u>	<p>.1 Develop detailed Project Schedule derived from Master Plan.</p> <p>.2 Ensure detailed Project Schedule respects submittal requirements and key project dates identified earlier, identifies project milestones.</p>
<u>1.7 PROJECT SCHEDULE REPORTING</u>	<p>.1 Update Project Schedule on weekly basis and with request for progress payment, reflecting activity changes and completions, as well as activities in progress.</p> <p>.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.</p> <p>.3 Discuss Project Schedule at regular site meetings with updates.</p> <p>.4 Identify activities that are behind schedule and provide measures to regain slippage.</p>

1.7 PROJECT SCHEDULE REPORTING (Cont'd) .4 (Cont'd)
Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

.5 Weather related delays with their remedial measures will be discussed and negotiated.

1.8 PROGRESS PAYMENT REQUEST .1 Progress schedule is to accompany the Request for Progress Payment. If project is behind schedule, the Contractor is to provide measures to regain slippage.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not used

PART 1 - GENERAL

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| <u>1.1 GENERAL</u> | <p>.1 This section specifies general requirements and procedures for contractor's submissions of shop drawings, product data and samples to Departmental Representative for review.</p> <p>.2 Additional specific requirements for submissions are specified in individual sections of Divisions 01 to 32.</p> |
| <u>1.2 ADMINISTRATIVE</u> | <p>.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.</p> <p>.2 Do not proceed with Work affected by submittal until review is complete and submittal acceptance is confirmed.</p> <p>.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.</p> <p>.4 Where items or information is not produced in SI Metric units converted values are acceptable.</p> <p>.5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.</p> <p>.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.</p> <p>.7 Verify field measurements and affected adjacent Work are co-ordinated.</p> <p>.8 Present calculation briefs containing all information required to support detailed</p> |
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|---------------------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.2 ADMINISTRATIVE
(Cont'd) | .8 | (Cont'd)
design of structures as indicated in these specifications. |
| | .9 | Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals. |
| | .10 | Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review. |
| | .11 | Keep one reviewed copy of each submission on site. |
| | .12 | Submit two (2) hard copies specified for each type of submittal and also submit in electronic format as pdf files. Forward pdf files through email or alternate means as specified by the Departmental Representative. |
| 1.3 SHOP DRAWINGS
AND PRODUCT DATA | .1 | The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work. |
| | .2 | Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications. |
| | .3 | Allow 5 working days for Departmental Representative's review of each submission. |
| | .4 | Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work. |
| | .5 | Make changes in shop drawings as Departmental Representative may require, consistent with |
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1.3 SHOP DRAWINGS
AND PRODUCT DATA
(Cont'd)

- .5 (Cont'd)
Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
 - .6 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
 - .7 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of design, installation, performance verification and decommissioning of temporary and permanent works, including load bearing structures duly stamped by a professional engineer (with Canadian related experience to items of work being designed) as specified in the respective Sections including:
 - .1 Design methodology including criteria, assumptions, and standards.
 - .2 Calculations.
 - .3 Details.
 - .6 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
 - .8 After Departmental Representative's review and acceptance, distribute copies.
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1.3 SHOP DRAWINGS
AND PRODUCT DATA
(Cont'd)

- .9 Submit three hard copies and one electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .10 Submit three hard copies and one electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .11 Submit three hard copies and one electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accordance with specified requirements.
- .12 Submit three hard copies and one electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .13 Delete information not applicable to project.
- .14 Supplement standard information to provide details applicable to project.
- .15 Verify field measurements and affected adjacent work are coordinated.
- .16 Submit MSDS sheets as required in Section 01 35 29 - Health and Safety Requirements.
- .17 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop

1.3 SHOP DRAWINGS
AND PRODUCT DATA
(Cont'd)

- .17 (Cont'd)
drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .18 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
.1 This review shall not mean that the Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
.2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.4 SAMPLES

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

1.4 SAMPLES
(Cont'd)

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

1.5 CERTIFICATES
AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers Safety and Insurance Board Experience Report.
- .2 Submit transcription of insurance immediately after award of Contract.

1.6 ELECTRONIC
FILES

- .1 When submissions are created electronically, the contractor is to make copies of all electronic records which are produced for the submissions listed in this section. This includes, but is not limited to, drawings, documents, and spreadsheet files.
 - .1 All files are to be properly labeled and placed in a well organized folder structure.
 - .2 The data is to be stored on a memory stick.
 - .3 The following are the preferred file formats:
 - .1 Drawings: AutoCAD version 2015 or latest version, or Adobe PDF.
 - .2 Documents: MS Word or Adobe PDF.
 - .3 Spreadsheet: MS Excel or Adobe PDF.
 - .4 Product Sheets: Adobe PDF.
 - .4 Three identical memory sticks containing all electronic records each, are to be submitted before the Certificate of Final Completion.

1.7 MEASUREMENT
FOR PAYMENT

- .1 The work covered by this section will not be considered separately for payment but will be considered as incidental to Work of the specification.

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 REFERENCES
- .1 Canadian Standards Association (CSA): Canada
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
 - .2 National Building Code 2010 (NBC):
 - .1 NBC 2010, Division B, Part 8 Safety Measures at Construction and Demolition Sites.
 - .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS)
 - .4 Province of Ontario:
 - .1 Occupational Health and Safety Act Revised Statutes of Ontario 1990, Chapter O.1 as amended, and:
 - .1 Regulations for Construction Projects, O. Reg. 213/91 as amended.
 - .2 Regulations for Diving Operations, O. Reg. 629/94 as amended.
 - .2 Workplace Safety and Insurance Act, 1997.
 - .3 Municipal statutes and authorities.
 - .5 Fire Commissioner of Canada (FCC):
 - .1 FC-301 Standard for Construction Operations, June 1982.
 - .2 FC-302 Standard for Welding and Cutting, June 1982.

Labour Program
 Fire Protection Engineering Services
 4900 Yonge Street 8th Floor
 North York, Ontario M2N 6A8

and copies may be obtained from:

Human Resources and Social Development Canada
 Labour Program
 Fire Protection Engineering Services
 Ottawa, Ontario K1A 0J2

- 1.2 SUBMITTALS
- .1 Make submittals in accordance with Section 01 33 00.
 - .2 Submit site-specific Health and Safety Plan:
 Within 7 days after date of Notice to Proceed
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1.2 SUBMITTALS
(Cont'd)

- .2 (Cont'd)
and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Site-specific safety hazard assessment and measures to be taken to address the anticipated hazards.
 - .2 Contractor's and Sub-contractor's Safety Communication Plan. Must include contact information for all key contacts. Departmental Representative will provide contact information for other key government agencies.
 - .3 If diving work is required, submit a separate site-specific Health and Safety Plan for Diving Operations, at least 7 days prior to commencement of diving work. Health and Safety Plan must include:
 - .1 Site-specific safety hazard assessment and measures to be taken to address the anticipated hazards associated with diving work.
 - .2 Diving Contractor's and Contractor's Safety Communication Plan. Must include contact information for all key contacts.
 - .3 Contingency and Emergency Response Plan addressing standard operating procedures specific to the Diving Operations to be implemented during emergency situations.
 - .4 Diving Contractor's Health and Safety Policy.
 - .5 Name of Health and Safety Coordinator.
 - .4 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative.
 - .5 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.
 - .6 Submit records of Contractor's Health and Safety meetings or daily tailgate meeting for diving operations when requested.
 - .7 Submit copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative monthly.
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|--------------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------|
| 1.2 SUBMITTALS
(Cont'd) | .8 | Submit Construction Safety Checklists after completion. |
| | .9 | Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors. |
| | .10 | Submit copies of incident and accident reports. |
| | .11 | Submit WHMIS MSDS - Material Safety Data Sheets to Departmental Representative. |
| | .12 | Submit Workplace Safety and Insurance Board (WSIB)- Experience Rating Report. |
| 1.3 FILING OF
NOTICE | .1 | File Notice of Project with Provincial authorities prior to commencement of Work. |
| | .2 | If project requires diving, a separate Notice of Project needs to be filed with Provincial authorities prior to commencement of work. |
| | .3 | Submit copies of Notice(s) of Project to the Departmental Representative. |
| | .4 | File all other required notices in accordance with Acts and Regulations of Province of Ontario. |
| | .5 | Keep copy of Notice of Project on site at all times. |
| 1.4 MEETINGS | .1 | Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work. |
| 1.5 REGULATORY
REQUIREMENTS | .1 | Comply with the Acts and regulations of the Province of Ontario. |
| | .2 | Comply with specified standards and regulations to ensure safe operations at site. |
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1.6 PROJECT/SITE
CONDITIONS

- .1 Work at site will involve contact with the following hazardous materials:
 - .1 Silica in concrete (from the concrete demolition).
 - .2 Pressure treated lumber (existing timber lock gates).
 - .3 Corroded metals.
 - .4 Benzene in fuel oil, paints and adhesives (for new materials).
- .2 Hazards on-site include but are not limited to:
 - .1 Working near or under electrical wires.
 - .2 Working around moving equipment.
 - .3 Working near or above water.
 - .4 Icy surfaces.
 - .5 Falling hazards.
 - .6 Extreme temperatures or weather conditions.
- .3 More specifically hazards associated with working near the lock include but are not limited to:
 - .1 General hazard around dams structures:
 - .1 Leakage between and around stop logs may suck in a worker who may be in the water and hold him below the water level with such force that he cannot escape.

1.7 GENERAL
REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
 - .2 Site-specific Health and Safety Plan needs to cover all sub trades utilized on the project, with the exception of diving operations, which require a separate site-specific Health and Safety Plan.
 - .3 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns either accepting or requesting improvements.
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1.8 COMPLIANCE
REQUIREMENTS

- .1 Comply with Ontario Occupational Health and Safety Act, Canada Labour Code Part II, and Canada Occupational Safety and Health Regulations.
- .2 If diving is required, comply with Ontario Occupational Health and Safety Act, Regulation 629/94.

1.9 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to 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, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- .3 Where applicable the Contractor shall be designated "Constructor", as defined by Occupational Health and Safety Act for the Province of Ontario.
- .4 Ensure a clear delineation in time and/or space between Parks Canada staff and Contractor's own forces such that Contractor shall maintain designation as "Constructor" as defined by the Occupational Health and Safety Act for the Province of Ontario.

1.10 UNFORESEEN
HAZARDS

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

1.11 HEALTH AND
SAFETY COORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Coordinator. Health and Safety Coordinator must:
 - .1 Have site-related working experience specific to activities associated with similar dam reconstruction projects.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
 - .5 Be on site during execution of Work and report directly to Site Supervisor.

1.12 POSTING OF
DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province of Ontario, and in consultation with Departmental Representative.
 - .2 Provide documents as follows and post on site:
 - .1 Contractor's Health and Safety Policy.
 - .2 Contractor's (Constructor's) Name.
 - .3 Notice of Project.
 - .4 Name, trade, and employer of Health and Safety Coordinator.
 - .5 Ministry of Labour orders and reports.
 - .6 Occupational Health and Safety Act and Regulations for Construction Projects for Province of Ontario.
 - .7 Address and phone number of nearest Ministry of Labour office.
 - .8 Material Safety Data Sheets.
 - .9 Written Emergency Response Plan.
 - .10 Site Specific Health and Safety Plan.
 - .11 Copy of valid certificate of first-aid personnel on duty.
 - .12 WSIB "In Case of Injury At Work" poster.
 - .13 Location of toilet and cleanup facilities.
 - .14 Any special handling or procedures specific to the site.
 - .3 Comply with Provincial general posting requirements.
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- 1.13 CORRECTION OF NON-COMPLIANCE
- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
 - .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
 - .3 Departmental Representative may stop Work if a perceived non-compliance of health and safety regulations or a potential issue is perceived to have not been immediately corrected.
- 1.14 BLASTING
- .1 Blasting or other use of explosives is not permitted on this project.
- 1.15 POWDER ACTUATED DEVICES
- .1 Use powder actuated devices only after submittal of full justification for the requirement of their use and receipt of written permission from Departmental Representative.
- 1.16 WORK STOPPAGE
- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.
 - .2 Assign responsibility and obligation to Health and Safety Coordinator to stop or start Work when, at Health and Safety Coordinator's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative or his/her designate may also stop Work for health and safety considerations.
- 1.17 EQUIPMENT LOCK-OUT/TAG-OUT
- .1 The Contractor shall coordinate and comply with Parks Canada/PWGSC lock-out/tag-out procedures for the equipment at the site. The more stringent of the Provincial Safety Regulation shall take precedence. The Parks Canada/PWGSC procedure involves a multi lock system.
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1.17 EQUIPMENT .2 Lock-out/tag-out procedures are to be
LOCK-OUT/TAG-OUT followed when working with PWGSC on existing
(Cont'd) or new installations.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not used.

- 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, waterway, 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, waterway and fish habitat protection.
- 1.2 MEASUREMENT AND PAYMENT PROCEDURES
- .1 No measurement will be made under this section.
 - .2 Payment will be included in Lump Sum Price.
- 1.3 SUBMITTALS
- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.
 - .1 Environmental Protection Plan to present comprehensive overview of known or potential environmental issues to be addressed during construction.
 - .2 Environmental Protection Plan to be prepared in accordance with requirements of Federal, Provincial and Municipal laws and regulations.
 - .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.
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1.3 SUBMITTALS
(Cont'd)

.4 (Cont'd)

.3 Names and qualifications of persons responsible for training site personnel.

.4 Description of environmental protection personnel training program.

.5 Erosion, sediment and dust control plan which identifies type and location of erosion, sediment and dust controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion, sediment and dust control plan, Federal, Provincial, and Municipal laws and regulations.

.6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

.7 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.

.1 Work area plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.

.8 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.9 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.10 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and are contained on project site.

.11 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.

.12 Waste water management plan that identifies methods and procedures for management and discharge of waste waters which are directly derived from construction activities, such as dewatering of lock, concrete curing water, clean-up water, dewatering of ground water, disinfection

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|-----------------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>1.3 SUBMITTALS</u>
(Cont'd) | .4 | (Cont'd) |
| | .12 | (Cont'd) |
| | | water, hydrostatic test water, and water used in flushing of lines. |
| | .13 | Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands. |
| | .14 | Pesticide treatment plan: to be included and updated, as required. |
| | .5 | Product Data: Submit manufacturer's instructions, printed product literature, data sheets and WHMIS MSDS sheets |
| <u>1.4 EXPLOSIVES</u> | .1 | Use of explosives is not permitted. |
| <u>1.5 FIRES</u> | .1 | Fires and burning of rubbish on site is not permitted. |
| <u>1.6 DEFINITIONS</u> | .1 | Deleterious Material: substance that, if added to a waterway, 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. |
| | .2 | Dripline: location on the ground surface directly beneath a theoretical line described by the tips of the outermost branches of the trees. |
| | .3 | Barrier: fence consisting of approved material, supported by steel posts and being a minimum of 1.8 m high, without breaks or unsupported sections. |
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1.7 TURBIDITY
CONTROL AND
DRAINAGE WATER

- .1 Control turbidity of water released during work.
 - .1 Do not pump water directly into waterway. Send discharge to settling pond or filtration area before being released into waterway.
 - .2 Provide marine grade turbidity curtain across areas where sediments can enter waterway. Turbidity curtain to be anchored or weighted down along its length to form continuous seal on canal bed with adequate flotation at water surface to prevent over spills of turbid water.
 - .3 Mechanical filtration of turbid water is also acceptable.
 - .4 In event of significant silting or escape of debris caused by construction activities, contractor to immediately stop work, notify Departmental Representative and 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 to be inspected daily to ensure that they are functioning properly and are maintained and upgraded as required.
- .4 If sediment, debris or erosion control measures are not functioning properly, no further work permitted until problem has been rectified.
- .5 Sediment, debris and erosion control measures to be left in place until disturbed areas within work area have been stabilized and sediments in water have settled. Removal permitted only after written approval from Departmental Representative.

1.8 WORK ADJACENT
TO WATERWAYS

- .1 Do not release deleterious materials into waterway.
- .2 Do not use salt as deicer or sand for traction within 30 m of canal.
 - .1 Where ice is safety concern, use environmentally acceptable deicing or traction materials approved by Departmental representative.

1.8 WORK ADJACENT TO WATERWAYS (Cont'd)	.2	(Cont'd)
	.2	No deicer or traction materials to be allowed to enter waterway.
	.3	Ensure equipment and temporary access structures such as scaffolding placed in waterbodies are free of earth material, and excess, loose or leaking fuel, lubricants, coolant and other deleterious material that could enter waterway.
	.4	Do not use waterway beds for borrow material.
	.5	Do not dump excavated fill, waste material or debris in waterways.
	.6	Stockpiles of excavated or fill materials to be stored and stabilized no closer than 30 m from waterway. Runoff from excavated or fill material to be contained from entering waterway.
1.9 AQUATIC LIFE PROTECTION	.1	Amphibians, reptiles or fish that could become or have become trapped within cofferdam area, between upper and lower stoplog gains of navigation lock, to be captured and transferred "live" immediately upstream or downstream of lock. .1 Work program will be overseen by Departmental Representative to ensure proper capture and handling of aquatic life.
1.10 EROSION, SEDIMENT AND DUST PROTECTION	.1	Prior to starting work that will create dust or debris, such as improvements to access, concrete sawing, removal, excavation or backfilling, install effective mitigation techniques for erosion, sediment, dust and debris control in accordance with Federal, Provincial and Municipal laws and regulations. Maintain these protective measures at all times, including during shut down periods.
	.2	Maintain effective surface drainage and direct runoff away from work areas and into adequately vegetated areas.
	.3	Provide one metre high silt fence barrier in areas where, due to construction activities, silt or debris may enter Canal or waterway. This includes, but is not limited to, silt barrier installed around staging and work

1.10 EROSION,
SEDIMENT AND DUST
PROTECTION
(Cont'd)

- .3 (Cont'd)
areas, and on canal bed (or ice surface)
parallel to canal wing walls. Install silt
curtain approximately 2 m to 3 m from wall for
re-pointing work only.
- .4 Maintain standby supply of pre-fabricated
silt fence barrier, or an equivalent
ready-to-install sediment control device.
- .5 Excavation to cease during periods of heavy
rainfall, unless runoff is contained from
entering waterway.
- .6 Cover or wet down dry materials and rubbish
to prevent blowing dust and debris.

1.11 PLANT AND
TREE PROTECTION

- .1 Protect trees and plants on site and adjacent
properties.
- .2 Limit clearing, grubbing, and tree-branch
removal to areas of work or access indicated
on approved shop drawings.
- .3 Provide barriers around trees which may be
affected by work, including staging areas.
 - .1 Locate barrier 1 metre beyond Dripline.
 - .2 Barrier to consist of protective wood
framework covered with plastic construction
fence material, extending from grade level to
a height of 2 metres.
 - .3 Maintain barriers in good repair
throughout duration Work.
 - .4 Remove barriers upon completion of Work.
- .4 Damage to trees due to Contractor's
operations:
 - .1 Broken branches 25 mm or greater in
diameter: cut back cleanly at break, or to
within 10 mm of their base, if substantial
portion of branch is damaged Departmental
Representative will direct.
 - .2 Exposed roots 25 mm or larger: cut back
cleanly to soil surface within five calendar
days of exposure.
 - .3 Damaged bark: neatly trim back to
uninjured bark, without causing further
injury, within five calendar days of damage.
- .5 Reduce soil displacement and compaction by
using heavy machinery in designated areas and
on existing vehicle paths.

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|---------------------------------------------------|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.11 PLANT AND
TREE PROTECTION
(Cont'd) | .6 | 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 pressure tires wherever possible. |
| 1.12 OPERATION AND
MAINTENANCE OF
EQUIPMENT | .1 | Do not operate heavy equipment in waterway, except when operated from barge or after dewatering completed. |
| | .2 | Clean equipment prior to entering waterway in designated area at least 30 m from waterway. |
| | .3 | Provide and use drip trays to prevent discharge of oil, grease, antifreeze, or other materials into ground or waterways. |
| | .4 | Equipment and heavy machinery to meet or exceed applicable emission requirements. |
| | .5 | Leave machinery running only while in actual use, except where extreme temperatures prohibit shutting machinery down. |
| | .6 | Vehicle and equipment maintenance and refueling to be conducted over impermeable/absorbent material situated at a designated area that is located at least 30 m away from nearest waterway. |
| | .7 | In case of fuel heaters to be located nearer than 15 m from canal, use large drip pan to contain possible leakage from heater or refueling operations. Absorbent material to be placed at bottom of drip pan for added measure. |
| 1.13 REMOVED
MATERIALS | .1 | Unless otherwise specified, materials designated for removal become Contractor's property. Remove these from site. |
| 1.14 HAZARDOUS
MATERIALS | .1 | Place materials defined as hazardous or toxic waste in designated containers. |
| | .2 | Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) |
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1.14 HAZARDOUS
MATERIALS
(Cont'd)

- .2 (Cont'd)
regarding use, handling, storage, and disposal
of hazardous materials; and regarding
labelling and provision of Material Safety
Data Sheets (MSDS) acceptable to Human
Resources Development Canada, Labour Program.
- .3 Store Hazardous Materials in secure areas on
impermeable pads, provide berms if necessary.

1.15 CLEAN UP

- .1 Clean up work area continuously as work
progresses.
 - .2 At end of each work period, and more often if
ordered by Departmental Representative, remove
debris from site, neatly stack material for
use, and clean up generally.
 - .3 Permit no amount of debris, trash or garbage
to accumulate on-site.
 - .4 Do not bury rubbish on site.
 - .5 Separate and recycle materials that can be
recycled.
 - .6 Dispose of waste or volatile materials, such
as mineral spirits, oil or paint thinner by
taking them to special designated waste
facility. Do not dump these into waterways,
storm or sanitary sewers.
 - .7 Ensure emptied containers are sealed and
stored safely for disposal away from children.
 - .8 Spills:
 - .1 Have environmental emergency response
plan in place, spill kit and other materials
readily available on-site to respond quickly
if spills occur.
 - .2 Report spills immediately to
Departmental Representative and Ontario
Ministry of Environment Spills Action Centre
(Telephone No. 1-800-268-6060).
 - .3 Secure source of spill to stop flow of
spill and isolate area of spill.
 - .4 Using appropriate safety precautions,
collect liquid or solidify liquid with an
inert, noncombustible material, or absorbant
pads.
 - .5 Clean-up, remove and dispose of
contaminated materials in accordance with MSDS
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|----------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.15 CLEAN UP
(Cont'd) | .8 | Spills:(Cont'd)
.5 (Cont'd)
or as directed by Ontario Ministry of Environment.
.6 Be responsible for costs of cleaning up spills to satisfaction of Departmental Representative. |
| | .9 | Remove scaffolding, temporary protection and surplus materials, tools, plant, rubbish and debris and dispose of them in an approved manner off Crown property at following times:
.1 By April 25, 2016 for items in Rideau Canal/River.
.2 At completion date of work for all other areas. |
| | .10 | Clean areas under contract to condition at least equal to that previously existing and to approval of Departmental Representative. |
| 1.16 CLEANING OF
CONCRETE EQUIPMENT | .1 | Departmental Representative will designate cleaning area for equipment and tools to limit water use and control runoff. |
| | .2 | Cleaning area to be no closer than 30 m from waterway to prevent contamination. |
| | .3 | Where no safe cleaning area is available, Contractor to provide settling pond for area where equipment to be cleaned. |
| | .4 | Alkali water, such as concrete wash water, to be collected and disposed off-site in accordance with federal, provincial, and local authority requirements. |
| | .5 | Use only trigger operated spray nozzles for water hoses. |
| 1.17 DISPOSAL OF
WASTE MATERIALS | .1 | Waste subject to Ontario Environmental Protection Act to be transported with valid "Certificate of Approval for a Waste Management System" to site approved by Ontario Ministry of the Environment to accept that waste. |
| | .2 | Obtain and submit Waste Generator Numbers, permits, manifests, and other paperwork necessary to comply. |
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- 1.18 NOISE CONTROL .1 Minimize noise levels from construction activities by using proper muffling devices, in addition to appropriate timing and location of these activities to reduce or minimize effect of noise on nearby residents, recreationists, and wildlife.
- .2 Comply with City of Ottawa's Noise By-Law No. 2004-253: By-law to Regulate Noise for residential areas.

1.1 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.

1.2 ACCESS TO WORK

- .1 Allow Departmental Representative access to work whenever and wherever it is in progress. Provide equipment required for access and executing inspection and testing by appointed agencies such as (but not limited to) ladders, lights, etc.
- .2 Co-operate to provide reasonable facilities for such access.

1.3 PROCEDURES

- .1 Notify Departmental Representative in advance of requirement for tests.
- .2 Submit samples and/or materials required for testing as listed in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.4 TESTING BY
DEPARTMENTAL
REPRESENTATIVE

- .1 Departmental Representative will perform inspection/testing on a random basis for auditing purposes. Correct defect and irregularities as advised by Departmental Representative at no cost. Pay costs for retesting and reinspection.
 - .2 If Contractor covers or permits to be covered Work that has been designated for inspections before these are made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
-

1.4 TESTING BY
DEPARTMENTAL
REPRESENTATIVE
(Cont'd)

- .3 Departmental Representative will order part of work to be examined if work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such work is found in accordance with Contract Documents, Departmental Representative will authorize payment of the cost of examination and replacement.

1.5 REJECTED WORK

- .1 Remove defective work whenever this is found, either through Contractor Quality Control procedures or through Departmental Representative's Quality Assurance. Replace or re-execute in accordance with Contract Documents.
- .2 If in opinion of Departmental Representative it is not expedient to correct defective Work or work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 This section specifies requirements for designing, supplying, installing, inspecting, maintaining, and removing:
- .1 All temporary structures used to access work.
 - .2 Housing and containment systems.
 - .3 Heating and ventilating workspaces.
 - .4 Lighting of workspaces.
- .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.
 - .3 protect areas adjacent to work during procedures which may damage surrounding areas.
 - .4 protect work and products against dampness and cold.
 - .5 provide ambient temperatures and humidity levels for storage, installation and curing of materials.
- 1.2 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement of Temporary Barriers and Enclosures.
- .2 Payment will be included in the Lump Sum Price.
- 1.3 RELATED WORK .1 Section 01 33 00 - SUBMITTAL PROCEDURES.
- .2 Section 01 35 29.06 - HEALTH & SAFETY REQUIREMENTS.
- .3 Section 01 35 43 - ENVIRONMENTAL PROCEDURES.
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- 1.4 REFERENCES .1 Canadian Standards Association (CSA International)
.1 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.
- .2 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)
- 1.5 SUBMITTALS .1 Shop drawings showing:
.1 Type and construction of housing and enclosures, connections with scaffolding, stability system and method of sealing.
.2 Ventilation fan location and capacity.
.3 Heater numbers, types, locations, and capacities. Size of drip trays provided with all liquid-fuelled heaters.
.4 Number and location of fire extinguishers associated with heating equipment.
.5 Number, type, strength, of all lighting provided within enclosure.
.6 Temporary connections to the existing stone masonry of the lock structure are not allowed.

PART 2 - PRODUCTS

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

PART 3 - EXECUTION

- 3.1 GENERAL .1 Carry out all work to:
- .1 Ontario Occupational Health and Safety Act and Regulations.
 - .2 Approved Site-Specific Safety Plan.
 - .3 Approved Site-Specific Environmental Protection Plan.
- 3.2 SCAFFOLDING .1 Make all changes to scaffolding required by Ministry of Labour officials.
- .2 Ensure transition area from ladder(s) to scaffolding is clear of obstructions and cross bracing.
 - .3 Make periodic inspections of scaffolding as work progresses.
 - .4 Do not load or permit to load any part of work or any temporary access structure with a weight or force that will endanger work or labourers.
 - .5 Do not weld to steel parts of the lock structure.
 - .6 Drilling holes in existing stone masonry is not allowed.
- 3.3 HOUSING AND CONTAINMENT .1 Provide strong and durable housing and containment for portions of Work to be protected, heated, and/or ventilated during Work.
- .1 Housing to be strong enough to withstand rain, wind and snow loads.
 - .2 Housing to be insulated against cold.
 - .3 Electrical wiring, lights, and other equipment located inside enclosure: explosion-proof type. Illumination shall be sufficient for safe execution of the work.
- 3.4 HEATING .1 Provide temporary heating required during construction period, including watchkeeping attendance, maintenance, and fuel.
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3.4 HEATING
(Cont'd)

- .2 Be responsible for damage to work due to failure in providing adequate heat and protection during construction.
- .3 Fire protection requirements: to Section 01 35 29 - HEALTH AND SAFETY REQUIREMENTS.
- .4 Use only heating equipment types acceptable to Departmental Representative.
- .5 Heating fuels: indirect fired heaters. Do not re-fuel inside the lock.
- .6 Fuel Storage: to requirements of Fire Commissioner of Canada and Section 01 35 43 - ENVIRONMENTAL PROTECTION.
- .7 Provide and maintain temporary fire protection equipment during performance of work commensurate with fuel source selected.
- .8 Ensure that heating requirements are met by providing, at optimum efficiency of equipment, a capacity of 125% of heat requirement and a sufficient number of standby heaters ready for use at the site.
- .9 Vent exhausts of heating equipment outside of housing, well clear of combustible materials and fresh air intake.

3.5 VENTILATING
EQUIPMENT

- .1 Intent of ventilation:
 - .1 To ensure required air temperature and quality in all parts of enclosure.
 - .2 To enhance health & safety of workers.
 - .2 Depending upon configuration of enclosure, it may be necessary to install both a mechanical supply and exhaust ventilation system to effect adequate air changes within confined space. Locate air-moving devices in a manner that assures that airflow is not restricted or short circuited and is supplied in proper direction and does not interfere with work.
 - .3 Ventilate storage spaces containing hazardous or volatile materials.
 - .4 Ventilation system must vent to downstream side of the lock or to take advantage of prevailing winds.
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3.6 FIELD QUALITY
CONTROL &
WATCHKEEPING

- .1 Provide and post at approved locations within housing, one maximum/minimum thermometer per approximately 10 square metres of plan area of housing.
- .2 Ensure continuity of protection by providing a watchkeeper to make periodic checks at all times when work is not in progress.
- .3 Watchkeeper's qualifications, under this section of specification, are to be sufficient to perform such duties as:
 - .1 Maintain strict supervision of operation of temporary heating and ventilating equipment.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes due to mis-use of heating and ventilating equipment.
 - .5 Undertake preventive maintenance and re-fueling.
 - .6 Complete emergency repairs of minor complexity.
 - .7 Place standby items in service.
- .4 Record maximum and minimum temperature at each thermometer on a daily basis, and re-setting thermometers as necessary.
 - .1 Make temperature records available to Departmental Representative on a daily basis.
 - .2 Provide certified written records to Departmental Representative on a weekly basis.

PART 1 - GENERAL

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|------------------------------------------------------|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>1.1 CONSTRUCTION
AND DEMOLITION
WASTE</u> | .1 | Carefully deconstruct and source separate materials/equipment and divert, from D&C waste destined for landfill to maximum extent possible. Target for this project is 30% 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 Wood, not including painted or treated or laminated wood.
.3 Steel.
.4 Electrical wiring.
.5 Hydraulic piping. |
| | .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. |
| <u>1.2 WASTE
PROCESSING SITES</u> | .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 |
-

1.2 WASTE PROCESSING SITES (Cont'd)	.2 Recycling Council of Ontario:(Cont'd)
	.3 Email: rco@rco.on.ca.
<u>PART 2 - PRODUCTS</u>	.4 Internet: http://www.rco.on.ca/.

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

3.1 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT	.1 Government Chief Responsibility for the Environment.
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Province	Address	General	Fax
<u>Inquiries</u>			
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

PART 1 - GENERAL

1.1 SECTION
INCLUDES

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

1.2 MEASUREMENT
AND PAYMENT
PROCEDURES

- .1 There will be no measurement of Closeout Submittals.
- .2 Payment will be included in the Lump Sum Price.

1.3 SUBMISSION

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
 - .2 Copy will be returned with Departmental Representative's comments.
 - .3 Revise content of documents as required prior to final submittal.
 - .4 Four weeks prior to Substantial Performance of the Work, submit to the Departmental Representative. Four final copies of maintenance manuals and commissioning documentation in English.
 - .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
 - .6 If requested, furnish evidence as to type, source and quality of products provided.
-

1.3 SUBMISSION
(Cont'd)

- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.

1.4 FORMAT

- .1 Organize data in the form of an instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide AutoCAD files in *.dwg format on CD or USB drive.
- .10 The contractor is to make copies of all electronic records, which are produced for the submissions listed in this section. This includes, but is not limited to, drawings, documents, and spreadsheet files.
 - .1 All files are to be properly labeled and placed in a well organized folder structure.
 - .2 The data is to be stored on Compact Disc and include a Jewel case with a front cover and an insert sleeve listing content.
 - .1 Cover and CD is to include project title and number, and date.

1.4 FORMAT
(Cont'd)

- .10 (Cont'd)
- .3 The following are the preferred file formats:
- .1 Drawings: AutoCad ver. 2015.
 - .2 Documents: MS Word
 - .3 Spreadsheet: MS Excel
 - .4 Product Sheets: Adobe PDF
 - .5 All files in the formats indicated above are also to be saved as pdf files.
- .4 Four copies of the electronic records on CD are to be submitted prior to the Certificate of Final Completion.

1.5 CONTENTS -
EACH VOLUME

- .1 Table of Contents: provide title of project;
- .1 date of submission; names,
 - .2 addresses, and telephone numbers of Consultant and Contractor with name of responsible parties;
 - .3 schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
- .1 list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- .6 Training: Refer to Section 01 79 00.

1.6 AS-BUILTS AND
SAMPLES

- .1 Maintain at the site for Departmental Representative one record copy of:
- .1 Contract Drawings.
 - .2 Specifications.
 - .3 Amendments.
 - .4 Change Orders and other modifications to the Contract.

1.6 AS-BUILTS AND
SAMPLES
(Cont'd)

- .1 (Cont'd)
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.
- .6 Turn one set, paper copy and electronic copy, of AS-BUILT drawings and specifications over to Departmental Representative on completion of work.
- .7 If project is completed without significant deviations from Contract drawings and specifications submit to Departmental Representative one set of drawings and specifications marked "AS-BUILT".

1.7 RECORDING
ACTUAL SITE
CONDITIONS

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

1.7 RECORDING
ACTUAL SITE
CONDITIONS
(Cont'd)

- .4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to established benchmark.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .5 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Amendments and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.8 EQUIPMENT AND
SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include

1.8 EQUIPMENT AND
SYSTEMS
(Cont'd)

- .4 Operating Procedures:(Cont'd)
regulation, control, stopping, shut-down, and
emergency instructions. Include summer,
winter, and any special operating
instructions.
- .5 Maintenance Requirements: include routine
procedures and guide for trouble-shooting;
disassembly, repair, and reassembly
instructions; and alignment, adjusting, and
checking instructions.
- .6 Provide servicing and lubrication schedule,
and list of lubricants required.
- .7 Include manufacturer's printed operation and
maintenance instructions.
- .8 Include sequence of operation by controls
manufacturer.
- .9 Provide original manufacturer's parts list,
illustrations, assembly drawings, and diagrams
required for maintenance.
- .10 Provide installed control diagrams by
controls manufacturer.
- .11 Provide Contractor's coordination drawings,
with installed colour coded piping (tubing)
diagrams.
- .12 Provide list of original manufacturer's spare
parts, current prices, and recommended
quantities to be maintained in storage.
- .13 Include test reports as specified in Section
01 91 00.
- .14 Additional requirements: As specified in
individual specification sections.

1.9 MATERIALS AND
FINISHES

- .1 Provide information for re-ordering custom
manufactured products.
- .2 Instructions for cleaning agents and methods,
precautions against detrimental agents and
methods, and recommended schedule for cleaning
and maintenance.
- .3 Moisture-protection and Weather-exposed
Products: include manufacturer's
recommendations for cleaning agents and

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|----------------------------------------|----|--------------------------------------------------------------------------------------------------------------------------------------------|
| 1.9 MATERIALS AND FINISHES
(Cont'd) | .3 | (Cont'd)
methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance. |
| | .4 | Additional Requirements: as specified in individual specifications sections. |
| 1.10 SPARE PARTS | .1 | Provide spare parts, in quantities specified in individual specification sections. |
| | .2 | Provide items of same manufacture and quality as items in Work. |
| | .3 | Deliver to location as directed; place and store. |
| | .4 | Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual. |
| | .5 | Obtain receipt for delivered products and submit prior to final payment. |
| 1.11 MAINTENANCE MATERIALS | .1 | Provide maintenance and extra materials, in quantities specified in individual specification sections. |
| | .2 | Provide items of same manufacture and quality as items in Work. |
| | .3 | Deliver to location as directed; place and store. |
| | .4 | Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual. |
| | .5 | Obtain receipt for delivered products and submit prior to final payment. |
| 1.12 SPECIAL TOOLS | .1 | Provide special tools, in quantities specified in individual specification section. |
| | .2 | Provide items with tags identifying their associated function and equipment. |
-

1.12 SPECIAL TOOLS (Cont'd) .3 Deliver to location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

1.13 STORAGE, HANDLING AND PROTECTION .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

1.14 WARRANTIES AND BONDS .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.

.4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Certificate of Substantial Performance is determined.

.5 Verify that documents are in proper form, contain full information, and are notarized.

.6 Co-execute submittals when required.

.7 Retain warranties and bonds until time specified for submittal.

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 MANUAL .1 An organized compilation of operating and maintenance data including detailed technical information, documents and records describing operation and maintenance of individual products or systems as specified in individual sections of Specifications.
- 1.2 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement of Operation and Maintenance Manual.
- .2 Payment will be included in the Lump Sum Price.
- 1.3 GENERAL .1 Assemble, coordinate, bind and index required data into Operation and Maintenance Manual.
- .2 Submit complete operation and maintenance manual to Departmental Representative 3 weeks prior to application for Interim Certificate of Completion of project.
- .3 Submit 6 copies.
- .4 Organize data into same numerical order as contract specifications.
- .5 Material: label each section with tabs protected with celluloid covers fastened to hard paper dividing sheets.
- .6 Type lists and notes.
- .7 Drawings, diagrams and manufacturers literature must be legible.
- 1.4 BINDERS .1 Binders: vinyl, hard covered, 3 "D" ring, loose leaf, sized for 215 x 280 mm paper, with spine pocket.
- .2 Identify contents of each binder on spine.
-

1.5 CONTENTS

- .1 Binder 1:
 - .1 Cover sheet containing:
 - .1 Date submitted.
 - .2 Project title, location, number.
 - .3 Names and addresses of Contractor, and all Sub-contractors.
 - .2 Table of Contents of all binders.
 - .3 List of maintenance materials specified in individual sections.
 - .4 List of special tools specified in individual sections.
 - .5 List of spare parts specified in individual sections.
 - .6 Warranties, guarantees.
 - .7 Copies of approvals, and certificates.
- .2 Remaining binders:
 - .1 Cover sheet containing:
 - .1 Date submitted.
 - .2 Project title, location, number.
 - .2 Table of Contents of individual binder.
 - .3 Provide data as specified in individual sections.
 - .1 List of equipment, service depot.
 - .2 Nameplate information including equipment number, make, size, capacity, model number and serial number.
 - .3 Parts list.
 - .4 List of spare parts which must be stocked to replace gaskets, seals, grease gun fittings and any other parts which are expected to require replacement within 5 years of contract completion.
 - .5 Installation details.
 - .6 Operating instructions, including recommended sequence and precautions under various conditions.
 - .7 Maintenance instructions for equipment.
 - .8 Maintenance instructions for finishes.
- .3 Shop drawings:
 - .1 Bind separately one complete set of reviewed final shop drawings and product data.

1.6 ELECTRONIC
RECORDS

- .1 The contractor is to make copies of all electronic records which are produced for the submissions listed in this section. This includes, but is not limited to, drawings, documents, and spreadsheet files.
 - .1 All files are to be properly labeled and placed in a well organized folder structure.
-

- 1.6 ELECTRONIC RECORDS
(Cont'd)
- .1 (Cont'd)
- .2 The data is to be stored on Compact Disc and include a Jewel case with a front cover and an insert sleeve listing content.
- .1 Cover and CD is to include project title and number, and date.
- .3 The following are the preferred file formats:
- .1 Drawings: AutoCad version 2015.
- .2 Documents: PDF
- .3 Spreadsheet: PDF or MS Excel
- .4 Product Sheets: Adobe PDF
- .4 Six copies of the electronic records on CD are to be submitted prior to the Certificate of Final Completion.

PART 2 - PRODUCTS

- 2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

- 3.1 NOT USED .1 Not Used.

- 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 Representative.
- 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 which are not shown 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 1 - GENERAL

- | | | |
|-----------------------------------------------------|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.1 SECTION
<u>INCLUDES</u> | .1 | Procedures for demonstration and instruction of equipment and systems to Owner's O & M personnel. |
| | .2 | O & M personnel includes property facility manager, lock operators and technical specialists, as applicable. |
| 1.2 MEASUREMENT
AND PAYMENT
<u>PROCEDURES</u> | .1 | There will be no measurement of Demonstration and Training. |
| | .2 | Payment will be included in the Lump Sum Price. |
| 1.3 DESCRIPTION | .1 | Demonstrate scheduled operation and maintenance of equipment and systems to Departmental Representative's personnel. |
| | .2 | Departmental Representative will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times. |
| 1.4 QUALITY CONTROL | .1 | When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed. |
| | .2 | Submit training schedule of time and date for demonstration and training of each item of equipment and each system in accordance with the training plan four weeks prior to designated dates, for Departmental Representative's approval. |
| | .3 | Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed. |
-

<u>1.4 QUALITY CONTROL</u> (Cont'd)	.4	Report shall give time and date of each demonstration and training, with list of persons present.
<u>1.5 CONDITIONS FOR DEMONSTRATIONS</u>	.1	Equipment has been inspected and put into operation.
	.2	Testing, adjusting, and balancing has been performed and equipment and systems are fully operational.
	.3	Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.
<u>1.6 PREPARATION</u>	.1	Verify that conditions for demonstration and instructions comply with requirements.
	.2	Verify that designated O & M personnel is present.
<u>1.7 DEMONSTRATION AND INSTRUCTIONS</u>	.1	Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times, at the designated location.
	.2	Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instructions.
	.3	Review contents of manual in detail to explain all aspects of operation and maintenance.
	.4	Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.
<u>1.8 TIME ALLOCATED FOR INSTRUCTIONS</u>	.1	After the completion of construction ensure amount of time required for instructions is as follows: .1 Mechanical components: 8 hours of instructions. .2 Electrical Components: 8 hours of instructions.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

PART 1 - GENERAL

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|-------------------------------------------------------|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>1.1 SECTION
INCLUDES</u> | .1 | Includes general requirements for commissioning facilities and facility systems. |
| <u>1.2 MEASUREMENT
AND PAYMENT
PROCEDURES</u> | .1 | There will be no measurement of Commissioning - General Requirements. |
| | .2 | Payment will be included in the Lump Sum Price. |
| <u>1.3 QUALITY
ASSURANCE</u> | .1 | Comply with applicable procedures and standards of the certification sponsoring association. |
| | .2 | Perform services under direction of supervisor qualified under certification requirements of sponsoring association. |
| <u>1.4 SUBMITTALS</u> | .1 | Submit documentation to confirm compliance with quality assurance provision. |
| | .2 | Submit 3 preliminary specimen copies of each type of startup checklist, product information and performance verification report forms proposed for use. |
| | .3 | Submit completed report forms within 3 days after completion of each testing to Departmental Representative for review and verification. |
| | .4 | Fifteen days prior to Substantial Performance, submit 3 copies of final reports on applicable forms for functional performance verification. |
| | .5 | Submit post-commissioning reports of testing, adjusting, and balancing postponed due to seasonal, climatic, occupancy, or other reasons beyond Contractor's control, promptly after execution of those services. |
-

1.5 REPORT FORMS

- .1 Contractor personnel having managerial responsibility shall make reports.
- .2 Report forms shall include:
 - .1 Startup Checklists.
 - .2 Product Information (PI) Report forms.
 - .3 Performance Verification (PV) Report forms.
- .3 Ensure each form bears signature of recorder, and that of supervisor of reporting organization.
- .4 Submit signed form to Departmental Representative for review, approval and signature.
- .5 Identify each instrument used for testing, adjusting and balancing and its latest date of calibration.

1.6 CONTRACTOR'S RESPONSIBILITIES

- .1 Prepare each system for testing and balancing.
- .2 Cooperate with testing organization and provide access to equipment and systems.
- .3 Provide personnel and operate systems at designated times, and under conditions required for proper testing, adjusting, and balancing.
- .4 Notify testing organization and Departmental Representative 7 days prior to time project will be ready for testing, adjusting, and balancing.
- .5 Accurately record data for each step.
- .6 Report to Departmental Representative any deficiencies or defects noted during performance of services.
- .7 Correct deficiencies identified in accordance with Departmental Representative's written instructions.

1.7 PREPARATION

- .1 Provide instruments required for testing, adjusting, and balancing operations.
-

- 1.7 PREPARATION .2 Make instruments available to Departmental
 (Cont'd)
- .3 Retain possession of instruments and remove
 at completion of services.
- .4 Verify systems installation is complete and
 in continuous operation.
- 1.8 EXECUTION .1 Test electrical and mechanical equipment for
 operating lock gates and sluice gate valves.

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 specifies requirements for removals to complete work as indicated by drawings and specifications.
 - . 2 Work includes but is not limited to:
 - .1 Removal and proper disposal off-site of upper and lower timber gates.
 - .2 Timber used for upper and lower gates are pressure treated with CCA. Disposal price to reflect environmentally acceptable method of disposing/utilizing pressure treated timber.
 - .3 Refer to reference drawings for existing timber gates details.
 - .4 Removal and salvaging of existing upper and lower gates pedestrian walkway handrail, access steps and sign boards located on gates. Included in salvaging are some components of pintle assembly for upper gates (pintle, heel casting and bearing plate), as shown on drawings.
 - .5 Removal, salvaging and reinstallation of all existing benches, garbage containers, existing signs and historical winches.
 - .6 Removal, salvaging, repainting and reinstallation of all four ladders.
 - .7 Removal of existing lower gates bumpers.
 - .8 Removal of existing upper and lower lock operating panels (control console).
 - .9 Removal and proper disposal off the site, of existing concrete precast slabs covering hydraulic cylinder pits at lower end of the lock, as shown on drawings.
 - .10 Refer to mechanical/electrical specifications for removal of mechanical/electrical systems.
- 1.2 RELATED WORK SPECIFIED ELSEWHERE
- .1 Excavating and Backfilling: Section 31 23 15
 - .2 Timber Lock Gates:Section 06 13 30
-

- 1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement of Removals.
- .2 Payment will be included in the Lump Sum Price.
- 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 Departmental Representative objects designated to be removed and objects to be preserved.
- .2 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.
- 3.3 SALVAGE .1 Carefully dismantle materials designated to be salvaged and stockpile at locations designated by the Departmental Representative.
- 3.4 LADDERS .1 Salvage existing ladders and deliver to shop for sandblasting and repainting.
-

- 3.4 LADDERS
(Cont'd)
- .2 Sandblast to SSPC-10 and paint as per Section 09 97 01 - Painting Steel Surfaces.
 - .3 Repair damaged or bent sections of ladders as needed.
 - .4 Paint as per Section 06 13 30 - Timber Lock Gates for metal components.
 - .5 Re-install ladders including new fasteners, as required, to secure ladder to lock wall.
- 3.5 REINSTALLATION
- .1 Reinstall all other items which were removed as a result of construction activities to the Departmental Representative's approval.
- 3.6 DISPOSAL OF MATERIALS
- .1 Dispose of materials not designated for salvage or reuse in work off the site.

PART 1 - GENERAL

- | | | |
|-----------------------------------------------|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>1.1 RELATED SECTIONS</u> | .1 | Section 03 20 00 - Concrete Reinforcing. |
| | .2 | Section 03 30 00 - Cast-in-Place Concrete. |
| <u>1.2 MEASUREMENT AND PAYMENT PROCEDURES</u> | .1 | No measurement will be made under this Section. Include costs in concrete items of work for which concrete formwork, falsework and accessories are required. |
| <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-086-01(R2006), Engineering Design in Wood (Limit States Design).
.3 CAN/CSA-086.S1-05, Supplement No. 1 to CAN/CSA-086-01, Engineering Design in Wood (Limit States Design).
.4 CSA 0121-08, Douglas Fir Plywood.
.5 CSA 0151-04, Canadian Softwood Plywood.
.6 CSA 0153-M1980(R2008), Poplar Plywood.
.7 CSA 0437 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. |
| <u>1.4 SHOP DRAWINGS</u> | .1 | Submit shop drawings for formwork and falsework in accordance with Section 01 33 00. |
| | .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. |
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|-----------------------------------------------|----|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.4 SHOP DRAWINGS
(Cont'd) | .4 | 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. |
| | .3 | Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOC's. |

PART 2 - PRODUCTS

- | | | |
|---------------|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.1 MATERIALS | .1 | Formwork materials: wood and wood product formwork materials to CSA 0153 and CSA 086.1. |
| | .2 | Sheathing: use only form ply plywood. |
| | .3 | Form ties: removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface. |
| | .4 | Form release agent: non-toxic, biodegradable, low VOC. |
| | .5 | Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 15 sq.mm/s to 24 sq.mm/s at 40°C, flashpoint minimum 150°C, open cup. |
| | .6 | Falsework materials: to CSA S269.1. |
-

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 Fabricate and erect falsework in accordance with CSA S269.1.
- .3 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.
- .4 Align form joints and make watertight.
- .5 Use 20 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless matching original profiles or specified otherwise.
- .6 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .7 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
- .8 Clean formwork in accordance with CAN/CSA-A23.1/A23.2, before placing concrete.

3.2 FORM RELEASE AGENT

- .1 No form release agent required with CPF formwork liner.
- .2 Apply agent where CPF formwork liner can not be installed, such as the corner chamfer.
- .3 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 Application:
 - .1 Apply concrete form release in accordance with manufacturer's instructions.

- 3.3 REMOVAL AND
RESHORING
- .1 Leave formwork in place for seven (7) 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 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

PART 1 - GENERAL

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| <u>1.1 RELATED WORK</u> | .1 | Cast-in-Place Concrete: Section 03 30 00. |
| | .2 | Concrete Forming and Accessories: Section 03 10 00. |
| | .3 | Submittals: Section 01 33 00 - Submittal Procedures. |
| <u>1.2 MEASUREMENT AND PAYMENT PROCEDURES</u> | .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: <ul style="list-style-type: none">.1 Item No.1 - Reinforcing Steel:<ul style="list-style-type: none">.1 For all concrete work related to quoin, pits, breastwall and upper and lower sill nosing as shown on the contract drawings. |
| | .3 | All other work of this section, which is not identified as a unit price item, is to be included in the Lump Sum Price stated in the Tender Form. |
| <u>1.3 REFERENCE STANDARDS</u> | .1 | Canadian Standards Association (CSA International) <ul style="list-style-type: none">.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-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement, A National Standard of Canada..4 CSA-G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel..5 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles, A National Standard of Canada..6 CSA W186-M1990(R2002), Welding of Reinforcing Bars in Reinforced Concrete Construction. |
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<u>1.3 REFERENCE STANDARDS (Cont'd)</u>	.2 Reinforcing Steel Institute of Canada (RSIC) .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.
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<u>1.4 SUBMITTALS</u>	.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures. .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice. .3 Submit shop drawings including placing of reinforcement and indicate: .1 Bar bending details. .2 Lists. .3 Quantities of reinforcement. .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings. .5 Indicate sizes, spacings and locations of chairs, spacers and hangers. .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 Quality Assurance: Upon Request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, 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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PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Reinforcing steel: Billet steel, grade 400 deformed bars to CSA G30.18, unless indicated otherwise. Hot-dipped galvanized all rebars to CAN/CSA G164.
 - .2 Chairs, bolsters, bar supports, spacers; to CAN/CSA-A23.1-00, CAN3-A23.1S1-1986, CAN3-A23.1S2-86.
 - .3 Cold-drawn annealed steel wire ties: to ASTM A 497/A497M.
- 2.2 FABRICATION
- .1 Fabricate reinforcing steel in accordance with CSA-A23.1-00, CAN3-A23.1S1-1986, CAN3-A23.1S2-86, and Reinforcing Steel manual of Standard Practice by the Reinforcing Steel Institute of Ontario.
 - .2 Obtain Departmental Representative's approval for locations of reinforcement splices.
 - .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186-M1990 (R1998).
 - .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

PART 3 - EXECUTION

- 3.1 FIELD BENDING
- .1 Do not field bend reinforcement except where authorized by Departmental Representative.
 - .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
 - .3 Replace bars, which develop cracks or splits.
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3.2 PLACING
REINFORCEMENT

- .1 Place reinforcing steel as indicated on reviewed approved placing drawings and in accordance with CSA-A23.1/A23.2
- .2 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing steel and position.
- .3 Minimum cover for reinforcement: 75 mm unless indicated otherwise.
- .4 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .5 Ensure cover to reinforcement is maintained during concrete pour.

PART 1 - GENERAL

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| <u>1.1 DESCRIPTION</u> | .1 | This section specifies the requirements for concrete placed as described by the drawings and the specifications. |
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| <u>1.2 MEASUREMENT AND PAYMENT PROCEDURES</u> | .1 | Measurement Procedures: in accordance with Section 01 22 01 - Measurement and Payment Procedures. |
| | .2 | Work covered by this section will be paid for under payment items included in the Unit Price Table:
.1 Item No.2 - Concrete in the construction of the new quoins, pits, breastwall and bottom sill. |
| | .3 | 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. |
| | .4 | No deductions will be made for volume of concrete displaced by reinforcing steel. |
| | .5 | Include in the prices of concrete the bonding agent. |
| | .6 | Include in the prices of concrete the installation of all items embedded therein. |
| | .7 | Include in the prices of concrete the work described in Section 03 10 00 - Concrete Forming and Accessories. |
| | .8 | Temporary enclosures and heating are included for payment under Section 01 56 00 - Temporary Barriers and Enclosures. |
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| <u>1.3 RELATED WORK</u> | .1 | Section 03 10 00 - Concrete Forming and Accessories. |
| | .2 | Section 03 20 00 - Concrete Reinforcement. |
| | .3 | Section 31 23 15 - Excavating and Backfilling. |
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| <u>1.4 REFERENCE STANDARDS</u> | .1 | Canadian Standards Association (CSA International)
.1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
.2 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
.1 CAN/CSA-A3001-03, Cementitious Materials for Use in Concrete. |
| | .2 | American Society for Testing and Materials International (ASTM)
.1 ASTM C260-06, Standard Specification for Air-Entraining Admixtures for Concrete.
.2 ASTM C494/C494M-08a, Standard Specification for Chemical Admixtures for Concrete. |
| <u>1.5 SUBMITTALS</u> | .1 | Submittals in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 | At least 3 weeks prior to beginning Work, submit to Departmental Representative concrete mix design and product data of curing compound. |
| <u>1.6 CONSTRUCTION QUALITY CONTROL</u> | .1 | Submit to Departmental Representative, minimum 3 weeks prior to starting concrete work, valid and recognized certificate from plant delivering concrete. |
| | .2 | Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements. |
| <u>1.7 DELIVERY, STORAGE AND HANDLING</u> | .1 | 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 Modifications to maximum time limit must be agreed by the Departmental Representative and concrete producer as described in CSA A23.1/A23.2. |
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| 1.7 DELIVERY,
STORAGE AND
HANDLING
(Cont'd) | .1 (Cont'd)
.2 Deviations to be submitted for review by
the Departmental Representative. |
| | .2 Concrete delivery: ensure continuous concrete
delivery from plant meets CSA A23.1/A23.2. |
| 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. |
| | .4 Provide appropriate area on job site where
concrete trucks can be safely washed. |
| | .5 Divert admixtures and additive materials from
landfill to approved official hazardous
material collections site as reviewed by
Departmental Representative. |
| | .6 Unused admixtures and additive materials must
not be disposed of into sewer systems, into
lakes, streams, onto ground or in other
location where it will pose health or
environmental hazard. |

PART 2 - PRODUCTS

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| 2.1 APPROVALS | .1 All concrete mixes to be approved by the
Departmental Representative. |
| 2.2 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 Cement: to CAN/CSA-A3001, Type GU. |
| | .3 Supplementary cementing materials: with 20%
to 30% hydraulic slag, by mass of total
cementitious materials to CAN/CSA-A3001. |
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2.2 MATERIALS
(Cont'd)

- .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 Curing compounds and other curing materials: to CAN/CSA-A23.1/A23.2.
- .8 Bonding agent: to ASTM C1059.
- .9 Other concrete materials: to CSA-A23.1/A23.2.

2.3 CONCRETE MIX

- .1 Proportion concrete mix in accordance with CSA-A23.1/A23.2 to meet following requirements:
 - .1 Cement: Mix of type GU Portland cement and a cementitious hydraulic slag cement ranging between 20% and 30%.
 - .2 Compressive strength at 28 days: 35 MPa.
 - .3 Maximum water cement ratio: .40.
 - .4 Class of exposure, C-1.
 - .5 Nominal size coarse aggregate: 20 mm.
 - .6 Slump at time and point of discharge: 50-110 mm.
 - .7 Air content: 5 to 8%.
 - .8 Admixtures, water reducing agents: quantity to manufacturer's recommendation.
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2.3 CONCRETE MIX (Cont'd)	.2	Weigh aggregates, cement, water and admixture separately when batching. No alternative method of measuring will be permitted.
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2.4 FORMWORK MATERIAL	.1	To CAN/CSA-A23.1/A23.2.
	.2	Form stripping agent to be non-staining, colourless mineral oil, free of kerosene with a Saybolt Universal Viscosity of 70 minimum and 110 seconds maximum at 38 degree Celsius, and minimum flash-point of 150 degrees Celsius open cup.

PART 3 - EXECUTION

3.1 GENERAL	.1	Perform cast-in-place concrete work in accordance with CAN/CSA-A23.1/A23.2.
	.2	Ensure that reinforcing steel, and other necessary items are in-place, clean and undamaged.
	.3	Notify the Departmental Representative at least 2 working days in advance of each proposed concrete placement.
	.4	Use proper and timely placing, finishing and curing practices.

3.2 PREPARATION	.1	Provide Departmental Representative 48 hours notice before each concrete pour.				
	.2	During concreting operations: <table> <tr> <td>.1</td> <td>Development of cold joints not allowed.</td> </tr> <tr> <td>.2</td> <td>Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.</td> </tr> </table>	.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.
.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.					
	.3	Protect previous work from staining.				
	.4	Clean and remove stains prior to application of concrete finishes.				

3.3 CONSTRUCTION

- .1 Pending on the concrete placing method used, there are locations where the concrete mix may need to be modified to suit the method of placement. In such cases, the method of placement and mix design must be submitted to the Departmental Representative for approval.
- .2 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place steel dowels of galvanized deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated. Maintain concrete substrate and ambient air within enclosure to temperature, and for duration of curing period recommended by manufacturer.
- .3 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, at 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.

3.4 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 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.

3.5 PLACING
CONCRETE
(Cont'd)

- .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.
- .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.

3.6 INSERTS

- .1 Cast in sleeves, ties, anchors, reinforcement, joint fillers and other inserts required to be built-in.

3.7 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 22.4.
- .3 Use smooth-form finish for formed surfaces. A sack-rubbed finish is also to be applied in accordance with CAN/CSA-23.1.

3.8 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 25°C, provide the hot weather protection and protection from drying required by Clause 21.2 of CAN/CSA-23.1-00. Ensure concrete temperatures at placing meet the requirements of Table 15: 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.
- .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.

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

- 3.10 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.

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

PART 1 - GENERAL

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| <u>1.1 DESCRIPTION</u> | .1 | Materials and installation for precast concrete slabs to cover lower gates hydraulic pits. |
| <u>1.2 RELATED SECTIONS</u> | .1 | Section 03 20 00 - Concrete Reinforcing. |
| | .2 | Section 02 41 21 - Removals. |
| <u>1.3 MEASUREMENT PROCEDURES</u> | .1 | There will be no measurement of Precast Concrete Slabs. |
| | .2 | Payment will be included in the Lump Sum Price. |
| <u>1.4 REFERENCES</u> | .1 | American Society for Testing and Materials International, (ASTM)
.1 ASTM C136-96a, Standard Test Method Specification for Sieve Analysis of Fine and Coarse Aggregates.
.2 ASTM C260-06, Standard Specification for Air-Entraining Admixtures for Concrete.
.3 ASTM C494/C494M-08a, Standard Specification for Chemical Admixtures for Concrete. |
| | .2 | Canadian Standards Association (CSA)/CSA International
.1 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
.1 CAN/CSA-A3001-08, Cementitious Materials for Use in Concrete.
.2 CAN/CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
.3 CSA-A23.4-05, Precast Concrete - Materials and Construction.
.4 CAN/CSA-G30.18-M92(R2007), Billet-Steel Bars for Concrete Reinforcement. |
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- 1.5 DESIGN CRITERIA .1 Design precast concrete slabs in accordance with requirements of CAN/CSA-A23.3-04(R2010) to resist forces, moments, shears and allow for movements indicated, unless specified otherwise.
- .2 Live Load:
- .1 Slabs to be design for a minimum specified uniformly distributed load of 4.8 kPa or minimum specified concentrated load of 4.5 kN applied at any point.
- .2 The loads required in sentence 1.5.2.1 need not be considered to act simultaneously.

- 1.6 SHOP DRAWINGS .1 Submit shop drawings for precast concrete slabs in accordance with Section 01 33 00.
- .2 Indicate sizes and layout of precast concrete slabs in relationship to project formed detailas.
- .3 Each drawing submitted to bear signature and stamp of a qualified professional engineer licensed to practise in Ontario, Canada.

- 1.7 WASTE MANAGEMENT AND DISPOSAL .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Divert unused concrete materials from landfill to local facility approved by Departmental Reresentative.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Portland cement with 20 to 30% Fly ash replacement: to CAN/CSA-A3001, Type GU.
- .2 Water: to CAN/CSA-A23.1/A23.2.
- .3 Aggregates: to CAN/CSA-A23.1/A23.2.
- .1 Coarse aggregates to be normal density.
- .4 Air entraining admixture: to ASTM C260.
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| 2.1 MATERIALS
(Cont'd) | .5 | Supplementary cementing materials: to CAN/CSA-A23.5. |
| | .6 | Reinforcing steel: to Section 03 20 00. |
| 2.2 CONCRETE MIXES | .1 | Proportion concrete in accordance with CAN/CSA-A23.1/A23.2, Alternative 1, to following requirements: |
| | .1 | Type GU cement. |
| | .2 | Minimum compressive strength at 28 days: 45 MPa. |
| | .3 | Maximum water/cement ratio: 0.4 |
| | .4 | Class of exposure: C-1. |
| | .5 | Nominal size of coarse aggregate: 20 mm. |
| | .6 | Slump at time and point of discharge: 50 to 110 mm. |
| | .7 | Air content: 5 to 8%. |
| 2.3 PRECAST
CONCRETE SLABS | .1 | Precast concrete slabs: to CAN/CSA-A23.4-09 and as follows: |
| | .1 | Size: as shown on contract drawings. |
| | .2 | Colour: natural grey concrete. |
| | .3 | Aggregate: limestone. |
| | .4 | Finish: natural, light sandblast finish to match existing slabs . Degree of sandblasting to be approved by Departmental Representative: submit up to three samples. |
| | .5 | Lock border slabs to have rounded edge to match existing stone masonry shape. |
| | .6 | Uniform in material and colour, and must be product of one manufacturer. |

PART 3 - EXECUTION

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| 3.1 INSTALLATION | .1 | Install precast concrete slabs as shown on contract drawings and as directed by Departmental Representative. |
| | .2 | Verify that structural surfaces, ie, hydraulic pit walls, conform to levels required for installation of precast concrete slabs. In case of discrepancies, notify Departmental Representative. |
| | .3 | Lay precast concrete slabs to pattern shown on approved shop drawings. Joints between slabs: 6 mm wide. |
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- 3.1 INSTALLATION
(Cont'd)
- .4 Inspect, remove, and replace chipped, broken or damaged and defective units and as directed by Departmental Reresentative.
 - .5 Surface elevation of slabs: as shown on contract drawings.
 - .6 Final surface elevations not to exceed plus or minus 3 mm under 3 m long straightedge.
 - .7 In areas where a slab is rocking due to the underside not resting fully on the bearing surface, shim by providing a thin layer of neoprene padding glued to the slab or bearing surface.

PART 1 - GENERAL

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| <u>1.1 DESCRIPTION OF THE WORK</u> | .1 | This section covers the requirements for the supply and installation of stainless steel anchors to anchor stones, including the installation of epoxy adhesive. |
| <u>1.2 RELATED WORK</u> | .1 | Section 04 43 04 - Repointing Stone Masonry. |
| | .2 | Section 04 43 06 - Cut Stone. |
| | .3 | Section 04 43 07 - Installation of Stone Masonry. |
| <u>1.3 MEASUREMENT AND PAYMENT PROCEDURES</u> | .1 | Measurement Procedures: in accordance with Section 01 22 01. |
| | .2 | Work covered by this section will be paid for under payment item included in the Unit Price Table: <ul style="list-style-type: none"> .1 Item No.3 - Masonry Anchors. .2 Payment at the unit prices bid for the above item shall be full compensation for all labour, equipment and materials necessary to do the work of these items including supply and application of epoxy in accordance with the Contract Drawings and these Specifications. .3 All other work of this section, which is not identified as a unit price item, is to be included in the Lump Sum Price stated in the Tender Form. |

PART 2 - PRODUCTS

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| <u>2.1 MATERIALS</u> | .1 | All masonry anchors to be stainless steel rebar, alloy 316. |
| | .2 | Epoxy for anchors: <ul style="list-style-type: none"> .1 Hybrid adhesive consisting of a methacrylate resin, hardener, cement and water. .2 Formulated for fast curing and installation in a wide range of solid base material temperatures from +40°C to -23°C. |
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2.1 MATERIALS (Cont'd)	.2	Epoxy for anchors:(Cont'd)
	.3	Acceptable materials: "Hilti" HIT-ICE/HIT-HY 150 or an approved alternate.

PART 3 - EXECUTION

3.1 DRILLING	.1	Drill for anchors using rotary drilling equipment or core drilling equipment, not with percussion equipment. Locate holes as shown on the drawings and do not damage stone masonry visually or structurally.
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.2	Rotary drilling is expected to be acceptable in most cases but, where this is expected to cause damage, diamond core drilling must be used.
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3.2 MASONRY ANCHORS	.1	Install anchors only as shown on drawings, and as directed by the Departmental Representative and in strict conformance with epoxy manufacturer's recommendations.
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.2	Epoxy to be installed deep in holes by power mixing gun or as per manufacturer's recommendations.
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.3	Embedment depths are to be as shown on the drawings.
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.4	Length of anchors vary in length. Cut rebars as required, and/or to lengths shown on the drawings.
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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:
.1 Repointing of all 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 | Measurement Procedures: in accordance with Section 01 22 01. |
| | .2 | Work covered by this section will be paid for under payment items included in the Unit Price Table:
.1 Item No.4 - General Repointing: This item covers the work described in subsections 1.1.2.1 and 1.1.2.2.
.2 Item No.5 - Expansion Joint: This item covers the work described in subsection 1.1.2.3. |
| | .3 | Chipping and repointing of joints which surround dutchman and complete stone replacement units are covered in Section 04 43 07. |
| | .4 | Temporary enclosures and heating are included for payment under Section 01 56 00. |
| <u>1.3 RELATED WORK</u> | .1 | Section 01 35 29 - Health and Safety Requirements. |
-

- 1.3 RELATED WORK (Cont'd)
- .2 Section 01 56 00 - Temporary Barriers and Enclosures.
 - .3 Section 04 43 05 - Masonry Removals.
 - .4 Section 04 43 07 - Installation of Masonry.
- 1.4 QUALIFICATIONS
- .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.
- 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
-

1.7 INSPECTION AND TESTING
(Cont'd)

- .2 (Cont'd)
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.

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
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1.10 ENVIRONMENTAL .3
REQUIREMENTS
(Cont'd)

(Cont'd)
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 .1
CONDITION

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.

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 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 stones.
 - .2 Rake all joints to 75 mm depth 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.
-

- 3.2 REPOINTING
(Cont'd)
- .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.
 - .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.
-

3.5 EXPANSION JOINT .3 Prepare all surfaces as required to ensure a
(Cont'd) proper bond between the sealant and stone/or
 concrete surface.

PART 1 - GENERAL

- 1.1 DESCRIPTION
- .1 Individual stones which have been designated for repairs either by dutchman or full stone replacement are identified on the drawings.
 - .2 Removals shall be completed with great care to prevent damage to the adjacent stones to remain.
- 1.2 RELATED WORK
- .1 Section 01 35 29 - Health and Safety Requirements.
 - .2 Section 04 43 04 - Repointing Stone Masonry.
 - .3 Section 04 43 06 - Cut Stone.
 - .4 Section 04 43 07 - Installation of Masonry.
- 1.3 MEASUREMENT AND PAYMENT AND PROCEDURES
- .1 Measurement Procedures: in accordance with Section 01 22 01.
 - .2 Work covered by this section will be paid for under payment item included in the Unit Price Table:
 - .1 Item No.6 - Stone Masonry Removals: This item covers the work described in subsection 1.1.1.
 - .3 The volume shall be the face area, including adjacent joint thickness, times the average depth of removal. The Contractor and the Departmental Representative shall together make measurements of the depth of removal to establish the average depth.
-

PART 2 - PRODUCTS

2.1 NOT USED .1 Not used.

PART 3 - EXECUTION

3.1 INSPECTION .1 Record and report, to the Departmental Representative, site conditions not described in Contract.

3.2 SUPPORT .1 Construct shoring and bracing, and other temporary framing and stabilization work, which is needed to support the structure, or parts of it, during removal operations.

3.3 REMOVAL OF STONE FACES FOR DUTCHMAN REPAIR .1 Sawcut perimeter of dutchman area minimum 75 mm deep.

.2 Carefully break out stone face by approved methods, such hand-held chipper hammers, and so as to do no damage to adjacent stones to remain.

.3 Departmental Representative approval, increase depth of stone removal beyond that shown on the drawings if the substrate is still unsound and deteriorated.

.4 Complete removal so as to produce a "neat" squared opening to receive the Dutchman replacement face unit.

.5 Refer to general notes shown on the drawings for further guidance.

3.4 REMOVAL OF FULL STONES .1 Sawcut mortar around the perimeter of the stone to be removed minimum 75 mm deep.

.2 Carefully break out stone by approved methods, such hand-held chipper hammers, and so as to do no damage to adjacent stones to remain.

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| 3.4 REMOVAL OF
FULL STONES
(Cont'd) | .3 | Excavate concrete backing/base approximately
25 mm. |
| | .4 | Cut and remove any existing anchors found. |

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 The work of this section covers the requirements for the supply, delivery and cutting of new stones to be used for dutchman repairs and stone replacement on this project.
- .1 Dutchman Stone: Stones located in the downstream pilasters of the lock.
- .2 Lock Wall Stone: Full stones identified to be replaced on the chamber walls.
- .3 Coping stones: Horizontal laid stones located on the walking surfaces of the lock.
- 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.7a - Dutchman Stone Supply
- .2 Item No.7b - Lock Wall Stone Supply
- .3 Item No.7c - Coping Stone Supply
- .3 Measurement will be taken as equal to the actual finished stone dimensions prior to placement which is subsequently installed.
- 1.3 RELATED WORK .1 Section 01 35 29 - Health and Safety Requirements.
- .2 Section 04 43 04 - Repointing Stone Masonry.
- .3 Section 04 43 05 - Masonry Removal.
- .4 Section 04 43 07 - Installation of Masonry.
- 1.4 REFERENCE .1 ASTM C616-10 - Standard Specification for Quartz-Based Dimension Stone.
- 1.5 SAMPLES .1 Samples shall be sufficient in size to demonstrate all finishes and profiles and shall be clearly marked as to location of quarry of origin and the supplier(s). Samples which are approved may be incorporated in the
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| 1.5 SAMPLES
(Cont'd) | .1 | (Cont'd)
work provided that they match all dimensions of stones scheduled as being replaced. |
| | .2 | Acceptability of the source of stone will also be determined by the weathered colour of the stone. Samples should include weathered examples. |

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| 1.6 DELIVERY AND
STORAGE | .1 | Deliver, store and handle cut stone in a manner to prevent damage, adulteration, deterioration and soiling in accordance with the manufacturer's written instructions. |
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PART 2 - PRODUCTS

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| 2.1 MATERIALS | .1 | New finished stone masonry supplied from quarry must be Quartzitic Sandstone to ASTM C616-10, Classification II, colour pitch and texture to match existing, with following physical requirements:
.1 A minimum of 90% free silica content;
.2 A maximum of 3% absorption;
.3 A minimum of 69 MPa compressive strength, taken in the weakest direction;
.4 A minimum of 6.9 MPa modulus of rupture. |
| | .2 | Samples submitted for acceptance will be required. There may be variations in colour within each quarry and not all stone from each quarry will be acceptable. |
| | .3 | The sandstone must be free of seams, cracks or other imperfections that would impair its structural integrity. |

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| 2.2 CUTTING | .1 | Cut stone to shape and dimensions and full to square with jointing to match existing. Dress exposed faces true. Cut stone to lay in a horizontal plane on its natural quarry bed and to an accuracy of 3 mm. |
| | .2 | Make beds and joints to match adjacent masonry and at right angles to face. When installed stone beds must be horizontal. |
| | .3 | Where applicable, cut stones for support systems. Provide holes to suit special lifting |

3.1 GENERAL

- .1 Early in the project, install approved access and inspect the masonry with the Departmental Representative to confirm as near as possible, the extent of stone replacement required, as shown on drawings. Supply replacement stones by number and size based on this delineation.
- .2 Supply stones to the site and protect from damage. Cut stones as required to match existing and to CSA S304.1-04 (R2010).
- .3 All face finishing debris and end cut-offs which are not used shall be removed from the site.
- .4 Cut all stones to match existing coursing.
- .5 Score sawn faces as shown on drawings.

3.2 SETTING

- .1 Clean stone exposed surfaces by washing with stiff fibre brush and water.
- .2 Drench dry stones to refusal by spraying with clean water just before setting.

- 3.3 STONE SUPPLY .1 As part of this Contract, review the work to establish the actual quantity required to finalize the supply and minimize over-supply and losses. Be responsible for acceptance of the supplied and finished stone.

PART 1 - GENERAL

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| <u>1.1 DESCRIPTION</u> | .1 | Work of this section includes, but is not limited to:
.1 Installation of stone masonry (Dutchman Repairs) on the lower right and left gate pilasters.
.2 Installation of stones masonry on the lock wall.
.3 Installation of stones on the coping (horizontal surfaces).
.4 New stone shall be used unless otherwise approved by the Departmental Representative. |
| | .2 | In general, stone installation shall replicate the "original" installation in terms of unit "squareness," matching thickness to adjacent or standard units, level and, square to level. Variance from this will only be permitted as directed by the Departmental Representative. |
| <u>1.2 MEASUREMENT AND PAYMENT PROCEDURES</u> | .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.8a - Dutchman Repairs: This item covers the work described in subsection 1.1.1.1.
.2 Item No.8b -Lock Wall Stone Installation: This item covers the work described in subsection 1.1.1.2.
.3 Item No.8c - Coping Stone Installation : This item covers the work described in subsection 1.1.1.3. |
| | .3 | Payment at the unit prices bid for the above items shall be full compensation for all labour, equipment and materials necessary to do the work of these items in accordance with the Contract drawings and these specifications including:
.1 Placing of up to 50 mm of grout to fill the voids behind the stone units.
.2 Placing of the stone units.
.3 Pointing of joints around the stone units.
.4 The unit price shall also include the cost of supply and installation of grout. |

1.2 MEASUREMENT AND PAYMENT PROCEDURES (Cont'd) .4 Temporary enclosures and heating are included for payment under Section 01 56 00.

1.3 RELATED WORK .1 Section 04 43 02 - Masonry Accessories
.2 Section 04 43 04 - Repointing Stone Masonry
.3 Section 04 43 06 - Cut Stone
.4 Section 04 43 05 - Masonry Removals

1.4 STANDARDS .1 All masonry restoration to be to CSA A371-04, "Masonry Construction for Buildings" and as augmented by these specifications.
.2 "Connectors for Masonry" to be in accordance with CSA A370-04 and as augmented by these specifications and the contract drawings.
.3 "Mortar and Grout for Unit Masonry" to be in accordance with CSA A179-04(R2009) and as augmented by these specifications.
.4 All work to be performed by skilled tradespersons, experienced in the type of work specified.
.5 All work to be supervised by skilled and experienced tradespersons in the type of work specified. The work of this section shall be executed under the continuous supervision and direction of a competent mason.

1.5 PRECAUTIONS .1 Move and lift stone units using means to prevent dropping or sudden impacts. Stone units, dropped or impacted, are to be reviewed by the Departmental Representative and approved before installation. Do not make holes or indentations, for lifting devices, on face or top side of stone.

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| <u>1.6 PROTECTION</u> | .1 | Protect adjacent stones from markings or damage due to work. |
| | .2 | Provide temporary support for masonry work during erection until permanent structure provides adequate support. |

PART 2 - PRODUCTS

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| <u>2.1 CUT STONE</u> | .1 | Supply cut stone in accordance with Section 04 43 06, Cut Stone. Dress face of cut stone, as shown on drawings, to match existing stonework, after unit is roughly sized to opening. |
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| <u>2.2 GROUT BEHIND STONE</u> | .1 | Proportion grout mix to comply with the following requirements:
.1 28 day compressive strength: 20-25 MPa;
.2 Maximum water/cement ratio 0.6;
.3 White portland cement type GU;
.4 Naphthalene sulfonate superplasticizer.
.5 Do not use expanding or shrinkage compensating agents. |
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| <u>2.3 MORTAR MIX FORMULA</u> | .1 | Masonry mortar for all jointing and bedding finished stone masonry: to Section 04 43 04. |
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PART 3 - EXECUTION

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| <u>3.1 CUTTING/SIZING OF STONE</u> | .1 | Use calipers, squares and levels to measure opening for new stone. Allow for mortar joints to match existing or, as directed by the Departmental Representative, around the stone perimeter. In the case of dutchman repairs, the space between the back of the new stone units and face of existing shall be nominally 25 mm to 50 mm (this space to be filled with grout). |
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| <u>3.2 MOVING STONES</u> | .1 | Use lifting devices, requiring drilling of the stones, on sides of stones only. |
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3.3 NEW STONE
INSTALLATION

- .1 Clean stone by washing with water and natural fibre brush before laying. Stone should not be dry at time of placing.
- .2 All stones shall be placed with the bedding planes horizontal unless, for a specific stone, the Departmental Representative directs otherwise.
- .3 Dampen surfaces of slot and apply mortar to stone perimeter.
- .4 Where there is more than one course of stone replacement, lay successive stone courses only after mortar in courses below has hardened sufficiently to support weight.
- .5 Prop and anchor stones until mortar has set.
- .6 Set large stones on water soaked hardwood wedges to support stone in proper alignment until mortar has set. Remove wedges when dry, do not break off. The use of stone wedges is not permitted.
- .7 Remove mortar droppings from face of stone before mortar is set. Sponge stone free of mortar as work progresses.
- .8 Set stones plumb, true, level in full bed of mortar with vertical joints flushed full except where otherwise specified. Completely fill anchor, dowel and lifting holes.
- .9 Install injection and venting ports for grouting behind each replaced stone.
- .10 Completely backfill the voids behind replaced stone and surrounding stones with grout.

3.4 FILLING
JOINTS/POINTING

- .1 Fill joints and point: in accordance with Section 04 43 04 "Repointing Stone Masonry".
- .2 Moist cure new mortar for 3 days.
- .3 Heating requirements for cold-weather protection is to be in accordance with Section 04 43 04 - Repointing Stone Masonry.

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Lock 13 Upgrades	MASONRY	Page 5
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PART 1 - GENERAL

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|-----------------------------------------------|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>1.1 DESCRIPTION</u> | .1 | This section specifies requirements for anchors required to complete concrete work related to pit construction and refacing of breastwall. |
| | .2 | Work covered by this section includes drilling holes and supplying and installing anchors, including grouting, as indicated on drawings and in specifications. |
| | .3 | Anchors required for the quoin and sill reconstruction are not covered by this section. |
| <u>1.2 MEASUREMENT AND PAYMENT PROCEDURES</u> | .1 | Measurement Procedures: in accordance with Section 01 22 01. |
| | .2 | Work covered by this section will be paid for under payment item included in the Unit Price Table: <ul style="list-style-type: none"> .1 Item No.9a - Anchor Dowels. .2 Item No.9b - Anchor Type B |
| | .3 | Payment for Anchors includes drilling hole in concrete base material; supplying and placing anchor bars, plates, nuts, etc; and supplying and placing the anchor grout. |
| | .4 | Housing and heating: to Section 01 56 00 and are not included in the unit price for each anchor. |

PART 2 - PRODUCTS

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|------------------------------|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>2.1 MATERIALS-GENERAL</u> | .1 | Use materials approved by the Departmental Representative. |
| <u>2.2 ANCHOR DOWELS</u> | .1 | Galvanized, billet steel, grade 400 deformed bars to CAN/CSA G30.18-09 (R2014). |
| | .2 | Epoxy for anchors shall be a hybrid adhesive consisting of a methacrylate resin, hardener, cement and water. It shall be formulated for fast curing and installation in a wide range |
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- 2.2 ANCHOR DOWELS (Cont'd) .2 (Cont'd)
of solid base material temperatures from +40°C to -23°C. Acceptable product is "Hilti" HIT-ICE/HIT-HY 150 or an approved alternate.
- .3 Size and location:
.1 20M bars, straight bar or standard hook.
- .4 Refer to drawings for minimum specified embedment depth.

- 2.3 ANCHOR TYPE B .1 Solid rock and concrete anchors.
- .2 Pre-stressable mechanical expansion anchor and steel bar, threaded as required.
- .3 Steel plates to ASTM A36/A36M
- .4 Location, capacity, diameter
.1 Refacing of breastwall, guaranteed ultimate tensile strength 160 kN; nominal diameter 19 mm.

PART 3 - EXECUTION

- 3.1 ANCHOR DOWELS .1 Except as specified in this section, install to the epoxy grout manufacturer's recommendations.
- .2 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 Drilled holes must be completely filled with epoxy grout.

- 3.2 ANCHOR TYPE B .1 Drill holes using manufacturer's recommended drill size, to extend 200 mm beyond length of anchor.
- .2 Clean hole thoroughly of dust and debris.
- .3 Install anchor in accordance with manufacturer's specifications.
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- 3.2 ANCHOR TYPE B (Cont'd)
- .4 At appropriate stage, grout with anchor grout through grout tube until a continuous flow of grout starts coming out of the de-air tube. Refer to Section 04 43 07 - Installation of stone masonry for grout mix.
- .5 Install accessory plates and nuts as shown on the drawings.
- 3.2 MANUFACTURERS' SPECIFICATIONS
- .1 Keep a manual of epoxy grout manufacturer's specifications and installation procedures at the work site.

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 This section includes the design, fabrication, supply, installation and testing for lower lock gates 1 and 2 complete with related accessories including the pintle assembly, top anchorage system, gate fenders, sealing blocks, embedded parts, sill nosing angle, and anchors for embedded parts.
- .2 Design, fabricate, deliver and erect gates at the site in accordance with the loads and standards specified in these specifications.
- 1.2 RELATED WORK .1 Section 03 30 00 - Cast-in-Place Concrete.
- .2 Section 05 50 00 - Metal Fabrications.
- .3 Section 09 97 15 - Painting Steel Surfaces.
- 1.3 MEASUREMENT PROCEDURES .1 There will be no measurement under this section.
- .2 Payment of Structural Steel Gates will be included in Lump Sum Price.
- .3 All other work including radiographic examination of approved shop splices, additional field splices necessary for completion of work of this section and grouting under top anchorage assemblies will not be measured separately for payment but will be considered incidental to work of this section.
- 1.4 REFERENCES .1 American Society for Testing and Materials (ASTM):
- .1 ASTM A27/27M-13, Standard Specification for Steel Castings, Carbon, for General Application.
- .2 ASTM A29/A 29M-05 Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought.
- .3 ASTM A217/A217M-14 Standard Specification for Steel Coasting, Martensitic Stainless and Alloy for Pressure-Containing Parts, Suitable for High-Temperature Service.
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1.4 REFERENCES (Cont'd)

- .1 (Cont'd)
 - .4 ASTM A325M-14, Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength.
 - .5 ASTM A 489-04-E04, Standard Specification for Carbon Steel Lifting Eyes.
 - .6 ASTM B22-15, Standard Specification for Bronze Castings for Bridges and Turntables.
 - .7 ASTM B505/B505M-14 Standard Specification for Copper Alloy Continuous Castings.
- .2 American Society for Mechanical Engineers (ASME):
 - .1 ASME B1.1-2003 Unified Screw Threads.
 - .2 ASME B1.3-2007 Screw Thread Gaging Systems for Acceptability: Inch and Metric Screw Threads (UN, UNR, UNJ, M and MJ).
 - .3 ASME B1.15-1995 Unified Screw Threads (UNJ Threadform).
 - .4 ASME B4.1 (1967; R 2004) Preferred Limits and Fits for Cylindrical Parts.
 - .5 ASME B18.22M (2005) Metric Plain Washers.
 - .6 ASME B46.1-2002 Surface Texture (Surface Roughness, Waviness, and Lay).
- .3 Canadian Standards Association:
 - .1 CAN/CSA-B651-04, Accessible Design for the Built Environment.
 - .2 CAN/CSA-G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel.
 - .3 CSA-S16-14, Design of Steel Structures.
 - .4 CSA S269.1-1975 (R2003), Falsework for Construction Purposes.
 - .5 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
 - .6 CSA W59-13, Welded Steel Construction (Metal Arc Welding).
- .4 Society of Automotive Engineers.
 - .1 SAE AS8879 Screw Threads - UNJ Profile, Inch Controlled Radius Root with Increased Minor Diameter.

1.5 SOURCE QUALITY CONTROL

- .1 Contractor responsible for quality control in accordance with Section 01 45 01 - Quality Assurance.
 - .2 Keep on file all purchase orders, invoices, suppliers' test certificates and documentation
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| 1.5 SOURCE QUALITY CONTROL
(Cont'd) | .2 | (Cont'd)
proving material meets requirements of specification. |
| | .3 | Be prepared to produce above documentation upon request of Departmental Representative. |
| | .4 | Retain representative samples of material used and supply to Departmental Representative for testing if required. |
| 1.6 DRAWINGS | .1 | Drawings showing steel lock gates details are not intended to be shop drawings or working drawings. They are provided for guidance only and do not constitute final design. Sizes and arrangements shown are only intended to illustrate feasible engineering solution to meet requirements of this specification. |
| | .2 | Do not design pintle assembly, gudgeon assembly and top hinge assembly. Fabricate as indicated. |
| 1.7 DESIGN CRITERIA | .1 | Design steel lock gates in accordance with requirements of CAN/CSA-S16 to resist forces, moments, shears and allow for movements indicated unless specified otherwise. |
| | .2 | Live Load:
.1 Gates to be designed for hydrostatic pressure based on hydrostatic head of 6.4 m above sill level and an ice load of 75 kN/m of gate width acting at winter water level. Use load factor of 1.3 for winter conditions (ice loads and hydrostatic pressure) and load factor of 1.5 for summer conditions (hydrostatic pressure only).
.2 Gate hydraulic cylinder actuator exerting maximum unfactored operating torque of 90 kN.m. on gate leaf hinge.
.3 Gate valve hydraulic cylinder exerting a maximum unfactored operating force of 80 kN.
.4 In addition design gates for other loads specified in CAN/CSA-S16. |
| | .3 | Welded connections: design in accordance with CSA W59. |
| | .4 | Use factor of safety of 5 on ultimate breaking stress for material not having established stress levels. |
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| 1.7 DESIGN CRITERIA | .5 | Minimum thickness of stress carrying members: |
| (Cont'd) | | 8 mm. |
| | .6 | Maintain same number of beams as shown on drawings. |
| | .7 | Pintle and top hinge anchorage details to be designed to permit field adjustment during erection and easy servicing and replacement of parts. Top hinge anchorages to be capable of transmitting to concrete reactions of dead load of gate in any position and operating force from hydraulic cylinder. |
| | .1 | Provide for lubricating top hinge and pintle with grease gun. Piping for grease lines to be stainless steel and fittings to be button head type. |
| 1.8 SUPPLIERS QUALIFICATIONS | .1 | Design, preparation of shop drawings and fabrication to be carried out by technical personnel with extensive experience in this type of work. |
| | .2 | Design, supply, fabrication and installation of work in this section to be done by only one supplier qualified in accordance with requirements of CSA W47.1-1992 Division 1 or 2.1, and be certified to CSA CAN3-Z299.3-1985 "Qualified assurance program-category 3" or equivalent, in addition to requirements specified herein, and supply Departmental Representative one (1) controlled copy of companies QA manual. |
| | .3 | Supplier of gates to coordinate design, supply, installation and testing of complete gates and operating equipment including embedded parts and anchors. |
| 1.9 SUBMITALS | .1 | Submittals to be in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 | Shop drawings, erection drawings and erection procedures to bear signature and stamp of qualified professional engineer registered or licensed in Ontario, Canada. |
| | .3 | Shop Drawings: |
| | .1 | Indicate shop and erection details including shop splices, cuts, copes, |
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1.9 SUBMITALS
(Cont'd)

- .3 Shop Drawings:(Cont'd)
 - .1 (Cont'd)
connections, holes, bearing plates, threaded fasteners, rivets and welds.
 - .2 Indicate welds by CSA W59, welding symbols.
- .4 Proposed welding procedures to be stamped and approved by Canadian Welding Bureau.
- .5 Submit method for supporting and transporting fabricated components to prevent distortion during shipping and handling.
- .6 Submit erection procedures with description of methods, temporary bracing and strengthening, sequence of erection, lifting points and type of equipment proposed for use in erecting steel lock gates.
 - .1 This submission or its approval does not relieve contractor of responsibility for providing proper methods, equipment, workmanship and safety precautions.
 - .2 Describe measures to protect existing components and structures.
 - .3 Include description of proposed methods and equipment to:
 - .1 Protect existing components and structures.
 - .2 Verify elevations.
 - .3 Ensure vertical and horizontal alignment before field boring.
 - .4 Adjust pintle assembly and top hinge assembly.
 - .5 Test operation of gates.
- .7 Falsework drawings submitted to bear signature and stamp of qualified professional engineer registered or licensed in province of Ontario, Canada.
- .8 Quality Control: Submit quality control testing reports.
- .9 Certifications: Submit certificates, signed by manufacturer, certifying material comply with specified performance characteristics and physical properties.
- .10 Submit manufacturer's literature on proposed epoxy resin filler.

1.10 DELIVERY,
STORAGE, AND
HANDLING

- .1 Exercise care to protect gates, assemblies and materials from damage during fabrication, delivery, storage, handling and erection.
- .2 Provide protective blocking for lifting, transportation and storing gates, assemblies and materials.
- .3 Do not notch edges of members.
- .4 Do not cause excessive stresses.
- .5 Mark mass on members and assemblies delivered to site weighing more than 3 tonnes.
- .6 Mark containers with weight.
- .7 Ensure no portion of steel comes into contact with ground.
- .8 Protect threads during shipping and handling.
- .9 Provide Departmental Representative with delivery schedules minimum 7 days before shipping.
- .10 Deliver and store spare sparts as directed by Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Structural steel: to CAN/CSA-G40.21, grade and types specified below:
 - .1 WWF Sections: Grade 350WT with Charpy V-Notch to Category 3, minimum absorbed energy 27 Joules at -30°C.
 - .2 HSS Sections: Grade 350W.
 - .3 Plates: Grade 350WT with Charpy V-Notch to Category 3, minimum absorbed energy 27 Joules at -30°C. existing.
 - .4 Other structural steel shapes: Grade 350W.
- .2 Pintle assembly:
 - .1 Comprised of spherical bronze bushing within steel heel casting on top of steel pintle.
 - .2 Pintle is held in place on steel base with lower lock plate.
 - .3 Steel base plate to be field welded, after final alignment, to bed plate of base frame set into floor of gate recess.

2.1 MATERIALS
(Cont'd)

- .2 Pintle assembly:(Cont'd)
 - .4 Steel heel casting and spherical bronze bushing are locked in place with upper lock plate.
- .3 Top Hinge Assembly:
 - .1 Steel gudgeon pin and bronze gudgeon bearing fitted into bracket field welded to jacket.
 - .2 Two adjustable connecting links are connected at gudgeon pin to top of gate and to embedded anchors in anchorage pit. One runs parallel to lock wall and one runs perpendicular to lock wall.
 - .3 Gudgeon is locked in place with gudgeon keeper plate.
- .4 Guide roller assembly:
 - .1 Consists of two brackets mounted one on each gate at upper miter corner. One bracket carries roller and one carries roller track.
- .5 Forged steel Parts: ASTM A235 Class C.
- .6 Alloy steel parts: Ni-Cr-Mo to ASTM A29, Grade 4340 and properties indicated on drawings.
 - .1 Wall end bolt properties are different from other parts.
- .7 Pintle: steel casting to ASTM A217 Grade WC4.
- .8 Heel casting: steel casting to ASTM A27 Grade 60-30.
- .9 Heel bushing, upper hinge gudgeon bearing and shimming washers: Bronze continuous cast to ASTM B-505 or centrifugal cast to ASTM B 22.
- .10 Turnbuckle wrench: mild steel 350W structural steel to CSA G40.20/G40.21.
- .11 Temporary gudgeon pin: mild steel, sized to be inserted in un-bored bearing snugly under hand installation.
- .12 Lifting lug: to ASTM A 489.
- .13 Miter guide roller bushing: Bronze casting to ASTM B22 copper alloy UNS No. C90500.
- .14 Vertical contact bars: SAE 1040.

2.1 MATERIALS
(Cont'd)

- .15 Miter guide rollers and roller blocks:
 - .1 roller and block: SAE 1040 BHN 325.
 - .2 roller pin: SAE 3140.
 - .16 High strength bolts, nuts and washers: to ASTM A325M. Bolts to ASTM A490M may be used if approved by Departmental Representative.
 - .17 Anchor bolts, washers and nuts: to CAN/CSA-G40.21, grade 300W.
 - .18 Welding electrodes:
 - .1 To CSA W48 series.
 - .2 low hydrogen, ultimate strength 490 MPa minimum, suitable for joining AISI 4340 Allow Steel with 300 MPa hot rolled structural steel and provide high toughness for cyclically loaded structures.
 - .3 Submit weld procedure and electrode selection.
 - .19 Gate Bumper Anchors: 316L Stainless steel 12 mm diameter threaded rod, with nuts and plates, epoxy grouted.
 - .20 Gate Bumper: Neoprene pad.
 - .21 Seal: moulded rubber J-Seal along bottom of gates, 150 mm wide with 50 mm diameter bulb on one side, with 20 mm diameter hole. Material to be natural rubber with reinforcing, antioxidants, vulcanizing agents, and plasticizers and following properties:
 - .1 Tensile Strength: 17.2 MPa.
 - .2 Elongation at Failure: 400%
 - .3 Hardness("Shore" type "A"): 50-60
 - .4 Brittleness Temperature: -35° C. or less
 - .5 Ozone Resistance (2 days 50 pphm, 20% elongation): surface cracking=0
 - .6 Permanent Compressive Deformation: 30% maximum.
 - .7 Material and manufacturing process are subject to inspection and testing by Departmental Representative. Permit access as required. Supply report confirming compliance with properties listed for each batch of elastomer mix used. Departmental Representative to be present during testing. Notify Departmental Representative 3 weeks before testing. Demonstrate seals supplied have same properties as material tested. Only seals with equivalent properties and made from same batches tested will be accepted. Splices to be hot vulcanized with 45° cut across thickness and with both ends firmly held in
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2.1 MATERIALS (Cont'd)

- .21 Seal:(Cont'd)
.7 (Cont'd)
mould. Clamp bar and support angle to have 6 mm radii where they contact seal stem near bulb. An acceptable material manufacturer is Seals Unlimited or an approved alternate.
- .22 Neoprene strip at pintle: durometer hardness of 60.
- .23 Grease: Food Grade Machinery Lubricant. Acceptable materials: Lubriplate Super FML-2 or an approved alternate.
- .24 Anti-sieze compound: White Food Grade with PTFE. Acceptable materials: Bostik Never-Seez White Food Grade with PTFE or an approved alternate.
- .25 Poured epoxy resin filler to anchor contact bar.
.1 Acceptable materials: Chockfast Gray by ITW Philadelphia Resins (tel:519-650-1254) or an approved alternate.
- .26 Pipe handrail: salvage, prepare, paint and reinstall existing.
- .27 Step hardware: salvage, prepare, paint and reinstall existing.
- .28 Timber walkway: in accordance with Section 06 13 30 - Timber Lock Gates.
- .29 Paint:
.1 Weldable pre-primer: heat resistant primer such as Interplate Zero, Interplate 937, Interplate 997, or Interplate 855 by International Marine Coatings, or other product with similar characteristics.
.2 Primer: Recommended by manufacturer to be compatible with selected Alkyd topcoat.
.3 Alkyd: Exterior marine alkyd enamel to CAN/CGSB 1.61-2004.

2.2 SOURCE QUALITY CONTROL

- .1 Provide Departmental Representative, before fabrication, two copies of steel producer certificates, in accordance with CAN/CSA-G40.20.
 - .2 Provide Departmental Representative with two copies of certified test reports for Charpy V-notch tests.
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2.2 SOURCE QUALITY CONTROL (Cont'd) .3 Provide suitable facilities and cooperate with inspection organization and Departmental Representative in carrying out inspection and tests required.

PART 3 - EXECUTION

3.1 GENERAL .1 Design gates, gate components, connections and embedded parts in accordance with these specifications.

.2 Do fabrication and erection of structural steel in accordance with CAN/CSA-S16 Limit State Design of Steel Structures.

.3 Fabricate gates in shop before shipping to site.

.4 Install and adjust gates in operating position.

.5 Attach to hydraulic cylinder mechanism.

.6 Test gate operation under simulation of worst operating conditions.

.7 Gates to be water tight and free of leakage when subjected to operating heads.

.8 Provide instruction to maintenance and operating personnel on site and provide a standby service for one navigation season (5 months).

3.2 FABRICATION GENERAL .1 Gates: assemble gates by welding in planned sequence to minimize warping and imbalanced residual stresses. Establish geometry of shop clearances to ensure ample field adjustment space for installation to required lines.

.2 Embedded parts and anchors: fabricate well before required date of installation in concrete forms.

.3 Pintle and top hinge assembly:

.1 fabricate and test fit to gates in shop to make sure fit is adequate and minimize field work.

.2 Match mark pre-assemblies to ease field fit up.

- | | |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.2 FABRICATION
GENERAL
(Cont'd) | <p>.3 Pintle and top hinge assembly:(Cont'd)</p> <p>.3 Provide for lubrication of pintle and top hinge assembly with grease gun from coping level.</p> <p>.4 Hydraulic cylinder mechanisms: Shop fit components to gate to minimise field work.</p> <p>.5 Timber walkway: Shop fit timber walkway to top of gates to verify proper fit before field assembly.</p> <p>.6 Shop paint gates in accordance with Section 09 97 15 - Painting Steel Surfaces.</p> |
| 3.3 FORGING OR
MACHINING ALLOY
PARTS | <p>.1 Alloy steel parts to be either forged or machined from solid.</p> <p>.2 If electing to fabricate by forging:</p> <p>.1 Provide Forging Plan to ASTM A668 S14.</p> <p>.2 Tension test forged pieces to ASTM A688.</p> <p>.3 Inspect rough forgings ultrasonically to ASTM A388 with acceptance criteria to ASTM A788 S18.</p> <p>.4 Do not repair by welding.</p> <p>.5 After finish machining, test threads and pin holes via magnetic particle testing to ASTM A275.</p> <p>.6 Submit Quality Control test results to Departmental Representative.</p> <p>.7 Departmental Representative will undertake random Quality Assurance tests in accordance with Section 01 45 01 - Quality Assurance.</p> <p>.3 If electing to fabricate by machining:</p> <p>.1 Parts to be machined from solid. No welding is permitted for fabrication.</p> <p>.2 Holes to be drilled. Flame cutting or punching are not permitted.</p> <p>.3 Departmental Representative will undertake random Quality Assurance tests. See Section 01 45 01 - Quality Assurance.</p> <p>.4 Note: On drawings gudgeon pin is shown oversized and bushing inner diameter is under-sized to allow for final field fit and finish.</p> <p>.5 Finished surfaces:</p> <p>.1 Required roughness heights indicated are maximum arithmetical averages.</p> |
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3.3 FORGING OR
MACHINING ALLOY
PARTS
(Cont'd)

- .5 Finished surfaces:(Cont'd)
 - .2 Provide roughness width and waviness height values consistent with specified roughness heights.
 - .3 Departmental Representative will reject parts with flaws such as scratches, ridges, holes, peaks, cracks, or checks will make part unsuitable for use in cyclic loading application.
 - .4 Coat finished surfaces with oil immediately after finalizing surface.
 - .6 Unfinished surfaces:
 - .1 True to lines shown on drawings and ground free of burrs, chips, rough spots.
 - .7 General acceptance criteria:
 - .1 Dimensions within specified tolerance.
 - .2 Materials conform to specified.
 - .3 Fabrication technique conforms to specified.
 - .4 Parts are free from fabrication defects.
 - .8 Gate end rods and wall end rods:
 - .1 Threading: UNJ threadform with controlled root radius. Minimum value shown on drawings.
 - .2 Left and right hand threads in locations shown on drawings.
 - .3 Holes: bored true to gauges, smooth, straight, at right angles to axis of member.
 - .4 Quality control testing:
 - .1 Dimensional checks;
 - .2 Magnetic particle or dye penetrant test entire eyelet bar. Take photographs to show condition.
 - .3 Provide written test report.
 - .9 Turnbuckle nuts and jam nuts:
 - .1 Fabricate as indicated.
 - .2 Commercially available off-the shelf turnbuckle nuts and jam nuts may be substituted for fabricated ones only if yield and ultimate tensile strengths of off-the-shelf materials meet or exceed those specified for 4340 steel.
 - .10 Gudgeon pin and bearing:
 - .1 Drawings show dimensions ready for field installation and alignment boring of bearing.
 - .2 Gudgeon pin will have to be turned down to size achieved via alignment boring before final installation.
 - .3 Roughness as noted on drawing.
-

3.4 FABRICATE TOP HINGE ASSEMBLY

- .1 Fabricate top hinge assembly in shop and prepare components for shipping to site.
- .2 Interlace inside and outside gate end rod eyelets and set to exact angle for each gate.
 - .1 Provide alignment mark with fine point waterproof marker or paint pen. Do not punch metal.
- .3 Shrink-fit bearing inside eyelets and align grease grooves into correct position.
- .4 Lubricate threads on eyelets with anti-seize compound.
- .5 Remove and store hex head set screw plugs from turnbuckle nut.
- .6 Assemble connecting links with gate end rod, wall end rod, turnbuckle nut and turnbuckle jam nuts.
- .7 Do not tighten jam nuts.
- .8 Set each connecting link length to length as measured in field for each gate.
- .9 Adjust so turnbuckle nut is engaged on an equal amount of threads on both sides.
- .10 Make match-marks with fine point waterproof marker or paint pen. Do not punch metal.
- .11 Install hex head set screw plugs in turnbuckle.
- .12 Wrap entire length between eyelets with bubble wrap or cardboard or otherwise protect.
- .13 Cover top and bottom of bearing with cardboard or bubble wrap to keep dirt and debris out.
- .14 Label each sub assembly with number of gate it is to be attached to and ship to site.
- .15 Be responsible for security in transit and until final installation on site.

3.5 ERECTION

- .1 Before erection of structural steel, verify location and elevations of concrete and embedded parts. Immediately report any discrepancies for proper placement of gate
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3.5 ERECTION
(Cont'd)

- .1 (Cont'd)
embeddded parts and anchors to Departmental Representative.
- .2 Erection sequence as follows:
 - .1 Set gates on pintles and ensure both pintle axes and top hinge anchorages are on same vertical axis.
 - .2 Fit vertical contact bars in field leaving clearance of no more than 0.25 mm at any point along height of contact bars.
 - .3 Align sill nose plate to ensure full contact with horizontal J-seal along bottom of gate. Ensure seal is uniformly compressed against sill nose angle along entire length of each gate (mimimum compression: 0.1 mm, maximum compression 6 mm).
- .3 Place concrete in sill after ensuring compression between gate seal and sill nose plate is within tolerances specified above.
- .4 Pour epoxy resin filler under contact bars in presence of technical product representative to ensure proper use of product. Provide heat and enclosure to meet temperature requirements of product during both pouring and curing stages. Pour in lifts as required to ensure complete filling.

3.6 EMBEDDED
ANCHORAGE ASSEMBLY

- .1 Ensure concrete surface prepared for installation of wall anchors.
- .2 Fabricate embedded anchor assembly.
- .2 Pre-prime embedded anchor assembly.
- .3 Install concrete anchors to attach embedded anchorage assembly to floor of anchorage pit as indicated and adjust embedded anchorage assembly to required elevation.
- .4 Install embedded anchor assembly by:
 - .1 Sliding top hinge assembly into place.
 - .2 Add or remove shims so connecting links are horizontal and at correct elevation with respect to embedded anchorage.
 - .3 Install temporary gudgeon pin.
- .5 Do alignment boring of final holes for wall end bolts through cheek straps, keeping these lined up with existing holes in wall end of

3.6 EMBEDDED
ANCHORAGE ASSEMBLY
(Cont'd)

- .5 (Cont'd)
wall end rods. This may require more than one
pass at increasing diameters.
- .1 Prime and paint anchor assembly.
- .2 Protect and do not paint other
components.
- .6 Install wall end pin complete with flat and
rocker washers (both UHMWPE) and plain round
steel washers. Apply Loctite or similar to
threads of nut and snug in place.

3.7 INSTALLATION

- .1 Welding: do welding in accordance with CSA
W59, except where specified otherwise.
- .2 High strength bolting: in accordance with
CAN/CSA-S16. Use 'turn-of-nut' tightening
method.
- .3 Finish: members true to line, free from
twists, bends, open joints, sharp corners and
sharp edges.
- .4 Shop splices:
 - .1 Use complete joint penetration groove
welds finished flush. Details of butt joints
to CSA W59. Use only as approved by
Departmental Representative.
- .5 Remove hex plugs from turnbuckle nuts before
installation and gate adjustment.
- .6 Setup for alignment boring of anchors and
measure to ensure verticality of bore.
- .7 Hone grease grooves to remove burrs. Vacuum
and wipe out all metal shavings from inside
hole.
- .8 Measure size of resulting hole in bearing and
determine final diameter of gudgeon pin to
provide specified clearance.
- .9 Machine gudgeon pin to required final
diameter.
- .10 Freeze gudgeon pin with dry ice and
immediately install.
- .11 Install gudgeon keeper plate, keeper bolts,
grease fitting and grease tubes.

3.8 ADJUSTMENT

- .1 Adjust gates only after components have acclimated to ambient temperature at least 12 hours after installation.
- .2 Add/remove bronze shimming washers to assure proper field alignment of hydraulic cylinder, connecting links and gudgeon.
- .3 Adjust top hinge assembly with gates under hydrostatic pressure.
 - .1 Contact bars at quoin should be taking full load under hydrostatic pressure.
 - .2 Connecting bars should be slack under hydrostatic pressure.
 - .3 Turn turnbuckle nuts just enough to take up slack in rods and no more.
 - .4 Remove hydrostatic pressure.

3.9 ADJUSTING GATES

- .1 Adjust gates in careful and controlled fashion in presence of Departmental Representative.
 - .2 Prevent over stressing of connecting links.
 - .1 Gates to be under hydrostatic pressure at all times from time when existing anchor bars are removed until all pins and fasteners are in place and tightened in new system.
 - .2 Process will require raising and lowering of water levels in lock and swinging of gates. These operations will be performed only by Site staff.
 - .3 Gates are set in pairs, either lower pair or upper pair.
 - .4 Adjusting starts after newly installed gudgeon anchors have warmed up minimum 12 hours after installation. Gates are under hydrostatic pressure. In this position, contact bars at quoin should be taking all load and gudgeon anchors should be slack. Turn turnbuckle nuts just enough to take up slack in rods, and no more.
 - .5 Remove hydrostatic pressure on gates.
 - .6 With assistance of diver in water and bosun's chair above water, measure and record quoin gap at no-head conditions on roughly at centre of each horizontal beam, from pintle to gudgeon. Acceptance criteria: gap should be greater than zero and less than 0.25 mm.
-

3.9 ADJUSTING GATES .7
(Cont'd)

- If gap is not sufficient then:
- .1 Open gate halfway between mitred and fully open, so position of gate exactly bisects angle between rods. In this position, rods will have equal tension.
 - .2 Loosen turnbuckle nuts very slightly, so as to lengthen rods by fractions of a millimeter. Loosen same amount on each turnbuckle. (Note: one full turn of turnbuckle nut will lengthen rods just over 6 mm)
 - .3 Close gate, apply head, measure gap again.
- .8 If gap is too large, then:
- .1 Mitre gates.
 - .2 Apply head.
 - .3 Tighten turnbuckle nut little more to take up fraction of millimeter more slack.
 - .4 Measure gap again.
- .9 Repeat filling, adjusting, emptying, adjusting, and measuring until proper gap has been achieved. This may require three or four iterations
- .10 Upon achievement of correct gap, then and
- .1 Snug jam nuts up hard against turnbuckle nut,
 - .2 Fill turnbuckle nut with anti-seize compound,
 - .3 Replace hex head set screw plugs in turnbuckle nut.
 - .4 Make match marks between turnbuckle nut and jam nuts with fine point paint pen.
- .11 Departmental Representative's inspection does not absolve Contractor of responsibility to ensure gates are in good condition and functional.

3.10 RAILING

- .1 Salvage existing timber walkway railing and deliver to shop for preparation and painting in accordance with Section 06 13 30 - Timber Lock Gates.
- .2 Test fit in shop before re-installing railing on site using new fasteners to secure railing to timber walkway.

- 3.11 MAINTENANCE
MANUAL
- .1 Two weeks before final testing of gates submit operation and maintenance data for operating and maintaining lock gates for incorporation into manual specified in Section 01 78 02 Operation and Maintenance Manual.
 - .2 Include following in each copy:
 - .1 Full description of operating procedures, recommended sequences and precautions under various conditions.
 - .2 Pertinent component leaflets, parts lists and installation instructions.
 - .3 Copy of main assembly drawings of gates and operating equipment with detailed drawings of parts expected to require inspection and maintenance.
 - .4 List of spare parts to be stocked to replace gaskets, seals, grease gun fittings, electrical components and other parts which are expected to require replacement within three years of contract completion.
 - .5 Mass of each gate.

PART 1 - GENERAL

- 1.1 DESCRIPTION
- .1 This section includes the design, fabrication, supply, installation and testing of two flow control sluice gates complete with frame, slide, guides and seals, compression cord, rising stem, couplings, mounting gaskets, bolts, stop collar, and other related accessories.
 - .2 Design, fabricate, deliver, and test sluices at the site in accordance with the loads and standards specified in these specifications.
- 1.2 RELATED WORK
- .1 Section 03 30 00 - Cast-in-Place Concrete.
 - .2 Section 05 50 00 - Metal Fabrications.
 - .3 Section 05 12 10 - Structural Steel Gates.
 - .4 Section 09 97 15 - Painting Steel Surfaces.
- 1.3 REFERENCES
- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A240 / A240M - 10, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - .2 ASTM D4020 - 05, Standard Specification for Ultra-High-Molecular-Weight Polyethylene Molding and Extrusion Materials.
 - .3 ASTM D2000 - 08, Standard Classification System for Rubber Products in Automotive Applications.
 - .4 ASTM A276 - 10, Standard Specification for Stainless Steel Bars and Shapes.
 - .5 ASTM F593-02 (R2008), Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - .6 ASTM F594-09, Standard Specification for Stainless Steel Nuts.
 - .7 ASTM D1056-07, Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
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- 1.3 REFERENCES .1 (Cont'd)
- (Cont'd)
- .8 ASTM D3935 - 09 Standard Specification for Polycarbonate (PC) Unfilled and Reinforced Material.
- .9 ASTM B584 - 09a, Standard Specification for Copper Alloy Sand Castings for General Applications.
- 1.4. GOVERNING STANDARDS .1 Except as modified or supplemented herein, all gates and operators shall conform to the applicable requirements of AWWA C561, latest edition.
- 1.5. QUALITY ASSURANCE
- .1 The manufacturer shall have experience in the production of substantially similar equipment, and shall show evidence of satisfactory operation in at least 50 installations. The manufacturer's shop welds, welding procedures and welders shall be qualified and certified in accordance with the requirement of the latest edition of ASME, Section IX.
- .2 Sluice Gates shall be shop inspected for proper operation before shipping.
- .3 The manufacturer shall be ISO 9001 : 2000 certified.
- 1.6 DRAWINGS
- .1 The drawings attached to these specifications showing the sluice gates, including stem and linkage to hydraulic cylinder, are not intended to be either shop or working drawings. They are provided for guidance only and do not constitute a final design. Sizes and arrangements shown are only intended to illustrate the type of sluice gate required to meet the requirements of this specification. Design sluice gate system to meeting the same requirements and supply and install the complete system.
-

1.7 DESIGN CRITERIA

- .1 Design sluice gates, details, stem, limit switch and hydraulic cylinder supports, and connections in accordance with requirements of CAN/CSA-S16-09 to resist forces, moments, shears and allow for movements indicated unless specified otherwise.
- .2 Live Load:
 - .1 Designed for hydrostatic pressure based on a hydrostatic head of 6.4 m above sill level and an ice load based on floating ice with intensity of 29 kN acting on the stem/cylinder.
 - .2 Sluice Gate hydraulic cylinder exerting a maximum unfactored operating force of 100 kN.
 - .3 In addition design sluice gates for other loads specified in CAN/CSA-S16.
- .3 Clear Valve Opening: 1524 mm long x 914 mm high.

1.8 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Each drawing submitted to bear signature and stamp of qualified professional engineer registered or licensed in Ontario, Canada.
- .3 The manufacturer shall submit for approval drawings showing the principal dimensions, general construction and materials used in the gate and lift mechanism.

1.9 MEASUREMENT
AND PAYMENT
PROCEDURES

- .1 There will be no measurement of Flow Control Sluice Gates.
 - .2 Payment of Flow Control Sluice Gates shall be included in the Lump Sum Price.
 - .3 All other work will not be measured separately for payment but will be considered incidental to the work of this section.
-

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Frame, sluice walls, stem guides, slide, stem extension: Stainless steel ASTM A-240 type 316L.
 - .2 Side seals, stem guide liner: Ultra high molecular weight polyethylene (UHMWPE) ASTM D-4020.
 - .3 Compression cord: Nitrile ASTM D2000 M6BG 708, A14, B14, E014, E034.
 - .4 Bottom seal: Neoprene ASTM D2000 Grade 2 BC 510.
 - .5 Fasteners: ASTM F593 and F594 GR2 for type 316.
 - .6 Gasket (between frame and Structural Steel Gate): EPDM ASTM 1056
 - .7 Lift nut, couplings: Manganese bronze ASTM B584 UNS-C86500.
 - .8 Acceptable product: Fontaine Industries Ltd (www.hfontaine.com), Series 20 Flow Control Sluice Gate, Model 204, or equal.
- 2.2 GENERAL DESIGN
- .1 Sluice Gates shall be non self-contained of the rising stem, with stem connected to hydraulic cylinder.
- 2.3 SLUICE WALLS
- .1 The walls shall be stainless steel and supplied by the gate manufacturer. Material thickness should be according to the manufacturer's recommendations and be of sufficient resistance to handle the operating forces.
- 2.4 FRAME
- .1 The sluice gate frame shall be constructed of structural members or formed plate welded to form a rigid one-piece frame. The frame shall be of the flange back design suitable for mounting on a standard flange (SF) of the
-

2.4 FRAME
(Cont'd)

- .1 (Cont'd)
Structural Steel Gate. The guide slot shall be made of UHMWPE (ultra high molecular weight polyethylene).
- .2 The frame configuration shall be of the flush-bottom type and shall allow the replacement of the top and side seals without removing the gate frame from the Structural Steel Gate.

2.5 SLIDE

- .1 The slide shall consist of a flat plate reinforced with formed plates or structural members to limit its deflection to 1/720 of the sluice gate's span under the design head.

2.6 GUIDES AND
SEALS

- .1 The guides shall be made of UHMWPE (ultra high molecular weight polyethylene) and shall be of such length as to retain and support at least two thirds (2/3) of the vertical height of the slide in the fully open position.
 - .2 Side and top seals shall be made of UHMWPE (ultra high molecular weight polyethylene) of the self-adjusting type. A continuous compression cord shall ensure contact between the UHMWPE guide and the gate in all positions. The sealing system shall maintain efficient sealing in any position of the slide and allow the water to flow only in the opened part of the gate.
 - .3 The bottom seal shall be made of resilient neoprene set into the bottom member of the frame and shall form a flush-bottom.
-

2.7 STEM

- .1 The operating stem shall be of stainless steel. Stem shall be capable of resisting a design force not be less than 1.25 times the output thrust of the hydraulic cylinder with a pressure equal to the maximum working pressure of the supply.
- .2 The stem shall have a slenderness ratio (L/r) less than 200.
- .3 For stems in more than one piece and with a diameter of 45 mm and larger, the different sections shall be joined together by solid bronze couplings. Stems with a diameter smaller than 45 mm shall be pinned to an extension tube.
- .4 The couplings shall be grooved and keyed and shall be of greater strength than the stem.
- .5 STEM GUIDES: Stem guides shall be fabricated from type 316L stainless steel. The guide shall be equipped with an UHMWPE bushing. Guides shall be adjustable and spaced in accordance with the manufacturer's recommendation. The L/r ratio shall not be greater than 200.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Sluice Gates and appurtenances shall be handled and installed in accordance with the manufacturer's recommendations.

3.2 FIELD TESTS

- .1 Following the completion of each sluice gate installation, the sluice gates shall be operated through at least 10 (ten) complete open/close cycles. Limit switches shall be adjusted following the manufacturer's instructions.
 - .2 Sluice Gates shall be checked for leakage by the contractor (refer to the "Performance" section for approval criteria).
-

3.3 LEAKAGE

- .1 Sluice gates shall be substantially watertight under the design head conditions. Under the design seating head, the leakage shall not exceed 0.60 l/min per meter of seating perimeter. Under the design unseating head, the leakage for heads of 6 m or less shall not exceed 1.25 l/min per meter of perimeter. For unseating heads greater than 6 m, the allowable leakage shall not exceed the rate per meter of perimeter specified by the following equations:
- .1 Maximum allowable leakage in Liters per minute per meter of perimeter : $= 1.25 + (0.1025 \times (\text{unseating head in meters} - 6.1))$

3.4 MAINTENANCE
MANUAL

- .1 Two weeks before final testing of the sluice gates submit operation and maintenance data for operating and maintaining the sluice gates for incorporation into manual specified in Section 01 78 02 Operation and Maintenance Manual.
- .2 Include the following in each copy: 1) a full description of operating procedures, recommended sequences and precautions under various conditions. 2) all pertinent component leaflets, parts lists and installation instructions. 3) a copy of the main assembly drawings of the sluice gates and operating equipment with detailed drawings of parts expected to require inspection and maintenance. 4) a list of spare parts which must be stocked to replace seals, and other parts which are expected to require replacement within three years of contract completion. 5) the mass of each sluice gate.

PART 1 - GENERAL

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|--------------------------------|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>1.1 DESCRIPTION</u> | .1 | This section specifies requirements for the supply and installation of all parts embedded in cast-in-place concrete including anchors unless specifically noted otherwise; other metal fabrications as described by the drawings and specification; and anchors for the items of work in this section. |
| | .2 | The work includes but is not necessarily limited to the supply and installation of: <ul style="list-style-type: none"> .1 Electrical/hydraulic trench frames and covers; .2 Frames and covers for equipment and gate anchorage pits in the lock coping. |
| | .3 | Work not included: <ul style="list-style-type: none"> .1 Gate embedded parts. |
| <u>1.2 RELATED WORK</u> | .1 | Cast-in-Place Concrete: Section 03 30 00 |
| | .2 | Structural Steel Gates: Section 05 12 10 |
| | .3 | Painting Steel Surfaces:Section 09 97 01 |
| <u>1.3 REFERENCE STANDARDS</u> | .1 | Canadian Standards Association (CSA): <ul style="list-style-type: none"> .1 CAN/CSA-G40.20-04/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel. .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles. .3 CAN/CSA-W59-03(R2008), Welded Steel Construction (Metal Arc Welding). .4 CAN/CSA-W47.1-92. .5 CAN/CSA-W48.1-M1991. |
| | .2 | Canadian General Standards Board (CGSB): <ul style="list-style-type: none"> .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating |
| | .3 | American Society for Testing and Materials International, (ASTM): <ul style="list-style-type: none"> .1 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength. |
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- 1.4 SHOP DRAWINGS
- .1 Submit shop drawings in accordance with Section 01 33 00.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

- 1.5 MEASUREMENT AND PAYMENT PROCEDURES
- .1 There will be no measurement of Work included in this Section.
 - .2 Payment shall be included in Lump Sum Price.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Steel sections and plates: to CAN/CSA-G40.21, Grade 300W unless noted otherwise.
 - .2 Welding materials: to CSA W59.
 - .3 Frames and covers for electrical/hydraulic trenches and top anchorage pits:
 - .1 Steel, galvanized finish, fabricate from 10 mm thick raised pattern plate set in galvanized angle frame.
 - .2 Bent plate anchors.
 - .3 Supply trench covers in lengths as indicated.
 - .4 All other anchor bolts to CAN/CSA G40.21 Type 300W.
 - .5 Anchors to be complete with all accessory parts as specified by the manufacturer, and additional accessories indicated on drawings or described in specification.
 - .6 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to CSA G164.
 - .7 Zinc primer: zinc rich, ready mix to CGSB 1-GP-181M.
-

- 2.2 FABRICATION
- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
 - .2 Where possible, fit and shop assemble work, ready for erection.
 - .3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

PART 3 - EXECUTION

- 3.1 ERECTION
- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
 - .2 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding, CSA W55.3 for resistance welding.
 - .3 Provide certification that all welded joints are certified by Canadian Welding Bureau.
 - .4 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
 - .5 Make field connections with high tensile bolts to CAN/CSA-S16, or weld, unless specified.
 - .6 Hand items over for casting into concrete to appropriate trades together with setting templates.
 - .7 Touch-up galvanized surfaces with zinc primer where damaged.

PART 1 - GENERAL

- | | | |
|-----------------------------------|----|---------------------------------------------------------------------------------------------------------------------------|
| <u>1.1 REFERENCES</u> | .1 | Canadian Standards Association (CSA) |
| | .1 | CSA O80 Series-97 Series-08, Wood Preservation. |
| | .2 | CSA W47.1-09(R2014), Certification of Companies for Fusion Welding of Steel Structures. |
| | .3 | CAN/CSA-G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel. |
| | .4 | CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles. |
| | .5 | CAN/CSA-W59-13, Welded Steel Construction (Metal Arc Welding). |
| | .6 | CAN/CSA-W47.1-09(R2014), Certification of companies for fusion welding of steel. |
| | .2 | National Lumber Grades Authority (NLGA) |
| | .1 | NLGA 2014, Standard Grading Rules for Canadian Lumber. |
| | .3 | Society for Protective Coatings (SSPC)/ National Association of Corrosion Engineers (NACE) |
| | .1 | SSPC-SP 3, Power Tool Cleaning. |
| | .2 | SSPC-SP 10/NACE No. 2, Near White Blast Cleaning. |
| <u>1.2 MEASUREMENT PROCEDURES</u> | .1 | There will be no measurement under this section. |
| | .2 | Payment will be included in Lump Sum Price. |
| <u>1.3 SOURCE QUALITY CONTROL</u> | .1 | Identify lumber by grade stamp of agency certified by Canadian Lumber Standards Administration Board (CLSAB). |
| | .2 | Certify preservative wood treatment and incising carried out in accordance with CAN/CSA-O80 Series. |
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1.4 QUALIFICATION OF MANUFACTURERS .1 Fabricator for welded steel connections to be certified in accordance with CSA W47.1.

1.5 SITE SURVEY .1 Immediately after draining lock, perform precise survey of existing lock and gates to verify required dimensions for fabrication of new lock gates.

.2 Submit proposed plan to surveying existing conditions and describe measurements to be recorded for review by Departmental Representative.

.3 Meet with Departmental Representative and Owner's (Parks Canada) in-house lock gate fabricator before preparation of shop drawings to better understand lock operations and gate fabrication details and techniques.

.4 Use data from site survey, check drawings and establish required adjustments to obtain data needed to build new gates and prepare shop drawings.

.5 Submit survey data and gate dimension data to Departmental Representative for examination simultaneously with proposed shop drawings.

1.6 SUBMITTALS .1 Submittals to be accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings, erection drawings and erection procedures to bear signature and stamp of professional engineer registered or licensed in province of Quebec, Canada.

.3 Shop Drawings:

.1 Indicate species, treatment, sizes, and stress grades of lumber to be used.

.2 Dimensions and details of wood and metal components.

.3 Dimensions and details of final assembly.

.4 Erection drawings and procedures:

.1 Describe in detail, proposed lock gate removal, erection and adjustment procedures including proposed methods, work sequence, materials and equipment.

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|-----------------------------------|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.6 SUBMITTALS
(Cont'd) | .4 | Erection drawings and procedures:(Cont'd)
.2 Show lifting points and support points for removal, handling, storage, transportation, erection and adjustment.
.3 Show temporary bracing details and attachment details.
.4 Describe in detail methods and equipment to be used to adjust gate at mitre and heel to ensure watertightness.
.5 Describe in detail procedure to be used to jack gate horizontally at several elevations along mitre to simulate hydraulic pressure in dry condition before conducting wet tests. |
| | .5 | Certifications: Submit certificates, signed by manufacturer certifying materials comply with specified performance characteristics and physical properties. |
| | .6 | Product Data: Submit manufacturer's instructions, printed product literature and data sheets for paint |
| | .7 | Samples: Submit colour samples of paint for wood components to Departmental Representative for review and acceptance. |
| 1.7 DELIVERY AND STORAGE | .1 | Deliver, handle, protect and store materials in accordance with manufacturer's recommendations. |
| | .2 | Store materials off ground, in clean, dry, sheltered and well-ventilated area. |
| | .3 | Store and protect wood and steel components from nicks, scratches, blemishes and damage. |
| | .4 | Store wood using bearing supports and bracings. Prevent damage, bending and warping. |
| | .5 | Replace defective or damaged materials with new. |
| 1.8 WASTE MANAGEMENT AND DISPOSAL | .1 | Collect, separate and recycle waste materials in accordance with Section 01 74 20. |
-

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Timber: use timber rated and stamped in accordance with applicable grading rules and standards of associations or agencies approved to grade lumber by Canadian Lumber Standards Accreditation Board of CSA.
 - .1 Species: Douglas Fir.
 - .2 Grade: Select Structural.
 - .3 Grading Authority: NLGA (National Lumber Grading Association).
 - .4 Wood to be free of cracks, waness, splitting or equivalent defects on each face.
 - .5 Surfacing: S4S
 - .6 Moisture content: max. 25%-30% moisture content.
 - .7 Submit certification from supplier confirming wood meets requirements and stating measured moisture content.
 - .2 Wood Preservative:
 - .1 CCA (Chromate Copper Arsenate) wood preservative in accordance with CSA-080.
 - .3 Steel Components:
 - .1 New steel components to CSA G40.21, grade 300W unless noted otherwise.
 - .2 Re-use steel components salvaged in accordance with Section 02 41 21 - Removals.
 - .3 Mechanical Type bolts, washers and nuts, with square head, hot-dip galvanized.
 - .4 Common type lag bolts, hot-dip galvanized.
 - .5 Common type nails, hot-dip galvanized.
 - .6 Steel rods, conforming to CSA G40.21, type 300W, threaded at both ends, with washers and nuts, all parts hot-dip galvanized.
 - .7 Sleeve nut turnbuckle, to match existing, Type QT steel, hot-dip galvanized, with service load of 260 kN.
 - .8 Eye lifting nuts for 44.5 mm diameter rod, hot-dip galvanized.
 - .4 Welding materials: to CSA W59.
 - .5 Galvanizing: hot dipped galvanizing with minimum zinc coating of 600 g/m² to CSA G164.
 - .6 Paint for Metal Components:
 - .1 Primer on new galvanized steel components:
-

2.1 MATERIALS
(Cont'd)

- .6 Paint for Metal Components:(Cont'd)
 - .1 (Cont'd)
 - .1 Water based, rust-inhibitive, galvanized steel primer, compatible with finishing paint.
 - .2 Acceptable materials: Tremclad, Galvanized White Primer or an approved alternate.
 - .2 Finishing Paint (two coats):
 - .1 Alkyd-based, rust-inhibitive paint, Gloss Black.
 - .2 Colour/Finish: Black/Gloss.
 - .3 Acceptable materials: Tremclad Rust Paint, Gloss Black or an approved alternate.
- .7 Paint for Wood:
 - .1 Acrylic latex, solid colour stain, self priming.
 - .2 Acceptable materials: Sherwin-Williams, Duckback Superdeck 9600 (using SC 9601 - Pastel Base) or an approved alternate.
 - .3 Colours to match existing:
 - .1 Gate, top of Walkway and top of step: Grey.
 - .2 Sides of walkway and step: White.
 - .3 Top and sides of round end of walkway: Black.
 - .4 Submit colour samples for review by Departmental Representative.

PART 3 - EXECUTION

3.1 GENERAL

- .1 Fabricate top lock gate in shop equipped to work with wood and metal, large enough for assembly of lock gate.
- .2 Fabricate wood and steel components so as to obtain for top gate one left gate leaf and one right gate leaf.
- .3 Test fit by assembling lock gate in shop for review by Departmental Representative before disassembly for wood preservation, metal galvanizing and painting.

3.2 REMOVALS

- .1 Survey existing lock and lock gates before to removal.

3.2 REMOVALS .2 Remove existing gate in accordance with
(Cont'd) Section 02 41 21 - Removals.

3.3 INSPECTION .1 Inspect existing steel components with
Departmental Representative to identify steel
components to remain in place or be salvaged
and re-used during fabrication of new lock
gates.

.2 Remove, tag, store and protect steel
components to be salvaged and re-used.

3.4 SALVAGED METAL COMPONENTS .1 Re-use salvaged metal components identified
for re-use in section 02 41 21 - Removals.

3.5 WOOD FABRICATION .1 Fabricate wood components for lock gates in
accordance with reviewed shop drawings.

.2 Lock gate height tolerance: +/- 10 mm for
tie-in to hydraulic system.

.3 Plane, saw, cut out, carve and round over
pieces of wood in accordance with reviewed
shop drawings.

.4 Groove, mortise, bore, ream and countersink
wood pieces at locations indicated on reviewed
shop drawings.

3.6 METAL FABRICATION .1 Fabricate and cut new metal components in
accordance with reviewed shop drawings.

.2 Weld in accordance with CSA-W59.

.3 Drill and countersink holes at locations
indicated.

.4 Grind sharp edges.

.5 Install metal components flush in wood as
indicated.

3.7 TEST FIT
ASSEMBLY

- .1 Assemble lock gates in shop to test fit all components for review and acceptance by departmental representative.
- .2 Test fit members using bolts, rods, metal plates, split rings and hardware to match existing.

3.8 WOOD
PRESERVATIVE

- .1 Treat wood only after fabrication and test fit assembly of lock gates are reviewed by Departmental Representative.
- .2 Disassemble lock gate to send individual wood components to factory certified by Wood Preservation Canada.
- .3 Treat wood by incised pressure impregnation using CCA preservative to obtain minimum net retention of 8.0 kg/m³ CCA in accordance with CSA-080. Use incision appropriate for large sized timber.
- .4 Submit certification wood components have been factory impregnated with wood preservative in accordance with specifications.
- .5 After installation, touch-up damaged wood surfaces, field cuts or adjustments using concentrated CCA in accordance with manufacturer's recommendations.

3.9 GALVANIZATION
OF STEEL COMPONENTS

- .1 Clean new steel components before galvanizing in accordance with SSPC-SP 10.
- .2 Galvanize new steel components in shop to CAN/CSA G164.
- .3 Do not galvanize salvaged railing components, walkway step hardware, pintle, heel casting or new T-plates and L-plates.

3.10 SHOP PAINTING
STEEL COMPONENTS

- .1 Prepare salvaged steel components immediately before painting in accordance with SSPC-SP 10.
 - .1 Clean surfaces again in accordance with manufacturer's recommendation if rusting occurs before application of primer.
 - .2 Do not prepare, prime or paint pintle, heel casting or bushing.

3.10 SHOP PAINTING .2 Prepare galvanized steel surfaces to be shop
STEEL COMPONENTS painted by removing oil and grease using TSP
(Cont'd) (Trisodium Phosphate) and in accordance with
manufacturer's recommendations.

.3 Prime steel components using water-based,
rust-inhibitive paint primer.

.4 Paint steel components using 2 coats of
alkyd-based, rust-inhibitive paint, Gloss
Black.

3.11 SHOP PAINTING .1 Shop paint wood components with two coats of
OF WOOD COMPONENTS solid colour stain.

.2 Prepare wood surfaces for painting in
accordance with manufacturer's
recommendations.

3.12 FINAL .1 Final assembly of lock gates may be completed
ASSEMBLY fully in shop, partially in shop or fully in
field.

.2 Connect members using bolts, nuts, metal
connector plates, split rings and shear plates
to match existing.

3.13 TRANSPORTATION .1 Supply and operate cranes required to lift
lock gate components or assembled lock gate at
shop and in field.

.2 Supply and operate flatbed truck specially
equiped to transport lock gate components or
assembled lock gate.

.3 Supply required escorts trucks and obtain all
required transporation permits for wide or
oversized load.

.4 Use equipment suitable for site field
conditions.

3.14 ERECTION .1 Erect lock gates in accordance with reviewed
erection drawings and erection procedures.

3.14 ERECTION
(Cont'd)

- .2 Use only lifting points and attachment methods described in erection drawings and erection procedures.
- .3 Make adequate provisions for handling and erection stresses.
- .4 Exercise care to prevent bending or twisting of lock gates during handling.
- .5 Immediately before erection, clean pintle and heel casting with power tools in accordance with SSPC-SP 3 and lubricate pintle and heel casting.
- .6 Install new gates at required location with crane of appropriate capacity.
- .7 Carefully place lubricated bushing in position and lower gate onto pintle.
- .8 When gate is correctly resting on pintle, install locking plate on heel casting.
- .9 Attach and adjust connecting links so gate is vertical.
- .10 Lubricate pintle using lubrication point in heel casting after installation is complete.

3.15 ADJUSTMENT OF
NEW GATES

- .1 Proposed field cutting or altering of lock gate components in field to be reviewed by Departmental Representative before execution.
- .2 Adjust connecting links to allow smooth operation of hydraulic mechanism and lock gate.
- .3 Cut, adjust and finish gates at mitre side to make gate watertight.
 - .1 This operation requires several successive cross-saw cuts, each one being closer and closer to final required result.
 - .2 Fix cutting template gate to guide cross-saw during operation, so cut is true and plumb from top to bottom.
- .4 Jack gate horizonatally at different elevations to simulate hydrostatic pressure in dry condition to adjust gate mitre to be watertight under hydrostatic pressure.
 - .1 Jack: max. 30 tonnes.

3.15 ADJUSTMENT OF
NEW GATES
(Cont'd)

- .5 Ensure new gates are watertight when closed. Make adjustments and corrections at mitre and heel until watertightness is obtained.
 - .1 Adjustments generally made by marking zones where contact is not perfect, followed by cross-saw cuts, planing or sanding where there is excess wood.
- .6 Test water tightness of gates in wet condition by performing successive filling and emptying cycles of area between cofferdam and gate.
 - .1 Adjust gate mitre and heel until watertightness is obtained.
- .7 During wet testing, correct water jet leaks as follows:
 - .1 Cross-saw, sand or plane mitre to correct leaks between gates or at hollow quoin.
 - .2 Inject epoxy resin in joints between beams where leaks are present.
 - .3 In serious cases of leaking at contact with heel and hollow quoin, remove gate and sand or plane half cylindrical portion of heel contact surface until adequate contact is obtained.

3.16 FIELD PAINTING .1

- .1 After installation and adjustment, touch up damaged wood treatment and paint surfaces on wood components such as field cuts or mitre and heel adjustments in accordance with manufacturer's recommendations.
- .2 After installation and adjustment, touch-up damaged paint on steel components in accordance with manufacturer's recommendations.

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 This section includes the painting of steel surfaces. Items to be painted include lock gates, portions of embedded parts not in contact with concrete, walkway, railings and items specified to be painted as described in sections 05 50 00 Metal Fabrications. Do not paint items which are hot dipped galvanized.
- 1.2 RELATED WORK .1 Section 05 12 10 Structural Steel Gates.
.2 Section 05 50 00 Metal Fabrications.
- 1.3 REFERENCES .1 Society for Protective Coatings (Formerly known as Steel Structures Painting Council abbreviated SSPC):
.1 Surface preparation standards:
.1 SSPC-SP-1 Solvent Cleaning.
.2 SSPC-SP-2 Hand Tool Cleaning.
.3 SSPC-SP-3 Power Tool Cleaning.
.4 SSPC-SP-6 Commercial Blast Cleaning.
.5 SSPC-SP-10 Near-White Metal Blast Cleaning.
.6 SSPC-SP-11 Power Tool Cleaning to Bare Metal.
.7 SSPC-SP-12 Waterjetting.
.2 Standards for visual inspection of surface preparation:
.1 SSPC-Vis-1 Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning.
.2 SSPC-Vis-3 Visual Standard for Power- and Hand-Tool Cleaned Steel
.3 SSPC-Vis-4 Guide and Reference Photographs for Steel Surfaces Prepared by Waterjetting.
.3 SSPC-PA-02 Measurement of Dry Coat Thickness with Magnetic Gauges.
.4 SSPC-AB-1 Mineral and Slag Abrasives.
.2 Manufacturer's current product data sheets must be used in conjunction with and form part of this specification.
.3 General Air Pollution Regulation (O. Reg. 346/90).
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- 1.4 DEFINITIONS
- .1 CAEAL: Canadian Association for Environmental Analytical Laboratories.
 - .2 STRIPE COAT: A coat of paint applied only to sharp edges of structure being painted such as edges of plates and rolled sections with sharp profile and all bolt heads. Stripe coats increase film thickness of coating around sharp edge where surface tension of liquid coating tends to thin it. All drying time and recoat conditions must be complied with as with other coats of paint.
 - .3 TCLP: Toxicity Characteristic Leaching Produce.
- 1.5 SUBMITTALS
- .1 Product data for coatings and other documents that prove proposed products will meet performance requirements of specification.
 - .2 All purchase orders, invoices for purchased products.
 - .3 Paint colour chips.
 - .4 Copies of manufacturer's instructions for mixing, straining, thinning, and applying coatings.
- 1.6 MEASUREMENT AND PAYMENT PROCEDURES
- .1 There will be no measurement of Painting Steel Surfaces.
 - .2 Payment of Painting Steel Surfaces shall be included in the Lump Sum Price.
-

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 PAINT SYSTEM 1: IMMERSION SURFACES
- .1 Primer and Stripe Coats: Self-priming epoxy phenalkamine suitable for use over water jetted surfaces with low temperature curing capabilities and moisture tolerance during application. Colour: any light colour. Dry film thickness to manufacturer's recommendation. Acceptable product: BAR-RUST 235 by Devoe Coatings.
- .2 Epoxy Penetrating Primer/Sealer: for all seams and areas that can not be properly prepared. Apply to any areas of poor design such as skip welds or back to back angles to a manufacturer recommended dry film thickness. Acceptable product: PRE-PRIME 167 by Devoe Coatings.
- .3 Topcoat: Self-priming epoxy phenalkamine suitable for use over water jetted surfaces with low temperature curing capabilities, moisture tolerance during application and available in a high abrasion resistance version. Submit paint chips showing full range of colours available and Departmental Representative will choose. Dry film thickness to manufacturer's recommendation. Acceptable product: DEVGRIP 238 by Devoe Coatings.
- .4 Other systems may be acceptable if they meet criteria above. All components used in individual paint systems must be the products of a single manufacturer. Submit alternatives via Submittals process.
- .2 PAINT SYSTEM 2: ALL OTHER SURFACES OF GATES
- .1 Primer and Stripe Coats: Self-priming epoxy phenalkamine suitable for use over water jetted surfaces with low temperature curing capabilities and moisture tolerance during application. Colour: any light colour. Dry film thickness to manufacturer's recommendation. Acceptable product: BAR-RUST 235 by Devoe Coatings.
- .2 Epoxy Penetrating Primer/Sealer: for all seams and areas that can not be properly prepared. Apply to any areas of poor design such as skip welds or back to back angles to a manufacturer recommended dry film thickness. Acceptable product: PRE-PRIME 167 by Devoe Coatings.
- .3 Topcoat: Aliphatic Urethane Gloss Enamel. Dry film thickness to manufacturer's
-

2.1 MATERIALS
(Cont'd)

- .2 PAINT SYSTEM 2:(Cont'd)
 - .3 Topcoat:(Cont'd)
recommendation. Acceptable product:
DEVTHANE 379UVA by Devoe Coatings.
 - .4 Other systems may be acceptable if they
meet criteria above. All components used in
individual paint systems must be the products of
a single manufacturer.
- .3 Timber Pedestrian Walkway: Stain to match
existing upper gates. Refer to Section 06 13
30 - Timber Lock Gates for painting
requirements.
- .4 COLOUR:
 - .1 Gate - Grey
 - .2 Timber pedestrian walkway - Grey, White,
Black. Color scheme to match existing upper
gates.
 - .3 Gate railings - Black
 - .4 Exact colours to match existing gates.
Coordinate colour match with Departmental
Representative.
- .5 Blast Cleaning Abrasive in shop: To
SSPC-AB-1, Mineral and Slag Abrasives.
Non-metallic, non-silica, angular abrasive
capable of producing surface profile of 2 mils
minimum and to give angular anchor tooth
pattern.
- .6 Water for water blasting: Municipal tap
water.

PART 3 - EXECUTION

3.1 QUALITY CONTROL

- .1 Departmental Representative will check degree
of cleanliness of surfaces against SSPC-Vis 1
and SSPC-Vis 4. Do not apply paint until
prepared surfaces have been accepted by
Departmental Representative.
 - .2 Departmental Representative will check each
coat of paint after it is applied and before
next is applied. Acceptance criteria:
 - .1 Correct type and colour of paint.
 - .2 Correct dry film thickness.
 - .3 Coating is free from gross defects such
as (but not limited to) holidays, pinholes,
bubbles, runs, skips, drops, ridges, waves,
laps, mudcracking, excessive or unsightly
-

3.1 QUALITY CONTROL .2
(Cont'd)

(Cont'd)

.3 (Cont'd)

brush marks, and all variations in colour, texture, and gloss.

.4 Departmental Representative will pay particular attention to edges, corners, crevices, seams, joints, welds, corrosion pits, and all other such surface irregularities to ensure they have received special attention in providing adequate thickness of paint and quality of application.

.3 Bear cost of rectifying defects. This may include, when so directed by Departmental Representative, the removal of all defective paint, re-cleaning of surfaces, and re-painting in accordance with these specifications.

.4 For each coat, do not apply subsequent coats until dry painted surface has been accepted by Departmental Representative.

.5 Claims against Crown for delays in completion of project will not be entertained for reasons of failures of surfaces or coatings to pass examinations.

3.2 PREPARATION

.1 Wash all steel areas to be painted in accordance with SSP SP1 solvent washing.

.2 Blast clean all new metal surfaces and surfaces of existing metal being reused in accordance with Steel Structures Painting Council SSPC-SP-10 Near White Metal. Do not paint metal surfaces which will be in direct contact with concrete.

.3 Compressed air to be free of water and oil before reaching nozzle.

.4 Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, by blowing with clean dry compressed air, or by vacuum cleaning.

.5 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.2 PREPARATION
(Cont'd)

- .6 Prior to commencing paint application the degree of cleanliness of surfaces to be in accordance with SSPC-Vis 1.
- .7 Protection of surfaces.
 - .1 Protect surfaces not to be painted and if damaged, clean and restore such surfaces as directed by Departmental Representative.
 - .2 Apply paint or pretreatment as soon as possible after surface has been cleaned and before deterioration of surface occurs.
 - .3 Clean surfaces again if rusting occurs after completion of surface preparation.
 - .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats of paint. Remove contaminants from surface and apply paint immediately.
 - .5 Protect cleaned and freshly painted surfaces from dust to approval of Departmental Representative .
- .8 Mixing paint:
 - .1 Do not dilute or thin paint for brush application; use as received from manufacturer.
 - .2 Mix ingredients in container before and during use and ensure breaking up of lumps, complete dispersion of settled pigment, and uniform composition.
 - .3 Do not mix or keep paint in suspension by means of air bubbling through paint.
 - .4 Thin paint for spraying according to manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Departmental Representative.
- .9 Number of paint coats:
 - .1 Prime coat: one coat dry film thickness to manufacturer's recommendation.
 - .2 Intermediate coat: one coat dry film thickness to manufacturer's recommendation.
 - .3 Top coat: one coat dry film thickness to manufacturer's recommendation.

3.3 SCAFFOLDING,
HOUSING AND HEATING

- .1 To Section 01 56 00 - TEMPORARY BARRIERS & ENCLOSURES.

3.3 SCAFFOLDING,
HOUSING AND HEATING
(Cont'd)

- .2 Environmental conditions: maintain from start of priming to end of curing period of top coat:
 - .1 Air temperature: between 10 and 20 degrees Celsius.
 - .2 Metal temperature: 5 degrees above dew-point to 20 degrees Celsius
 - .3 Relative humidity: between 20 and 60%.
 - .4 Metal surface: out of direct sunlight.
- .3 Departmental Representative will monitor environmental conditions to ensure these are being maintained at all times.

3.4 APPLICATION

- .1 Prior to commencing application of any coat obtain approval of Departmental Representative of prepared surface.
- .2 Apply paint in accordance with manufacturers requirements unless specified otherwise.
- .3 Apply paint by spraying.
- .4 Use dipping or roller coating method of application only when specifically authorized by Departmental Representative in writing.
- .5 Caulk open seams at contact surfaces of built up members with material approved by Engineer, before intermediate coat is applied.
- .6 Where surface to be painted is not under cover, do not apply paint when:
 - .1 Air temperature is below 5°C or when temperature is expected to drop to 0°C before paint has dried.
 - .2 Temperature of surface is over 50°C.
 - .3 Fog or mist occur at site; it is raining or snowing; there is danger of rain or snow; relative humidity is above 85%.
 - .4 Surface to be painted is wet, damp or frosted.
 - .5 Previous coat is not dry.
- .7 Provide cover when paint must be applied in damp or cold weather. Protect, shelter, or heat surface and surrounding air to comply with temperature and humidity conditions specified in 3.4.6. Protect until paint is dry or until weather conditions are suitable to. Departmental Representative.

3.4 APPLICATION
(Cont'd)

- .8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.
 - .9 Apply each coat of paint as continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
 - .10 Spray application.
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .2 Provide traps or separators to remove oil and water from compressed air and drain periodically during operations.
 - .3 Keep paint ingredients properly mixed in spray pots or containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
 - .4 Apply paint in uniform layer, with overlapping at edges of spray pattern.
 - .5 Brush out immediately all runs and sags.
 - .6 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray. In areas not accessible to spray gun, use brushes, daubers or sheepskins.
 - .7 Remove runs, sags and brush marks from finished work and repaint.
 - .11 Shop painting.
 - .1 Do shop painting after fabrication and before any damage to surface occurs from weather or other exposure.
 - .2 Spray paint contact surfaces of field assembled, bolted, friction type joints with primer coat only. Do not brush primer after spraying.
 - .3 Do not paint metal surfaces which are to be embedded in concrete.
 - .4 Remove weld spatter before painting. Remove weld slag and flux as specified in 3.2.
 - .5 Protect machine finished or similar surfaces that are not to be painted but that do require protection, with coating of rust inhibitive petroleum, molybdenum disulphide, or other coating approved by Departmental Representative.
 - .6 Copy previous erection marks and weight marks on areas that have been shop painted.
-

3.4 APPLICATION
(Cont'd)

.12 Handling painted metal.

.1 Do not handle painted metal until paint has dried, except for necessary handling for painting or stacking for drying.

.2 Scrape off and touch up paint which is damaged in handling, with same number of coats and kinds of paint as were previously applied to metal.

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 The work outlined in this section describes the new pintle grease system. The lower gates are being replaced and will require this system to be added. Refer to the drawings for details.
- 1.2 RELATED WORK .1 Section 01 78 02 - Operation and Maintenance Manual
.1 Compile all necessary information for operation and maintenance.
.2 Section 01 79 00 - Demonstration and Training
.3 Section 01 91 00 - Commissioning - General Requirements.
- 1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement for all work described in this Section.
.2 Payment for all work described in this Section shall be included in the Lump Sum Price.

PART 2 - PRODUCTS

- 2.1 PINTLE GREASE LINES & FITTINGS .1 Materials: Stainless Steel (316SS)
.2 Working pressure: Up to 5,000 psi
.3 Service:
.1 Biodegradable grease (id), submerged in fresh water (od).
.2 Refer to grease specification. Ensure all tubing and fittings are compatible with selected grease.
.4 Working temperature: -10 deg-C to +40 deg-C.
-

2.1 PINTLE GREASE .5
LINES & FITTINGS
(Cont'd)

Tube:

.1 5/16" od tubing. Material 316 ss. ASTM A269 or equivalent, (0.035" wall minimum, but must be capable of the working pressure per: SAE J1065). Tube fitting manufacturer will specify the allowable ranges of tube wall thickness, diameter, and material hardness.
.2 High quality, fully annealed, seamless or drawn type (316) austenitic stainless steel. Tubing to be free of scratches, suitable for bending, and must properly adapt to a compression fitting. Hardness not to exceed 80 HRB. Contractor must ensure od tolerance is suitable for connection. Lines must be continuous with no butt-splices.

.6 Tube Fittings:

.1 Use compression style fittings for all tubing connections.
.2 The tube fitting assembly must not gall during assembly.
.3 The fitting style must allow for disassembly and re-assembly, while maintaining a leak-tight seal.
.4 Tube fitting and components will be stamped to identify manufacturer and material, and must be certified to produce fittings under an N-Stamp program accredited by ASME.
.5 The fitting manufacturer must have a statistical quality control program in place.
.6 No component of any other tube fitting manufacturer will be interchanged or intermixed.

.7 Tube Installation:

.1 All tube and fitting installation must follow current standard best practices, and tube and fitting vendor specifications.
.2 The manufacturer will provide clear instructions for proper tube fitting installation.
.3 Tube fitting will not require disassembly for inspection after assembly.
.4 Maximum bending radius and bends near fittings and fasteners: per vendor specifications.
.5 Line preparation: per vendor specifications.

.8 Grease Nipple:

.1 1/8" NPT - standard zerk (grease with nipple) dust cap.
.2 Refer to drawings for zerk fitting locations and general arrangement.

2.1 PINTLE GREASE
LINES & FITTINGS
(Cont'd)

- .9 Pintle Connection:
 - .1 Contractor to adapt grease tubing to existing and new pintle base heel castings.
 - .2 1/4" threaded connection shown on existing site drawings. Contractor to confirm.
- .10 Fasteners: Refer to drawings.
- .11 Material Handling: Tubes must be free of damages upon commissioning.
- .12 Cleaning: Tube and components must be free of oils, debris, cutting fluids, etc., before grease is applied to line.
- .13 Testing:
 - .1 Contractor must visually inspect all fitting for leaks while greasing system during dry-lock installation.
 - .2 Contractor to produce a visual test report.

2.2 PINTLE GREASE

- .1 Operating Temperature: -10 deg-C to +40 deg-C
- .2 Cold Storage Temperature: -40 deg-C. System is static during winter months.
- .3 Service:
 - .1 Bearing and grease submersed in fresh water.
 - .2 Grease must resist water washout.
- .4 Type: Readily biodegradable marine grease, > 85%) per CEC-L-A-94, ASTM D-5864.

2.2 PINTLE GREASE
(Cont'd)

- .5 Toxicity:
 - .1 Non- toxic , aquatic ecotoxicity classification WGK 1 (or equivalent).
 - .2 Departmental Representative to approve grease toxicity characteristics before commissioning.
- .6 Application: Plain bearing (pintle).
- .7 Operating Speed: Very slow (near static).
- .8 Duty Cycle: <10,000 cycles per year.
- .9 Material Compatibility: Hardened steel race and bronze bearing.
- .10 Delivery:
 - .1 Through standard zerk + 6 m long 5/16" (8 mm) grease tube.
 - .2 Grease must be able to be delivered under specified conditions with standard grease gun.

2.3 GREASE GUN

- .1 Type: Single hand - manual hand pump style.
- .2 Barrel: Standard (i.e. 420 ml nominal cartridge), black powder coated or zinc plated.
- .3 Grease Delivery: Maximum pressure: 5000 psi.
- .4 Nozzle: 12" flex hose extension. Hose can be reinforced neoprene or polypropylene.
- .5 Connection: Standard zerk (grease nipple). To mate with pintle line zerks.
- .6 Label:
 - .1 Pintle grease only: "GREASE BRAND/TYPE"
"NUMBER OF PUMPS REQUIRED TO RE-LUBE"
 - .2 Label to be created/installed by contractor.
 - .3 Contractor to determine number of grease gun pumps during commissioning to re-lube pintle head.
 - .4 Number of pumps shall be put on label.

PART 3 - EXECUTION

3.1 FABRICATION AND .1 Refer to the drawings.
INSTALLATION

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 This section outlines the work associated with removing hydraulic oil from the existing system before the equipment is decommissioned, and cleaning the existing trenches before the new equipment is installed. Refer to the drawings and specification provided.
- 1.2 RELATED WORK .1 Section 01 78 02 - Operation and Maintenance Manual.
.1 Compile all necessary information for operation and maintenance.
.2 Section 01 79 00 - Demonstration and Training.
.3 Section 01 91 00 - Commissioning - General Requirements.
- 1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement for all work described in this section.
.2 Payment for all work described in this Section shall be included in the Lump Sum Price.

PART 2 - PRODUCTS

- 2.1 NOT USED .1 Not used.

PART 3 - EXECUTION

- 3.1 HYDRAULIC OIL REMOVAL .1 Drain all existing hydraulic oil from cylinders, lines and reservoirs.
.2 Remove oil from site.
.3 Ensure no oil drains into waterway.
-

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|---------------------------------------------|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>3.2 TRENCH, PIT
CLEANING</u> | .1 | Trenches (indoor and outdoor) to be cleaned of all pooled and superficial oil, grease, debris, etc. |
| <u>3.3 MATERIAL
COMPATIBILITY</u> | .1 | Cleaning agents and processes must not damage existing materials (concrete trenches, aluminum cable trays, polymer cable jackets, steel mounting hardware, etc.). |
| <u>3.4 SITE LOGISTICS</u> | .1 | Trenches are adjacent to (and drain towards) waterway. |
| | .2 | Measures must be taken to ensure that all materials and cleaning agents are removed from site and not flushed into waterway or displaced onto adjacent lawns, buildings, masonry, etc. |
| <u>3.5 STANDARDS AND
PERMITTING</u> | .1 | Ministry of environment standards (including certificates of authorization if applicable). |
| <u>3.6 QUALIFICATIONS
OF CONTRACTOR</u> | .1 | Contractor must hold current license for handling, transferring and disposing of hazardous materials. |

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 The work outlined in this section describes the fasteners and hardware to be used for the installation of all new mechanical and structural equipment associated with the hydraulic system(s). The contractor shall conform to this specification unless other specific fasteners are prescribed by equipment vendors; however, the material prescribed in this specification must be followed.
- 1.2 RELATED WORK .1 Section 01 78 02 - Operation and Maintenance Manual.
.1 Compile all necessary information for operation and maintenance.
.2 Section 01 79 00 - Demonstration and Training.
.3 Section 01 91 00 - Commissioning - General Requirements.
- 1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement for all work described in this Section.
.2 Payment for all work described in this Section shall be included in the Lump Sum Price.

PART 2 - PRODUCTS

- 2.1 MACHINE SCREW, CAP SCREWS, BOLTS AND ASSOCIATED NUTS .1 Must be stainless steel, unless stated otherwise.
.2 Must have a minimum tensile strength of 480 MPa (70,000 psi).
- 2.2 WEDGE ANCHORS (AND ASSOCIATED NUTS/WASHERS) .1 Use sizes as specified.
.2 Must be stainless steel.
.3 Install per manufacturer's specifications.
-

- 2.3 OTHER
- .1 All components must be suitable for their intended purpose.
 - .2 Where no specification exists, components must be reviewed and approved by public works (or designated technical firm).

PART 3 - EXECUTION

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

- 3.2 FABRICATION AND INSTALLATION
- .1 Refer to the drawings.

PART 1 - GENERAL

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

1.2 RELATED WORK .1 Section 01 78 02 - Operation and Maintenance Manual.
.1 Compile all necessary information for operation and maintenance.
.2 Section 01 79 00 - Demonstration and Training
.3 Section 01 91 00 - Commissioning - General Requirements.

1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement for all work described in this Section.
.2 Payment for all work described in this Section shall be included in the Lump Sum Price.

PART 2 - PRODUCTS

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

- | | | |
|-------------------------------------------|----|-------------------------------------------------------------------------------------------------------------|
| <u>2.2 CLIPS (AND
OTHER HARDWARE)</u> | .1 | Clips and mounting hardware must work properly with selected strut. |
| | .2 | Must be hot dipped galvanized or stainless steel. |
| | .3 | Must have integrated rubber or polymer liner to prevent galvanic corrosion and wear on tubing. |
| | .4 | Must allow axial movement of mounted components (tubes, etc.) to allow for thermal expansion / contraction. |

PART 3 - EXECUTION

- | | | |
|---------------------------------------------|----|------------------------|
| <u>3.1 FABRICATION AND
INSTALLATION</u> | .1 | Refer to the drawings. |
|---------------------------------------------|----|------------------------|

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 The work outlined in this section describes the complete specification regarding the hydraulic lines, hoses, and fittings. This includes all pressure and return lines that are used to operate the hydraulic cylinders in the field. Note: there is a separate specification provided for the grease lines and fittings (refer to the pintle grease specification, Section 11 99 01).
- 1.2 RELATED WORK .1 Section 01 78 02 - Operation and Maintenance Manual.
.1 Compile all necessary information for operation and maintenance.
.2 Section 01 79 00 - Demonstration and Training
.3 Section 01 91 00 - Commissioning - General Requirements.
.4 Section 11 99 01 - Pintle Grease System
- 1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement for all work described in this Section.
.2 Payment for all work described in this Section shall be included in the Lump Sum Price.

PART 2 - PRODUCTS

- 2.1 PRESSURE .1 Design pressure: Up to 3000 psi.
.2 Operating pressure: Max 1800 psi.
- 2.2 SERVICE .1 Biodegradable hydraulic oil (ID), submerged in fresh water (OD)
.2 Refer to hydraulic oil specification. Ensure all tubing and fittings are compatible with selected oil.
-

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

- 2.4 TUBING
- .1 Requirements:
 - .1 Material 316 ss.
 - .2 Various sizes.
 - .3 ASTM A269 or equivalent.
 - .4 Per SAE J1065, tube wall thickness must meet pressure requirements.
 - .5 Tube fitting manufacturer must specify the allowable ranges of tube wall thickness, diameter, and material hardness.
 - .6 High quality, fully annealed, seamless or drawn type (316) austenitic stainless steel.
 - .7 Tubing to be free of scratches, suitable for bending, and must properly adapt to a compression fitting.
 - .8 Hardness not to exceed 80 hrb.
 - .9 Contractor must ensure OD tolerance is suitable for connection. Lines must be continuous with no butt-splices.

- 2.5 TUBE FITTINGS
- .1 Use compression style fittings for all tubing connections.
 - .2 Block connections to be SAE J514 O-ring boss.
 - .3 Where required, adapt to adjacent equipment with proper connection type.
 - .4 The tube fitting assembly must not gall during assembly.
 - .5 The fitting style must allow for disassembly and re- assembly, while maintaining a leak-tight seal.
 - .6 Tube fitting and components will be stamped to identify manufacturer and material, and must be certified to produce fittings under an n-stamp program accredited by ASME.
 - .7 The fitting manufacturer must have a statistical quality control program in place.
-

- 2.5 TUBE FITTINGS (Cont'd) .7 (Cont'd)
No component of any other tube fitting manufacturer will be interchanged or intermixed.
- .8 If NPTF fittings have to be used (i.e. existing hydraulic cylinders), high density gray stainless steel PTFE thread seal tape must be used (MIL specification T-22730A)
- 2.6 HOSE AND FLEX LINES .1 SAE 100R2AT standard per SAE J517
- 2.7 HOSE FITTINGS .1 316 ss crimp fittings. Fittings to adapt to equipment as required.
- 2.8 FASTENERS/ SUPPORTS .1 Refer to drawings for typicals.
- .2 Tube support brackets must not prevent axial movement from thermal contraction and expansion. 5 ft spacing maximum for all tubing.
- .3 Contractor must ensure best practices are followed for tube installation for the temperature ranges stated.
- 2.9 ADAPTERS .1 All adaptors to be stainless steel
- .2 Use Standard S.A.E. dash sizes
- .3 Where possible, use 37° JIC to connect to flex lines
- .4 If connecting to NPT, use a high density grey stainless steel PTFE thread seal tape. (MIL Specification T-227730A)
- .5 Use best "Industry Accepted" installation, assembly and routing methods
- 2.10 SUCTION LINES .1 Sizes and requirements:
- .1 From oil reservoir to pumps: 1" hose.
- .2 Must meet requirements listed in SAE J1065.
-

- 2.11 PRESSURE LINES
- .1 Sizes and requirements:
 - .1 From pump outlet to valve manifold: 3/4 hose.
 - .2 From valve manifold to and from cylinders: 3/4" x 0.049 wall tubing, 1/2" hose (at cylinders and at pintle centres for gate rotation).
 - .3 From manifold to tank: "1 tubing.

PART 3 - EXECUTION

- 3.1 TUBE INSTALLATION
- .1 All tube and fitting installation must follow current standard best practices, and tube and fitting vendor specifications. The manufacturer will provide clear instructions for proper tube fitting installation. Tube fitting will not require disassembly for inspection after assembly.

- .2 Maximum bending radius and bends near fittings and fasteners: per vendor specifications. All fittings and valve stems must be placed where easily accessible. Contractor must provide shop drawings for review before installation.

- .3 Line preparation: per vendor specifications.

- 3.2 HOSE INSTALLATION
- .1 Current best practices must be followed.
 - .2 Hoses must not kink or twist throughout the movement of operating ranges. Routing must be per layout drawings.

- 3.3 MATERIAL HANDLING
- .1 Tubes, hoses, pipes and fittings must be free of damages upon commissioning.

- 3.4 CLEANING
- .1 Tubing and all hydraulic components to be cleaned of debris, oils, etc. Before installation following applicable standards. After installation complete, use pumps to cycle hydraulic oil through system (1 hr per channel). Before - turnover, contractor to supply oil sample report; oil must meet ISO 17/11 as a minimum. Contractor to make record of cleaning.
-

3.4 CLEANING .2 Note: temporary plumbing arrangements may be
(Cont'd) required to cycle oil through system.
Contractor to ensure oil cleanliness meets or
exceeds all specifications required for all
wetted hydraulic components in the system.

3.5 TESTING .1 Static test:
.1 Disconnect all cylinders (do not apply
pressure to cylinders during testing), dead
end system and test to maximum working
pressure.
.2 Attach pressure gauge and hold pressure
for 4 hours. Inspect all connection joints for
leaks during test.
.3 All tube and hose connections must
provide a leak-tight seal during the pressure
test.
.4 Contractor to make record of testing
inspection.

3.6 FABRICATION AND .1 Refer to the drawings.
INSTALLATION

PART 1 - GENERAL

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

1.2 RELATED WORK .1 Section 01 78 02 - Operation and Maintenance Manual
.1 Compile all necessary information for operation and maintenance.
.2 Section 01 79 00 - Demonstration and Training
.3 Section 01 91 00 - Commissioning - General Requirements.

1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement for all work described in this Section.
.2 Payment for all work described in this Section shall be included in the Lump Sum Price.

PART 2 - PRODUCTS

2.1 TYPE .1 Readily biodegradable hydraulic oil (> 85%) per CEC-L-A-94, ASTM D-5864.
.2 Acceptable Products (or equivalent) that can be used:
.1 AMSOIL Synthetic Biodegradable Hydraulic Oil TBI
.2 Petro Canada - Environ hydraulic fluid
.3 Note: Vegetable based products are NOT acceptable.

2.2 TOXICITY .1 Non-toxic per OECD 209, OECD 202, OECD 203.
.2 Must pass acute aquatic toxicity on daphnia and trout.
.3 Parks Canada to approve oil toxicity characteristics before commissioning.

- 2.3 TEMPERATURE .1 Cold operating temperature: -10 degC.
- .2 Cold storage temperature: -40 degC.
- 2.4 RUST .1 Must pass distilled water test.
- .2 Anti rust per ASTM D-665.
- .3 Must meet or exceed all vendor requirements for all wetted hydraulic equipment / components / specifications.
- 2.5 COPPER CORROSION .1 Value = 1A: copper corrosion test per ASTM D-130 (3 hrs at 100 deg C).
- .2 Must meet or exceed all vendor requirements for all wetted hydraulic equipment / components / specifications.
- 2.6 FOAMING .1 Anti-foaming per ASTM D-892 sequence I, sequence II, sequence III.
- .2 Must meet or exceed all vendor requirements for all wetted hydraulic equipment / components / specifications.
- 2.7 WEAR .1 Must meet or exceed all vendor requirements for all wetted hydraulic equipment / components / specifications, i.e. per ASTM D-4172, or Vickers 35VQ25 vane pump test, Denison vane pump T5D test, etc.
- 2.8 SAE GRADE .1 Per equipment specifications, and operating temperature.
- .2 Must meet or exceed all vendor requirements for all wetted hydraulic equipment/components / specifications.
- 2.9 VISCOSITY .1 Per equipment specifications, and operating temperature.
-

<u>2.9 VISCOSITY</u> (Cont'd)	.2	Must meet or exceed all vendor requirements for all wetted hydraulic equipment / components / specifications.
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<u>2.10 CLEANLINESS</u>	.1	Per ISO 4406, must meet or exceed all vendor requirements for all wetted hydraulic equipment / components / specifications.
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<u>2.11 OTHER</u>	.1	All other characteristics must meet or exceed all vendor requirements for all wetted hydraulic equipment / components / specifications, including seals.
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PART 3 - EXECUTION

<u>3.1 FABRICATION AND INSTALLATION</u>	.1	Refer to the drawings.
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PART 1 - GENERAL

- 1.1 DESCRIPTION .1 This section describes the hydraulic components that make up the oil reservoir and associated equipment, pump/motor mounts, oil flow and pressure control devices.
- 1.2 RELATED WORK .1 Section 01 78 02 - Operation and Maintenance Manual.
.1 Compile all necessary information for operation and maintenance.
.2 Section 01 79 00 - Demonstration and Training.
.3 Section 01 91 00 - Commissioning - General Requirements.
- 1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement for all work described in this Section.
.2 Payment for all work described in this Section shall be included in the Lump Sum Price.

PART 2 - PRODUCTS

- 2.1 OIL RESERVOIR .1 Operating Pressure: Atmosphere.
.2 Reservoir Material: 10 gauge 316 stainless steel.
.3 Capacity: 60 gallons usable.
.4 Reservoir Style: 'L' shape.
.5 Cleaning Access: Hinged or removable cover with gaskets, tee handle fasteners.
.6 Baffle: yes.
.7 Magnet: yes. Top accessible, removable without draining tank.
.8 Drain: Yes. SAE.
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2.1 OIL RESERVOIR
(Cont'd)

- .9 Ports: The tank will include sufficient number of ports, plus spare suction and return ports (plugged) to connect all necessary equipment.
- .10 Heaters:
 - .1 1500 Watt
 - .2 2" NPT
 - .3 Two element
 - .4 c/w built-in thermostat (10°C to 120°C range)
 - .5 Single phase 110V, 60HZ, 1PH
- .11 Lifting: Skid must come with suitable lifting holes.
- .12 Finishes:
 - .1 Exterior: unfinished stainless steel.
 - .2 Interior: unfinished stainless steel.
- .13 Motor Mounting Plate: 3/8" steel.
- .14 Drip tray: 10 gauge steel - sized to hold 60 gallons +10% = 66 gallons.
- .15 Component Configuration:
 - .1 Refer to hydraulic schematic.
 - .2 Contractor to follow current best practices and standards as outlined in NFPA T2.24.1.
 - .3 Contractor to produce shop drawings for review before fabrication.

2.2 OIL RESERVOIR
SIGHT GLASS

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

2.2 OIL RESERVOIR
SIGHT GLASS
(Cont'd)

- .8 Transparent Window:
 - .1 Material to suit application.
 - .2 Must be transparent.
- .9 Seals: BUNA-N/nitrile.
- .10 Connections: Bolted.

2.3 UNLOAD VALVE

- .1 Operating Pressure: 1800 psi.
- .2 Maximum Pressure: 3000 psi.
- .3 Operating Temperature: -10 degC to 80 degC.
- .4 Type / Style: Solenoid, 2 position, spring return control valve.
- .5 Flow Rate: 6.4 gpm (minimum).
- .6 Mounting Pattern / size: NFPA D05 - standard.
- .7 Solenoid Voltage: 120 VAC / 60 Hz.
- .8 Spool Configuration: According to schematic.
- .9 Leakage Rate: < 40 cm³/min/land @ 3000 psi (maximum), @ 50 degC.
- .10 Approvals: CSA.
- .11 Indicator Lights: Yes.
- .12 Actuator Type: Wet armature solenoid.
- .13 Seals: Nitrile.
- .14 Electrical Connection: DIN 43650A.

2.4 OIL RESERVOIR
TEMPERATURE
SWITCH

- .1 Operating Temperature: -10 degC to 80 degC.
- .2 Operating Pressure: < 2 psig.
- .3 Maximum Pressure: 30 psig.
- .4 Type:
 - .1 Threaded mount temperature alarm switch.
 - .2 Threads into side of oil reservoir.
- .5 Diaphragm: Nitrile.
- .6 Body Material: To suit application.

2.4 OIL RESERVOIR
TEMPERATURE
SWITCH
(Cont'd)

- .7 Switch Type / Circuit: SPST / No.
- .8 Electrical Switching Capacity: 1A, 110 VAC.
- .9 Electrical Connection: DIN 43650A, IP65.
- .10 Mechanical Connection: Male 1/2" NPT.
- .11 Temperature Setting: 150degF (66 degC) rising.
- .12 Setting Tolerance: +/- 4 degC.
- .13 Differential: <10 degC deadband.
- .14 Mechanical Life: > 1 million cycles.
- .15 Approvals: CSA.

2.5 OIL RESERVOIR
LEVEL SWITCH

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

<u>2.6 RETURN LINE HYDRAULIC OIL FILTER</u>	.1	Operating Temperature: -10 degC to +80 degC.
	.2	Operating Pressure: 15 psig.
	.3	Type: Assembly: spin on oil filter with bypass check valve.
	.4	Differential Gauge:
	.1	0-25 psig safe operating range.
	.2	Required for monitoring filter condition.
	.5	Bypass Valve Setting: 25 psig.
	.6	Flow Rate: Minimum 24 USGPM nominal rating.
	.7	Filter Canister Size: Size to suit.
	.1	Pressure drop during clean filter operation not to exceed 1 psig.
	.2	Note: This is intentionally oversized for improved performance and extended life.
	.8	Canister Style: Disposable, spin on.
	.9	Filter Media: Microglass.
	.10	Particle Size: 10 Microns.
<u>2.7 OIL RESERVOIR SUCTION STRAINER</u>	.11	Filter Performance / Efficiency: Beta 75 (minimum).
	.12	Canister and Head Material: All materials to suit application.
	.13	Port Sizes: SAE-ORB, to suit filter head.
	.14	Mounting: Head must be suitable for mounting.
	.1	Operating Temperature: -10 degC to +80 degC.
	.2	Operating Pressure: Not to exceed 0.2 psi differential.
	.3	Maximum Pressure (Negative): -5 psig.
	.4	Type: Submerged pump suction strainers.
	.5	Bypass Valve Setting: 3-5 psi (differential).
	.6	Maximum Flow Rate: 18 USGPM nominal capacity.
	.7	Filter Element: Stainless Steel.

2.7 OIL RESERVOIR
SUCTION STRAINER
(Cont'd)

- .8 Particle Size: 200 mesh = 75 micron.
- .9 Dirt Holding Capacity: ISO 4572.
- .10 Filter Canister Size: Size to suit.
 - .1 Pressure drop during clean filter operation not to exceed 0.2 psi differential.
- .11 Canister and Head Material: Materials to suit application.
- .12 Port Sizes: Single port 3/4" NPT (minimum).

2.8 PUMP SKID TEST
PORTS

- .1 Operating Pressure: 1800 psi.
- .2 Maximum Working Pressure: 3000 psi.
- .3 Operating Temperature: -10 degC to +80 degC.
- .4 Type:
 - .1 DIN 2353 with dust cap.
 - .2 Test probes may be connected and disconnected at full system pressure without fluid loss or ingress of dirt.
- .5 Threaded Connection: - 6 SAE.
- .6 Body Material: To suit application.
- .7 Seals: To suit application.

2.9 OIL RESERVOIR
BREATHER

- .1 Filtration Element:
 - .1 Indicating silica gel desiccant.
 - .2 Element must change colour to indicate when filter requires replacement.
- .2 Operating Temperature: -10 to +80 degC.
- .3 Threaded Connection: Male 1" NPT.
- .4 Type: Desiccant style.
- .5 Body Material: To suit application.
- .6 Maximum Operating Pressure (Differential): 5 psig.
- .7 Filter Element Size: 3 micron.
- .8 Particle Removal Efficiency: Beta 75.

```
.1    Manifolds: two
.2    Operating Pressure: 1800 psi.
.3    Maximum Pressure: 3000 psi.
.4    Type: Bar manifold.
.5    Threaded Ports: SAE-ORB
.6    Valve Mounting Pattern: NFPA T3.5.1-D05.
.7    Valve Spacing: 3.25" / standard spacing.
.8    Material: Aluminum.
```

- 2.11 CONTROL VALVE MANIFOLD
(Cont'd)
- .9 Number of Stations: 5 per manifold.
 - .10 Circuit Type: Parallel.
 - .11 Relief Cavity: Yes.
 - .12 Connections/Supports: Foot mount bracket.
- 2.12 PRIMARY
HYDRAULIC GEAR PUMP
- .1 Working Pressure: 3000 psi.
 - .2 Operating Pressure: 1800 psi
 - .3 Type: High pressure hydraulic gear pump.
 - .4 Mechanical Efficiency: > 95%.
 - .5 Volumetric Efficiency: > 95%.
 - .6 Threaded Connections: SAE-ORB
 - .7 Volume Flow Rate (based on 1725 rpm motor):
 - .1 Pump must provide: minimum 6 gpm, maximum 6.4 gpm (based on required flow rates, 7.5 hp motor, 1800 psi maximum operating pressure).
 - .8 Mounting:
 - .1 Include adapter and coupling to directly mount to motor c-face.
 - .2 Coupling must have a flexible insert.
 - .9 Bushings: Teflon lined.
 - .10 Seals: Buna-N.
- 2.13 EMERGENCY
HYDRAULIC GEAR PUMP
- .1 Working Pressure: 3000 psi.
 - .2 Operating Pressure: 1800 psi.
 - .3 Type: High pressure hydraulic gear pump.
 - .4 Mechanical Efficiency: > 95%.
 - .5 Volumetric Efficiency: > 95%.
 - .6 Threaded Connections: SAE-ORB.
 - .7 Volume Flow Rate @ 1725 rpm.
 - .1 Pump must provide: minimum 1.22 gpm, maximum 1.71 gpm (based on required flow
-

2.13 EMERGENCY
HYDRAULIC GEAR PUMP
(Cont'd)

- .7 (Cont'd)
 - .1 Pump must provide:(Cont'd)
rates, 2.0 HP motor, 1800 psi maximum
operating pressure).
- .8 Mounting:
 - .1 Include adapter and coupling to directly
mount to motor c-face.
 - .2 Coupling must have a flexible insert.
- .9 Bushings: Teflon Lined.
- .10 Seals: Buna-N.

2.14 CHECK VALVE

- .1 Operating Pressure: 1800 psi.
- .2 Maximum Pressure: 3000 psi.
- .3 Type: Metal poppet check valve.
- .4 Cracking Pressure: Between 5 and 15 psi
differential.
- .5 Threaded Port: SAE.
 - .1 Primary Pumps (SAE-10).
 - .2 Emergency Pump (SAE-6).
- .6 Operating Temperature: -10 degC to +80 degC.
- .7 Body Material: Stainless Steel.
- .8 Seals: Buna-N/Nitrile.

2.15 BALL VALVE

- .1 Operating Pressure: < 4 psig.
- .2 Class: ANSI Class 150 (or better).
- .3 Max Pressure: 150 psig (minimum).
 - .1 Ball valves only to be used on low
pressure side of pumps.
 - .2 Refer to hydraulic schematic.
- .4 Operating Temperature: -10 degC to +80 degC.
- .5 Type: Full bore 90 degree ball valve.
- .6 Seals: Must be compatible with selected
hydraulic fluid.

- 2.15 BALL VALVE
(Cont'd)
- .7 Body / Stem Material: Stainless Steel.
 - .1 No metal to metal moving parts.
 - .8 Ball Material: Chrome plated or stainless steel.
 - .9 Connections: SAE O-ring boss.
 - .10 Handle:
 - .1 Locking style, with flow direction arrow.
 - .2 One hand operation.
- 2.16 PRESSURE RELIEF CARTRIDGE VALVE
- .1 Operating Pressure: 1800 psi.
 - .2 Maximum Pressure: 3000 psi.
 - .3 Type: Pilot operated, cartridge style, balanced spool relief valve.
 - .4 Flow Rate: 6.4 gpm (minimum).
 - .5 Operating Temperature: -10 degC to +80 degC.
 - .6 Adjustment Range: 100 -1800 psig minimum range.
 - .7 Adjustment: Sealed screw type, 4-6 turns through adjustment range.
 - .8 Configuration: Per hydraulic schematic.
 - .9 Connection: Must connect to control valve manifold relief cavity port.
 - .10 Seals: Buna-N.
- 2.17 SAMPLING PORT
- .1 Operating Pressure: Atmospheric.
 - .2 Operating Temperature: -10 degC to 80 degC.
 - .3 Mounting: 1/4" NPT.
 - .4 Threaded Port: DIN 2353 with dust cap.
 - .5 Tube: 1/4" stainless steel tubing.
 - .6 Tube Length: To reach mid-level of fluid in reservoir.
-

- 2.18 SANDWICH BODY .1 Operating Pressure: 1800 psi.
FLOW
CONTROL VALVE .2 Max Pressure: 3000 psi.
- .3 Type: Sandwich body/cartridge style needle valve flow control.
- .4 Mounting Pattern: NFPA D05 - Standard.
- .5 Flow Rate:
.1 At full open, valve must pass 3.2 gpm (minimum), 7 gpm (maximum).
.2 Valve will control flow from 0 gpm to 3.2 gpm during operation.
- .6 Operating Temperature : -10 degC to +80 degC.
- .7 Body Material: Aluminum.
- .8 Adjustment: Sealed screw type, adjustment range 4 turns minimum.
- .9 Leakage: No leakage at shutoff.
- .10 Seals: Buna-N.
- .11 Configuration: Per schematic.
- 2.19 SANDWICH BODY .1 Operating Pressure: 1800 psi.
PRESSURE
REDUCING VALVE .2 Max Pressure: 3000 psi.
- .3 Type: Pilot operated, sandwich body/cartridge style pressure reducing valve.
- .4 Mounting Pattern: NFPA D05 - Standard.
- .5 Pressure Adjustment:
.1 100-1800 psig minimum range.
.2 Valve will control pressure between 100 and 1800 psi during operation.
- .6 Operating Temperature: -10 degC to +80 degC.
- .7 Body Material: Aluminum.
- .8 Adjustment: Sealed screw type, adjustment range 4 turns minimum.
- .9 Seals: Buna-N.
- .10 Configuration: Per schematic.
-

2.20 SANDWICH BODY DUAL PO CHECK VALVE	.1	Operating Pressure: 1800 psi.
	.2	Max Pressure: 3000 psi.
	.3	Type: Pilot operated, sandwich body/cartridge style, check valve.
	.4	Mounting Pattern: NFPA D05 - Standard.
	.5	Operating Temperature: -10 degC to +80 degC.
	.6	Nominal Flow Rate: 3.2 gpm (minimum).
	.7	Body Material: Aluminum.
	.8	Manual Load Release: Yes: sealed screw type.
	.9	Seals: Buna-N.
	.10	Configuration: Per schematic.
2.21 REGENERATIVE BALANCE VALVE ASSEMBLY	.1	Operating Pressure: 1800 psi.
	.2	Max Pressure: 3000 psi.
	.3	Type: Cartridge style components.
	.4	Flow Rate: 3.2 gpm (minimum) at inlet.
	.5	Operating Temperature : -10 degC to +80 degC.
	.6	Body Material: Aluminum.
	.7	Adjustment: Sealed screw type, easily accessible.
	.8	Seals: Buna-N.
	.9	Configuration: Per schematic. .1 Several cartridges will be required to complete this assembly.
	.10	Ports: SAE O-ring boss.
	.11	Mounting: Foot bracket(s).

- 2.21 REGENERATIVE .12 Port Locations:
BALANCE VALVE .1 A, B & T on bottom.
ASSEMBLY .2 Cylinder ports on top.
(Cont'd)
-
- .13 Adjustment Range: 500 - 1800 psi (minimum range).
- 2.22 SANDWICH BODY .1 Operating Pressure: 1800 psi.
DUAL FLOW .2 Max Pressure: 3000 psi.
CONTROL
-
- .3 Type: Sandwich body/cartridge style.
.4 Mounting Pattern: NFPA D05 - Standard.
.5 Flow Rate: 6.4 gpm maximum.
.6 Operating Temperature: -10 degC to +80 degC.
.7 Body Material: Aluminum.
.8 Adjustment: Sealed screw type, 4 turns minimum.
.9 Seals: Buna-N.
.10 Configuration: Per schematic.

PART 3 - EXECUTION

- 3.1 FABRICATION AND .1 Refer to the drawings.
INSTALLATION

PART 1 - GENERAL

1.1 DESCRIPTION .1 This section describes the hydraulic cylinders and associated equipment that will be used to operate the lock gates and sluice valves.

1.2 RELATED WORK .1 Section 01 78 02 - Operation and Maintenance Manual.
.1 Compile all necessary information for operation and maintenance.
.2 Section 01 79 00 - Demonstration and Training.
.3 Section 01 91 00 - Commissioning - General Requirements.

1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement for all work described in this Section.
.2 Payment for all work described in this Section shall be included in the Lump Sum Price.

PART 2 - PRODUCTS

2.1 LOWER SLUICE GATE CYLINDER .1 Operating Pressure: 1800 psi.
.2 Maximum Pressure: 3000 psi.
.3 Type: Double acting hydraulic cylinder.
.4 Flow Rate: 6.4 gpm (Minimum).
.5 Operating Temperature: -10°C to +80°C.
.6 Body Material: Washdown rated.
.7 Rod Material: Stainless steel, chrome plated.

.8 Seal Material: Compatible with oil.
.9 Configuration: As shown on layouts.

(Cont'd)

- .10 Bore size: 4" diameter.
- .11 Rod size: 2-1/2" diameter.
- .12 Stroke: (About 24") Specify to accommodate full sluice valve motion.
- .13 Accessories: Replace existing cylinder accessories.
- .14 Ports: SAE O-ring boss.
- .15 Other Features: As noted on layouts.

2.2 LOWER GATE
CYLINDER

- .1 Operating Pressure: 1800 psi.
- .2 Maximum Pressure: 3000 psi.
- .3 Type: Double acting hydraulic cylinder.
- .4 Flow Rate: 6.4 gpm.
- .5 Operating Temperature : -10°C to +80°C.
- .6 Body Material: Washdown rated.
- .7 Rod Material: Stainless steel, chrome plated.
- .8 Seal Material: Compatible with oil.
- .9 Configuration: As shown on layouts.
- .10 Bore Size: 5" diameter.
- .11 Rod Size: 3-1/2" diameter.
- .12 Stroke: (About 58") Specify to accommodate full gate motion, plus 1" on each end of stroke.
- .13 Accessories: Replace existing cylinder accessories.
- .14 Ports: SAE O-ring boss.
- .15 Other Features: As noted on layouts.

- 2.3 CYLINDER BLEED VALVES
- .1 Operating Pressure: 1800 psi.
 - .2 Max Pressure: 3000 psi.
 - .3 Type: Needle style flow control valve.
 - .4 Threaded Port: -4 SAE.
 - .5 Operating Temperature: -10 degC to +80 degC.
 - .6 Turns to full open: 5 minimum.
 - .7 Valve Materials: Stainless steel.
 - .8 Seals: Buna-n/nitrile.
 - .9 Max flow rate: < 5 gpm.

PART 3 - EXECUTION

- 3.1 FABRICATION AND INSTALLATION
- .1 Refer to the drawings.

PART 1 - GENERAL

- | | | |
|---------------------------------|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>1.1 RELATED REQUIREMENTS</u> | .1 | Section Includes:
.1 General requirements that are common to NMS sections found in Division 26 - Electrical. |
| <u>1.2 REFERENCES</u> | .1 | Canadian Standards Association (CSA International)
.1 CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations. |
| | .2 | Health Canada / Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS). |
| | .3 | The Ontario Electrical Safety Code 2012, and all bulletins (Ontario). |
| | .4 | Hydro requirements and local applicable codes and regulations. |
| <u>1.3 DEFINITIONS</u> | .1 | Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122. |
| <u>1.4 DESIGN REQUIREMENTS</u> | .1 | Operating voltages: to CAN3-C235. |
| | .2 | Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. |
| | .3 | Language operating requirements: provide identification nameplates and labels for control items in English. |
-

1.5 ACTION AND
INFORMATIONAL
SUBMITTALS

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

1.6 QUALITY
ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 01 - Quality Control.
- .2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Territorial Act respecting manpower vocational training and qualification.
 - .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
 - .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
- .3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 DELIVERY,
STORAGE AND
HANDLING

- .1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract.
 - .2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section
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1.7 DELIVERY, STORAGE AND HANDLING (Cont'd)	.2	(Cont'd) 01 74 20 - Construction/Demolition Waste Management and Disposal.
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1.8 SYSTEM STARTUP	.1	Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.
	.2	Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
	.3	Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

1.9 OPERATING	.1	Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel
	.2	Operating instructions to include following: .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment. .2 Start up, proper adjustment, operating, and shutdown procedures. .3 Safety precautions. .4 Procedures to be followed in event of equipment failure. .5 Other items of instruction as recommended by manufacturer of each system of item of equipment.
	.3	Print or engrave operating instructions and frame under glass or in approved laminated plastic.
	.4	Post instructions where directed.
	.5	For operating instructions exposed to weather, provide weather-resistant materials (cont'd) or weatherproof enclosures.

<u>1.9 OPERATING (Cont'd)</u>	.6	Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removals or peeling.
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PART 2 - PRODUCTS

<u>2.1 MATERIALS AND EQUIPMENT</u>	.1	Material and equipment to be CSA certified. Where CSA certified material and equipment is not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
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	.2	Factory assemble control panels and component assemblies.
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<u>2.2 WIRING TERMINATIONS</u>	.1	Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.
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<u>2.3 EQUIPMENT IDENTIFICATION</u>	.1	Identify electrical equipment with nameplates and labels as follows: .1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, black face, white core, lettering accurately aligned and engraved into core. .2 Sizes as follows:
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NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Labels: embossed plastic labels with 6mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Identify equipment with Size 3 labels engraved as directed by Departmental Representative.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.

2.4 WIRING
IDENTIFICATION

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

2.5 CONDUIT AND
CABLE
IDENTIFICATION

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

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

		Prime	Auxiliary
<u>PART 3 - EXECUTION</u>			
<u>3.1 INSTALLATION</u>	.1	Do complete installation in accordance with CSA C22.1 except where specified otherwise.	
	.2	Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.	
<u>3.2 NAMEPLATES AND LABELS</u>	.1	Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.	
<u>3.3 FIELD QUALITY CONTROL</u>	.1	Conduct the following tests in accordance with Section 01 45 01.	
	.2	Carry out tests in presence of Departmental Representative.	
	.3	Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.	
<u>3.4 CLEANING</u>	.1	Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.	
	.2	Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.	
<u>3.5 LOCATION OF OUTLETS</u>	.1	Locate outlets in accordance with the drawings.	
	.2	Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.	
	.3	Change locations of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.	

- 3.6 FIELD QUALITY
- .1 Conduct the following tests in accordance with Section 01 45 01.
 - .2 Carry out tests in presence of Departmental Representative.
 - .3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- 3.7 MOUNTING HEIGHTS
- .1 Mounting height of equipment is from finished floor to centerline of equipment unless specified or indicated otherwise.
 - .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
 - .3 Install electrical equipment at following heights unless indicated otherwise:
 - .1 Local switches: 1400 mm.
 - .2 Wall receptacles:
 - .1 General: 300 mm.
 - .2 Above top of continuous baseboard heater: 200 mm
 - .3 Above top of counters or counter splash backs: 175 mm
 - .4 In mechanical rooms: 1400 mm.
 - .3 Panel boards: as required by Code or as indicated.
- 3.8 CO-ORDINATION OF PROTECTIVE DEVICES
- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS .1 Section 26 05 00 - Common Work Results for Mechanical.

1.2 REFERENCES .1 Canadian Standards Association (CSA International)
.1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
.2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.

1.3 ACTION AND INFORMATIONAL SUBMITTALS .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

PART 2 - PRODUCTS

2.1 CABLES AND REELS .1 Provide cables on reels or coils.
.1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
.2 Each coil or reel of cable to contain only one continuous cable without splices.

2.2 CONDUITS .1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel.

2.3 CONDUIT FASTENINGS .1 One hole steel straps to secure surface conduits 50 mm and smaller.
.1 Two hole steel straps for conduits larger than 50 mm.

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| <u>2.4 CONDUIT
FITTINGS</u> | .1 | Fittings: to CAN/CSA C22.2 No. 18,
manufactured for use with conduit specified.
Coating: same as conduit. |
| | .2 | Ensure factory "ells" where 90 degrees bends
for 25 mm and larger conduits. |

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|----------------------|----|----------------|
| <u>2.5 FISH CORD</u> | .1 | Polypropylene. |
|----------------------|----|----------------|

PART 3 - EXECUTION

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|--------------------------------------------|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>3.1 MANUFACTURER'S
INSTRUCTIONS</u> | .1 | Compliance: comply with manufacturer's
written recommendations or specifications,
including product technical bulletins,
handling, storage and installation
instructions, and datasheets. |
|--------------------------------------------|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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|-------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------|
| <u>3.2 INSTALLATION</u> | .1 | Install conduits to conserve headroom in
exposed locations and cause minimum
interference in spaces through which they
pass. |
| | .2 | Conceal conduits except in mechanical and
electrical service rooms. |
| | .3 | Use rigid galvanized steel threaded conduit
except where specified otherwise. |
| | .4 | Minimum conduit size for lighting and power
circuits: 19 mm. |
| | .5 | Bend conduit cold:
.1 Replace conduit if kinked or flattened
more than 1/10th of its original diameter. |
| | .6 | Mechanically bend steel conduit over 19 mm
diameter. |
| | .7 | Field threads on rigid conduit must be of
sufficient length to draw conduits up tight. |
| | .8 | Install fish cord in empty conduits. |
| | .9 | Remove and replace blocked conduit sections.
.1 Do not use liquids to clean out
conduits. |
| | .10 | Dry conduits out before installing wire. |
-

- 3.3 SURFACE
CONDUITS
- .1 Run parallel or perpendicular to building lines.
 - .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
 - .3 Run conduits in flanged portion of structural steel.
- 3.4 CLEANING
- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 This section describes the main control cabinet that will be located in the control building (surrounding the hydraulic skid). It also describes all of the equipment that will be housed inside of or on the main control cabinet.
- 1.2 RELATED WORK .1 Section 01 78 02 - Operation and Maintenance Manual.
.1 Compile all necessary information for operation and maintenance.
- .2 Section 01 79 00 - Demonstration and Training.
- .3 Section 01 91 00 - Commissioning - General Requirements.
- 1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement for all work described in this Section.
- .2 Payment for all work described in this Section shall be included in the Lump Sum Price.

PART 2 - PRODUCTS

- 2.1 MAIN CONTROL CABINET .1 Type: Continuous hinge, clamped cover.
- .2 Rating: CSA Type 12.
- .3 Backplane: Yes.
- .4 Material: Formed 14 gauge steel body and door.
- .5 Provision for Padlocking: Yes.
- .6 Finish: Powder coating inside and out.
- .7 Size: To be determined by Contractor.
-

2.2 FUSE - 20 AMP

- .1 Ampere rating: 20.
- .2 Class: CC.
- .3 Speed: Time delay.
- .4 Voltage: 600 VAC.
- .5 Interrupt Rating: 200 Ka.
- .6 Approvals: CSA Approved.

2.3 FUSE HOLDER
THREE-POLE

- .1 Type: Finger safe.
- .2 Mounting: DIN rail.
- .3 Voltage: 600 VAC.
- .4 # of poles: 3.
- .5 Withstand Rating: 200 kA.
- .6 Approvals: CSA approved.

2.4 SAFETY
CONTACTOR

- .1 NEMA size: 1.
- .2 Continuous Current: 27 A.
- .3 Enclosure Type: Open.
- .4 Voltage: 575 VAC.
- .5 Phase: 3.
- .6 HP (kW): 10 (7.5).
- .7 Coil voltage: 120 VAC.
- .8 Safety Rated: yes.
- .9 No. of Aux Contacts:
 - .1 1 normally open.
 - .2 1 normally closed.
- .10 Aux Contacts Type: Mechanically linked, positively guided.
- .11 Approvals: CSA approved.

-
- 2.5 HOUR METER .1 Type: Panel mount.
- .2 Display: 5 digit.
- .3 Reset: no.
- .4 Voltage: 120 VAC.
- .5 Frequency: 60 Hz.
-
- 2.6 3-POSITION
SELECTOR SWITCH .1 Type: Heavy duty.
- .2 No. of positions: 3.
- .3 Contact Details: 2 contacts closed per position.
- .4 Ratings: CSA Type 4X, oil tight, water tight.
- .5 Size: 30 mm.
- .6 Contact Continuous Current Rating: 10 A.
- .7 Contact Voltage Rating: 120 VAC minimum.
-
- 2.7 FUSE - 2 AMP .1 Ampere Rating: 2.
- .2 Class: CC.
- .3 Speed: Time delay.
- .4 Voltage: 600 VAC.
- .5 Interrupt rating: 200 kA.
- .6 Approvals: CSA approved.
-
- 2.8 FUSE HOLDER
TWO-POLE .1 Type: Finger safe.
- .2 Mounting: DIN rail.
- .3 Voltage: 600 VAC.
- .4 No. of poles: 2.
- .5 Withstand Rating: 200 kA.
- .6 Approvals: CSA approved.
-

-
- 2.9 OVERLOAD RELAY .1 Type: Stand-alone.
- 575 VAC
-
- .2 Current Range: Minimum 7 Amps-12 Amps.
.3 Voltage: 575 VAC.
.4 Phase: 3.
.5 HP: 7.5.
.6 Aux Contacts:
.1 1 normally open.
.2 1 normally closed.
.3 For future use.
.7 Approvals: CSA approved.
- 2.10 GROUND FAULT .1 Type: DIN rail mount.
INTERRUPTER
-
- .2 Current rating: 10 amps.
.3 Voltage: 120V.
.4 Phase: 1.
.5 Rated short circuit capability: 10 kA.
.6 Approvals: CSA approved.
- 2.11 OVERLOAD RELAY .1 Type: Stand-alone.
- 240 VAC
-
- .2 Current Range: Min. 8 Amps-15 Amps.
.3 Voltage: 240 VAC.
.4 Phase: 1.
.5 HP: 2.
.6 Aux Contacts:
.1 1 normally open.
.2 1 normally closed.
.3 For future use.
.7 Approvals: CSA approved.
-

2.12 PROGRAMMABLE
LOGIC CONTROLLER

- .1 Power Supply: 120 VAC.
- .2 Input Voltage Required: 120 VAC.
- .3 No. of Inputs: 48 minimum.
- .4 Output Voltage Required: 120 VAC.
- .5 No. of Outputs: 32 minimum.
- .6 Mounting Style: DIN rail.
- .7 Temperature (Non Operating) : -40 to 85 degC.
- .8 Temperature (Operating): 0 to 55 deg C.
- .9 Operating Humidity: 5% to 95% (without condensation).

2.13 CONTROL
TRANSFORMER

- .1 Type: Dry, open type.
- .2 Input Voltage: 600 VAC.
- .3 Input Phase: 1.
- .4 Output Voltage: 120 VAC.
- .5 Output Phase: 1.
- .6 Output VA: 1000.
- .7 Operating Frequency: 60 Hz.
- .8 Standards: CSA.

2.14 SAFETY RELAY

- .1 Type:
 - .1 Category 4 (EN954-1) safety relay.
 - .2 Wired for two channel e-stop with short circuit and earth fault monitoring.
- .2 Safety Inputs: 2 minimum.
- .3 Safety Outputs: 2 N.O. minimum.
- .4 Reset Function:
 - .1 Reset on closure of reset circuit only if safety inputs are previously closed or if safety inputs are closed within 50 ms.
 - .2 Must not allow reset in the case of shorted or operator defeated reset button.

2.14 SAFETY RELAY
(Cont'd)

- .5 Monitoring:
 - .1 Relay must monitor for short circuit conditions on safety inputs, and not allow a reset in the case of a short circuit.
 - .2 Must not allow reset in the case of no change of state condition in either safety input.
 - .3 No output if safety inputs mismatch for more than 50ms.
 - .4 Earth monitoring and lockout if detected.
- .6 Power Supply: 115 VAC.
- .7 Mechanical Life: >10,000,000.
- .8 Output Ratings: 3A/115 VAC inductive.
- .9 Operating Temperature: 0 degC to +55 degC.
- .10 Mounting: DIN rail.

2.15 BUZZER

- .1 Type: Panel mount.
- .2 Voltage: 120 VAC.
- .3 Maximum Current Draw: 100 milli-amps.
- .4 Volume: >85 db minimum.

2.16 2-POSITION
SELECTOR SWITCH
MAINTAINED

- .1 Type: Heavy duty.
- .2 Operator Type: 2-position selector, gloved hand, maintained.
- .3 Contact details:
 - .1 Left position - Empty.
 - .2 Right position - 1 N.O. contact.
- .4 Ratings: CSA Type 4X, oil tight, water tight.
- .5 Size: 30 mm.
- .6 Contact Continuous Current Rating: 10 A.
- .7 Contact Voltage Rating: 120 VAC minimum.
- .8 Colour: Black.
- .9 Illuminated Pushbutton: No.

- 2.17 FUSE - 4 AMP .1 Ampere Rating:4
- .2 Class: CC.
- .3 Speed: Time delay.
- .4 Voltage: 600 VAC.
- .5 Interrupt rating: 200 kA.
- .6 Approvals: CSA approved.

PART 3 - EXECUTION

- 3.1 INSTALLATION .1 Install Main Control Cabinet and Operator Stations, and interconnect per drawings.
- .2 Cabinets to be in conformance with UL508.

- 3.2 FIELD QUALITY CONTROL .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and check out operation of section.
- .3 Upon completion of sectional test, undertake group testing.
- .4 Check out complete system for operational sequencing.

- 3.3 IDENTIFICATION .1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

PART 1 - GENERAL

1.1 DESCRIPTION .1 This section describes the electrical power and electrical control cables that are associated with the new hydraulic system.

1.2 RELATED WORK .1 Section 01 78 02 - Operation and Maintenance

Manual.

.1 Compile all necessary information for operation and maintenance.

.2 Section 01 79 00 - Demonstration and Training.

.3 Section 01 91 00 - Commissioning - General Requirements.

1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement for all work described in this Section.

.2 Payment for all work described in this Section shall be included in the Lump Sum Price.

PART 2 - PRODUCTS

2.1 CABLE - #10 .1 Type: RW90, stranded.
RW90 - BLACK

.2 Insulation: XLPE.

.3 Size: #10 AWG.

.4 Maximum Conductor Temperature: 90 degC.

.5 Material: Copper.

.6 Colour: Black.

.7 Approvals: CSA approved.

2.2 CABLE - # 14
RW90 - RED

- .1 Type: RW90, stranded.
- .2 Insulation: XLPE.
- .3 Size: #14 AWG.
- .4 Maximum Conductor Temperature: 90 degC.
- .5 Material: Copper.
- .6 Colour: Red.
- .7 Approvals: CSA approved.

2.3 CABLE - #14
RW90 - WHITE

- .1 Type: RW90, stranded.
- .2 Insulation: XLPE.
- .3 Size: #14 AWG.
- .4 Maximum Conductor Temperature: 90 degC.
- .5 Material: Copper.
- .6 Colour: White.
- .7 Approvals: CSA approved.

2.4 CABLE - #14
RW90 - GREEN

- .1 Type: RW90, stranded.
- .2 Insulation: XLPE
- .3 Size: #14 AWG
- .4 Maximum Conductor Temperature: 90 degC.
- .5 Material: Copper.
- .6 Colour: Green
- .7 Approvals: CSA approved.

2.5 CABLE - #10
RW90 - RED

- .1 Type: RW90, stranded.
- .2 Insulation: XLPE
- .3 Size: #10 AWG
- .4 Maximum Conductor Temperature: 90 degC.

2.5 CABLE - #10 RW90 - RED (Cont'd)	.5	Material: Copper.
	.6	Colour: Red
	.7	Approvals: CSA approved.
2.6 #14 ARMOURED CABLE	.1	Type: Multi-conductor armoured cable.
	.2	Size: #14 AWG stranded.
	.3	No. of Conductors: 2.
	.4	Bare Ground Wire: Yes.
	.5	Insulation Material: XLPE.
	.6	Outer Shield: None.
	.7	Outer Jacket Over Armour: Yes.
	.8	Outer Jacket Over Armour Material: PVC.
	.9	Armour Type: Interlocked.
	.10	Armour Material: Aluminum.
	.11	Operating Temperature: -40 degC to +90 degC.
	.12	Maximum Voltage: 600 VAC.
	.13	Suitability-Burial: Yes.
	.14	Suitability-Sunlight: Yes.
	.15	Material: Copper.
2.7 CABLE - #10 RW90 - BLUE	.1	Type: RW90, stranded.
	.2	Insulation: XLPE.
	.3	Size: #10 AWG.
	.4	Maximum Conductor Temperature: 90 degC.
	.5	Material: Copper.
	.6	Colour: Blue.
	.7	Approvals: CSA approved.

2.8 SOOW CABLE - 14
AWG

- .1 Cable Type: SOOW flexible.
- .2 Conductor Size: #14 AWG.
- .3 Conductor Count: 3 conductor.
- .4 Conductor Type: Stranded.
- .5 Material: Bare copper.
- .6 Voltage range: 600 VAC.
- .7 Temperature Rating: 90 degC.
- .8 Insulation Material: CPE chlorinated polyethylene.
- .9 Screen/Shield: Unshielded.
- .10 Jacketing Material: CPE chlorinated polyethylene.
- .11 Colour: Black.
- .12 Earth/Ground Wires: No.
- .13 Standards: CSA.

2.9 CABLE - #14
RW90 - BLACK

- .1 Type: RW90, stranded.
- .2 Insulation: XLPE.
- .3 Size: #14 AWG.
- .4 Maximum Conductor Temperature: 90 degC.
- .5 Material: Copper.
- .6 Colour: Black.
- .7 Approvals: CSA approved.

2.10 SOOW CABLE -
10 AWG

- .1 Cable Type: SOOW flexible.
- .2 Conductor Size: #10 AWG.
- .3 Conductor Count: 4 conductor.
- .4 Conductor Type: Stranded.
- .5 Material: Bare copper.

2.10 SOOW CABLE - 10 AWG (Cont'd)	.6	Voltage Range: 600 VAC.
	.7	Temperature Rating: 90 degC.
	.8	Insulation Material: CPE chlorinated polyethylene.
	.9	Screen/Shield: Unshielded.
	.10	Jacketing Material: CPE chlorinated polyethylene.
	.11	Colour: Black.
	.12	Earth/Ground Wires: No.
	.13	Standards: CSA.
2.11 MULTI- CONDUCTOR ARMOURED CABLE	.1	Type: Multi-conductor armoured cable.
	.2	Size: #16 AWG stranded.
	.3	No. of Conductors: 48.
	.4	Insulation Material: PVC.
	.5	Outer Shield: Yes.
	.6	Outer Jacket Over Armour: Yes.
	.7	Outer Jacket Over Armour Material: PVC.
	.8	Armour Type: Interlocked.
	.9	Armour Material: Aluminum.
	.10	Operating Temperature: -40 degC to +90 degC.
	.11	Maximum Voltage: 600 VAC.
	.12	Suitability-Sunlight: Yes.
	.13	Material: Copper.
2.12 CABLE - #10 RW90 - WHITE	.1	Type: RW90, stranded.
	.2	Insulation: XLPE.
	.3	Size: #10 AWG.
	.4	Maximum Conductor Temperature: 90 degC.

- | | | |
|------------------|----|--------------------------|
| 2.12 CABLE - #10 | .5 | Material: Copper. |
| RW90 - WHITE | | |
| (Cont'd) | .6 | Colour: White. |
| | .7 | Approvals: CSA approved. |

PART 3 - EXECUTION

- | | | |
|---------------------------|----|-----------------------------------------------------------------------------------------|
| 3.1 FIELD QUALITY CONTROL | .1 | Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical. |
| | .2 | Perform tests before energizing electrical system. |

- | | | |
|--------------------------------|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.2 GENERAL CABLE INSTALLATION | .1 | Section omitted. |
| | .2 | Section omitted. |
| | .3 | Cable Colour Coding: to Section 26 05 00 Common Work Results for Electrical. |
| | .4 | Conductor length for parallel feeders to be identical. |
| | .5 | Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points. |
| | .6 | Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated. |
| | .7 | Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring. |

- | | | |
|----------------------------------------------|----|--------------------------------------------------------|
| 3.3 INSTALLATION OF MINERAL-INSULATED CABLES | .1 | Install cable concealed, securely supported by straps. |
| | .2 | Support 2 hour fire rated cables at 1 m intervals. |
| | .3 | Make cable terminations by using factory-made kits. |
-

3.3 INSTALLATION OF MINERAL-INSULATED CABLES .4 Cable terminations: use thermoplastic sleeving over bare conductors.

(Cont'd) .5 Do not splice cables unless indicated.

3.4 INSTALLATION OF ARMOURED CABLES .1 Group cables wherever possible on channels.

PART 1 - GENERAL

- | | | |
|-----------------------------------------------|----|-----------------------------------------------------------------------------------------------------------------------------|
| <u>1.1 DESCRIPTION</u> | .1 | This section describes the operator control stations that will be located at the upper and lower gates. |
| <u>1.2 RELATED WORK</u> | .1 | Section 01 78 02 - Operation and Maintenance Manual.
.1 Compile all necessary information for operation and maintenance. |
| | .2 | Section 01 79 00 - Demonstration and Training. |
| | .3 | Section 01 91 00 - Commissioning - General Requirements. |
| <u>1.3 MEASUREMENT AND PAYMENT PROCEDURES</u> | .1 | There will be no measurement for all work described in this Section. |
| | .2 | Payment for all work described in this Section shall be included in the Lump Sum Price. |

PART 2 - PRODUCTS

- | | | |
|---------------------------------|----|-----------------------------------------------|
| <u>2.1 OPERATOR STATION</u> | .1 | Rating: CSA Type 4X. |
| | .2 | Material: Stainless steel (316). |
| | .3 | Finish: Brushed finish. |
| | .4 | Inner Panel: No. |
| | .5 | Layout: Refer to drawings. |
| <u>2.2 MOMENTARY PUSHBUTTON</u> | .1 | Type: Heavy duty. |
| | .2 | Operator Type: Momentary, full guard. |
| | .3 | Contact Details: 1 normally open. |
| | .4 | Ratings: CSA Type 4X, oil tight, water tight. |
-

2.2 MOMENTARY PUSHBUTTON (Cont'd)	.5	Size: 30 mm.
	.6	Contact Continuous Current Rating: 10 A.
	.7	Contact Voltage Rating: 120 VAC minimum.
2.3 2-POSITION KEY SWITCH SELECTOR	.1	Type: Heavy duty.
	.2	No. of positions: 2.
	.3	Key Operated: Yes, key withdraw when contacts are open only.
	.4	Contact Details: 3 normally open contacts.
	.5	Ratings: CSA Type 4X, oil tight, water tight.
	.6	Size: 30 mm.
	.7	Contact Continuous Current Rating: 10 A.
	.8	Contact Voltage Rating: 120 VAC minimum.
	.9	Where multiple key switches are used (even on separate panels) they must use identical keys.
2.4 INDICATOR LIGHT - RED	.1	Type: Heavy duty.
	.2	Pilot Light Type: Push to test, LED.
	.3	Voltage: 120 VAC.
	.4	Ratings: CSA Type 4X, oil tight, water tight.
	.5	Size: 30 mm.
	.6	Colour: Red.
2.5 MAINTAINED PUSHBUTTONS (E-STOP)	.1	Type: Heavy duty.
	.2	Operator Type: Maintained, red mushroom head.
	.3	Contact Details: 2 normally closed.
	.4	Ratings: CSA Type 4X, oil tight, water tight.
	.5	Size: 30 mm.
	.6	Contact Continuous Current Rating: 10 A.

2.5 MAINTAINED PUSHBUTTONS (E-STOP) (Cont'd)	.7	Contact Voltage Rating: 120 VAC minimum.
	.8	Self-Monitoring Contact Blocks: Yes. N.O. to monitor the mechanical connection for the contact blocks to the operator.
2.6 INDICATOR LIGHT - GREEN	.1	Type: Heavy duty.
	.2	Pilot Light Type: Push to test, LED.
	.3	Voltage: 120 VAC.
	.4	Ratings: CSA Type 4X, oil tight, water tight.
	.5	Size: 30 mm.
	.6	Colour: Green.
2.7 3-POSITION SELECTOR SWITCH SPRING RETURN	.1	Type: Heavy duty.
	.2	Operator Type: 3-position selector, gloved hand, spring return to centre.
	.3	Contact details:
	.1	Left position - 1 N.O. contact.
	.2	Right position - 1 N.O. contact.
	.4	Ratings: CSA Type 4X, oil tight, water tight.
	.5	Size: 30 mm.
	.6	Contact Continuous Current Rating: 10 A.
	.7	Contact Voltage Rating: 120 VAC minimum.
2.8 3-POSITION SELECTOR SWITCH MAINTAINED	.8	Colour: Black.
	.9	Illuminated Pushbutton: No.
	.1	Type: Heavy duty.
	.2	Operator Type: 3-position selector, gloved hand, maintained.
	.3	Contact details:
	.1	Left position - 1 N.O. contact.
	.2	Right position - 1 N.O. contact.
	.4	Ratings: CSA Type 4X, oil tight, water tight.

2.8 3-POSITION SELECTOR SWITCH MAINTAINED (Cont'd)	.5	Size: 30 mm.
	.6	Contact Continuous Current Rating: 10 A.
	.7	Contact Voltage Rating: 120 VAC minimum.
	.8	Colour: Black.
	.9	Illuminated Pushbutton: No.
2.9 CONTROL PANEL COVER	.1	Form From: #11 ga. stainless steel (316).
	.2	Seams (if applicable): to be continuously welded and ground smooth.
	.3	Finish - Remove all sharp edges.
	.4	Install hardware and fasteners as noted on pedestal assembly drawings.
	.5	Padlock Holes - Ensure that padlock clearance holes align properly in opened and closed positions.
	.6	(Padlock to be supplied by Parks Canada.)
2.10 GAS SPRINGS	.1	Stainless steel body with M6 male threaded end.
	.2	Stainless steel rod with M6 male threaded end.
	.3	Stainless steel ball end fitting with Female M6 thread.
	.4	Stainless steel mounting ball stud, sized and rated to suit.
	.5	Extended Length - Overall extended length of assembly (ball center - ball center) : 320-325 mm.
	.6	Retracted Length - Overall retracted length of assembly (ball center - ball center) : 220-225 mm.
	.7	Spring Force - Nominal spring force rating: 15 lbs.

- | | | |
|-------------------------------------|----|---------------------------------------------------------------------------------------------------------------------------------------------|
| <u>2.10 GAS SPRINGS</u>
(Cont'd) | .8 | Configuration - Install as shown on pedestal assembly drawing (orientation must match drawing for proper seal lubrication). |
| | .9 | Mounting flexibility - Install as shown. Make minor position adjustments if necessary to accommodate actual gas spring assembly dimensions. |

PART 3 - EXECUTION

- | | | |
|----------------------------------|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>3.1 INSTALLATION</u> | .1 | Install Main Control Cabinet and Operator Stations, and interconnect per drawings. |
| | .2 | Cabinets to be in conformance with UL508. |
| <u>3.2 FIELD QUALITY CONTROL</u> | .1 | Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical. |
| | .2 | Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and check out operation of section. |
| | .3 | Upon completion of sectional test, undertake group testing. |
| | .4 | Check out complete system for operational sequencing. |
| <u>3.3 IDENTIFICATION</u> | .1 | Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical. |

PART 1 - GENERAL

- | | | |
|-----------------------------------------------|----|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>1.1 DESCRIPTION</u> | .1 | This section describes the new sensors that will be used on the lower sluice gate cylinders, lower lock gate cylinders, and lower gate miter locations. |
| <u>1.2 RELATED WORK</u> | .1 | Section 01 78 02 - Operation and Maintenance Manual.
.1 Compile all necessary information for operation and maintenance. |
| | .2 | Section 01 79 00 - Demonstration and Training. |
| | .3 | Section 01 91 00 - Commissioning - General Requirements. |
| <u>1.3 MEASUREMENT AND PAYMENT PROCEDURES</u> | .1 | There will be no measurement for all work described in this Section. |
| | .2 | Payment for all work described in this Section shall be included in the Lump Sum Price. |

PART 2 - PRODUCTS

- | | | |
|-----------------------------|----|-------------------------------------|
| <u>2.1 PROXIMITY SENSOR</u> | .1 | Type: Pre-Wired, Unshielded, 2 Wire |
| | .2 | Minimum Sensing Distance: 18 mm |
| | .3 | Size: M30 |
| | .4 | Length: Long Barrel Type |
| | .5 | Output State: Normally Open |
| | .6 | Supply Voltage: 120 VAC |
| | .7 | Sensing Object: Magnetic Metals |
| | .8 | Rating: IEC IP67. |
-

- 2.2 FIELD MOUNTED JUNCTION BOX
- .1 Rating: CSA Type 4X.
 - .2 Material: Two piece molded fiberglass reinforced polyester.
 - .3 Size: Contractor to determine

PART 3 - EXECUTION

- 3.1 SENSOR INSTALLATION
- .1 Refer to the drawings.

- 3.2 JUNCTION BOX INSTALLATION
- .1 Install junction boxes in inconspicuous but accessible locations.
 - .2 Install terminal block as required.
 - .3 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.
 - .4 Refer to the drawings.

- 3.3 IDENTIFICATION
- .1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

PART 1 - GENERAL

1.1 DESCRIPTION .1 This section describes the equipment associated with the emergency backup power system. This includes the generator, and associated electrical equipment.

1.2 RELATED WORK .1 Section 01 78 02 - Operation and Maintenance Manual.
.1 Compile all necessary information for operation and maintenance.
.2 Section 01 79 00 - Demonstration and Training.
.3 Section 01 91 00 - Commissioning - General Requirements.

1.4 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement for all work described in this Section.
.2 Payment for all work described in this Section shall be included in the Lump Sum Price.

PART 2 - PRODUCTS

2.1 TRANSFER SWITCH .1 Voltage: 120 VAC minimum.
.2 Amp Rating: 30 Amp minimum.
.3 No. of Poles: Double pole.
.4 Transfer Mode: Manual.
.5 Approvals: CSA approved.

2.2 TWIST LOCK PLUG .1 Wiring Scheme: 3 pole, 4 wire grounding.
.2 Voltage: 120/240 VAC.
.3 Amperage: 30.
.4 NEMA Configuration: L14-30P.

2.2 TWIST LOCK PLUG .5 Terminal Accommodation: 30 Amp #10 AWG.
(Cont'd)

.6 Rating: IEC IP66.

2.3 TWIST LOCK .1 Wiring Scheme: 3 pole, 4 wire grounding.
CONNECTOR BODY

.2 Voltage: 120/240 VAC.

.3 Amperage: 30.

.4 NEMA Configuration: L14-30R.

.5 Terminal Accommodation: 30 Amp #10 AWG.

.6 Rating: IEC IP66.

2.4 GENERATOR .1 Type: Two wheeled, portable, gas.

.2 Rated Voltage: 120/240 VAC.

.3 Phase: 1.

.4 Receptacles: 30A 125/250V locking plug.

.5 Accepts NEMA Plug Number: L14-30P.

.6 AC Output Rated: 5500 Watts.

.7 AC Output Max: 6500 Watts.

.8 Fuel Type: Regular unleaded.

.9 Starting Type: Electronic ignition.

.10 Starting Method: Electric start with manual
rewind.

2.5 TWIST LOCK .1 Type: Flanged inlet.
SAFETY SHROUD

FLANGED INLET .2 Wiring Scheme: 3 pole, 4 wire grounding.

.3 Amperage: 30 Amp.

.4 Voltage: 125/250 VAC.

.5 NEMA Configuration: L14-30P.

.6 Style: Shrouded, watertight.

2.5 TWIST LOCK .7 Terminal Accommodation: 30 Amp, #10 WG.
SAFETY SHROUD
FLANGED INLET .8 Installation: Watertight.
(Cont'd)

PART 3 - EXECUTION

3.1 FABRICATION AND .1 Refer to the drawings.
INSTALLATION

PART 1 - GENERAL

1.1 DESCRIPTION .1 This section describes the main hydraulic pump motors, and the backup hydraulic pump motors.

1.2 RELATED WORK .1 Section 01 78 02 - Operation and Maintenance Manual.
.1 Compile all necessary information for operation and maintenance.
.2 Section 01 79 00 - Demonstration and Training.
.3 Section 01 91 00 - Commissioning - General Requirements.

1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement for all work described in this Section.
.2 Payment for all work described in this Section shall be included in the Lump Sum Price.

PART 2 - PRODUCTS

2.1 THREE PHASE MOTOR - PRIMARY PUMPS .1 Enclosure: Totally enclosed fan cooled (TEFC)
.2 Mounting style: Foot mount
.3 Flange: C
.4 Voltage: 600 VAC
.5 Phase: 3
.6 RPM: 1750
.7 HP: 7.5
.8 Frequency: 60 hz
.9 Type: Squirrel cage

- | | | |
|--------------------------------------------------------|----|------------------------------------------------|
| <u>2.2 SINGLE PHASE
MOTOR - EMERGENCY
PUMP</u> | .1 | Enclosure: Totally enclosed fan cooled (TEFC). |
| | .2 | Mounting style: Foot mount. |
| | .3 | Flange: C |
| | .4 | Voltage: 240 VAC |
| | .5 | Phase: 1 |
| | .6 | RPM: 1750 |
| | .7 | HP: 2 |
| | .8 | Frequency: 60 hz |
| | .9 | Type: Squirrel cage |

PART 3 - EXECUTION

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| <u>3.1 FABRICATION AND
INSTALLATION</u> | .1 | Refer to the drawings. |
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| <u>3.2 MANUFACTURER'S
INSTRUCTIONS</u> | .1 | Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets. |
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| <u>3.3 INSTALLATION</u> | .1 | Dry out motor if dampness present in accordance with manufacturer's instructions. |
| | .2 | Install motor on hydraulic pump skid. |
| | .3 | Make wiring connections.
.1 Use liquid tight pvc jacketed flexible conduit between rigid conduit and motor. |
| | .4 | Make flexible conduit long enough to permit movement of motor over entire length of slide rails. |
| | .5 | Check for correct direction of rotation, with motor uncoupled from driven equipment. |
| | .6 | Align and couple motor to driven machinery to manufacturer's instructions, using only |
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- 3.3 INSTALLATION .6 (Cont'd)
(Cont'd) correct parts such as couplings, as provided
by manufacturer.
- 3.4 FIELD QUALITY .1 Perform tests in accordance with Section
CONTROL 26 05 00 - Common Work Results for Electrical.
- 3.5 CLEANING .1 Proceed in accordance with Section 01 74 11 -
Cleaning.
- .2 On completion and verification of performance
of installation, remove surplus materials,
excess materials, rubbish, tools and
equipment.

PART 1 - GENERAL

- 1.1 DESCRIPTION
- .1 This section specifies the requirements for excavating and backfilling to complete work as indicated by drawings and specifications.
 - .2 Work includes but is not limited to:
 - .1 Removal of common material, as required, to allow for existing lower gates hydraulic pits demolition and re-construction, as shown on the drawings.
 - .2 Removal/demolition of existing lower gates concrete hydraulic pits, as shown on the drawings.
 - .3 Removal/demolition of existing lower gates concrete quoins by means of vertical close drilling.
 - .4 Removal/demolition of all embedded steel components. This includes, but is not limited to, the heel post gudgeons (a.k.a. pintle), gate anchorage components and sill steel nosing.
 - .5 Removal/demolition part of existing upper and lower gates concrete sill, as shown on the drawings.
 - .6 Supply and placing granular backfill in the excavated areas listed in sub-section 1.1.2.1 to subgrade.
 - .7 Saw-cuts required to remove the concrete as shown on the drawings.
 - .8 Preparation of all concrete surfaces against which new concrete is to be cast.
 - .9 Removing all silt and concrete debris from inside the lock.
 - .10 Disposing of surplus material.
- 1.2 RELATED SECTIONS
- .1 Section 02 41 21 - Removals.
 - .2 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 Payment for these items shall be included in the Unit Price Table:
 - .1 Item No.10 - Concrete Excavation: This item covers the work described in subsections 1.1.2.2 and 1.1.2.5.
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1.3 MEASUREMENT
AND PAYMENT
PROCEDURES
(Cont'd)

- .2 (Cont'd)
 - .2 Item No.11 - Common Excavation: This item covers the work described in subsection 1.1.2.1.
 - .3 Item No.12 - Close Drilling: This item covers the work described in subsection 1.1.2.3.
 - .4 Item No.13 - Backfilling: This item covers the work described in subsection 1.1.2.6.
- .3 Saw-cuts: as required for concrete excavation. This item is to be included in the price of Concrete Excavation.
- .4 Preparation of Concrete Surfaces is to be included in the price of Concrete.
- .5 All other work of this section which is not identified as a unit price item is to be included in the lump sum amount stated in the Bid Form.
- .6 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.

1.4 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).
 - .2 Supplying, placing, grading and compacting common backfill for site grading and backfilling.
 - .3 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.

<u>1.4 DEFINITIONS (Cont'd)</u>	.3	"Rock":(Cont'd) Concrete and frozen material are not classified as rock.
	.4	"Common Backfill" - selected, excavated materials approved by the Departmental Representative for use as backfill.
<u>1.5 REQUIREMENTS OF REGULATORY AGENCIES</u>	.1	Comply with local, provincial and national codes and regulations.
	.2	Adhere to municipal and provincial requirements relating to safety of excavations and protection of workers.
<u>1.6 SOURCE QUALITY CONTROL</u>	.1	Sieve Series: MTO OPSS 1010 April 2004 Sieve Series or ASTM E11-09 Series equivalents.
	.2	Samples and sampling: to ASTM D75/D74M-09.
	.3	Maximum density and optimum moisture: to ASTM D698-07e1.
	.4	When requested, submit for approval and testing a 25 kilogram sample of each granular material specified for use.
<u>1.7 MATERIALS HANDLING</u>	.1	Transport, store and handle granular materials in such a manner as to eliminate segregation.
<u>1.8 SUBMITTALS</u>	.1	Provide details of: .1 Proposed demolition and excavation methods and equipment.
<u>1.9 PROTECTION OF EXISTING FEATURES</u>	.1	Existing surface features: .1 Conduct, with Departmental Representative, condition survey of existing trees, bushes and other plants, lawns, light poles, pavement, benches, garbage containers, historical winches which may be affected by work.

1.9 PROTECTION OF EXISTING FEATURES (Cont'd)	.1	(Cont'd)
	.2	Protect existing surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Departmental Representative.

1.10 BLASTING	.1	Blasting is not permitted.
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PART 2 - PRODUCTS

2.1 BACKFILL MATERIALS	.1	Granular backfill: to Ontario Provincial Standard Specification 1010, April 2004 for: .1 Granular A. Maximum size 19.0 mm.
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PART 3 - EXECUTION

3.1 STOCKPILING	.1	Stockpile fill materials in areas designated by Departmental Representative. Stockpile granular materials in manner to prevent segregation.
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3.2 CONCRETE EXCAVATION	.1	Saw cut to lines and depths indicated on drawings.
	.2	Close drill concrete at the location and to the depth or elevation shown on the drawings.
	.3	Close drill 50 mm diameter holes not more than 225 mm apart.
	.4	Where concrete is not shown to be removed by close drilling, remove existing concrete by hand-held jackhammers (chipping hammers) 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 using jackhammers of appropriate weights (maximum 10 kg). .2 Contractor must maintain jackhammer chipping bits sharp, so as to minimize

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| 3.2 CONCRETE
EXCAVATION
(Cont'd) | .4 (Cont'd)
.2 (Cont'd)
micro-cracking in the concrete layer behind
the area of excavation. |
| | .5 Remove existing reinforced concrete to
excavation lines indicated on drawings. |
| | .6 Dispose the excavated material in an approved
manner off Government of Canada land. |
| 3.3 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. |
| | .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. |
| 3.4 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. |
| | .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. |
| 3.5 COMMON
EXCAVATION | .1 Excavate to elevations and dimensions
indicated or required for construction of
work. |
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3.5 COMMON EXCAVATION (Cont'd)

- .2 Earth bottoms of excavation to be dry undisturbed soil, reasonably level, free from loose or organic matter.
- .3 Make excavation to clean lines to minimize quantity of fill material required.
- .4 Correct over-excavation below proposed bottom of excavation elevation with granular material compacted to 95% maximum dry density or 20 MPa lean concrete.
- .5 Hand trim, make firm and remove loose material and debris from excavations immediately prior to placing concrete or granular backfill. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

3.6 BACKFILLING WITH GRANULAR BACKFILL

- .1 Do not proceed with backfilling operations until Departmental Representative has inspected and approved work in place.
- .2 Backfill 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.
- .3 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.
- .4 Place backfill material in uniform layers not exceeding 150 mm for granular 'A' loose thickness, and simultaneously on sides of structure, pipe or other item so that loading is equalized.
- .5 Compact each layer to minimum 95% of maximum dry density in accordance with ASTM D698-07e1,
- .6 When using hand operated tamping devices, deposit backfill material in uniform layers not exceeding 100 mm loose thickness.
- .7 Backfill spaces that will receive topsoil to elevations that will permit a 150 mm compacted thickness of topsoil below finished elevation.

PART 1 - GENERAL

1.1 MEASUREMENT AND PAYMENT PROCEDURES	.1	There will be no measurement of Landscaping.
	.2	Payment of Landscaping shall be included in the Lump Sum Price.

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 Restoring lawn by seeding grass. .4 Maintaining sodded and seeded areas until acceptance.
	.2	All disturbed sodded areas, within the limits of construction zone, as shown on the drawings, to be covered with topsoil, smoothed to the finish grade, and re-sodded at Contractor's expense.
	.3	All disturbed sodded areas, outside the limits of construction zone, to be covered with topsoil, smoothed to the finish grade, and restored by seeding at Contractor's expense. Refer to drawings for details.
	.4	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 PRELIMINARY INSPECTION	.1	Establish the condition of sodded areas in conjunction with Departmental Representative before starting work.
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1.5 SOURCE QUALITY CONTROL

.1 At least 2 weeks before starting final topsoil work, advise Departmental Representative of proposed sources of topsoil, sod and grass seeds. 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.

1.6 DELIVERY AND STORAGE

.1 Schedule deliveries in order to keep storage at the job site to a minimum without causing delays.

.2 Deliver, unload and store rolled sod on pallets only.

.3 Deliver sod to site within 24 hours of being lifted and lay sod within 36 hours of being lifted.

.4 Do not deliver small, irregular, or broken pieces of sod. Departmental Representative will reject these.

.5 During wet weather, allow sod to dry sufficiently to prevent tearing during lifting and handling.

.6 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.

.7 Supply sod in standard-sized units and of a uniform thickness, rolled for easy handling.

1.7 SCHEDULING OF SODDING AND SEEDING WORK

.1 Schedule sod laying and seeding to coincide with final topsoil operations.

.2 Obtain Departmental Representative's approval of the schedule for seeding 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 1 Kentucky Bluegrass/Fescue sod" sod grown from minimum 40% Kentucky Bluegrass, 30% Creeping Red Fescue.
- 2.3 SEEDS
- .1 Number 1 Kentucky Bluegrass/Fescue seeds to produce sod with minimum 40% Kentucky Bluegrass, 30% Creeping Red Fescue.

PART 3 - EXECUTION

- 3.1 PREPARATION OF TOPSOIL SUB-GRADE
- .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
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| <u>3.1 PREPARATION OF
TOPSOIL SUB-GRADE
(Cont'd)</u> | .3 | (Cont'd)
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. |
| <u>3.2 PLACING AND
SPREADING OF
TOPSOIL</u> | .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. |
| <u>3.3 ACCEPTANCE OF
TOPSOIL GRADING</u> | .1 | Departmental Representative will inspect topsoil in place and determine acceptance of depth of topsoil and finish grading. |
| <u>3.4 SURPLUS
TOPSOIL MATERIAL</u> | .1 | Dispose of materials not required off site. |
| <u>3.5 SODING AND
SEEDING</u> | .1 | Obtain Departmental Representative's approval of topsoil grade and depth before starting sodding and seeding lawn. |
| | .2 | Loosen surface of topsoil where it has become compacted. |
| | .3 | Protect all sodded and seeded areas against any damage until lawn has been fully |
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| 3.5 SODING AND SEEDING
(Cont'd) | .3 | (Cont'd)
established. Supply and install required protective apparatus. |
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| 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. |
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| 3.7 MAINTENANCE OF SEEDED AREAS | .1 | Maintain 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. |
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| 3.8 ACCEPTANCE OF SODDED AND SEEDED AREAS | .1 | Approval of material at its source does not prevent subsequent rejection on job site. |
| | .2 | Sod and seeded lawn will be approved when:
.1 Growth of sodded or seeded areas has been properly established;
.2 Turf is free of bare and dead spots;
.3 No surface soil is visible when grass has been mowed to a height of 80 mm; and,
.4 Grass has been cut a minimum of 2 times. |
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3.9 SODDING ON SLOPES GREATER THAN THREE TO ONE	.1	Lay sod sections perpendicular to slopes greater than 3:1 (run/rise) and secure with stakes. Place stakes 3 per m ² , 100 mm below top edge to prevent shifting of sod and drive stakes flush with top of sod soil.
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PART 1 - GENERAL

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| <u>1.1 DESCRIPTION</u> | .1 | This section specifies the requirements for dewatering the work spaces, as described by the drawings and the specification. |
| | .2 | The work includes but is not limited to: <ul style="list-style-type: none"> .1 The design, construction, and maintenance of methods to improve the water-tightness of the upstream and downstream dewatering structures (stoplogs), and of the systems used to remove the water from the work spaces and maintain these spaces in the dry state. .2 Fabrication, supply, installation, maintenance and removal a steel stoplog cofferdam located at the downstream log gains. .3 The provision and maintenance of all dewatering equipment. .4 The removal of water from the work spaces and the continued maintenance of these spaces in the dry state for the duration of the work. .5 The supply of standby equipment to replace dewatering equipment which malfunctions. .6 The removal of the materials used to improve the dewatering structure, no later than April 22, 2016 |
| | .3 | Work not included: The supply, installation, and removal of the upstream timber stoplogs shall be the responsibility of the owner, Parks Canada Agency. |
| <u>1.2 MEASUREMENT AND PAYMENT PROCEDURES</u> | .1 | There will be no measurement of Dewatering Work. |
| | .2 | Payment of Dewatering Work shall be included in the Lump Sum Price. |
| <u>1.3 RELATED WORK</u> | .1 | Section 01 35 43 - ENVIRONMENTAL PROCEDURES. |
| | .2 | Section 35 49 25 - TURBIDITY CURTAIN |
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1.4 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA):
 - .1 CAN/CSA-G40.20-04/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA-W59-03(R2008), Welded Steel Construction (Metal Arc Welding).
 - .3 CAN/CSA-W47.1-92.
 - .4 CAN/CSA-W48.1-M1991.

1.5 REGULATORY REQUIREMENTS

- .1 Adhere to local, provincial & federal requirements relating to:
 - .1 Protection of environment;
 - .2 Safety of construction; and
 - .3 Protection of workers.
- .2 Installation of cofferdams must be approved by Parks Canada.
- .3 Pumping water out of cofferdam enclosure: to Section 01 35 43 - ENVIRONMENTAL PROCEDURES.
- .4 Obtain and pay costs of, all required permits.

1.6 SUBMITTALS

- .1 Shop drawings of water-tightness improvements, downstream stoplog cofferdam and other dewatering systems.
- .2 Submit detail drawings to Regulatory Agencies, as required to satisfy conditions for granting of permits.

1.7 DRAWINGS

- .1 The drawings attached to these specifications showing the steel stoplogs are not intended to be shop drawings. They are provided so that shop drawings can be submitted for approval.

1.8 DESIGN CRITERIA

- .1 Design cofferdams water-tightness improvements to ensure maintenance of work spaces in a dry state for duration of work.
 - .2 All of the water which enters the work area shall be directed through the site during construction.
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- 1.8 DESIGN CRITERIA (Cont'd) .3 Plan & design dewatering systems considering:
- .1 Access to cofferdams, & access to reach any portion of Work.
 - .2 Space required for crews to work in dewatered areas.
 - .3 Sequence of Work.
 - .4 Water levels.
- .4 At all times, maintain environmental quality of water to Section 01 35 43.
- .5 Ensure that no phase of Work threatens safe performance of cofferdam.
- .6 Provide a minimum of 600 mm freeboard, that is, 2 stoplogs above water level, to prevent overtopping of downstream cofferdam. Total number of steel stoplogs to be supplied and install is ten (10).
- 1.9 WATER LEVELS .1 Refer to Section 01 11 00 - GENERAL INSTRUCTIONS.
- 1.10 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.
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PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Use materials in good condition, approved by the Departmental Representative and suitable for their use in the work.
 - .2 Do not use materials which may cause environmental damage to the waterway or to the land at or near the site.
 - .3 Materials and methods proposed for use in the dewatering structure improvements, and the dewatering systems, must be approved by Parks Canada.
 - .4 Earth or granular materials are not acceptable for improving the water-tightness of the stoplog dewatering structures.
 - .5 Downstream cofferdam (stoplogs): Steel sections and plates: to CAN/CSA-G40.21, Grade 350W unless noted otherwise.
- 2.2 FABRICATION
(Steel Stoplogs)
- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
 - .2 Fit and shop assemble work ready for installation.
 - .3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

PART 3 - EXECUTION

- 3.1 GENERAL
- .1 Evaluate, plan and execute the work in an expert and prudent manner giving due consideration to:
 - .1 The existing strata within and adjacent to the work location.
 - .2 Climatic conditions which may occur at the work location during the period of doing the work in its entirety.
 - .3 The safety of personnel and of the general public.
 - .4 Safety of removals.

3.2 DEWATERING
CONSTRUCTION

- .1 The owner, Parks Canada - Rideau Canal, will supply and install timber stoplogs in the upstream log gains.
- .2 Supply and install downstream stoplog cofferdam. Improve water-tightness of structure as required.
- .3 When existing structures are incorporated into the dewatering system, the Departmental Representative does not guarantee the water-tightness of the structures.
- .4 Design, supply and install any additional methods and materials required to maintain the site in dry condition.
- .5 The contractor may improve the water-tightness of the stoplogs in the dewatering structures with plastic sheeting, burlap bags or similar material.

3.3 DEWATERING

- .1 Dewater the work spaces and maintain them in a dewatered state until the work has been completed.
- .2 Continue dewatering operations, to enable the work to proceed in the dry, for the duration of the work.
- .3 Repeat the entire dewatering procedure as often as may be necessary if flooding or other damage occurs prior to the completion of the work.
- .4 Maintain the dewatered state by pumping.
- .5 Ensure that any drawdown of the water surface due to pumping does not affect:
 - .1 The safety or quality of the work.
 - .2 Neighbouring property in an adverse manner.
 - .3 The stability of soils.
- .6 Ensure continuity of dewatering by providing a watchperson to make periodic checks, at all times when work is not in progress.

3.4 EQUIPMENT

- .1 General:
 - .1 Provide equipment in safe operating condition and maintain it in a safe operating condition for the entire periods of use and/or standby for use on the work.
 - .2 Provide skilled operators for equipment.
- .2 Standards and Performance:
 - .1 Provide equipment of such quality and in such quantity as to provide sufficient capability to perform the essential functions of the work.
 - .2 Provide standby replacement for pumps and other essential dewatering equipment which may break down during the work.
 - .3 Keep this replacement equipment available at the site for immediate use.
 - .4 The watchperson's qualifications under this section are to be sufficient that he can perform on dewatering equipment such duties as:
 - .1 Preventive maintenance and refuelling normally performed during any shift.
 - .2 Emergency repairs of minor complexity.
 - .3 Placing standby items in service.

3.5 DEWATERING
REMOVAL

- .1 At an approved stage in the work remove materials used to improve the water-tightness of the stoplogs in the dewatering structure; any additional temporary structures; and dewatering systems.
- .2 Remove downstream stoplogs and deliver them to the Rideau Canal Maintenance Workshop located at 49 Centre Street, Smiths Falls, Ontario.
- .3 The owner, Parks Canada - Rideau Canal, shall remove the upstream timber stoplogs in the dewatering structures.

3.6 CLEAN-UP

- .1 Clean the lock chambers of accumulated silt, zebra mussels, debris and other materials deposited as a result of the contract activities.
- .2 Dispose of all unwanted materials in an approved manner off the property.

- 3.6 CLEAN-UP
(Cont'd)
- .3 Do not dispose of any materials in the river or canal.
- .4 All waste described as subject to Regulation 347, Environmental Protection Act, must be transported with a valid "Certificate of Approval for a Waste Management System" to a site approved by the Ontario M.O.E. to accept the waste.

PART 1 - GENERAL

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|-------------------------------------------------------|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>1.1 RELATED WORK</u> | .1 | Section 01 35 43 - Environmental Procedures. |
| | .2 | Section 35 20 22 - Dewatering. |
| <u>1.2 MEASUREMENT
AND PAYMENT
PROCEDURES</u> | .1 | There will be no measurement of Turbidity Curtain. |
| | .2 | Payment of Turbidity Curtain shall be included in the Lump Sum Price. |
| <u>1.3 REFERENCES</u> | .1 | American Society for Testing and Materials (ASTM) |
| | .1 | ASTM D4491-99a(2004)e1, 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 D4716-04, 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. |
| | .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, General Requirements for Rolled or Welded Structural Quality Steel. |
| | .2 | CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles. |
| | .4 | Ontario Provincial Standard Drawings (OPSD) |
| | .1 | OPSD 219.260 November 2006, Turbidity Curtain. |
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- 1.3 REFERENCES (Cont'd)
- .4 (Cont'd)
 - .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 1 week 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. 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 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.
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| 2.1 MATERIAL
(Cont'd) | .2 Physical properties:(Cont'd) |
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- .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: 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

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| 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. Ensure compliance of the sediment control plan throughout the project. |
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- .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
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3.1 GENERAL (Cont'd)	.3 (Cont'd) maximum increase of total suspended solids above background levels permitted is of 5 mg/L
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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: <ul style="list-style-type: none"> .1 The floatation shall provide support along the length of the turbidity curtain. .2 A sleeve shall be formed and heat-sealed or sewn along the entire bottom edge of the turbidity curtain geosynthetic, to contain the ballast in the sleeve. Breaks may be made in the sleeve to facilitate pulling, provided they are a minimum 100 mm in size and spaced at minimum 3 m intervals. .3 Where turbidity curtain geosynthetic is joined to provide a continuous run, the sections shall be connected to provide a continuous seal and prevent the escape of turbid water between the sections. .4 The turbidity curtain, as prepared for installation, shall be of sufficient width to account for water depth and wave action. .5 Adjustment lines shall be placed at maximum intervals of 10 m, and are to encircle the turbidity curtain from top to bottom. .6 The turbidity curtain shall be prepared for installation by furling and tying with furling ties every 1.5 m for the entire length of the curtain. .7 Anchor locations shall be established as is necessary to maintain the turbidity curtain in place and functioning.

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, 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.

