



Fisheries and Oceans
Canada

Pêches et Océans
Canada

HARBOUR IMPROVEMENTS
SILVER ISLET, ONTARIO

FOR

FISHERIES AND OCEANS CANADA
SMALL CRAFT HARBOURS

Fisheries and Oceans Ref. No.723043



TABLE OF CONTENTS

	Pages	
00 01 07	Seals Page	1
01 11 05	General Instructions	11
01 35 29 .06	Health and Safety Requirements	3
01 35 43	Environmental Procedures	4
01 45 00	Quality Control	2
01 74 20	Construction/Demolition Waste Management and Disposal	2
02 41 13	Selective Site Demolition	4
03 10 00	Concrete Forming and Accessories	3
03 20 00	Concrete Reinforcing	3
03 30 00	Cast-In-Place Concrete	7
03 41 00	Precast Structural Concrete	5
05 50 00	Metal Fabrications	7
06 05 73	Wood Treatment	2
06 10 00	Timber Cribwork	3
31 23 33.01	Excavating and Backfilling	7
31 32 19.01	Geotextiles	3
31 61 13	Pile Foundations, General Requirements	4
31 62 16	Steel Sheet Piles	7
32 11 23	Aggregate Materials	5
35 51 23	Floating Dock System	3

Drawings:

JML S-1 of 13 Rev. 0	Existing – Site Plan
JML S-2 of 13 Rev. 0	New Construction – Site Plan
JML S-3 of 13 Rev. 0	Demolition – Wharf Site Plan and Sections
JML S-4 of 13 Rev. 0	New Construction – Wharf Site Plan and Sections
JML S-5 of 13 Rev. 0	New Construction – Wharf Details
JML S-6 of 13 Rev. 0	New Construction – Wharf Details
JML S-7 of 13 Rev. 0	New Construction – Wharf Details
JML S-8 of 13 Rev. 0	New Construction – Wharf Details
JML S-9 of 13 Rev. 0	Boat Launch – Demolition and New Construction Plans
JML S-10 of 13 Rev. 0	Boat Launch – New Construction Plans, Sections and Details
JML S-11 of 13 Rev. 0	Breakwater – Demolition and New Construction Sections
JML S-12 of 13 Rev. 0	Floating Dock – Plans and Sections
JML S-13 of 13 Rev. 0	Scope of Work and General Technical Notes, Projected Water Levels



Michael Edmonds, P.Eng.
Project Engineer
JML Engineering Ltd.
Wharf



George McKay, P. Eng.
Senior Project Engineer
JML Engineering Ltd.
Breakwater & Boat Launch

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

The work site described in this specification is located in Silver Islet, Thunder Bay District, Ontario. Silver Islet is situated on the shores of Lake Superior on the Sibley Peninsula, approximately 80 kilometres east of Thunder Bay via Highway 11/17 and Highway 587.

- .1 The scope of work under this Contract includes, but is not limited to the following:
 - .1 Wharf:
 - .1 Establish traffic, pedestrian, and environmental protection.
 - .2 Remove and salvage existing markers.
 - .3 Remove and dispose existing concrete barriers, chain link fence, timber decking, tie-offs, ladders, curbs, stringers, pile caps, piles, timber cribs, concrete approach slab, retaining wall, and concrete/rock protection.
 - .4 Remove and salvage rock fill from within existing cribs (in areas of demolition).
 - .5 Clean debris from lakebed within limits of turbidity curtain.
 - .6 Provide H-Piles at ends of existing steel sheet pile (SSP).
 - .7 Provide new steel sheet pile (SSP) for new wharf and three new anchor walls.
 - .8 Provide closure plates between existing SSP and H-Piles, and new SSP and H-Piles.
 - .9 Dredge along north face of wharf where indicated to El. 181.680 m.
 - .10 Provide 300 mm thick rock protection c/w geotextile in dredged area.
 - .11 Provide rock armouring at south toe of existing sheet piling.
 - .12 Provide steel walers and tie rods at existing SSP.
 - .13 Cut piles and remove existing crib timbers 300 mm below low water level at existing sheet pile wharf. Remove and dispose existing walers at timber piles.
 - .14 Cut existing sheet pile to new cutoff elevation.
 - .15 Provide new cap channel c/w dowels.
 - .16 Provide rock fill c/w geogrid and Granular 'A' c/w geotextile.
 - .17 Provide remaining armouring along perimeter of wharf.
 - .18 Form and pour new reinforced concrete deck and reinforced concrete approach slab.
 - .19 Provide new steel ladders, bollards, and cleats.
 - .20 Provide new steel pipe curb.
 - .21 Provide new "D" shape fenders.
 - .22 Reinstall salvaged markers.

- .2 Boat Launch:
 - .1 Establish traffic and environmental protection.
 - .2 Concrete retaining wall, flag pole and benchmark to remain.
 - .3 Remove and dispose of existing concrete ramp.
 - .4 Excavate to limits indicated.
 - .5 Provide clear stone c/w geotextile.
 - .6 Provide rock protection for all disturbed surfaces below to 1 m above high water.
 - .7 Provide precast concrete boat launch ramp c/w sleeper beams.
 - .8 Form and pour concrete approach ramps.
 - .9 Touch-up Granular A.
 - .10 Remove traffic and environmental protection.

- .3 Breakwater
 - .1 Remove, salvage and store existing armour protection stone on site.
 - .2 Provide new quarry run core stone.
 - .3 Provide new concrete floating dock breakwater anchors.
 - .4 Provide new Type A Armour Stone at the harbour side.
 - .5 Provide new Type B Armour Stone at the Lake Superior side and crest.
 - .6 Provide new crusher fines path and gangway timber cribs.

- .4 Floating Dock
 - .1 Provide floating docks with anchors at harbour side of new breakwater.
 - .2 Construct and backfill timber cribs. Place rock protection around base as shown.
 - .3 Provide new gangways on timber cribs.

- .2 The work to be done by the Contractor under this Contract shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, insurance, and all things necessary for and incidental to the satisfactory performance and completion of all work as specified herein. All work to be done in accordance with details shown on the accompanying plans and as specified herein.

1.2 DEFINITIONS

- .1 The word “provide(s)” means “supply and install”.
- .2 For purposes of this contract, “Departmental Representative”, “Architect/Engineer” and “Engineer” shall have the same meaning.

1.3 WORK SCHEDULE

- .1 Provide within 10 working days after Contract award, schedule showing anticipated progress stages and final completion of work within time period required by contract documents.

- .2 Interim reviews of work progress based on work schedule will be conducted as decided by Engineer and schedule updated by Contractor in conjunction with and to approval of Engineer.
- .3 Work under this Contract is to be performed in a timely manner. Commence planning and preparatory work immediately upon receipt of official notification of acceptance of Contract, and Schedule the work so that the construction can commence in 2019, and be completed by March 31, 2020.
- .4 Work Sequence:
 - .1 Before work is undertaken, ensure that all materials and trades required are available to finish work in as short a period as possible.
 - .2 No area to be renovated shall be placed out of service until it is confirmed that there shall be no need to stop the work waiting for receipt of materials, equipment or labour.
- .5 Obtain Engineer's approval prior to scheduling any weekend work.

1.4 MILESTONE DATES

- .1 Interim completion milestone dates:
 - .1 March 15, 2020, Completion of all in-water work including installation of steel sheet piling, armour stone and launch ramp.
 - .2 May 15, 2020, Completion of all work.

1.5 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.

1.6 FEES, PERMITS AND CERTIFICATES

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

1.7 MEASUREMENT FOR PAYMENT - GENERAL

- .1 Mobilization and Demobilization
 - .1 Payment for mobilization and demobilization shall be included as part of the lump sum and shall include but not be limited to the following:
 - .1 Mobilize equipment, materials, tools, supplies, labour and supervisors.
 - .2 Insurance(s) required for the duration of construction.
 - .3 Fees, certificates and work permits.
 - .4 Temporary construction facilities.
 - .5 Signage.
 - .6 Securing work and storage areas.

- .7 Vehicle and pedestrian protection.
 - .8 Daily site cleaning, and
 - .9 Demobilization of aforementioned items upon completion of construction.
- .2 Lump Sum Amount:
- .1 Work included in the Lump Sum Amount represents all work not included in the unit price table.
 - .2 Work included in the Lump Sum Amount includes but is not limited to:
 - .1 Mobilization and Demobilization
 - .2 Environmental Protection
 - .3 Site Selective Demolition
 - .4 Salvage and Reinstall of Rock Fill from Wharf
 - .5 Dredging
 - .6 Excavation
 - .7 Salvage and Reinstall Type B Armouring Stone
 - .8 Walking path from floating dock gangway to Highway 587
 - .3 Notify Engineer sufficiently in advance of operations to permit required measurements for payment.
 - .4 Submit to Engineer, at least 14 days before information for first application for payment, cost breakdown, Progress Payment in detail as directed by Engineer, for parts of Work, aggregating total amount of Contract Price, so as to facilitate evaluation of applications for payment. After approval by Engineer, cost breakdown will be used as basis for progress payments.
 - .5 Items measured for payment are in metric (SI) units.
 - .6 Submit requests for payment in metric units corresponding with items on the Unit Price Table.
 - .7 Provide, within 10 working days after Contract award, a detailed list together with associated costs, of all items included as part of the Lump Sum Amount.

1.8 INTERPRETATION OF DOCUMENTS

- .1 Drawings and Specifications are complementary. When work is shown or mentioned on the Drawings but is not indicated in the Specifications, or when work is indicated in the Specifications but is not shown or mentioned on the Drawings, it shall nevertheless be included in the Contract.
- .2 The sub-division of the Specification into sections, identified by title and number, is for convenience only and does not modify the singularity of the document, nor does it operate to make or imply that the Engineer is an arbiter to establish the limits or extent of Contract between Contractor and Subcontractors or to determine the limits or extents of work that may be decided by trade unions or contractors' organizations. Extras to the Contract will not be considered on the grounds of differences in interpretation of the Specification and/or Drawings as to which trade performs the work.

- .3 Do not scale off drawings.
- .4 In the event of discrepancies or conflicts in interpreting the Plans (drawings) and Specifications, Specifications take precedence over drawings bound with specifications.

1.9 CONTRACTOR'S USE OF SITE

- .1 Co-ordinate use of premises under direction of the Engineer.
- .2 Do not unreasonably encumber the site with materials and equipment.
- .3 Assume full responsibility for protection and safekeeping of products under this Contract.
- .4 Move stored products or equipment which interfere with operations of Engineer or other harbour users.
- .5 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .6 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .7 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Engineer.
- .8 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.10 AS-BUILT RECORD DRAWINGS

- .1 As work progresses, neatly record significant deviations from the Contract Drawings using fine, red marker on full size white prints.
- .2 Neatly print lettering and numbers in size to match original. Lines may be drawn free-hand but shall be neat and accurate. Add at each title block note: "AS BUILT RECORD".
- .3 Record following significant deviations:
 - .1 Depths of various elements and foundations.
 - .2 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
 - .3 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
 - .4 Field changes of dimension.
 - .5 Other significant deviations which are concealed in construction and can not be identified by visual inspection.

1.11 SUBMITTALS AND SHOP DRAWINGS

- .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. Refer to individual specification sections for submission requirements.
- .2 Notify the Departmental Representative, in writing at the time of submission, of any deviations from the Contract Documents. If the proposed deviation significantly alters the design, as deemed by the Engineer, it will be the Contractor's responsibility to certify if the design is equivalent and the submission shall be sealed by a Professional Engineer.
 - .3 Submit to Engineer 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.
 - .4 Do not proceed with Work affected by submittal until review is complete.
 - .5 Present shop drawings, product data, samples and mock-ups in SI Metric units.
 - .6 Prior to submission check and certify as correct, Shop Drawings and product data sheets. Issue to Engineer each submission at least 7 days before dates reviewed submission will be needed.
 - .7 Submit reproducible transparency (sepia) of Shop Drawings for custom made items. Dimension in metric (SI) units.
 - .8 Submit 5 copies of product data sheets for standard manufactured items.
 - .9 Shop Drawings of structural items shall bear the stamp of a Registered Professional Engineer.
 - .10 Responsibility for errors, omissions or deviations from requirements of Contract Documents is not relieved by Engineer's review of submittals.
 - .11 Keep one reviewed copy of each submission on site.

1.12 EXISTING SERVICES

- .1 Notify Engineer and utility companies of intended interruption of services and obtain required permission.
- .2 Where work involves breaking into or connecting to existing services, give Engineer 72 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions.
- .3 Establish location and extent of service lines in area of work before starting work. Notify Engineer of findings.
- .4 Submit schedule to and obtain approval from Engineer for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .5 Where unknown services are encountered, immediately advise Engineer and confirm findings in writing.
- .6 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .7 Record locations of maintained, re-routed and abandoned service lines.

1.13 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy of each document as follows:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed Shop Drawings.
 - .5 Change Orders.
 - .6 Other Modifications to Contract.
 - .7 Copy of Approved Work Schedule.
 - .8 Health and Safety Plan and Other Safety Related Documents.
 - .9 Other documents as specified.

1.14 CODES AND STANDARDS

- .1 Perform work in accordance with National Building Code of Canada (NBC) and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Work to meet or exceed requirements of contract documents, specified standards, codes and referenced documents.
- .3 Codes, standards, polices, guidelines, publications, manuals, installation, application and maintenance instructions, and other guiding documents referred to in the Contract documents, unless otherwise specified, shall be the latest published editions as of the tender close date.

1.15 PROJECT MEETINGS

- .1 Engineer will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.

1.16 SETTING OUT OF WORK

- .1 Engineer will provide only those survey control points and set such stakes as necessary to define general location, alignment and elevations of work. Give Engineer seven (7) days notice of requirements for such control points and stakes.
- .2 Set grades and lay out work in detail from control points and grades established by Engineer.
- .3 Provide devices needed to lay out and construct work.
- .4 Supply such devices needed to lay out and construct work.
- .5 Supply such devices as straight edges and templates required to facilitate Engineer's inspections of work.
- .6 Supply stakes and other survey markers required for laying out work.

1.17 ADDITIONAL DRAWINGS

- .1 Engineer may furnish additional Drawings for clarification. These additional Drawings have same meaning and intent as if they were included with plans referred to in Contract documents.
- .2 When additional Drawings and instructions are required by the Contractor, provide reasonable notice in writing to the Engineer in advance of the date they are required.

1.18 EXAMINATION

- .1 Before submitting tender, examine existing conditions and determine conditions affecting work.
- .2 Obtain all information which may be necessary for proper execution of Contract.

1.19 SITE INSPECTION

- .1 The submission of a tender is deemed to be a confirmation of the fact that the Tenderer has inspected the site and is fully conversant with all the conditions under which the work is to be carried out.

1.20 MATERIAL AND EQUIPMENT

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

1.21 SECURING WORK AREA

- .1 Secure the work areas in each stage in an approved manner. This includes fencing or barricades to prevent public access to any areas where construction activities occur and construction materials are stored.

1.22 CONSTRUCTION FACILITY

- .1 Provide construction facilities, including storage facilities, in order to execute Work expeditiously. Remove from site all such work after use.
- .2 Do not load or permit to load any part of Work with a weight of force which will endanger the Work.
- .3 Parking will be permitted on site provided it does not disrupt the performance of the Work.
- .4 Provide a heated, office space, lighted and ventilated of sufficient size to accommodate site meetings, and laydown table.
- .5 Locate materials on site in a manner to cause least interference with the Work activities.

- .6 Provide sanitary facilities for workforce in accordance with Sanitary Regulations and ordinances.
- .7 Provide site plan including proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installations.
- .8 When using existing public and private roads for access to project site, maintain such roads for duration of Contract and repair damage resulting from Contractors' use of the roads.
- .9 Provide access to wharf, breakwater and launch ramp via land or water as required.
- .10 Provide and erect adequate project signage, including:
 - .1 Project identification signs; sign to include name of Owner, Consultant and Contractor.
 - .2 All local construction safety, notice and warning signage around the site.
 - .3 Construction signage on public and private roads leading to the project site, to provide advance warning of a work zone for long duration operations.
 - .4 No other signs or advertisements, other than warning signs, are permitted on site.
- .11 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.
- .12 Provide access to temporary facilities as applicable.
- .13 Maintain and protect traffic on affected roads during construction period. This includes flag-persons, erection of barricades, placing of lights around and in front of equipment and work, as required
- .14 Contractor's traffic on roads selected for hauling material to and from site shall interfere as little as possible with public traffic.
- .15 Verify adequacy of existing roads and allowable load limit on these roads. The Contractor shall be responsible for repair of damage to roads caused by construction operations.
- .16 Construct access and haul roads necessary with suitable grades and widths.
- .17 Dust control: adequate to ensure safe operation at all times.
- .18 Provide snow removal where required during period of Work.

1.23 WATER LEVELS

- .1 Water levels on Lake Superior are subject to periods of variable low water conditions followed by periods of variable higher water conditions, with the average range of fluctuation being 0.3 metres.
- .2 Chart Datum is 183.2 m.
- .3 Predicted water levels for Lake Superior see Fisheries and Oceans Canada Monthly Water Level Bulletin for Lake Superior at <http://www.waterlevels.gc.ca/c&a/bulletin-eng.html>.

1.24 VEHICLE AND PEDESTRIAN PROTECTION

- .1 Provide snow fencing, wooden barriers, or other approved hoarding to prevent vehicles and pedestrians from accessing the site during construction.
- .2 Contractor shall provide appropriate signage for vehicle and pedestrian protection.
- .3 All hoarding shall include delineation and reflectors to stand out at nightfall.

1.25 DRAWINGS

- .1 Before proceeding with the work, check and verify all dimensions and elevations shown on drawings and report any discrepancies.
- .2 The following Drawings are to be read in conjunction with this specification:
 - .1 JML S-1 of 13 Rev. 0 Existing – Site Plan
 - .2 JML S-2 of 13 Rev. 0 New Construction – Site Plan
 - .3 JML S-3 of 13 Rev. 0 Demolition – Wharf Site Plan and Sections
 - .4 JML S-4 of 13 Rev. 0 New Construction – Wharf Site Plan and Sections
 - .5 JML S-5 of 13 Rev. 0 New Construction – Wharf Details
 - .6 JML S-6 of 13 Rev. 0 New Construction – Wharf Details
 - .7 JML S-7 of 13 Rev. 0 New Construction – Wharf Details
 - .8 JML S-8 of 13 Rev. 0 New Construction – Wharf Details
 - .9 JML S-9 of 13 Rev. 0 Boat Launch – Demolition and New Construction Plans
 - .10 JML S-10 of 13 Rev. 0 Boat Launch – New Construction Plans, Sections and Details
 - .11 JML S-11 of 13 Rev. 0 Breakwater – Demolition and New Construction Sections
 - .12 JML S-12 of 13 Rev. 0 Floating Dock – Plans and Sections
 - .13 JML S-13 of 13 Rev. 0 Scope of Work and General Notes, Projected Water Levels

1.26 CLEANING

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials off site at regular intervals for disposal.
- .3 Do not burn waste materials on site. Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 When Work is substantially completed, remove surplus products, tools, and equipment not required to complete remaining Work.

1.27 CLOSEOUT

- .1 Request Engineer inspection after Contractor has substantially completed the work, inspected the work and has repaired the deficiencies.
- .2 Engineer and Contractor will conduct a joint inspection to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
- .3 Request Engineer Final Inspection after all deficiencies have been corrected. Repair all Works outstanding as observed by Engineer during this inspection.
- .4 Commencement of lien and Warranty Period is the date of Owner's Acceptance of declaration of Substantial Performance unless otherwise required by lien statute at Place of Work.
- .5 Submit to Engineer as-built, shop drawings, product data, field test records, inspection and manufacturers certification at time of Substantial Performance.
- .6 Submit to Engineer copy of warranties applicable for this project.

1.28 CONSTRUCTION PHOTOGRAPHS

- .1 Submit photographs of construction progress to the Departmental Representative.
- .2 Frequency: daily upon request, or as otherwise directed by the Departmental Representative

1.29 TAXES

- .1 Pay applicable Federal, Provincial and Municipal taxes.

END OF SECTION

Part 1 General

1.1 MEASUREMENT FOR PAYMENT

- .1 No measurement will be made under this Section.

1.2 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Health and Safety Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Ontario
 - .1 Workers' Compensation Act, R.S.O. 1990, c. W.11

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit site-specific Health and Safety Plan within 7 days after date of Notice to Proceed and prior to commencement of Work.
- .2 Submit copies of incident and accident reports to Engineer.
- .3 Submit WHMIS MSDS – (Material Safety Data Sheets) to Engineer.
- .4 Engineer will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor after receipt of plan. Revise plan as appropriate and resubmit plan to Engineer within 5 days after receipt of comments from Engineer.
- .5 Engineer'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 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.4 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.

1.5 SAFETY ASSESSMENT

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

1.6 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 Observe and enforce construction safety measures required by Canadian Construction Safety Code, Provincial Government, Worker's Compensation Board, and municipal statutes and authorities.

- .3 In the event of a conflict between any provisions of above authorities, the most stringent provision will apply.

1.7 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.

1.8 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Ontario and advise Engineer verbally and in writing.

1.9 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have site-related working experience specific to activities associated with dock reconstruction at an active harbour site.
 - .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.

1.10 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 Engineer.

1.11 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Engineer.
- .2 Provide Engineer with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Engineer may stop Work if non-compliance of health and safety regulations is not corrected.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 MEASUREMENT AND PAYMENT

- .1 No measurement will be made under this Section.

1.2 RELATED REQUIREMENTS

- .1 Section 02 41 13 – Selective Site Demolition.

1.3 REFERENCES

- .1 Definitions:
 - .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
 - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

1.4 FIRES

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

1.5 DRAINAGE

- .1 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .2 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.6 WORK ADJACENT TO WATERWAYS

- .1 All materials and equipment used for the purpose of site preparation and project completion shall be operated, maintained, and stored in a manner that prevents any deleterious substance (e.g. petroleum products, silt etc.) from entering the water.
- .2 No construction debris from work activities will be allowed to enter the lake. The work site must be cleaned daily. Every effort will be made to minimize the introduction of sediment to the lake during work activities.
- .3 Any impacts below the ordinary high water mark that are not shown on the site plan are not permitted without written approval from the Engineer. Up to 30 days may be required for approval.
- .4 Areas used for stockpiling construction materials, including fill or other equipment storage will be well back from the edge of the water body and, if possible, in areas which have already been disturbed or are devoid of vegetation.

- .5 The Contractor shall not remove, destroy or disturb species pursuant to Provincial Threatened Endangered and Extirpated Species regulation, or species listed in the federal Species at Risk Act.
- .6 The Contractor shall not disturb migratory bird nests.
- .7 A double silt curtain shall be installed and maintained as described below.
- .8 Silt fences shall be installed on the downslope side adjacent to new backfill areas.
- .9 Turbidity curtains and silt fences shall be as per OPSS 805.
- .10 Construction equipment shall not enter the lake.
- .11 Waterways to be kept free of excavated fill, waste material and debris.
- .12 Design and construct temporary crossings to minimize erosion to waterways.
- .13 Do not skid construction materials across waterways.
- .14 Avoid damage to shoreline.
- .15 Restore disturbed areas to previous or better condition.

1.7 VERTICAL DOUBLE SILT CURTAIN

- .1 Contractor to supply, install and maintain silt curtain(s) for environmental protection for all in-water work. Silt curtain(s) to fully isolate the work area(s) from the waterbody outside the work area(s).
- .2 Cost for supply, installation, maintenance, and removal of the silt curtain(s) will be considered as part of the lump sum arrangement and shall include all labour, material and equipment to do the work.
- .3 The turbidity curtain(s) must meet the following requirements:
 - .1 free of tears and gaps;
 - .2 of enough width to account for water depth and wave action.
 - .3 Geosynthetics shall have a grab tensile strength of at least 990 N, meeting CAN/CGSB 148.1, No. 7.3 and be one of geotextile or geomembrane.
 - .4 Geotextile shall be a woven material. The filtration opening size (FOS) shall be no greater than 300 µm, meeting CAN/CGSB 148.1, No. 10. tasks.
 - .5 Floatation shall be a material that has sufficient buoyancy to provide the curtain with continuous support.
 - .6 Ballast shall be 8 mm steel chain.
 - .7 Anchors shall be mushroom or kedge anchors with a minimum mass of 34 kg for firm mud bottoms or self-burying anchors with a minimum mass of 5 kg for sandy bottoms.
 - .8 Load lines shall be 8 mm diameter steel cable or 19 mm diameter nylon or polypropylene rope.
 - .9 Mooring buoys shall have provision for the mooring line to be securely attached and be sufficiently buoyant to remain afloat under normal load conditions.
 - .10 An acceptable product is “Tough Guy” type 1E Turbidity Barrier or approved equivalent.

- .4 Contractor to submit details of the temporary silt curtain system(s) to Departmental Representative prior to start of the Work.
- .5 Installation:
 - .1 Install turbidity curtain(s) adjacent to the existing structure and push outwards to exclude fish from the area. Conduct a fish salvage if fish cannot be excluded with the turbidity curtain.
 - .2 Design to conform to OPSS 805, and OPSD 219.260 and OPSD 219.261 as a minimum.
 - .3 Once installed, the turbidity curtain(s) shall remain in place until all in-water work is completed, and all suspended sediments are settled out.
 - .4 The bottom edge of the turbidity curtain(s) shall be continuously in contact with the waterbody bed and the sides shall be continuously in contact with the adjacent walls or shoreline, so that sediment passage from the enclosed area is prevented as well as fish passage into the enclosed area is prevented.
 - .5 Folds in the turbidity curtain(s) that form next to the floatation collar shall be regularly monitored and cleared of collected sediment.
 - .6 On completion of the project carefully remove silt curtain(s) to ensure settled sediment is not disturbed.

1.8 POLLUTION CONTROL

- .1 Control emissions from equipment and plant in accordance with local authorities' emission requirements.
- .2 Prevent extraneous materials from contaminating air and waterways beyond application area.
- .3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
- .4 Locate temporary fuel storage 100 meters from shore and comply with Provincial Environmental legislation.
- .5 Refueling, servicing or cleaning of equipment within 100 meters of shore is prohibited.
- .6 Contractor shall ensure all equipment operating on project is free of external fluid leaks, grease, oil and mud.
- .7 Contractor to contain all oil leaks from equipment working adjacent to waterways.
- .8 The Contractor shall not use chemical dust suppressant materials on roads within 100 metres of the construction site.
- .9 No maintenance of vehicles or equipment in construction areas.
- .10 Use drip pans to catch leaking oil from compressors, pumps, etc.
- .11 All required machinery should be supplied with appropriate spill containment kits as a precaution in the event of accidental fuel spills or hydraulic leaks. Additional kits should be available on site with the capacity to contain any spills of deleterious substances that may be reasonably expected to occur. Contractors should ensure that all personnel are familiar with the spill kits.
- .12 The Contractor shall report spills of fuels or other contaminants to the Engineer.

1.9 DISPOSAL OF WASTES

- .1 Do not bury rubbish and waste materials on site.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways. Hazardous waste including fuels, oils and lubricants to be disposed of by a licensed hazardous waste carrier/handler in accordance with Provincial Environmental Legislation.
- .3 Collect all rubbish and waste material and dispose of in accordance with applicable governing authorities.
- .4 Do not allow debris of any type to enter waterway.
- .5 The Contractor shall dispose of non-reusable construction debris and solid waste from construction at a waste disposal ground operating under the authority of a permit under Provincial regulation.

1.10 PLANT PROTECTION

- .1 Protect trees and plants on site and adjacent properties.
- .2 Avoid disturbance of topsoil and vegetation unless otherwise specified. The Contractor is responsible to restore all impacted areas to original state.
- .3 The Contractor shall revegetate soil in areas exposed by construction with vegetation native to the area. These areas shall be revegetated as quickly as possible following construction to prevent soil erosion and establishment of noxious weeds.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 MEASUREMENT FOR PAYMENT

- .1 No measurement will be made under this Section.

1.2 INSPECTION

- .1 Allow Engineer access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Engineer.
- .3 Engineer 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.

1.3 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by the Contractor for purpose of inspecting and/or testing portions of Work.
 - .1 Provide inspection/testing reports to Engineer for written approval/acknowledgment prior to proceeding to the next stage of work.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Engineer at no cost to Owner. Pay costs for retesting and re-inspection.

1.4 ACCESS TO WORK

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

1.5 PROCEDURES

- .1 Notify Engineer in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.6 REJECTED WORK

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

1.7 TESTS AND MIX DESIGNS

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

1.8 MILL TESTS

- .1 Submit mill test certificates as requested.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 MEASUREMENT FOR PAYMENT

- .1 No measurement will be made under this Section.

1.2 CONSTRUCTION & DEMOLITION WASTE

- .1 Carefully deconstruct and source separate materials and divert, from demolition and construction waste destined for landfill, to maximum extent possible. 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 Corrugated cardboard.
 - .3 Wood, not including painted or treated wood or laminated wood.
 - .4 Steel
- .3 Submit a waste reduction workplan indicating the materials and quantities of material that will be recycled and diverted from landfill.
 - .1 Indicate how material being removed from the site will be reused, recycled, composted or anaerobically digested.
- .4 Submit proof that all waste is being disposed of at a licensed landfill site or waste transfer site. A copy of the disposal/waste transfer site's license and a letter verifying that said landfill site will accept the waste must be supplied to Departmental Representative prior to removal of waste from the demolition site.

1.3 WASTE PROCESSING SITES

- .1 Contact local and Provincial governments for information on waste management facilities.
- .2 Province of: Ontario, contact:
 - .1 Ministry of the Environment and Climate Change
 - .2 Telephone: 1-800-565-4293
- .3 Recycling Council of Ontario, 215 Spadina Avenue, #225, Toronto, ON, M5T 2C7.
 - .1 Telephone: 416-657-2797 or 1-888-501-9637.
 - .2 Fax: 416-960-8053.
 - .3 Email: rco@rco.on.ca
 - .4 Internet: <http://www.rco.on.ca/>.

Part 2 Products

2.1 NOT USED

.1 Not Used

Part 3 Execution

3.1 NOT USED

.1 Not Used

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 35 43 Environmental Procedures.
- .2 Section 05 50 00 Metal Fabrications.

1.2 MEASUREMENT AND PAYMENT

- .1 All items for removal and disposal off site, as indicated on the drawings, will be covered under the lump sum amount including, but not limited to the specific items as outlined below:
 - .1 concrete barriers, approach slab, retaining wall (at wharf), boat launch ramp,
 - .2 chain link fence,
 - .3 timber decking, abutment wall, curbs, fenders, stringers, pile caps, piles (full length of pile or top portion, as indicated on drawings), cribs (full height or top portion, as indicated on drawings), lagging,
 - .4 existing steel sheet pile: cut and remove top of the existing steel sheet piling to the new cut-off elevation,
 - .5 tie-offs,
 - .6 ladders,
 - .7 existing granular / subbase, as required,
 - .8 debris from lakebed within work area.
- .2 All items for removal, salvage, temporary storage and re-instatement, as indicated on the drawings, will be covered under the lump sum amount including, but not limited to the specific items as outlined below:
 - .1 Range markers c/w with base plate,
 - .2 Signs,
 - .3 Picnic tables,
 - .4 Flag pole
- .3 Payment for salvage and reinstatement of all rock fill (including fill from with existing timber cribs), rock protection, and armour stone will be measured as part of the lump sum amount and shall include excavating, stockpiling and backfilling/placement.
 - .1 Approximate quantity of salvaged Rock Fill: 400 tonnes.
 - .2 Approximate quantity of salvaged Type 'B' Armour Stone: 550 tonnes.
- .4 All benchmarks shall remain and are to be protected from disturbance throughout construction.
- .5 Payment at the Contract price shall be full compensation for all labour, permits, equipment and material to removal, salvage and reinstated items, as specified,

1.3 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with applicable Provincial regulations.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Storage and Protection.
 - .1 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Engineer and at no cost to Owner.
 - .2 Remove and store materials to be salvaged, in manner to prevent damage.
 - .3 Store and protect in accordance with requirements for maximum preservation of material.
 - .4 Handle salvaged materials as new materials.

1.5 SITE CONDITIONS

- .1 Site Environmental Requirements.
 - .1 Perform work in accordance with Section 01 35 43 - Environmental Procedures.
 - .2 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
 - .3 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
 - .1 Ensure proper disposal procedures are maintained throughout the project.
 - .4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
 - .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.
 - .6 Protect trees, plants and foliage on site and adjacent properties where indicated.

Part 2 Products

2.1 EQUIPMENT

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

Part 3 Execution

3.1 PREPARATION

- .1 Inspect site with Engineer and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.

3.2 REMOVAL OF HAZARDOUS WASTES

- .1 Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

3.3 REMOVAL OPERATIONS

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.
- .3 Disposal of Material:
 - .1 Dispose of materials not designated for salvage or reuse off site, including concrete barriers, chain link fence, timber decking, tie-offs, ladders, timber curbs, timber stringers, timber pile caps, timber piles, timber cribs, timber lagging, concrete approach slab, concrete retaining walls, concrete/rock protection, and concrete boat launch ramp.
- .4 Contractor to be responsible for storage of all salvaged items until items are reinstated.
- .5 Prevent movement, settlement or damage of existing structure during construction. Do not use equipment that will compromise the integrity of the existing structure prior to removal.
- .6 The structural competency of the existing structures is not guaranteed in undertaking any removal or new construction. The Contractor shall undertake his/her own evaluations and plan the work accordingly with or without access on the existing structures.
- .7 The Contractor may use the existing structure at their own risk to complete removals. The Department will not be held liable for the structural competency of the existing structure during demolition.

3.4 RESTORATION

- .1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.
- .2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.5 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
 - .2 Remove debris, trim surfaces and leave work site clean, upon completion of Work.
 - .3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

3.6 PROTECTION

- .1 Repair damage to adjacent materials or property caused by selective site demolition.
- .2 Prior to starting the Work, assess the condition of all items identified for salvage. Notify the Departmental Representative of any damage.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 20 00 Concrete Reinforcing.
- .2 Section 03 30 00 Cast-In-Place Concrete
- .3 Section 03 41 00 Precast Structural Concrete

1.2 PRICE AND PAYMENT PROCEDURES

- .1 Measurement and Payment:
 - .1 No measurement will be made under this Section.
 - .2 Include concrete forming and accessory costs in item of concrete work in Section 03 30 01 Cast-In-Place Concrete, or Section 03 41 00 Precast Structural Concrete.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-O86-14, Engineering Design in Wood.
 - .3 CSA O121-17 Douglas Fir Plywood.
 - .4 CSA O151-17, Canadian Softwood Plywood.
 - .5 CSA O153-13 (R2017), Poplar Plywood.
 - .6 CSA-O325-16, Construction Sheathing.
 - .7 CSA O437 Series-93(R2011), Standards for OSB and Waferboard.
 - .8 CSA S269.1-16, Falsework for Construction Purposes.
 - .9 CSA-S269.3-M92(R2013), Concrete Formwork, National Standard of Canada

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit shop drawings for formwork and falsework.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.
- .2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, and locations of temporary embedded parts.
- .3 Indicate sequence of erection and removal of formwork/falsework as directed by Engineer.

Part 2 Products

2.1 MATERIALS

- .1 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CAN/CSA-O86.
- .2 Form release agent: non-toxic, biodegradable, and low VOC.
- .3 Form stripping agent: colourless mineral oil, non-toxic, free of kerosene, with viscosity between 15 to 24 mm²/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
- .4 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 Verify concrete elevations in advance of the pour. Mark on forms, install screed markers or provide other means of establishing final elevations during concrete pours.
- .3 Fabricate and erect falsework in accordance with CSA S269.1.
- .4 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .5 Align form joints and make watertight.
 - .1 Keep form joints to minimum.
- .6 Use 20 mm chamfer strips on external corners unless indicated otherwise.
- .7 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .8 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
 - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .9 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.
- .10 Relative alignment between adjacent formed concrete surfaces shall be less than or equal to 5 mm.
- .11 Plumbness of slab edges shall be within 1:400 measured at any one surface.

3.2 REMOVAL AND RESHORING

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 7 days for slabs and approach ramp.
- .2 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 30 0001 Cast-In-Place Concrete.
- .2 Section 03 41 00 Precast Structural Concrete

1.2 PRICE AND PAYMENT PROCEDURES

- .1 Measurement and Payment:
 - .1 No measurement will be made under this Section.
 - .2 Include reinforcement costs in items of concrete work in Section 03 30 00.01 - Cast-In-Place Concrete or Section 03 41 00 Precast Structural Concrete.

1.3 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 CSA International
 - .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA-A23.3-14, Design of Concrete Structures.
 - .3 CSA-G30.18-09 (R2014), Carbon Steel Bars for Concrete Reinforcement.
 - .4 CSA-G40.20/G40.21-13 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CSA W186-M1990(R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .3 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 05 – General Instructions.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice SP-66.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario.
 - .1 Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.

- .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Engineer, with identifying code marks to permit correct placement without reference to structural drawings.
- .5 Pour limits
- .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.
 - .1 Provide Type B unless otherwise indicated.

1.5 QUALITY ASSURANCE

- .1 Mill Test Report: upon request, provide Engineer with certified copy of mill test report of reinforcing steel, minimum four weeks prior to beginning reinforcing work. Test report to show physical and chemical analysis.
 - .1 Upon request submit in writing to Engineer proposed source of reinforcement material to be supplied.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Engineer.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.
- .4 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .5 Mechanical splices: subject to approval of Engineer.
- .6 Plain round bars: to CSA-G40.20/G40.21.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain Engineer's written approval for locations of reinforcement splices other than those shown on placing drawings.

- .3 Do not weld reinforcement unless approved by Departmental Representative. If approved, weld reinforcement in accordance with CSA W186.
- .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 or field weld reinforcement except where indicated or authorized by Engineer.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

3.2 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on placing drawings in accordance with CSA-A23.1/A23.2.
- .2 Prior to placing concrete, obtain Engineer's approval of reinforcing material and placement.
- .3 Ensure cover to reinforcement is maintained during concrete pour.
- .4 Reinforcing steel in the slab may be supported off the granular base using small pieces of concrete block.

3.3 CLEANING

- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 MEASUREMENT FOR PAYMENT

- .1 Payment for the reinforced concrete deck shall be by square metres of concrete poured in place, as calculated from neat dimensions as indicated on the drawings. There will be no separate payment for localized deck thickening.
- .2 Payment for the cast-in anchors for the new steel bollards shall be included in the concrete deck item.
- .3 Payment for shelf angles c/w dowels shall be as per Section 05 50 00–Metal Fabrications.
- .4 Payment for the reinforced concrete wharf approach slab shall be by square metres of concrete poured in place, as calculated from neat dimensions as indicated on the drawings.
- .5 Payment for the reinforced concrete boat launch approach ramp shall be by square metres of concrete poured in place, as calculated from neat dimensions as indicated on the drawings.
- .6 Payment for formwork and falsework, reinforcing steel, joints, sealants, adhesive anchors, cast-in anchors, wire ties, splices, bar supports, chairs, dowels, and other accessories are incidental and are deemed to be included with the reinforced concrete items.
- .7 Payment at the Contract price of unit rate tender items shall be full compensation for all labour, equipment and material to do the work, including reinforcing steel.
- .8 Hot and cold weather protection will be considered incidental in placing of concrete and will not be measured separately for payment.
- .9 Concrete tickets may be submitted for reference only but will not form the basis of area. No allowance for concrete wastage will be included in the area for payment.
- .10 No deductions will be made for area/volume of concrete displaced by reinforcing steel, structural steel or piles.

1.2 RELATED REQUIREMENTS

- .1 Section 03 10 00 Concrete Forming and Accessories
- .2 Section 03 20 00 Concrete Reinforcing
- .3 Section 05 50 00 Metal Fabrication
- .4 Section 31 23 33.01 Excavating and Backfilling

1.3 REFERENCES

- .1 ASTM International
 - .1 ASTM D1751-18, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).
- .2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
- .3 CSA International
 - .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A3000-18, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .3 CAN/CSA-G30.18-09(R2014), Billet-Steel Bars for Concrete Reinforcement.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 11 05 – General Instructions.
- .2 Shop Drawings:
 - .1 Submit drawings showing formwork and falsework design to: CSA A23.1/A23.2.
 - .2 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario.
- .3 Concrete mix design(s) that meet the minimum performance criteria for the various types of concrete(s) as shown on the Drawings and specified in Part 2 – Materials. The concrete mix design(s) for the required type(s) of concrete shall specify the following:
 - .1 Cementitious content in kilograms per cubic metre or equivalent unit for each type of cementitious material.
 - .2 Designated size, or sizes, of aggregates, and the gradation.
 - .3 Aggregate source locations.
 - .4 Weights of aggregates in kilograms per cubic metre or equivalent units. Mass of aggregates shall be in saturated surface dry basis.
 - .5 Maximum allowable water content in kilograms per cubic metre or equivalent units design water/cement ratio.
 - .6 The limits for slump.
 - .7 The limits for air content.
 - .8 Quantity in millilitres per cubic metre or equivalent units and brand name for each type of admixture.
 - .9 Certification that all concrete constituents are compatible.
 - .10 Certification that the concrete mix(es) will meet the specified concrete performance criteria.
- .4 Provide testing and inspection results reports for review by Engineer upon request and do not proceed without written approval when deviations from mix design or parameters are found.
- .5 Concrete hauling time: provide for review by Engineer deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.
- .6 Provide concrete supplier certification that the plant is certified with Concrete Ontario (formerly the Ready-Mix Concrete Association of Ontario)
- .7 Provide Weather Protection Plans (hot and cold temperature weather conditions)

- .1 It shall be the full responsibility of the Contractor to review the schedule, anticipate the impacts of work / concreting, and incorporate the costs for such weather protection schemes and associated works.
- .2 When concrete is to be placed and cured in extreme temperature conditions (less than 5 degrees Celsius and more than 25 degrees Celsius), the Contractor shall submit written descriptions of proposed methods of providing appropriate concreting conditions and preventing cold weather damage (with drawings or sketches, as required).
- .3 Incorporate modifications (from comments provided) for protective measures before placing concrete.

1.5 QUALITY ASSURANCE

- .1 Provide to Engineer, four weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
- .2 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in Part 2 – Products.
- .3 Minimum four weeks prior to starting concrete work, provide quality control procedure for review by Departmental Representative for the following items:
 - .1 Falsework erection,
 - .2 Hot weather concrete,
 - .3 Cold weather concrete,
 - .4 Curing,
 - .5 Finishes,
 - .6 Formwork removal,
 - .7 Joints.

1.6 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 DESIGN CRITERIA

- .1 To CSA A23.1/A23.2.

2.2 PERFORMANCE CRITERIA

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

2.3 MATERIALS

- .1 Concrete:
 - .1 Type 10 (Type GU) cement for all applications.
 - .2 Compressive strength when tested in accordance with CAN/CSA-A23.2, (9C): average 28 day compressive strength to be minimum 32 MPa with 5-8% air entrainment.
 - .3 Air content when tested in accordance with CAN/CSA-A23.2, (4C), immediately after discharge: in accordance with CSA A23.1 Table 10.
 - .4 Class of exposure: Class C-2
 - .5 Use of chemical admixture will be approved only when specified mix requirements or workability cannot be achieved by proportioning of aggregates, water, cement and air entraining admixture.
 - .6 Maximum coarse aggregate size shall be 20 mm.
 - .7 Water: to CSA A23.1/A23.2.
- .2 Premoulded expansion joint filler:
 - .1 Bituminous impregnated fibreboard: to ASTM D1751.
- .3 Expansion joint sealer/filler:
 - .1 Grey to CAN/CGSB-19.24, Type 1, Class B.
 - .2 To be approved by Engineer prior to use.
- .4 Backer Rods
 - .1 Sponge rubber: to ASTM D1752 Type I, flexible.
- .5 Control joint sealer/filler:
 - .1 Grey to CAN/CGSB-19.13, Classification C-1-40-B-N and C-1-25-B-N.
 - .2 To be approved by Engineer prior to use.
- .6 Other concrete materials:
 - .1 To CSA A23.1/A23.2.

Part 3 Execution

3.1 PREPARATION

- .1 Provide Engineer six (6) business day's notice before each concrete pour.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.

- .2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.
- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .4 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing, including protection of concrete during placing and curing in adverse weather.
- .5 Surfaces shall be thoroughly cleaned of all foreign material prior to depositing fresh concrete. For hardened concrete surfaces, the aggregate shall be partially exposed and surface to be rough.
- .6 Protect previous Work from staining.
- .7 Clean and remove stains prior to application of concrete finishes.
- .8 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .9 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
 - .1 Place steel dowels and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated
- .10 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 FORMWORK

- .1 Install in accordance with Section 03 10 00 – Concrete Forming and Accessories and to following requirements:
 - .1 Provide forms of sufficient strength to support and keep alignment under weight of spreading and finishing machines.
 - .2 Set forms true to line and grade, join neatly and tightly and secure to resist concrete pressure and impact from tampers without springing.
 - .3 Clean and oil forms before each use.
 - .4 Obtain Engineers approval of forms before placing concrete.

3.3 SUBGRADE AND SUBBASE PREPARATION

- .1 Subbase to be in accordance with 31 23 33.01 Excavating and Backfilling.
- .2 Subbase to consist of specified material and have a compacted thickness of not less than specified.
- .3 Subbase shall be compacted to specified density.
- .4 Prepared subbase shall be checked for conformity with the cross-section and grade tolerances. Finished surface of subbase shall not deviate more than 0 mm above and 20 mm below specified grade and cross-section, and surface shall not deviate more than 10 mm at any place on a 3 mm template.
- .5 Repair damage to subbase resulting from hauling or equipment operations.
- .6 Prior to placing concrete, subbase shall be thoroughly wetted. Wetting shall be carried out, such that standing water is not present on grade.
- .7 Surface condition of base to be approved by Engineer before placing concrete.

3.4 REINFORCING STEEL AND DOWELS

- .1 Placing reinforcing steel as indicated and to Section 03 20 00 – Concrete Reinforcing.
- .2 Remove oil, grease, dirt and deleterious material from reinforcing bars before placing concrete.
- .3 Steel placement to be approved by Engineer before placing concrete.

3.5 INSTALLATION/APPLICATION

- .1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.
- .2 Place concrete to lines, grades and depths as indicated.
- .3 Discharge concrete into forms as soon as practical after mixing.
- .4 Use hand placing where machine spreading is not feasible.
- .5 Spread uniformly with approved equipment to thickness sufficient to allow for proper consolidation and finishing.
- .6 When completing concrete placement for day, carry placement through to scheduled control joint location.
- .7 Where concrete placement is stopped for more than 30 minutes due to breakdowns, weather or other reasons, construct extra bulkhead and construction joint as directed by Engineer.
- .8 Do not place concrete on frozen surface.
- .9 No concrete shall be placed during rain.
- .10 When rain appears imminent pouring operation should cease. Protect freshly laid concrete from rain damage and adverse weather condition and in accordance with CAN/CSA A23.1. Extend protective coverings over edges of concrete and arrange so as not to bear on unprotected edges.
- .11 Concrete placed when the ambient temperature is at or above 27 degrees C to be cured by continuous water curing from soaker hoses providing complete coverage of the pavement to minimize the temperature rise of the concrete.
- .12 When concrete has been placed in cold weather and the air temperature is expected to drop below 5 degrees C, insulating curing blankets or other suitable material shall be placed on the concrete pavement and weighted to prevent movement. Curing to continue until the cumulative number of days, or fraction thereof, during which the temperature of the concrete is 10 degrees C, has totalled a minimum of 7 days.
- .13 Deck, Approach Slab, Boat Launch Approach Ramp:
 - .1 Screed to plane surfaces and use non-steel floats.
 - .2 Provide chamfered edges and joint spacings using standard forms and tools.
 - .3 Broom finish in the transverse direction to provide lightly brushed non-slip finish.

- .14 Tolerances:
- .1 The average thickness of the deck shall be no more than 5 mm less thickness than the specified thickness, and no individual thickness measurement shall be more than 10 mm less than the specified thickness.
 - .2 Finished elevation of deck shall be within ± 5 mm from design elevations.
 - .3 The average slope of the finished floor shall not exceed 1:400 from the design centerline profile and deck-fall.
- .15 Thoroughly clean joints to receive sealant.

3.6 CONTROL JOINTS

- .1 Cut control joints in deck at locations indicated, to CSA A23.1/A23.2. Install specified joint sealer and silica sand inside joints.
- .2 Sawcut joints within 24 hours of the final concrete set time.

3.7 EXPANSION AND ISOLATION JOINTS

- .1 Install premoulded joint filler in expansion and isolation joints full depth of slab to CSA A23.1/A23.2. Install sealant on top of joint flush with finished surface.

3.8 CURING

- .1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

3.9 SITE TOLERANCES

- .1 Concrete slab and deck finishing tolerance to CSA A23.1/A23.2.

3.10 FIELD QUALITY CONTROL

- .1 Concrete testing: to CSA A23.1/A23.2 by testing laboratory designated and paid for by Owner.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 10 00 Concrete Forming and Accessories
- .2 Section 03 20 00 Concrete Reinforcing

1.2 MEASUREMENT FOR PAYMENT

- .1 Payment for the precast concrete ramp panels shall be per each panel installed and shall include all costs to supply, deliver, store and install the units. Wire rope post installed ties shall be considered included in the unit price for precast concrete ramp panels and will not be measured separately for payment.
- .2 Payment for the precast concrete submerged anchor blocks shall be per each anchor installed including steel floating dock chains (two chains per anchor). Length of chain to be sufficient enough to anchor the floating dock in place and have enough free chain to provide adjustment). The unit price shall include all costs to supply, deliver, store and install the units.
- .3 Payment for the precast concrete anchor blocks (breakwater) shall be per each anchor installed including angle floating dock strut in accordance with Section 05 50 00 – Metal Fabrication (one strut per anchor). Unit price shall include all costs to supply, deliver, store and install the units.
- .4 Reinforcing and lifting devices are considered included in the unit price for precast items and will not be measured separately for payment.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .2 ASTM A775/A775M-17, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - .3 ASTM C260/260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.
 - .4 ASTM D412-16, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
 - .5 ASTM D2240-15e1, Standard Test Method for Rubber Property - Durometer Hardness.
 - .6 ASTM A413 Standard Specification for Carbon Chain.
- .2 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008, Stipulated Price Contract.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-2000, Anticorrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181-99, Ready Mixed Organic Zinc-Rich Coating.

- .4 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-A23.3-14, Design of Concrete Structures.
 - .3 CSA-A23.4-16, Precast Concrete - Materials and Construction.
 - .4 CAN/CSA-A3000-18, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-13, Cementitious Materials for Use in Concrete.
 - .5 CSA G4-09, Steel Wire Rope for General Purpose and For Mine Hoisting and Mine Haulage.
 - .6 CAN/CSA-G30.18-09 (R2014), Billet-Steel Bars for Concrete Reinforcement.
 - .7 CAN/CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .8 CSA-W186-M1990(R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.4 PERFORMANCE REQUIREMENTS

- .1 Tolerance of precast elements to CSA-A23.4.
- .2 The maximum allowable dimensional variation shall be 1:800 or +/- 5 mm, whichever is greater.
- .3 Deviations from straight lines not to exceed 6 mm in 3 m.
- .4 Precast elements not to vary by more than plus or minus 6 mm from true overall cross sectional shape as measured by difference in diagonal dimensions.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 11 05 – General Instructions.
- .2 Shop Drawings:
 - .1 Submit precast element drawings prepared in accordance with plans to clearly show element size, shape, location of lifting points, groove details, element weight and necessary details of reinforcing.
 - .2 Submit erection plan including lifting hardware requirements.
 - .3 Submit drawings showing formwork and falsework design to: CSA A23.1/A23.2.
 - .4 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario.
- .3 Provide testing and inspection results reports for review by Engineer upon request and do not proceed without written approval when deviations from mix design or parameters are found.

1.6 QUALITY ASSURANCE

- .1 Provide to Engineer, four weeks minimum prior to starting concrete work, valid and recognized certificate from precast plant.

- .1 Quality Control Plan: provide written report to Engineer verifying compliance that concrete in place meets performance requirements.

1.7 QUALIFICATIONS

- .1 Fabricate and erect precast concrete elements by manufacturing plant certified in appropriate categories according to CSA-A23.4
- .2 Only precast elements fabricated in such certified plants to be acceptable to Engineer and plant certification to be maintained for duration of fabrication, erection until warranty expires.
- .3 Welding companies certified to CSA-W47.1.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle and store precast/prestressed units according to manufacturer's instructions.
- .2 Protect unit corners from contacting earth to prevent from staining.
- .3 Replace damaged precast units at no additional cost.

1.9 WARRANTY

- .1 Contractor warrants that precast element will not spall or show visible evidence of corrosion of embedded steel and cracking, except for normal hairline shrinkage cracks, in accordance with General Conditions (GC) - CCDC GC 12.3, but for 5 years.
- .2 Contractor warrants that precast elements will not spall or show visible evidence of cracking, except for normal hairline shrinkage cracks, in accordance with subsection GC32.1 of General Conditions "C", but for 12 months warranty period, which is extended to 60 months.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

- .1 To CSA A23.1/A23.2.

2.2 MATERIALS

- .1 Use Type GU cement for all applications.
- .2 Compressive strength when tested in accordance with CAN/CSA-A23.2, (9C): average 28 day compressive strength to be minimum 32 MPa with 5-8% air entrainment.
- .3 Air content when tested in accordance with CAN/CSA-A23.2, (4C), immediately after discharge: in accordance with CSA A23.1 Table 10.
- .4 Class of exposure: Class C-2
- .5 Use of chemical admixture will be approved only when specified mix requirements or workability cannot be achieved by proportioning of aggregates, water, cement and air entraining admixture.
- .6 Water: to CSA A23.1/A23.2.

- .7 Maximum coarse aggregate size shall be 20 mm.
- .8 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.
- .9 Other concrete materials: to CSA A23.1/A23.2.
- .10 Wire rope to 16 mm diameter , Extra Improved Plow Steel (EIPS), Independent Wire Rope Core (IWRC). Wire rope to meet CSA G4-09 requirements.
- .11 Chain to be ½ “ galvanized chain, Grade 70. Chain to meet ASTM A413 Grade 70.

2.3 MANUFACTURED UNITS

- .1 Manufacture units in accordance with CSA-A23.4.
- .2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit not be exposed.
- .3 Provide hardware suitable for handling elements.

2.4 FINISHES

- .1 Finish units to standard grade to CSA-A23.4.
- .2 Provide “V-Groove” at boat launch panels, as detailed on the drawings. Contractor may use different groove configuration, subject to approval from the Departmental Representative.

2.5 SOURCE QUALITY CONTROL

- .1 Provide Engineer with certified copies of quality control tests related to this project as specified in CSA-A23.4.
- .2 Provide records from in-house quality control programme based upon plant certification requirements to Engineer for inspection and review.
- .3 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and provide to Engineer for review upon request.

Part 3 Execution

3.1 ERECTION

- .1 Do precast concrete work in accordance with CSA-A23.4.
- .2 Do welding in accordance with CSA-W59, for welding to steel structures and CSA-W186, for welding of reinforcement.
- .3 Set elevations and alignment between units to within allowable tolerances before connecting units.

3.2 CLEANING

- .1 Use cleaning methods as reviewed by Engineer before cleaning soiled precast concrete surfaces.

END OF SECTION

Part 1 General

1.1 MEASUREMENT FOR PAYMENT

- .1 Pile Cap: Payment for the pile cap shall be by linear metres and shall include all labour, equipment, and material required to:
 - .1 Supply prime painted pile cap to the site.
 - .2 Weld pile cap to top of steel sheet piling. If necessary, provide alternative steel clip angles for connection.
 - .3 Provide dowels c/w nuts, washers, and plate washers and thru-bolt to the cap channel, where indicated.
 - .4 Provide pairs of stiffener plates at existing SSP locations, as required.
 - .5 Provide new shelf angles c/w dowels for the new concrete deck along the inside of the new steel sheet piling, where indicated.
 - .1 Weld shelf angles to the inpanels of the steel sheet piling.
 - .6 All splices, stiffener plates, shelf angles, dowels, nuts, washers, plate washers, anchors, support plates, field welding, and finishing shall be considered included in the unit price and will not be measured separately for payment.
- .2 Pipe Curb: Payment for the pipe curb shall be by linear metres and shall include all labour, equipment, and material required to:
 - .1 Provide new prime painted steel pipe curb as detailed.
 - .2 Where indicated on the drawings install the pipe curb base plate:
 - .1 On the on the new concrete deck using adhesive anchors; or
 - .2 On the pile cap by welding.
 - .3 All anchors, splices, support plates, field welding, and finishing shall be considered included in the unit price and will not be measured separately for payment.
- .3 Bollards: Payment for the new bollards shall be per each bollard and shall include all labour, equipment, and material required to:
 - .1 Supply prime painted bollards to the site.
 - .2 Install bollards where indicated.
 - .3 Provide nuts and washers.
 - .4 All anchors, welding, field welding, and finishing shall be considered included in the unit price and will not be measured separately for payment.
- .4 Cleats: Payment for the new cleats shall be per each cleat and shall include all labour, equipment, and material required to:
 - .1 Supply cleats to the site.
 - .2 Install cleats on the new concrete deck using adhesive anchors c/w nuts and washers.
 - .3 All anchors, nuts, washer and finishing shall be considered included in the unit price and will not be measured separately for payment.

- .5 Ladders: Payment for the ladders shall be per each ladder and shall include all labour, equipment, and material required to:
 - .1 Provide new fixed ladder against steel sheet piling.
 - .2 Provide cable ladder and rung tabs.
 - .3 All anchors, connections, field welding and finishing shall be considered included in the unit price and will not be measured separately for payment.
- .6 Fenders: Payment for the fenders shall be per each fender and shall include all labour, equipment, and material required to:
 - .1 Provide vertical steel channels c/w A325 bolts and adhesive anchors c/w nuts and washers.
 - .2 Provide vertical rubber 'D' fenders.
 - .3 All anchors, nuts, washer, connections, field welding and finishing shall be considered included in the unit price and will not be measured separately for payment.
- .7 Steel Sleepers: Payment for the steel sleepers shall be by linear metres and shall include all labour, equipment, and material required to:
 - .1 Provide new steel channel sleepers below the concrete boat launch ramp.
- .8 Wire Rope Post Installed Ties: Payment for internal post-installed wire rope ties holding boat launch panels together shall be included with the precast concrete ramp panel, and will not be measured separately for payment.
- .9 Angle Floating Dock Struts: Payment for angle floating dock struts tying back to the breakwater shall be included with the precast concrete anchor blocks (breakwater) in Section 03 41 00 – Precast Structural Concrete, and will not be measured separately for payment.
- .10 Cleaning, shop painting and field painting of steel will not be measured separately for payment but shall be considered included in the measurement for payment for each item.

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A53/A53M-18, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A307 – 14e1, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 CSA International
 - .1 CSA G40.20/G40.21-13 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA S16-14, Design of Steel Structures.
 - .4 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59-13, Welded Steel Construction (Metal Arc Welding) Metric.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Shop Drawings:
 - .1 Prior to fabrication, submit drawings for all items, stamped and signed by professional engineer registered or licensed in Ontario, Canada, for all metal fabrications.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, dimensions, welding details, and all other relevant information required for fabrication.
 - .3 Prior to ordering, submit details of prefabricated items including cleats, cable ladder.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Structural steel sections: to CSA G40.20/G40.21, Grade 350W.
- .2 Miscellaneous steel and plates: to CSA G40.20/G40.21, Grade 300W.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts, nuts, and washers shall be ASTM A325.
- .6 Rods and cast-in anchors: to ASTM A307, galvanized where exposed to weather.
- .7 Adhesive anchors for pipe curb:
 - .1 Nominal diameter: 16 mm.
 - .2 Minimum embedment depth: 132 mm.
 - .3 Anchors, nuts, and washers shall be AISI 304 stainless steel as per ASTM F593.
 - .4 Minimum design strength for four anchors at one curb base plate (the least of steel strength or adhesive strength based upon concrete/bond failure):
 - .1 Tension: 100 kN
 - .2 Shear: 118 kN
- .8 Adhesive anchors for cleats:
 - .1 Minimum strength and embedment as specified by manufacturer.
- .9 Rubber for fenders: Weather and abrasion resistant, extruded rubber.

- .1 Provide submittal for rubber fender.

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.

2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to CAN/CSA-G164.

2.4 SHOP PAINTING

- .1 Primer: VOC limit 250 g/L maximum to GS-11 CCD-047a CCD-048.
- .2 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .3 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .4 Clean surfaces to be field welded; do not paint.

2.5 PILE CAP

- .1 Steel channels: prime painted, C380x50, or bent plate to suit.
- .2 Finish: shop painted.
- .1 Primer: VOC limit 250 g/L maximum to GS-11 when applied on site.

2.6 SHELF ANGLES

- .1 Shelf angles: L 150x150x13 c/w 15 M x 600 mm long dowels at 600 mm centres, shelf angles shall be 1300 mm in length.
- .2 Finish: unpainted.

2.7 ANGLE STRUTS

- .1 Angle struts for floating dock to be L102x102x13 and shall be 3000 mm in length.
- .2 Finish: galvanized.

2.8 SLEEPERS BELOW BOAT LAUNCH

- .1 Steel sleepers: prime painted, C150x19 9600 mm long.
- .2 Finish: unpainted.

2.9 PIPE CURB

- .1 Continuous Curb: HSS101.6x8.8
- .2 Vertical Posts: 19 mm thick plate.

- .3 Base Plates for anchorage to concrete: 226 mm x 200 mm x 19 mm thick.
- .4 Anchors: 4-16 mm diameter adhesive anchors at each base plate.
- .5 Finish: shop painted.
- .1 Primer: VOC limit 250 g/L maximum to GS-11 when applied on site.

2.10 BOLLARDS

- .1 Pipes: DN100XS, 365 mm in length.
- .2 Cap Plates: 127 mm diameter, 6 mm thick.
- .3 Bars: 32 mm diameter, 315 mm in length.
- .4 Base Plates: 214 mm x 180 mm x 12 mm thick.
- .5 Finish: shop painted.
- .1 Primer: VOC limit 250 g/L maximum to GS-11 when applied on site.

2.11 CLEATS

- .1 Length: 305 mm.
- .2 Height from top of deck to top of cleat: 100 mm.
- .3 Number of anchors at each cleat: four.

2.12 LADDER

- .1 9.5 mm bent plate stringers prime painted, cut to lengths as indicated.
- .2 Fixed rungs: 19 mm diameter, prime painted, sizes as indicated. Shop weld to stringers at 300 mm centres.
- .3 Primer: VOC limit 250g/L Maximum to GS-11 when applied on site.
- .4 Cable ladder: pre-manufactured, 300 mm wide c/w black steel cables, black shrink tube on rungs, two attachment points, snap hooks at top, length as indicated. To be approved by Departmental Representative.

2.13 FENDERS

- .1 C200x17 verticals, painted.
- .2 Vertical 203x203 rubber "D" shaped fender, unpainted.
- .3 Finish: shop painted.
- .1 Primer: VOC limit 250 g/L maximum to GS-11 when applied on site.

2.14 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.

Part 3 ERECTION

3.1 General

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Engineer such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to be hot dipped galvanized and /or shall be compatible with material through which they pass.
- .5 Make field connections with bolts to CSA S16.
- .6 Touch-up field welds, bolts and burnt or scratched surfaces with primer;
 - .1 Primer: maximum VOC limit 250 g/L to GS-11.
- .7 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
 - .1 Primer: maximum VOC limit 250 g/L to GS-11.

3.2 PILE CAP ON STEEL SHEET PILING

- .1 Install pile cap as indicated to top of steel sheet piling.
- .2 Weld underside of pile cap to top of steel sheet piling as indicated.
- .3 In areas where direct welding cannot be achieved, provide steel angles to connect the pile cap to the steel sheet piling.

3.3 LADDERS

- .1 Install ladders in locations as indicated.
- .2 Ensure rungs are 150 mm clear of steel sheet piling.
- .3 Install top rung/grab bar at top of steel curb.
- .4 Install cable ladder off bottom rung of fixed ladder using snap hooks.
- .5 Ensure no part of new fixed ladder assembly projects beyond face of steel sheet piling outpans.

3.4 SHELF ANGLES

- .1 Weld 1300 mm lengths of shelf angles to inpanels of steel sheet piling, centred on every second outpan.
- .2 Weld dowels to shelf angles at 600 mm centers.

3.5 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

3.6 PROTECTION

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

END OF SECTION

Part 1 General

1.1 Measurement for Payment

- .1 No measurement will be made under this Section.

1.2 RELATED SECTIONS

- .1 Section 06 10 00 – Timber Cribwork
- .2 Section 35 51 23 – Floating Dock System

1.3 REFERENCES

- .1 American Wood-Preservers' Association (AWPA)
 - .1 AWPA M2-01, Standard for Inspection of Treated Wood Products.
 - .2 AWPA M4-06, Standard for the Care of Preservative-Treated Wood Products.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA O80 Series-97(R2002) - O80S2-05, Wood Preservation.
 - .2 CSA O80.20-1.1-M97(R2002), This Standard applies to the fire-retardant treatment of lumber by pressure processes..
 - .3 CSA O80.27-1.1-M97(R2002), This Standard covers the fire-retardant treatment of Douglas Fir, hardwood, softwood, and Poplar plywood by pressure processes.
 - .4 CSA O80.201-M89, This Standard covers hydrocarbon solvents for preparing solutions of preservatives.
 - .5 CSA O322-02, Procedure for Certification of Pressure-Treated Wood Materials for Use in Preserved Wood Foundations.

1.4 QUALITY ASSURANCE

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Worker protection:
 - .1 Workers must wear gloves, eye protection and protective clothing when handling, drilling, sawing or cutting preservative treated wood and applying preservative materials.
 - .2 Workers must not eat, drink or smoke while applying preservative material.
- .3 Clean up spills of preservative materials immediately with absorbent material. Safely discard of absorbent material to approved landfill.

1.5 WASTE MANAGEMENT

- .1 Do not dispose of preservative treated wood through incineration.
- .2 Do not dispose of preservative treated wood with other materials destined for recycling or reuse.
- .3 Dispose of treated wood, end pieces, wood scraps and sawdust at an approved landfill

Part 2 Products

2.1 MATERIALS

- .1 Preservative treatment by a pressure process to CSA O80 Series.

Part 3 Execution

3.1 APPLICATION: PRESERVATIVE

- .1 Treat timber with CCA or ACA preservative, incision method, to 6.4 kg/cubic metre (0.40 lb/cubic foot) retention or refusal. Treatment to conform to the latest edition of CSA specification O80.

3.2 Care of pressure-treated wood products

- .1 Apply the recommended and accepted practices followed in the care and handling of all wood products to pressure-treated wood products.
- .2 Avoid damage of field fabrication causing alteration of the original pressure-treated surface.
- .3 Thoroughly saturate all cuts or injuries occurring subsequent to pressure treatment by liberal brushing, spraying, dipping, soaking or coating with preservative solution.
- .4 Fill holes necessarily bored after pressure treatment with preservative solution to allow ample soaking time for penetration of solution.
- .5 Use in any of the above the same preservative solution as that used in the original pressure treatment or a field treating solution of colour to match original treatment.

3.3 HANDLING TREATED TIMBER

- .1 Handle treated material without damaging original treatment.
 - .1 Replace treated timber with major damage to original treatment, as instructed by Engineer.
- .2 Field treatment: apply and saturate cuts, minor surface damage, abrasions, and nail and spike holes with preservative to CAN/CSA-O80 Series.

END OF SECTION

Part 1 General

1.1 MEASUREMENT FOR PAYMENT

- .1 Payment for the timber cribs shall be by each crib supplied and installed as indicated on the drawings. Payment at the unit price shall include all cribwork timbers, decking, fasteners, shims, rock fill and wood preservation.
- .2 Rock for stone mattress will be paid in accordance with Section 32 11 23 Aggregate Materials, Part 1.2.1 Rock Protection.
- .3 Native fill will be measured as part of the lump sum arrangement and shall include all labour, equipment and materials necessary to complete the excavating, stockpiling and backfilling of native backfill.
- .4 Excavation for installation of timber cribs to be considered incidental to supply and installation of timber cribs.
- .5 Payment at the Contract price of unit rate tender items shall be full compensation for all labour, equipment and material to do the work, including reinforcing steel dowels.

1.2 RELATED SECTIONS

- .1 Section 06 05 73 – Wood Treatment
- .2 Section 32 11 23 - Aggregate Materials
- .3 Section 03 20 00 – Concrete Reinforcing.

1.3 MATERIALS

- .1 Timber: use timber graded 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: Group A (Douglas Fir).
 - .2 Grade: Structural, No 2 or better.
 - .3 Grading authority: BCLMA
 - .4 All timber to be rough sawn.
 - .5 All decking to be square sawn sized lumber.
 - .6 All specified treated timber and planks to be pressure treated in accordance with Section 06 05 73 – Wood Treatment.
 - .7 All end cuts, abrasions and bolt holes to be well soaked with two coats of ACQ preservative acceptable to Engineer.
 - .8 Machine bolts used are to be of sufficient length to accept two washers and one fully threaded hexagonal headed nut.
 - .9 Drift pins to be 15M reinforcing steel.
 - .10 Bore holes for drift bolts 1.5 mm smaller diameter than bolt and 52 mm short of length of bolt.
 - .11 All end cuts to be placed above high water line where possible.
- .2 Miscellaneous steel:
 - .1 Hot dip galvanized: to CAN/CSA-G164.

- .2 Wire nails, spikes, staples: to CSA-B111.
- .3 Bolts, nuts, washers: to ASTM A307.
- .4 Drift pins: to CSA-G30-18, Grade 400, deformed bars
- .5 Steel straps and plates: to CAN/CSA-G40.21, Grade 300.
- .3 Ballast for timber cribs to following requirements:
 - .1 Backfill material: Rock Fill in accordance with Section 32 11 23 - Aggregate Materials
 - .2 Stone mattress: Rock Protection in accordance with Section 32 11 23 - Aggregate Materials.

Part 2 Execution

2.1 PREPARATION

- .1 Confirm existing measurements on site and confirm materials supply is sufficient. Inform engineer of any measurement discrepancies present.
- .2 Before construction, stockpile sufficient ballast to completely fill cribs.

2.2 CRIB CONSTRUCTION

- .1 All longitudinal timbers and cross timbers shall be of sufficient length to span crib in one length or as noted on drawing. Longitudinal timbers and cross timbers to be drifted to each other at each contact point with 15M x 350 reinforcing steel drift pins. Each longitudinal and cross timber to be fastened to vertical binder post with 20 mm machine bolt complete with nut and 2 washers. All machine bolts used to be of sufficient length to accept 2 washers and have room for fully threading a hexagonal nut. All machine bolts to be countersunk on exterior faces.
- .2 Place ballast floor on pockets on bottom timbers. Secure each ballast floor timber to bottom timbers with 19 mm x 457 drift bolts.
- .3 Vertical binder posts to be in one length from bottom of cribwork to top of cribwork.
- .4 Maximum spacing between cross timbers and longitudinal not to exceed 215mm.
- .5 Bore holes for drift bolts 1.5 mm smaller diameter than bolt 52 mm short of length of bolt. Bore holes for machine bolts to same diameter as bolts.
- .6 Decking to be installed once gangways have been installed. Ensure proper shimming to eliminate trip hazards.

2.3 BALLAST

- .1 Place ballast to avoid damage to timber cribwork.
- .2 Place ballast so that differential height of fill between adjacent cells, at any time, will be less than 1 m.
- .3 Cribs to be fully ballasted from ballast floor to bottom of decking.

2.4 TOLERANCES

- .1 1 in 300 in overall dimensions.

2.5 CLEANING

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 35 43 – Environmental Procedures
- .2 Section 32 11 23 – Aggregate Materials

1.2 MEASUREMENT OF PAYMENT

- .1 Excavation, stock-piling and reuse of native materials will be considered as part of the lump sum amount.
- .2 Clearing of the driveline will be considered part of the lump sum amount, and will include clearance of miscellaneous obstructions necessary to prepare the surface for sheet pile work, including, but not limited to, rock, cribbing and timber piles.
- .3 Excavation and legal disposal of excess and/or unsuitable materials will be considered as part of the lump sum amount.
- .4 Removal, salvage and re-installation of stone, rock, armour stone, rock protection is considered part of the lump sum amount and will not be measured separately for payment.
- .5 Supply and installation of erosion and sedimentation control is considered incidental to excavating and backfilling and will not be measured separately for payment.
- .6 Payment at the Contract price of unit rate tender items shall be full compensation for all labour, equipment and material to do the work.
- .7 Compaction shall be considered incidental and not measured separately for payment.
- .8 Shoring, bracing, cofferdams, underpinning and de-watering of excavation will not be measured separately for payment.
- .9 Payment for geotextiles shall be as per Section 31 32 19.01 – Geotextiles.
- .10 Payment for backfilling using new Granular ‘A’ shall be as per Section 32 11 23 – Aggregate Materials.
- .11 Underwater excavation of Class B material, including handling, dewatering and transporting of materials to disposal site, as well as confirmation of excavation grade depth will be considered as part of the lump sum amount. The estimated quantity of underwater excavation of Class B material within the marked areas on the drawings is 60 m³. Estimated quantity does not include side slopes required for neat dimension of the marked areas.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C117-17, Standard Test Method for Material Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136-14 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

- .3 ASTM D422-63(2007)e2, Standard Test Method for Particle-Size Analysis of Soils.
- .4 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
- .5 ASTM D1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
- .6 ASTM D4318-17e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
 - .3 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

1.4 DEFINITIONS

- .1 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .2 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .3 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .4 Unsuitable materials:
 - .1 Weak, chemically unstable, and compressible materials.
 - .2 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 ASTM C136: Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
- .5 Underwater excavation definitions:
 - .1 Dredging: excavating, transporting and disposing of underwater materials.
 - .2 Class A material: solid rock requiring drilling and blasting to loosen, and boulders or rock fragments of individual volumes 1.5 m
 - .3 Class B material: loose or shale rock, silt, sand, quick sand, mud, shingle, gravel, clay, sand, gumbo, boulders, hardpan and debris of individual volumes less than 1.5 m
 - .4 Obstructions: material other than class A, having individual volumes of 1.5 m
 - .5 Debris: pieces of wood, wire rope, scrap steel, pieces of concrete and other waste materials.
 - .6 Grade: plane above which material is to be dredged.
 - .7 Sub-grade: plane parallel to and 300 mm below grade.
 - .8 Estimated quantity:

- .1 Volume of material calculated to be above sub-grade and within specified side slopes unless otherwise specified.
- .2 Areas in square metres of material calculated horizontally to exist above grade and within dredge limits, unless otherwise specified.
- .9 Side slope: inclined surface or plane from subgrade at side limit of dredging area to intersect original ground line outside of side limit and to be expressed as ratio of horizontal to vertical.
- .10 Chart Datum: permanently established plane from which soundings or tide heights are referenced, usually Lowest Normal Tide (LNT).
- .11 Universal Transverse Mercator Projection (UTM) or Modified Transverse Mercator Projection (MTM) Co-ordinates: plane rectangular coordinates used in grid system in which grid network is applied to UTM. or MTM. projection. Horizontal control information as indicated.
- .12 Minimum Mode: mode of operation of hydrographic survey equipment where minimum sounding over length of travel between position updates will be retained in memory. Soundings taken in this mode may be shallower than actual bottom elevations due to variations in water depths due to wave action.
- .13 Matrix Block: each dredge area is presented as number of [1.2 x 3.0] m long blocks. Dependent on position of sounding, block may have [0 to 4] soundings contained within it.
- .14 Least of Minimum Plan: hydrographic survey plan in which least sounding in grouping of matrix blocks is plotted.
- .15 Instantaneous Mode: mode of operation of hydrographic survey equipment where only sounding observed at predetermined distance interval is retained in memory.
- .16 Average of Instantaneous Plan: hydrographic survey plan in which average sounding in appropriate grouping of matrix blocks is plotted.
- .17 Lowest Normal Tide (LNT): plane so low that tide will seldom fall below it.
- .18 Cleared Area: area of dredging accepted as complying with plans and specifications.

.6

1.5 SUBMITTALS

- .1 Quality Control:
 - .1 Submit for review by Engineer proposed dewatering methods as described in PART 3 of this Section.
 - .2 Submit to Engineer written notice at least 7 days prior to excavation work, to ensure cross sections are taken.
 - .3 Submit to Engineer written notice when bottom of excavation is reached.
 - .4 Submit to Engineer testing results as described in PART 3 of this Section.
- .2 Preconstruction Submittals:
 - .1 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, and location plan of relocated and abandoned services, as required.

- .3 Submit to Departmental Representative for approval, four weeks prior to excavation, the proposed location for dewatering purposes and location of disposal.

1.6 QUALITY ASSURANCE

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Keep design and supporting data on site.
- .3 Engage services of qualified professional Engineer who is registered or licensed in Province of Ontario, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .4 Health and Safety Requirements:
 - .1 Do construction occupational health and safety in accordance with Provincial standards.

1.7 EXISTING CONDITIONS

- .1 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .3 Where utility lines or structures exist in area of excavation, obtain direction of Engineer before removing or re-routing.
 - .4 Record location of maintained, re-routed and abandoned underground lines.
- .2 Existing buildings and surface features:
 - .1 Conduct condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by Work. Notify Departmental Representative of any damage prior to starting work.
 - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Engineer.

1.8 SURVEY AND ACCEPTANCE OF WORK

- .1 Provide, at own expense, survey vessel, equipment and crew to set up and maintain control for location of underwater excavation limits and to sound areas immediately after excavation to verify that grade depth has been attained.
- .2 Contractor to excavate as necessary to remove all material within limits which are found to be above grade.
- .3 All sounding depths obtained by Departmental Representative must be within +/- 0.2 m of the specific grade depth before the area will be considered completed.

Part 2 Products

2.1 MATERIALS

- .1 Geotextiles: Section 31 32 19.01 - Geotextiles
- .2 Aggregates: Section 32 11 23 - Aggregate Materials

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties, walkways and waterways.
- .2 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 SITE PREPARATION

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

3.3 PREPARATION/PROTECTION

- .1 Keep excavations clean, free of standing water, and loose soil.
- .2 Protect buried services that are required to remain undisturbed.

3.4 DEWATERING

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Engineer approval details of proposed dewatering methods, including dikes, well points, and sheet pile cut-offs.
- .3 Protect open excavations against flooding and damage due to surface run-off.
- .4 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures and in manner not detrimental to public and private property, or portion of Work completed or under construction.

3.5 EXCAVATION

- .1 Advise Engineer at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as indicated.
 - .1 In addition, remove all topsoil, organic matter, debris, rocks, and other loose and harmful matter encountered at subgrade level.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Excavate trenches to provide uniform continuous bearing and support for specified thickness of bedding material.

- .5 Dispose of all excavated material off site.
- .6 Base of excavations to be free from loose, soft or organic matter.
- .7 Notify Engineer when bottom of excavation is reached.
- .8 Obtain Engineer approval of completed excavation.
- .9 Correct unauthorized over-excavation by backfilling with approved material (without cost to Owner), to the satisfaction of the Departmental Representative.
- .10 Level and compact base of excavation to 95% SPD to ensure a smooth profile free of sharp edges.
- .11 Install geotextile at limits of excavation, as indicated on the Drawings and in accordance with Section 31 32 19.01 - Geotextiles.

3.6 EQUIPMENT

- .1 Contractor to determine required equipment necessary to carry out underwater excavation, handling and disposal of the material and locations specified for removal.

3.7 UNDERWATER EXCAVATION

- .1 Remove materials in dredge location shown on drawings, above grade depth of 181.680 m. Material removed from below grade depth is not part of the Work.
 - .1 Dredge side slopes to two horizontal to one vertical.
- .2 Remove spillage, shoaling or infilling which occurs prior to acceptance by Departmental Representative.
- .3 Immediately notify Departmental Representative upon encountering object which might be classified as obstruction. By-pass object after clearly marking its location and continue Work.
- .4 The Contractor shall install all protection measures required prior to initiating underwater excavation activities.
- .5 Upon completion of underwater excavation, Contractor to confirm, in presence of Departmental Representative, that grade depth has been achieved.
- .6 Dispose of material by depositing in off-site location approved by Departmental Representative. Do not dispose of material in waterways. Contractor is responsible for any required testing, such as Toxicity Characteristic Leaching Procedure (TCLP) to determine disposal location.
- .7 Contractor is to transport material to the disposal site using appropriate equipment.
- .8 Truck boxes to be watertight to prevent spillage of material during transit from site to disposal location. Clean up spillage as directed and take necessary action to prevent reoccurrence.
- .9 Do not dispose of debris in lake.
- .10 Dispose of debris in containment facility or at approved land disposal site.

3.8 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated and specified below.

- .1 Granular 'A' placed in lifts not exceeding 150 mm, compacted to 100% SPMDD.

3.9 BACKFILLING

- .1 Do not proceed with backfilling operations until completion of following:
 - .1 Engineer has inspected and approved installations.
 - .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
 - .3 Do not use backfill material which is frozen or contains ice, snow or debris.
 - .4 Place granular backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

3.10 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris off site.

END OF SECTION

Part 1 General

1.1 MEASUREMENT AND PAYMENT

- .1 Payment for geotextiles shall be by square metres of surface covered by material. No allowance will be made for seams and overlaps.
- .2 Payment for geogrid shall be by square metres of surface covered by material. No allowance will be made for seams and overlaps.

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2 No. 11.2-M89 (R2013), Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
 - .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
 - .1 No.2-M85 Methods of Testing Geosynthetics - Mass per Unit Area.
 - .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
 - .3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
 - .4 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
 - .5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.
- .2 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS.PROV 1860 – April 2018, Material Specification for Geotextiles.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 05 – General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for geotextiles and geogrid and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Test and Evaluation Reports:
 - .1 If requested, submit copies of mill test data and certificate at least 4 weeks prior to start of Work.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Storage and Handling Requirements:

- .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect geotextiles from direct sunlight and UV rays.
- .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIAL

- .1 Non-woven geotextiles shall be Class II and consist of a manufactured sheet, web, or batt of directionally or randomly oriented fibres, filaments, or other elements produced by bonding or interlocking the elements by mechanical, thermal, or chemical means.
 - .1 Tensile strength, Marv, minimum 660 N to CAN/CGSB 148.1, Method No. 7.3.
 - .2 Elongation at break, typical, >50% to CAN/CGSB 148.1, Method No. 7.3.
 - .3 Tear strength, MARV, minimum, 250 N to CAN/CGSB 4.2, Method No. 12.2.
 - .4 Puncture strength, MARV minimum, 1375 N to ASTM D 6241.
 - .5 Permittivity, minimum, to 0.05 CAN/CGSB 148.1, Method No. 4 s⁻¹.
 - .6 Ultraviolet stability, minimum, 50% retained tensile strength at 500 hours to ASTM D 4355.
- .2 Geogrid shall be one of the following (or Engineer approved equal):
 - .1 Terrafix TBX3000 biaxial geogrid,
 - .2 Tensar BXSQ3030 biaxial geogrid,
 - .3 Layfield E'Grid 3030 biaxial geogrid.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for geotextile material installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Engineer.
 - .2 Inform Engineer of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

- .1 Place geotextile or geogrid material by unrolling onto graded surface in orientation, manner and locations indicated.
- .2 Place geotextile at the following locations:
 - .1 Between rock fill and Granular 'A' at wharf.
 - .2 Around clean stone base at boat launch.
- .3 Place geogrid at the following location:

- .1 On lakebed within new sheet piling wharf.
- .4 Place geotextile or geogrid material smooth and free of tension stress, folds, wrinkles and creases.
- .5 Overlap each successive strip of geotextile or geogrid 600 mm over previously laid strip.
- .6 Protect installed geotextile or geogrid material from displacement, damage or deterioration before, during and after placement of material layers.
- .7 After installation, cover with overlying layer within 4 hours of placement.
- .8 Replace damaged or deteriorated geotextile or geogrid to approval of Engineer.
- .9 Place and compact soil layers in accordance with Section 32 11 23 – Aggregate Materials.

3.3 CLEANING

- .1 Progress Cleaning:
 - .2 Leave Work area clean at end of each day.
 - .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile or geogrid.

END OF SECTION

Part 1 General

1.1 MEASUREMENT FOR PAYMENT

- .1 Payment for H-Piles will be measured by linear metres of pile remaining in place after cut-off, and shall include the cost of fabrication, delivery, and installation.

1.2 SUBMITTALS

- .1 Product Data: submit manufacturer's printed product literature, specifications and datasheet.
- .2 Submit schedule of planned sequence of driving to Engineer for review, as specified.
- .3 Spliced piles: when authorized, submit design details of splice complete with signature and stamp of qualified professional engineer registered or licensed in Province of Ontario.
- .4 Equipment:
 - .1 Submit prior to pile installation for review by Engineer, list and details of equipment for use in installation of piles.
 - .1 A pile driving analysis based upon the Contractor's selected equipment shall be completed by the Contractor. Written approval of the Contractor's equipment/methodology shall be received prior to driving piles.
 - .2 Impact hammers: submit manufacturer's written data as specified.
 - .3 Non-impact methods; submit characteristics to evaluate performance.
- .5 Quality assurance submittals:
 - .1 Test reports: submit copy of certified test reports for piles from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's instructions.
- .2 Protect piles from damage due to excessive bending stresses, impact, abrasion or other causes during delivery, storage and handling.
- .3 Replace damaged piles as directed by Engineer.

1.4 SCHEDULING

- .1 Drive piles in what is considered most economical sequence.
- .2 Submit schedule of planned sequence of driving to Engineer for approval, not less than 2 weeks prior to commencement of pile driving.

Part 2 Products

2.1 MATERIALS

- .1 Grade 350W.
- .2 Supply full length piles and provide equipment of sufficient capacity to handle full length piles without cutting or splicing.
- .3 Do not splice piles without written permission from Engineer.
- .4 Pile lengths indicated on plans are based on the final installation lengths. 300 mm to be cut off after installation of piles.

2.2 EQUIPMENT

- .1 Impact hammers: provide manufacturer's name, type, rated energy per blow at normal working rate, mass of striking parts of hammer, mass of driving cap and type and elastic properties of hammer and pile cushions.
- .2 Non-impact methods of installation such as augering, jacking, vibratory hammers or other means: provide full details of characteristics necessary to evaluate performance.
- .3 Hammer:
 - .1 Hammers to be selected on basis of driveability analysis using wave equation theory, performed to show that piles can be driven to levels indicated.
 - .2 Driveability analysis to include, but not be limited to, following: hammer, cushion, and cap block details; static soil parameters; quake and damping factors, total soil resistance, blow count, pile stresses and energy throughput at representative penetrations.
 - .3 When required criteria cannot be achieved with the proposed hammer, use larger hammer and take other measures as required.
- .4 Equipment information: supply equipment of sufficient size and capacity to adequately install the piling to the indicated depth. Prior to bringing on site, submit to Departmental Representative for review, details of equipment for installation of piles.
- .5 Floating plant (if used in the work)
 - .1 Shall to be of sufficient capacity and in good operation conditions to satisfactorily complete the work, within the time schedule and in accordance with the specifications.
 - .2 Contractor to submit a complete list of proposed floating plant to Departmental Representative for review prior to commencement of work. Any modification required to floating plant and associated equipment shall be performed by Contractor prior to commencing work at not additional cost to the Owner.
 - .3 Mark floating equipment with lights in accordance with the Collision Regulations with Canadian Modifications 1983, and maintain a VHF marine radio watch on board.
 - .4 Do not impede navigation during progress of work in accordance with the Collision Regulations with Canadian Modifications 1983. Make no claims for delay results from vessel movement from harbour area.

Part 3 Execution

3.1 PREPARATION

- .1 Protection:
 - .1 Protect adjacent structures, services and work of other sections from hazards due to pile driving operations.
 - .2 Arrange sequencing of pile driving operations and methods to avoid damages to adjacent existing structures.
 - .3 When damages occur, remedy damaged items to restore to original or better condition at own expense.
- .2 Ensure that ground conditions at pile locations are adequate to support pile driving operation and load testing operation.
 - .1 Make provision for access and support of piling equipment during performance of Work.

3.2 INSTALLATION

- .1 Leads: construct pile driver leads to provide free movement of hammer.
 - .1 Hold leads in position at top and bottom, with guys, stiff braces, or other means to ensure support to pile while being driven.
- .2 Followers:
 - .1 Provide followers of such size, shape, length and mass to permit driving pile in desired location to required depth and resistance.
- .3 Installation of each pile will be subject to approval of Engineer.
- .4 Drive each pile to pile tip elevation indicated on drawings.

3.3 APPLICATION / DRIVING

- .1 Hold piles securely and accurately in position while driving.
- .2 Deliver hammer blows along axis of pile.
- .3 Cut off piles neatly and squarely at elevations as indicated.
- .4 Provide sufficient length above cut-off elevation so that part damaged during driving is cut off.
- .5 Remove cut-off lengths from site on completion of work.

3.4 DRIVING TOLERANCES

- .1 Pile heads to be within 75 mm of locations as indicated.
- .2 Piles not to be more than 2% of length out of vertical alignment.

3.5 REPAIR AND RESTORATION

- .1 Pull out rejected piles and replace with new piles.
 - .1 Remove rejected pile and replace with a new and if necessary, a longer pile.
 - .2 Engineer will reject any pile that is driven out of position, is driven below cut-off elevation, or is damaged during driving or handling.

- .2 No extra compensation will be made for removing and replacing or other work made necessary through rejection of defective piles.
- .3 Departmental Representative will reject any pile that is driven out of position or is damaged during driving or handling. Extend piles driven below cut off elevation as directed by Departmental Representative, at no cost to Owner.

3.6 PILE CAPACITY

- .1 Install each pile with approved pile driving procedures. Departmental Representative will be sole judge of acceptability of each pile with respect to depth of penetration or other criteria specified.
- .2 Drive each pile to a minimum penetration of the pile tip to elevation shown on the drawings.

3.7 FIELD QUALITY CONTROL

- .1 Measurement:
 - .1 Maintain accurate records of driving for each pile, including:
 - .1 Type and make of hammer, stroke or related energy.
 - .2 Other driving equipment including water jet, driving cap, cushion.
 - .3 Pile size and length, location of pile in pile group, location or designation of pile group.
 - .4 Sequence of driving piles in group.
 - .5 Final tip and cut-off elevations.
 - .6 Other pertinent information such as interruption of continuous driving, pile damage.
 - .7 Record elevation taken on adjacent piles before and after driving of each pile.
 - .2 Provide Engineer with three copies of records.

3.8 CLEANING

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 02 41 13 Selective Site Demolition.
- .2 Section 03 30 00 Cast-In-Place Concrete
- .3 Section 05 50 00 Metal Fabrications
- .4 Section 31 23 33.01 Excavating and Backfilling
- .5 Section 31 61 13 Pile Foundations, General Requirements
- .6 Section 32 11 23 Aggregate Materials

1.2 MEASUREMENT FOR PAYMENT

- .1 Payment for the supply steel sheet piling will be measured in square metres of piling delivered to site. Supplied sheets to allow for a minimum of 0.1 m cut off.
- .2 Payment for the installation of steel sheet piling will be measured in square metres of piling remaining in place after cut-off. Piling will be measured in plane of bulkhead, calculated by multiplying straight horizontal centre line length of bulkhead measured at top of piles by average vertical length of piles installed and left in place. There will be no separate payment for the following:
 - .1 drilled holes and cutting of sheet piles.
 - .2 tack welding sheets during driving, to avoid down drag.
 - .3 custom or standard corner pieces.
 - .4 welding plates to seal joints between the new and existing steel sheet piling to the new H-piles
- .3 Supply and installation of steel sheet pile required for anchor walls shall be paid under the items above.
- .4 Payment to provide tie rods shall be by linear metre of tie rod installed. Bearing plates, nuts, washers (tapered, where required), turnbuckles, and all other associated hardware to be included in the cost of the tie rods.
- .5 Payment to provide new steel walers shall be by linear metres of waler installed. Nuts, pipe spacers, splice and corner plates, plate washers (tapered, where required), tie bolts, and all other associated hardware shall be included in the lineal metre cost of the steel walers.
- .6 Payment to provide closures shall be by each closure suitably installed, and shall include steel members, field welds, custom sheet pile sheets, anchors and concrete.
- .7 Payment at the Contract Price of unit rate tender items shall be full compensation for all labour, equipment and material to do the work.

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A6/A6M-17a, Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.

- .2 ASTM A307-14e, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
- .3 ASTM A1011/A1011M-18a, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- .4 ASTM A328/A328M-13a(2018), Standard Specification for Steel Sheet Piling.
- .2 Canadian Standards Association (CSA International).
 - .1 CAN/CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W47.1-09(R2014), Certification of Companies for Fusion Welding of Steel Structures.
 - .3 CSA W47.1S1-M1989(R1998)], Supplement No.1-1989 to W47.1-1983, Certification of Companies for Fusion Welding of Steel Structures.
 - .4 CSA W59-2018, Welded Steel Construction (Metal Arc Welding) (Metric Version).
 - .5 CSA W59S1-M1989(R1998)], Supplement No.1-M1989, Steel Fixed Offshore Structures, to W59-M1989, Welded Steel Construction (Metal Arc Welding).

1.4 SUBMITTALS

- .1 Prior to sheet pile driving operations, submit shop drawings for following:
 - .1 A plan layout of the steel sheet piling sections comprising the wall indicating all dimensions.
 - .2 A plan layout of the tie rods and anchors.
 - .3 Details of the steel sheet piling sections including welding details for plates.
 - .4 Layout and details of the steel double channel waler indicating location of splices, splice details, tie bolt details and steel washer plate details
 - .5 Special details for corners and bends in the wall.
 - .6 Details for all miscellaneous steel elements including, but not limited to, steel plate washer, nuts, lock nuts, couplers.
- .2 Prior to sheet pile operations, Contactor to submit:
 - .1 list of equipment and access methods to be used for pile driving.
 - .2 full details of method and sequence of installation of piling for approval prior to start of pile installation work. Details must include templates, bracing, setting and driving sequence and number of piles in panels for driving.
- .3 At least 2 weeks prior to fabrication, submit to Engineer, 2 copies of steel producer certificates in accordance with ASTM A1011/A1011M, and mill test reports in accordance with CAN/CSA-G40.20/G40.21.
- .4 Document and submit the installation depth of all piles.
- .5 Provide test results for tension and bend testing of sheet pile and tie rod materials.

1.5 QUALITY ASSURANCE

- .1 Inspection and testing of steel sheet piling material may be carried out by testing laboratory designated by Engineer at any time during course of Work.

- .2 Materials inspected or tested by Engineer which fail to meet contract requirements will be rejected.
- .3 Materials failing to meet contract requirements may be rejected.
- .4 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, Contractor to pay costs for additional tests or inspections. Engineer to approve corrected work.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Use slings for lifting piling so that mass is evenly distributed and piling is not subjected to excessive bending stresses.
- .2 Store sheet piling on level ground or provide supports so that sheet piling is level when stored.
 - .1 Provide blocking at spacing not exceeding 5 m so that there is no excessive sagging in piling.
 - .2 Overhang at ends not to exceed 0.5 m.
 - .3 Block between lifts directly above blocking in lower lift.
- .3 If material is stock-piled on structure, ensure that structure is not overloaded.

Part 2 Products

2.1 MATERIALS

- .1 Steel sheet piles: to CAN/CSA-G40.21, including chemical and mechanical requirements and following:
 - .3 Continuous interlocking flat web with minimum web thickness 8.0 mm and minimum mass of 96.4 kg/m².
 - .5 Continuous interlocking Z section:
 - .1 Minimum effective section modulus of 1100 cm³ per metre of wall for Grade 350W.
 - .2 Minimum flange thickness of 8.0 mm.
 - .3 Minimum web thickness of 8.0 mm.
 - .4 Sheet piling:
 - .1 Minimum thickness of any portion of web or flange to be 8.0 mm.
 - .6 Special corners: shop fabricate by welding as required.
 - .7 Interlocks: to be such that section of interlock bar of 1 m minimum length will pass along full length of pile without binding.
 - .8 Mark each piece of sheet piling legibly by stencilling or die-and-stamping with following information.
 - .1 Heat Number.
 - .2 Manufacturer's Name.
 - .3 Length and Section Number.
 - .9 Do not pre-cut lifting or slinging holes in sheet piles.

- .10 Structural steel for wales, bearing plates, wales splices, and miscellaneous steel: to CAN/CSA-G40.21, Grade 300W.
- .11 Tie rods, sleeve nuts and turnbuckles:
 - .1 Tie rods:
 - .1 As per ASTM A615, continuous threaded bar, hot rolled.
 - .2 Minimum yield load = 520 kN.
 - .3 Grade 517 MPa.
 - .4 Double corrosion protection.
 - .5 Diameter as indicated on Drawings.
 - .2 Sleeve nuts, and connector sleeves: to have load capacity in excess of capacity of tie rod.
 - .3 Preassemble, mark and test tie rod assemblies in shop. Align threaded connection to following tolerances at sleeve nut or connector sleeve: 1/80 of normal rod diameter, deviation of centreline, 1 in 160.
 - .4 Nuts and bolts: hexagon nuts, bolts, and washers: to ASTM A325 High Strength.
- .12 Backfill material: to Section 31 23 33.01 – Excavating and Backfilling.

2.2 SOURCE QUALITY CONTROL: COLD FORMED STEEL SHEET PILING

- .1 Provide results of tension tests of sheet piling material to be used on project as follows:
 - .1 One tension test from each heat for quantities of finished material less than 50 tonnes.
 - .2 Two tension tests from each heat for quantities of finished material exceeding 50 tonnes.
 - .3 Tension tests: to CSA G40.20/G40.21.
 - .4 Provide results of bend tests of sheet piling material to be used on project as follows:
 - .1 Bend tests: to ASTM A6/A6M, with amendments as follows:
 - .2 Perform S14.1 bend tests with material in condition as used in cold forming operation. Three tests to be made from each heat and each thickness of material produced. Take bend test specimens from edge of each coil. Longitudinal axis of specimen to be transverse to coil rolling direction.
 - .3 S14.1.1 - Except as provided below, bend test specimens to have minimum width to thickness ratio of 8, with both edges parallel throughout section in which bending occurs, and is maintained.
 - .4 S14.2 - Minor surface separations less than 0.8 mm in depth related to superficial steel surface or subsurface discontinuities to not cause rejection. Surface separations in excess of 0.8 mm depth or cracks normal to metal surface are cause for rejection.

2.3 SOURCE QUALITY CONTROL: TIE RODS

- .1 Provide results of tension tests of tie rod material to be used on project as follows:
 - .1 One tension test from each 50 tie rods to be installed.
 - .2 Tension tests in accordance with ASTM A615/A615M-18.

- .2 Provide results of bend tests of tie rod material to be used on project as follows:
 - .1 One bend test for each 50 tie rods to be installed.
 - .2 Bend tests: to ASTM A615/A615M-18, with amendments as follows.
 - .1 Perform bend tests to 30°.

Part 3 Execution

3.1 INSTALLATION

- .1 Do welding in accordance with CSA W59 and CSA W59S1, except where specified otherwise.
- .2 Do not begin pile installation until required quality control tests have been completed and test results approved by Engineer.
- .3 Do pile installation Work in accordance with Section 31 61 13 - Pile Foundations, General Requirements except where otherwise specified.
- .4 Submit full details of method and sequence of installation of piling to Engineer for approval prior to start of pile installation work. Details must include templates, bracing, setting and driving sequence and number of piles in panels for driving.
- .5 When constructing the anchored sheet pile wall, use the following procedure:
 - .1 Install steel sheet piling wall and anchors.
 - .2 Install waler assembly and tie rods.
 - .3 Backfill within new wharf with rock fill and Granular 'A'.
- .6 When installing steel sheet piling wall, use the following procedure:
 - .1 Select a Vibratory Driver suitable for the site and driving conditions. Upsize the equipment when required to correct drive capacity.
 - .2 Provide temporary templates or bracing to hold piles in alignment during setting and driving.
 - .3 Drive piles two at a time. Drive first double pile to full depth, then place panel of five to eight double sheet piles in templates and secure last (end) double pile in location to prevent spreading of piles in panel.
 - .4 Drive end double pile in panel sufficiently deep into ground to ensure that it will remain plumb, then, drive remaining double piles in panel to full depth beginning with double pile next to end double pile and finishing with double pile next to double pile first driven.
 - .5 After one panel has been driven, place and drive succeeding panels in similar manner. Complete the driving of end double pile of first panel after double piles of second panel have been driven.
- .7 When installation is complete, face of wall at top of sheet piles to be within 50 mm of location as indicated and deviation from vertical not to exceed 2% of the vertical length.

3.2 WALES

- .1 Fabricate and erect steel in accordance with CSA Standard S16.1. Fabricate horizontal members with weep holes for drainage where required.
- .2 Fit joints and intersecting members accurately. Make Work in true planes with adequate fastenings. Build and erect Work perfectly rigid, plumb or true to slope, square, straight,

level and accurate to sizes detailed, free from distortion or defects detrimental to appearance or performance.

- .3 Set and secure framing brackets, hangers, anchors, inserts or similar supports for proper erection.
- .4 Bolt, splice and field weld members as detailed on the Contract Drawings.
- .5 Install tapered plates and tapered washers where required to suit skewed tie rods. Provide a minimum thickness of 16 mm on tapered plates.

3.3 OBSTRUCTIONS

- .1 If obstruction encountered during driving, leave obstructed pile and proceed to drive remaining piles. Return and attempt to complete driving of obstructed pile later.
- .2 Advise Engineer immediately if impossible to drive pile to full penetration, and obtain direction from Engineer on further steps required to complete Work.

3.4 HOLES

- .1 Patch holes in sheet pile wall, except where permanent holes are indicated.
 - .1 Use 9.5 mm thick plate of material equal to that of piling to patch holes and overlap not less than hole diameter.
 - .2 Weld to develop full strength of plate.
- .2 Drill any required holes in piling.

3.5 CUTTING

- .1 When flame cutting tops of piles, and when permitted flame cutting holes in piles approved by Engineer, use following procedure:
 - .1 When air temperature is above 0 degrees C, no pre-heat is necessary.
 - .2 When air temperature is below 0 degrees C, pre-heat until steel 25 mm on each side of line of cut has reached a temperature very warm to hand (approximately 35 degrees C). Tempil sticks may be used to measure temperature.
 - .3 Use torch guiding device to ensure smooth round holes or straight edges.
 - .4 Make cut smooth and free from notches throughout thickness. If grinding is employed to remove notch or crack, finished radius to be minimum 5 mm.

3.6 SPLICING

- .1 Use full length piles unless splicing is approved by Engineer.

3.7 TIE ROD ANCHORAGE SYSTEM

- .1 Do not place backfill behind new steel sheet pile until piles have been completely driven, adjusted and secured in final position by anchorage system.
- .2 Support tie rods at intervals along their length as required.
- .3 Fit and adjust tie rod systems so that connections at waling and anchor end of tie rods are tight before backfilling.

3.8 BACKFILLING

- .1 Backfill in accordance with Section 31 23 33 – Excavating and Backfilling and as indicated.
- .2 Protect piling tie rods and anchorage systems from damage or displacement during backfilling operations.
- .3 Do not commence backfilling until tie rods and anchor walls have been installed, and approved by the Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 33.01 – Excavating and Backfilling

1.2 MEASUREMENT AND PAYMENT

- .1 Payment for Rock Fill shall be in tonnes and checked by tickets supplied from quarry of material incorporated into Work and accepted in writing by Engineer. It shall include all labour, equipment and materials.
- .2 Payment for Granular ‘A’ shall be in tonnes and checked by tickets supplied from quarry of material incorporated into Work and accepted in writing by Engineer. It shall include all labour, equipment and materials.
- .3 Payment for Clear Stone shall be in tonnes and checked by tickets supplied from quarry of material incorporated into Work and accepted in writing by Engineer.
- .4 Payment for Type ‘A’ Armour Stone shall be by tonnes and shall include all labour, equipment and materials required to supply, place and consolidate armour stone materials as required.
- .5 Payment for Type ‘B’ Armour Stone shall be by tonnes and shall include all labour, equipment and materials required to supply, place and consolidate armour stone materials as required.
- .6 Payment for Rock Protection shall be by tonnes and shall include all labour, equipment and materials required to supply, place and consolidate rock protection materials as required.
- .7 Core Stone will be measured in tonnes of material supplied and placed to the final dimensions indicated on the drawings and incorporated into the completed work and shall include all labour, equipment and materials necessary to complete the work.
- .8 Crusher Fines to be paid as part of the lump sum amount.
- .9 Weigh all stone placed in the Work at the quarry on a scale approved and certified as correct by the Department of Consumer and Corporate Affairs Weights and Measures Inspection Branch. Prior to use, have weigh scale certified as meeting requirements of Statutes of Canada, Chapter 36, Weights and Measures Act 1971 and subsequent amendments. Provide the Departmental Representative with a copy of the certificate and display certificate in prominent location. Costs for maintenance and operation of scale shall be considered incidental to the work.
- .10 Provide the Departmental Representative with weight tickets at time of delivery to site.
- .11 Construction, maintenance and removal of haul roads are to be considered incidental to this work. Construction and maintenance of haul roads will not be measured for payment.
- .12 Salvage and reinstatement of armour stone and rock fill will be measured as part of the lump sum amount and shall include all labour, equipment and materials necessary to complete the excavating, stockpiling and backfilling of armour stone and rock fill.

1.3 REFERENCES

- .1 ASTM International
 - .1 ASTM C117-17, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C131-14, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM C136-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
 - .5 ASTM D1557-12e1, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³) (2,700kN-m/m³).
 - .6 ASTM D1883-16, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
 - .7 ASTM D4318-17e1, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Ontario Provincial Standard Specification (OPSS)
 - .1 OPSS 1004, Material Specification for Aggregate – Miscellaneous
 - .2 OPSS 1010, Material Specification for Aggregate – Base, Subbase, Select Subgrade, and Backfill Material

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 05 – General Instructions.

Part 2 Products

2.1 MATERIALS

- .1 Rock Fill
 - .1 Rock Fill shall be of hard, durable, evenly graded stone.
 - .2 Use of shale or slate shall not be permitted.
 - .3 Rock Fill shall have a maximum diameter of 300 mm in major portion of fill and a maximum diameter of 150 mm in upper 600 mm of Rock Fill inside the SSP wharf.
 - .4 Fill material will contain no more than 6 percent by weight passing the 25.4 mm sieve.
 - .5 Rock Fill to be evenly graded within the limits specified.
- .2 Granular base: material in accordance with the following requirements:
 - .1 Granular ‘A’

- .2 Gradations to be within limits specified when tested to ASTM C136 ASTM C117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
- .3 Gradation as per OPSS.MUNI.1010.
- .3 Clear Stone: to OPSS.MUNI.1004.
- .4 Type 'A' Armour Stone
 - .1 Hard, dense with relative density (formally specific gravity) not less than 2.65, durable quarry stone, free from seams, cracks or other structural defects.
 - .2 Greatest dimensions of each stone not to exceed two times least dimension.
 - .3 250 kg to 2.0 tonnes each by weight.
 - .4 Armour stone is to be free from cracks, seams and other defects which may impair durability. The Los Angeles abrasion loss determined using ASTM procedures shall not exceed 35%. The armour stone shall be durable blasted limestone or granite. Slate and shale are not acceptable.
- .5 Type 'B' Armour Stone
 - .1 Hard, dense with relative density (formally specific gravity) not less than 2.65, durable quarry stone, free from seams, cracks or other structural defects.
 - .2 Greatest dimensions of each stone not to exceed two times least dimension.
 - .3 1.8 tonnes to 2.7 tonnes each by weight.
 - .4 Armour stone is to be free from cracks, seams and other defects which may impair durability. The Los Angeles abrasion loss determined using ASTM procedures shall not exceed 35%. The armour stone shall be durable blasted limestone or granite. Slate and shale are not acceptable.
- .6 Rock Protection
 - .1 As per OPSS.MUNI.1004
- .7 Core Stone
 - .1 Greatest dimensions of each stone not to exceed three times least dimension.
 - .2 2.7 kg to 180 kg each by weight, shovel run material, with 60 percent of the total volume to be at the midpoint of the specified range, and not more than a maximum of 5 percent content less than 25 mm.
 - .3 Material is to be free of roots and other deleterious material.
 - .4 Stones are to be fractured and angled. Field stone is not acceptable.
- .8 Crusher Fines
 - .1 Remnants of the gravel crushing process. Material passing the 9.5 mm sieve.

Part 3 Execution

3.1 PREPARATION

- .1 Haul roads: construct and maintain haul roads.

3.2 PLACEMENT AND INSTALLATION

- .1 Place backfill, granular subbase, and granular base after sub-grade surface is inspected and approved in writing by Engineer.
- .2 Placing:
 - .1 Do not commence backfilling until areas of work to be backfilled have been inspected and approved by Engineer. All organic material to be removed prior to backfilling.
 - .2 Areas to be backfilled shall be free from debris, snow, ice, water, organic material, or frozen ground. Backfill material shall not be frozen or contain ice, snow, or debris.
 - .3 Construct granular base to depth and grade in areas indicated.
 - .4 Place material using methods which do not lead to segregation or degradation of aggregate.
 - .5 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
 - .1 Engineer may authorize thicker lifts (layers) if specified compaction can be achieved.
 - .6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
 - .7 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .3 Compaction Equipment:
 - .1 Ensure compaction equipment is capable of obtaining required material densities.
 - .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Engineer before use.
 - .3 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compacting:
 - .1 Compact in 150 mm lifts new Granular 'A' base to density not less than 100% corrected maximum dry density.
 - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
 - .3 Apply water as necessary during compacting to obtain specified density.
 - .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by Engineer.
 - .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .5 Proof rolling:
 - .1 Obtain written approval from Engineer to use non standard proof rolling equipment.
 - .2 Proof roll sub-grade as indicated.
 - .3 Where proof rolling reveals areas of defective sub-grade:
 - .1 Remove sub-grade material to depth and extent as directed by Engineer.

- .2 Backfill excavated sub-grade with limestone granular material and compact in 150 mm lifts to 98% Standard Procter Density.

.6 Armour Stone

- .1 Place each armour stone in stable position with general arrangement as shown on the Contract Drawings.
- .2 The stone shall be placed in such a way that the whole structure will be bound and consolidated to as great an extent as the nature of the rock will allow.
 - .1 Sort, fit, and tightly key each rock to ensure stability of faces.
- .3 Placing shall be done in such a manner that the surface of the armour stone treated slope shall have a uniform appearance.
- .4 Place armour stone to lines, grades, slopes and dimensions as indicated on the drawings.
- .5 Place armour stone in thickness courses to total layer thickness as shown on drawings.
- .6 Placement not deemed acceptable must be removed and replaced.

3.3 SITE TOLERANCES

- .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.
- .2 Core Stone: plus or minus 150 mm.
- .3 Armour Stone: plus or minus 300 mm.

3.4 CLEANING

- .1 Progress Cleaning.
- .2 Leave Work area clean at end of each day.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

3.5 PROTECTION

- .1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Engineer.

END OF SECTION

Part 1 General

1.1 MEASUREMENT PROCEDURES

- .1 Payment for the floating docks will be measured by each dock supplied and installed, including treated timber, pontoons, cleats (two per floating dock), and connecting hardware (connections for chains, struts and gangways).
- .2 Payment for the gangways will be measured by each gangway supplied and installed, including treated timber, steel components and connecting hardware.
- .3 Payment for angle struts and chains to be included in unit price for precast anchor blocks, Section 03 41 00 – Precast Structural Concrete.
- .4 Payment at the Contract Price of unit rate tender items shall be full compensation for all labour, equipment and material to do the work.
- .5 Payment at the Contract Price of unit rate tender items shall be full compensation fabrication, storage, delivery to site and installation.

1.2 FLOATING DOCK REQUIREMENTS

- .1 Design floating docks such that the top of the deck lies 600 mm (+/- 25 mm) above still water level when there is no live load on the deck.
- .2 Design floating docks with a design life of 25 years.
- .3 Floating modules and timber decks shall be designed to withstand the local and global structural effects of a 2.4 kPa uniformly distributed live load. Any combination of pattern live loading that produces the worst effect both structurally and for buoyancy and stability shall be considered.
- .4 Floating walkway modules shall be designed to resist the berthing and mooring loads from a 9.14m sized vessel. The steel framing and connections shall be capable of resisting simultaneous transverse and longitudinal loads applied at each walkway to main float connection point.
- .5 Connect all walkway float sections with damped hinge systems.
- .6 Provide removable watertight plug at the top of each pontoon.

1.3 GANGWAY REQUIREMENTS

- .1 Design gangways for a design life of 25 years.
- .2 Gangways shall be designed to withstand the local and global structural effects of a 2.4 kPa uniformly distributed live load.
- .3 Design floating docks with a design life of 25 years.
- .4 Any combination of pattern live loading that produces the worst effect both structurally and for buoyancy and stability shall be considered.

1.4 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.

- .2 CAN/CSA O80 Series-08, Wood Preservation.
- .3 CSA O112 Series-[M1977(R2006)], CSA Standards for Wood Adhesives.
- .2 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber [2010].
- .3 The Engineered Wood Association (APA)

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide site specific shop drawing for approval showing:
 - .1 Dock layout
 - .2 Pontoon layout (to be 610 mm diameter continuous)
 - .3 Gangway layout
 - .4 Details of connections to adjacent docks and gangways
 - .5 Details of connections of gangways to timber cribs.
 - .6 Details of connection to angle struts to breakwater
 - .7 Details of connection to chains and submerged anchors
 - .8 Design load of 2.4 kPa (50 psf) for floating docks.
 - .9 Design load of 4.8 kPa (100 psf) for gangways.
 - .10 Design life of 25 years
 - .11 Statement that floating dock assembly can be left in water for all seasons
 - .12 Lumber grade and preservative treatment
 - .13 Thickness and buoyancy rating for pontoons
- .2 Product Data: submit manufacturer's printed product literature, specifications and datasheet.
- .3 Manufacturer's Instructions: submit manufacturer's installation instructions.

Part 2 Products

2.1 MATERIALS

- .1 Lumber:
 - .1 Lumber to be graded 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.
 - .2 Species: Douglas-Fir
 - .3 Grade: Structural.
 - .4 Grading: authority NLGA.
- .2 Preservative treatment: all end cuts, abrasions, and holes to be well soaked with two coats of ACQ preservative, acceptable to the Engineer in accordance with Section 06 06 73 – Wood Treatment.
- .3 Glue: to CSA O112 Series. Frame joints to be glued with waterproof cold setting resorcinol or phenol resorcinol resin adhesive.

- .4 Fasteners: hot dip galvanized wire nails, spikes, staples to CSA B111.
- .5 Pontoons:
 - .1 High-Density Polyethylene (HDPE)
 - .2 Minimum wall thickness 3/4"
 - .3 End caps: butt fused

Part 3 Execution

3.1 CONSTRUCTION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
- .2 Construct as per shop drawings or as indicated on design drawings.
- .3 Site Tolerances: plus or minus 25mm on overall dimensions.

3.2 FIELD QUALITY CONTROL

- .1 Site Tests/Inspections:
 - .1 Provide Departmental Representative with minimum of 7 days notice of date of beginning Work on floating dock system and provide access to Work for inspection.
 - .2 Final inspection of floating dock system will be made on shore and in place.

3.3 CLEANING

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

END OF SECTION