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Lion's Head, Ontario                      Specification Title Page  
Service Dock Repairs  
Project No. 720182

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2013-07-29

Project Title                      Lion's Head, Ontario  
Stable                                  Service Dock Repairs

Project Number                      720182

Project Date                      2013-07-29



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PART 1 - GENERAL

- 1.1 MINIMUM STANDARDS .1 Execute work to meet or exceed:
- .1 National Building Code of Canada 2010, National Fire Code of Canada 2010, Ontario Building Code 2012 and any other code of provincial or local application, including all amendments up to project date, provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
  - .2 Rules and regulations of authorities having jurisdiction.
  - .3 Fire Commissioner of Canada, No. 301, Standard for Construction Operations, and No. 302, Standard for Welding and Cutting, June 1982 and Fire Protection Standard for Correctional Institutions - Treasury Board Personnel Management Manual, Occupational Safety and Health, Chapter 3-6, Feb. 1992.
  - .4 Occupational Health and Safety Act and Regulations for Construction Projects, Revised Statutes of Ontario 1990, Chapter O.1 as amended, O. Reg. 213/91 as amended by O. Reg. 631/94, R.R.O. 1990, Reg. 834, Diving Operations, O. Reg. 629/94, as amended.
  - .5 Environmental Protection Act, O. Reg. 102/94 and O. Reg. 103/94.
- 1.2 TAXES .1 Pay applicable Federal, Provincial and Municipal taxes.
- 1.3 EXAMINATION .1 Before submitting bid, examine existing conditions and determine conditions affecting work.
- .2 Obtain all information which may be necessary for proper execution of Contract.
- 1.4 EXISTING CONDITIONS .1 The geotechnical investigation is bound in Appendix A - Geotechnical Investigations.
- .2 Contractor shall be familiarized with all available data and scope, and price accordingly.
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- 1.5 SITE .1 Confine work, including temporary structures, plant, equipment and materials to established limits of site.
- .2 Locate temporary buildings, roads, walks, drainage facilities, services as directed and maintain in clean and orderly manner.
- 1.6 CONSTRUCTION & STORAGE AREA .1 The limits of the Construction and Storage Area will be designated by the Departmental Representative prior to commencement of work unless otherwise shown on the Drawings.
- 1.7 DOCUMENTS .1 Keep on site one copy of contract documents, reviewed shop drawings and submissions.
- .2 Specifications shall govern over Drawings.
- 1.8 CONTRACT METHOD .1 Construct Work under a combined price contract. All costs for work not specifically identified as a unit price item shall be included in the lump sum arrangement.
- .2 Drawings show asphalt paving for final grading purposes. Supply and installation of new asphalt is not in this contract.
- 1.9 MEASUREMENT PROCEDURES .1 Within 48 hours of bid acceptance submit a list of subcontractors and a detailed breakdown of costs associated with the lump sum arrangement.
- .2 Items measured for payment are in metric (SI) units.
- .3 Submit requests for payment in metric units corresponding with items on the Unit Price Table.
- .4 Submit supporting documents in metric units. Perform all necessary conversions required.
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- 1.10 LAYOUT OF WORK .1 Immediately upon entering site for purpose of beginning work on this project, locate all general reference points and take proper action necessary to prevent their disturbance.
- .2 Engage an ontario land surveryer to stake out the property lines for fencing along the west side of wharf.
- .3 Supply stakes and other survey markers required for this work. Employ competent personnel to lay out work in accordance with lines and grades provided.
- .4 Maintain all reference points and markers for duration of contract.
- 1.11 CO-OPERATION & PROTECTION .1 Execute work with minimum disturbance to occupants public and normal use of site work area. Make arrangements with Departmental Representative to facilitate execution of work.
- .2 Maintain access and exits.
- .3 Provide necessary barriers, warning lights and signs. Protect work from damage. Replace damaged existing work with material and finish to match original.
- 1.12 EXISTING UTILITIES .1 Establish location, protect and maintain existing utility lines.
- .2 Connect to existing utilities with minimum disturbance to pedestrian and vehicular traffic.
- 1.13 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 is specified by standard or performance specifications, upon request of Departmental Representative, obtain from manufacturer an independent testing laboratory report, stating that material or
-

1.13 MATERIAL AND EQUIPMENT  
(Cont'd)

.3 (Cont'd)  
equipment meets or exceeds specified requirements.

1.14 INSPECTION AND TESTING

.1 The Departmental Representative may employ an Inspection and Testing company to ensure work conforms with Contract Documents.

.2 When initial tests and inspections reveal work not to contract requirements, pay for tests and inspections required by Departmental Representative on corrected work.

.3 Submit timely inspection and test reports to Departmental Representative.

1.15 SCHEDULING OF WORK

.1 On award of contract submit bar chart construction schedule for work, indicating anticipated progress stages within time of completion.

.2 When schedule has been reviewed by the Departmental Representative take necessary measures to complete work within scheduled time. Do not change schedule without notifying Departmental Representative.

1.16 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.

- 1.16 AS-BUILT RECORD DRAWINGS (Cont'd)
- .3 (Cont'd)
    - .5 Other significant deviations which are concealed in construction and can not be identified by visual inspection.
  - .4 Turn one set of As-Built Record Drawings over to Departmental Representative completion of work.
  - .5 If project is completed without significant deviations from contract drawings declare this in writing and submit to Departmental Representative in lieu of As-Built Record Drawings.
- 1.17 ADDITIONAL DRAWINGS
- .1 Departmental Representative may furnish additional drawings to clarify work.
  - .2 Such drawings become part of Contract Documents.
- 1.18 FIRES AND TEMPORARY HEATERS
- .1 Burning of rubbish on site not permitted.
  - .2 Only fires for temporary heaters are permitted on site.
  - .3 Maintain temperature required to prevent frost damage to work.
- 1.19 DATUM
- .1 Elevations and soundings shown on Drawings are expressed in metres relative to chart datum.
  - .2 Chart datum for Lake Huron is 176.0 metres I.G.L.D (1985).
- 1.20 OPSS AND OPSD
- .1 Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD) quoted in these specifications are available online at <http://www.raqsa.mto.gov.on.ca/techpubs/ops.nsf/OPSHomepage>.

PART 1 - GENERAL

1.1 SECTION  
INCLUDES

- .1 Shop drawings and product data.
- .2 Certificates and transcripts.
- .3 Fees and permits.

1.2 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
  - .2 Do not proceed with Work affected by submittal until review is complete.
  - .3 Present shop drawings, product data and samples in SI Metric units.
  - .4 Where items or information is not produced in SI Metric units converted values are acceptable.
  - .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
  - .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
  - .7 Verify field measurements and affected adjacent Work are coordinated.
  - .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
-

- 1.2 ADMINISTRATIVE (Cont'd)
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
  - .10 Keep one reviewed copy of each submission on site.
  - .11 Submit number of hard copies specified for each type and format of submittal and in also submit in electronic format as pdf files. Forward pdf files on PWGSC encrypted CD or through email.
- 1.3 SHOP DRAWINGS AND PRODUCT DATA
- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
  - .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
  - .3 Prior to submission check and certify as correct, shop drawings and product data sheets. Issue to Departmental Representative each submission at least 14 days before dates reviewed submission will be needed.
  - .4 Where technical sections specify that shop drawings bear the stamp of a Registered Professional Engineer, registered in the Province of Ontario.
  - .5 Allow 5 days for Departmental Representative's review of each submission.
  - .6 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
-

- 1.3 SHOP DRAWINGS AND PRODUCT DATA  
(Cont'd)
- .7 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of any revisions other than those requested.
  - .8 Shop drawings of structural items shall bear the stamp of a Registered Professional Departmental Representative.
  - .9 Submissions shall include:
    - .1 Transmittal Page/Letter
    - .2 Contractor's name and address.
    - .3 Date and revision dates.
    - .4 Project title and number.
    - .5 Identification and quantity of each shop drawing, product data and sample.
    - .6 Name and address of:
      - .1 Subcontractor.
      - .2 Supplier.
      - .3 Manufacturer.
  - .10 After Departmental Representative's review, distribute copies.
  - .11 Submit two prints and one electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
  - .12 Submit two prints and one electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
  - .13 Submit two hard copies and one electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
    - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
    - .2 Testing must have been within 3 years of date of contract award for project.
  - .14 Submit three hard copies and one electronic copy of certificates for requirements requested
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1.3 SHOP DRAWINGS  
AND PRODUCT DATA  
(Cont'd)

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- .14 (Cont'd)  
in specification Sections and as requested by  
Departmental Representative.  
.1 Statements printed on manufacturer's  
letterhead and signed by responsible officials  
of manufacturer of product, system or material  
attesting that product, system or material meets  
specification requirements.  
.2 Certificates must be dated after award of  
project contract complete with project name.
- .15 Submit three hard copies and one electronic  
copy of manufacturers instructions for  
requirements requested in specification Sections  
and as requested by Departmental Representative.  
.1 Pre-printed material describing  
installation of product, system or material,  
including special notices and Material Safety  
Data Sheets concerning impedances, hazards and  
safety precautions.
- .16 Submit three hard copies and one electronic  
copy of Manufacturer's Field Reports for  
requirements requested in specification Sections  
and as requested by Departmental Representative.
- .17 Documentation of the testing and verification  
actions taken by manufacturer's representative  
to confirm compliance with manufacturer's  
standards or instructions.
- .18 Submit three hard copies and one electronic  
copy of Operation and Maintenance Data for  
requirements requested in specification Sections  
and as requested by Departmental Representative.
- .19 If upon review by Departmental Representative,  
no errors or omissions are discovered or if only  
minor corrections are made, copies will be  
returned and fabrication and installation of  
Work may proceed. If shop drawings are rejected,  
noted copy will be returned and resubmission of  
corrected shop drawings, through same procedure  
indicated above, must be performed before  
fabrication and installation of Work may  
proceed.
- .20 Responsibility for errors, omissions or  
deviations from requirements of Contract  
Documents is not relieved by Departmental  
Representative's review of submittals.
-

1.3 SHOP DRAWINGS AND PRODUCT DATA (Cont'd) .21 The review of shop drawings by the Departmental Representative is for sole purpose of ascertaining conformance with general concept. This review shall not mean that the Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.

1.4 CERTIFICATES AND TRANSCRIPTS .1 Immediately after award of Contract, submit WSIB - Workplace Safety and Insurance Board Experience Report.

1.5 FEES, PERMITS AND CERTIFICATES .1 Provide authorities having jurisdiction with information requested.  
.2 Pay fees and obtain certificates and permits required.  
.3 Furnish certificates and permits.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

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PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

PART 1 - GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA): Canada
  - .1 CSA-S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .2 National Building Code 2010 (NBC):
  - .1 NBC 2010, Division B, Part 8 Safety Measures at Construction and Demolition Sites.
- .3 National Fire Code 2010 (NFC):
  - .1 NFC 2010, Division B, Part 2 Emergency Planning, subsection 2.8.2 Fire Safety Plan.
- .4 Province of Ontario:
  - .1 Occupational Health and Safety Act Revised Statutes of Ontario 1990, Chapter O.1 as amended, and Regulations for Construction Projects, O. Reg. 213/91 as amended.
  - .2 Workplace Safety and Insurance Act, 1997.
  - .3 Municipal statutes and authorities.
- .5 Fire Commissioner of Canada (FCC):
  - .1 FC-301 Standard for Construction Operations, June 1982.
  - .2 FC-302 Standard for Welding and Cutting, June 1982.

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

and copies may be obtained from:

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

1.2 SUBMITTALS

- .1 Make submittals in accordance with Section 01 11 02.
- .2 Submit site-specific Health and Safety Plan:  
Within 5 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

1.2 SUBMITTALS  
(Cont'd)

- .2 (Cont'd)
- .1 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
  - .2 Measures and controls to be implemented to address identified safety hazards and risks.
  - .3 Contingency and Emergency Response Plan addressing standard operating procedures specific to the harbour sites to be implemented during emergency situations.
- .3 Departmental Representative will review Contractor's site- specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 7 days after receipt of comments from Departmental Representative.
- .4 Departmental Representative's review of Contractor's final Site Specific Health and Safety Plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction site health and safety.
- .5 Submit records of Contractor's Health and Safety meetings when requested.
- .6 Submit 3 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative, upon requested.
- .7 Submit copies of reports or directions issued by safety inspectors of authority having jurisdiction.
- .8 Submit copies of incident and accident reports.
- .9 Submit names of personnel and alternates responsible for site safety and health.

1.3 FILING OF  
NOTICE

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

- 1.4 SAFETY ASSESSMENT .1 Perform site specific safety hazard assessment related to project.
- 1.5 REGULATORY REQUIREMENTS .1 Comply with Acts and regulations of the Province of Ontario.
- .2 Comply with specified standards and regulations to ensure safe operations at site.
- .3 In event of conflict between any provisions of specified standards and regulations, the most stringent provision governs.
- 1.6 PROJECT/SITE CONDITIONS .1 Work at site will involve contact with:
- .1 Silica in concrete.
- .2 Work at and near water.
- 1.7 GENERAL REQUIREMENTS .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to commencing any site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns either accepting or requesting improvements.
- .3 Relief from or substitution for any portion or provision of minimum Health and Safety standards specified herein or reviewed site-specific Health and Safety Plan shall be submitted to Departmental Representative in writing.
- 1.8 RESPONSIBILITY .1 Be responsible for safety of persons and property on site and for protection of persons off site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and
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- 1.8 RESPONSIBILITY (Cont'd) .2 (Cont'd)  
(Cont'd) local statutes, regulations, and ordinances, and  
with site-specific Health and Safety Plan.
- .3 The Contractor shall be designated  
"Constructor", as defined by Occupational Health  
and Safety Act for the Province of Ontario.
- 1.9 UNFORESEEN .1 Should any unforeseen or peculiar  
HAZARDS safety-related factor, hazard, or condition  
become evident during performance of Work,  
immediately stop work and advise Departmental  
Representative verbally and in writing.
- .2 Follow procedures in place for Employees Right  
to Refuse Work as specified in the Act for the  
Province of Ontario.
- 1.10 HEALTH AND .1 Employ and assign to Work, competent and  
SAFETY CO-ORDINATOR authorized representative as Health and Safety  
Co-ordinator. Health and Safety Co-ordinator  
must:
- .1 Have working knowledge of occupational  
safety and health regulations.
- .2 Be responsible for completing Contractor's  
Health and Safety Training Sessions and ensuring  
that personnel not permitted to enter site to  
perform Work.
- .3 Be responsible for implementing, enforcing  
daily and monitoring site-specific Contractor's  
Health and Safety Plan.
- 1.11 POSTING OF .1 Ensure applicable items, articles, notices and  
DOCUMENTS orders are posted in conspicuous location on  
site in accordance with Acts and Regulations of  
Province of Ontario, and in consultation with  
Departmental Representative.
- .1 Contractor's Safety Policy.
- .2 Constructor's Name.
- .3 Notice of Project.
- .4 Name, trade, and employer Health and  
Safety Representative or Joint Health and Safety  
Committee members (if applicable).
- .5 Ministry of Labour Orders and reports.
- .6 Occupational Health and Safety Act and  
Regulations for Construction Projects for  
Province of Ontario.
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- 1.11 POSTING OF DOCUMENTS (Cont'd) .1 (Cont'd)
- .7 Address and phone number of nearest Ministry of Labour office.
  - .8 Material Safety Data Sheets.
  - .9 Written emergency Response Plan.
  - .10 Site Specific Safety Plan.
  - .11 Valid certificate of first aider on duty.
  - .12 WSIB "In Case of Injury At Work" poster.
  - .13 Location of toilet and cleanup facilities.
- 1.12 CORRECTION OF NON-COMPLIANCE .1 Immediately address health and safety non-compliance issues identified by Departmental Representative and regulatory agency having jurisdiction in the Province.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
  - .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.
- 1.13 BLASTING .1 Blasting or other use of explosive is not permitted.
- 1.14 WORK STOPPAGE .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.
- .2 Assign responsibility and obligation to Competent Supervisor to stop or start Work when, at Competent Supervisor's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative may also stop Work for health and safety considerations.
-

PART 2 - PRODUCTS

2.1 NOT USED .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not used.

PART 1 - GENERAL

- 1.1 FIRES .1 Fires and burning of rubbish on site not permitted.
- 1.2 WORK ADJACENT TO WATERWAYS .1 Do not operate construction equipment in waterways.  
.2 Do not use waterway beds for borrow material.  
.3 Do not dump excavated fill, waste material or debris in waterways.  
.4 Implement measures as required, to ensure that no deleterious materials including paint chips, fuel, grease, solvents, enter the waterways.
- 1.3 ENVIRONMENTAL PROTECTION .1 No in water work is permitted from March 15 to July 15 to protect local fish populations during their spawning and nursery.
- 1.4 ENVIRONMENTAL MEASURES .1 Meet or exceed the requirements of all environmental legislation and regulations, including all amendment up to the project date provided that in any case of conflict or discrepancy the more stringent requirements shall apply.
- 1.5 DISPOSAL OF WASTES .1 To Section 01 74 20.
- 1.6 POLLUTION CONTROL .1 Maintain temporary erosion and pollution control features installed under this contract.  
.2 Control emissions from equipment and plant to local authorities emission requirements.  
.3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.
-

1.6 POLLUTION  
CONTROL  
(Cont'd)

- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.
- .5 Do not allow any debris, fill or other foreign material to enter the waterway.
- .6 Abide by local noise by-laws.
- .7 Spills of deleterious substances:
  - .1 Immediately contain, limit spread and clean up in accordance with provincial regulatory requirements.
  - .2 Report immediately to Ontario Spills Action Centre: 1-800-268-6060.
  - .3 Further information on dangerous goods emergency cleanup and precautions including a list of companies performing this work can be obtained from the Transport Canada 24-hour number (613) 996-6666 collect.
- .8 Re-fueling of machinery must take place at a safe distance from the waterway.
- .9 Machinery to arrive on site in a clean, washed condition and maintained free of leaks.

1.7 DRAINAGE

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Do not pump water containing suspended materials and other harmful substances into waterways, sewer or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.8 PILE DRIVING

- .1 Ramped up slowly pile driving so initial strikes will act as a scare and cause fish to flee the area.
-

1.9 CONCRETE  
OPERATIONS

- .1 The following clauses are applicable to all work under Section 03 30 00, 03 37 26 and 03 41 00.
  - .2 Employ measures to prevent entry of concrete wash water or leachate from uncured concrete into the water.
  - .3 Containment facilities shall be provided at the site for the wash-down water from concrete delivery trucks, concrete equipment, and other tools and equipment as required. Water used to wash concrete should not be allowed to enter directly into water bodies. The sediment should be allowed to settle out and reach neutral pH before the clarified water is released to the drain system or allowed to percolate into the ground.
  - .4 Concrete trucks and concrete equipment should be washed out in a designated area where runoff to the marine environment, adjacent waterways and storm drains can be prevented.
  - .5 Prior to placement of concrete, all forms shall be thoroughly inspected to ensure that formwork is fully secured and sealed to prevent the release of concrete or concrete contaminated water into the waterway.
  - .6 If escape of concrete is observed or detected, pumping should be stopped and appropriate action taken to immediately rectify the situation.
  - .7 Keep a carbon dioxide (CO<sub>2</sub>) tank with regulator, hose and gas diffuser readily available during concrete work. Use it to release carbon dioxide gas into the affected area to neutralize pH levels should a spill occur. Train workers to use the tank.
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PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used

PART 3 - EXECUTION

3.1 NOT USED .1 Not used.

PART 1 - GENERAL

- 1.1 CONSTRUCTION & DEMOLITION WASTE
- .1 Carefully deconstruct and source separate materials/equipment and divert, from D&C waste destined for landfill to maximum extent possible. Reuse, recycle, compose, 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 Brick and portland cement concrete.
      - .2 Corrugated cardboard.
      - .3 Wood.
      - .4 Steel.
      - .5 Asphalt pavement.
- 1.2 WASTE PROCESSING SITES
- .1 Province of: Ontario.
    - .1 Ministry of Environment and Energy, 135 St. Clair Avenue West, Toronto, ON, M4V 1P5.
    - .2 Telephone: 800-565-4923 or 416-323-4321.
    - .3 Fax: 416-323-4682.
  - .2 Recycling Council of Ontario: 215 Spadina Avenue, #225, Toronto, ON, M5T 2C7.
    - .1 Telephone: 416-657-2797
    - .2 Fax: 416-960-8053
    - .3 Email: rco@rco.on.ca.
    - .4 Internet: <http://www.rco.on.ca/>.
- 1.3 DISPOSAL OF WASTES
- .1 Do not bury rubbish and waste materials on site unless approved by Departmental Representative.
  - .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.
  - .3 All waste materials should be disposed of in a legal manner at a site approved by Local Authorities.
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1.3 DISPOSAL OF WASTES (Cont'd) .4 Do not allow deleterious substances to enter the waterway.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

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

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

PART 1 - GENERAL

- 1.1 REFERENCES .1 Canadian Standards Association (CSA International)  
.1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- 1.2 UTILITY LINES .1 Water, gas and electrical services to the wharf within the limits of the wharf reconstruction will be removed by the Municipality prior to the commencement of work.  
.2 Maintain and protect from damage other services to the marina building.  
.3 Record locations of underground utility lines.  
.4 Make good damage to existing utility lines resulting from work.
- 1.3 PROTECTION .1 Prevent movement, settlement or damage of adjacent parts of existing structure to remain. Make good damage and be liable for injury caused by demolition and removal.
- 1.4 DEMOLITION, REMOVAL AND DISPOSAL MEASUREMENT PROCEDURES .1 Demolition, removal and disposal of all components identified on the drawing and as specified is considered part of the lump sum arrangement. Item/component to be demolished, removed and disposed, but not limited to, are as follows unless specified otherwise:  
.1 Concrete related components: concrete blocks, parapets, deck slab, concrete step and pavers.  
.2 Asphalt pavement.  
.3 Safety ladders.
- 1.5 WASTE MANAGEMENT AND DISPOSAL .1 To Section 01 74 20.  
.2 Submit a waste reduction workplan indicating the materials and quantities of material that will be recycled and diverted from landfill.
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1.5 WASTE MANAGEMENT AND DISPOSAL (Cont'd) .2 (Cont'd)  
.1 Indicate how material being removed from the site will be reused or recycled.

1.6 WORK .1 Dispose legally off the site all demolished and removed materials.

1.7 SAFETY CODE .1 Unless otherwise specified, carry out demolition work in accordance with CSA S350-M1980.

PART 2 - PRODUCTS

2.1 EQUIPMENT .1 Leave equipment and machinery running only while in use, except where extreme temperatures prohibit shutting down.  
.2 Demonstrate that tools and machinery are being used in manner which allows for salvage of materials in best condition possible.

PART 3 - EXECUTION

3.1 PREPARATION .1 Prior to commencing demolition and removal, inspect and verify with Departmental Representative limits of asphalt pavement to be removed.

3.2 PROTECTION .1 Protect existing pavement not designated for removal and portions of existing wharf structure from damage. In event of damage, immediately replace or make repairs to approval of Departmental Representative at no additional cost.  
.2 Prevent movement, settlement, or damage to adjacent structures and utilities that are to remain in place. Provide bracing and shoring required.

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- 3.2 PROTECTION (Cont'd)
- .3 Keep noise, dust, and inconvenience to occupants to minimum.
  - .4 Protect building systems, services and equipment.
  - .5 Provide temporary dust screens, covers, railings, supports and other protection as required.
  - .6 Prevent deleterious material from entering the waterway.
- 3.3 UTILITY LINES
- .1 Locate and protect utility lines. Do not disrupt active or energized utilities traversing site.
- 3.4 DEMOLITION, REMOVAL AND DISPOSAL
- .1 Neatly demolish and remove all components within the limits of removal including, but not limited to, the following:
    - .1 Paving stones
    - .2 Concrete deck slab.
    - .3 Fill.
    - .4 Concrete parapet.
  - .2 Disposed of all removed components not specified for salvaging or reuse legally off site.
- 3.5 ASPHALT DEMOLITION AND REMOVALS
- .1 Saw cut pavement to full depth in a neat line at limits of asphalt removal to expose fresh vertical surface.
  - .2 Remove existing asphalt pavement to limits shown on the drawing.
  - .3 Dispose removed asphalt pavement off site in accordance with Section 01 74 20.
- 3.6 CLEANING AND RESTORATION
- .1 Keep site clean and organized throughout demolition procedure.
  - .2 Remove dust, contaminants, loose and foreign materials, oil and grease in areas receiving new asphalt.
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- 3.6 CLEANING AND RESTORATION  
(Cont'd)
- .3 Use rotary power brooms supplemented by hand brooming as required.
- .4 Keep drainage system clear of loose and waste materials.
- 3.7 BOLLARDS
- .1 Salvage all bollards with base plates for reinstallation in this contract.

PART 1 - GENERAL

1.1 REFERENCE  
STANDARDS

- .1 American Association of State Highway and Transportation Officials (AASHTO):
    - .1 AASHTO M194M/M194: Standard Specification for Chemical Admixtures for Concrete.
  - .2 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 A307-12, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
    - .3 ASTM C39/C39M-12a, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
    - .4 ASTM C233-11/C233M-11, Standard Test Method for Air-Entraining Admixtures for Concrete.
    - .5 ASTM C494/C494M-12, Standard Specification for Chemical Admixtures for Concrete.
    - .6 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - .3 Canadian Standards Association (CSA):
    - .1 CAN/CSA-A3000-08, Cementitious Materials Compendium (which consists of A3001, A3002, A3003, A3004 and A3005).
      - .1 CAN/CSA-A3001-08, Cementitious Materials for Use in Concrete.
    - .2 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
    - .3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
    - .4 CSA-G40.20-04/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .4 Ontario Provincial Standard Drawings (OPSD):
    - .1 OPSD 310.020, November 2005, Ontario Provincial Standard Drawing, Concrete Sidewalk adjacent to Curb and Gutter.
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- 1.2 SUBMITTALS
- .1 Submittals in accordance with Section 01 33 00.
  - .2 Submit WHMIS MSDS - Material Safety Data Sheets.
  - .3 At least 2 weeks prior to beginning Work, submit to Departmental Representative samples of following materials proposed for use:
    - .1 Concrete, Alternative 1 - Performance: in accordance with CSA-A23.1/A23.2 and as described in MIXES of PART 2 - PRODUCTS.
    - .2 Cold weather concrete protection.
  - .4 Submit testing results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
  - .5 Concrete hauling time: submit for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of work and discharged after batching.
  - .6 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 for epoxy paint.
- 1.3 QUALITY ASSURANCE
- .1 Submit to Departmental Representative, minimum 2 weeks prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
  - .2 Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to Departmental representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.
- 1.4 HEALTH AND SAFETY REQUIREMENTS
- .1 Do construction occupational health and safety in accordance with Section 01 35 30.
-

1.5 DELIVERY,  
STORAGE AND  
HANDLING

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

1.6 WASTE  
MANAGEMENT AND  
DISPOSAL

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- .1 Waste management and disposal: to Section 01 74 20.
  - .2 Separate waste materials for reuse and recycling.
  - .3 Ensure emptied containers are sealed and stored safely.
  - .4 Use excess concrete as directed by Departmental Representative.
  - .5 Provide appropriate area on job site where concrete trucks to be safely washed.
  - .6 Divert admixtures and additive materials from landfill to approved official hazardous material collections site as reviewed by Departmental Representative.
  - .7 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
  - .8 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.
-

1.7 MEASUREMENT  
PROCEDURES

- .1 Concrete parapet will be measured by the linear metre as measured horizontally along the outside face of the new parapet and shall include the furnishing of all materials, labour and equipment necessary to complete the work. Saw cut and restoration of existing concrete parapet at limits indicated is considered incidental and will not be measured separately for payment.
- .2 Reinstallation of salvaged mooring cleats including new anchor bolts will be considered incidental to the new concrete parapet and will not be measured separately for payment.
- .3 Concrete gas pump platform will be measured by the square metres based on the neat lines called for on the drawings and shall include the furnishing of all materials, labour and equipment necessary to complete the work.
- .4 Reinforcing steel, splices, wire ties, bar supports, chairs, spacers, dowels, fender anchors bolts, nuts, and washers shall be considered included in the placing of the concrete and will not be measured separately for payment.
- .5 Heating water, aggregates and providing cold weather protection considered included in the placing of concrete and will not be measured separately for payment.

1.8 DESIGN  
REQUIREMENTS

- .1 Alternative 1 - Performance: in accordance with CSA-A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.
-

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Concrete: for parapet, pad and concrete repair (with steel plating).
  - .1 Cement: to CAN/CSA-A3001, Type GU.
  - .2 Compressive strength: 35 MPa at 28 days.
  - .3 Exposure class: C-1 to CSA-A23.1/A23.2.
  - .4 Slump: 80 mm at time of deposit, ± 20 mm.
  - .5 Air content: 6%, Table 4, Category 1.
  - .6 Admixtures: air entraining to ASTM C233-04 Standard Test Method for Air-Entraining Admixtures for Concrete. Calcium chloride or compounds containing calcium chloride not permitted.
  - .7 Water: to CSA-A23.1/A23.2.
  - .8 Aggregate size: 20 mm (rounded aggregate).
- .2 Reinforcing/steel bars: to CAN/CSA-G30.18, grade 400R.
- .3 Joint filler: non-extruding, preformed asphalt saturated fibre to ASTM D1751.
- .4 Joint sealer: [grey] to CAN/CGSB-19.24, Type 1, Class B.
- .5 Other concrete materials: to CSA A23.1/A23.2.
- .6 Formwork: to CSA-A23.1/A23.2
- .7 Plate, shapes and bars: to CSA-G40.20/40.21, Grade 350W.
- .8 Threaded rods, bolts, nuts and washers: to ASTM A307.
- .9 Bollard anchor bolts: to ASTM A307 and galvanized, size to match existing, minimum 200 mm long with 50 mm leg.
- .10 Galvanizing: to Section 35 59 14.

2.2 MIXES

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria in accordance with CAN/CSA-A23.1/A23.2.
    - .1 Ensure concrete supplier meets performance criteria as established below and provide
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- 2.2 MIXES .1 (Cont'd)  
(Cont'd) .1 (Cont'd)  
verification of compliance as described in PART  
3 - VERIFICATION.

PART 3 - EXECUTION

- 3.1 GALVANIZING .1 Galvanized bollard anchor bolts to ASTM  
A123/A123M.
- 3.2 PREPARATION .1 Carry out demolition and removals to details  
indicated on drawings and to Section 02 41 15.
- .2 Provide netting to capture all removed  
concrete. Submit details of netting and  
installation to Section 01 30 00. Collect all  
concrete debris and residue from concrete  
removal operation and dispose legally off site.
- .3 Protect existing concrete and previous work  
from staining.
- .4 Remove all deteriorated concrete, dirt, oil,  
grease and other foreign substance in accordance  
to manufacturer's recommendation.
- .5 Excavate and backfill to lines and grades  
indicated and to Section 31 23 11.
- .6 Where concrete must bond to existing surfaces,  
clean surfaces just prior to starting concrete  
placement.
- .7 During concreting operations:  
.1 Cold joints not allowed.  
.2 Ensure concrete delivery and handling  
facilitates placing with minimum of re-handling,  
and without damage to existing structure or  
Work.
- .8 Protect previous work from staining.
- .9 Clean and remove stains prior to application  
for concrete finishes.
- .10 Maintain accurate records of poured concrete  
items to indicate date, location of pour,  
quality, air temperature and test samples taken.
-

- 3.2 PREPARATION  
(Cont'd)
- .11 Do not place load upon new concrete until authorized by Departmental Representative.
  - .12 Where concrete must bond to existing surfaces, clean surfaces just prior to starting concrete placement.
    - .1 Use water jets, mechanical scrapers or other means, and when quantities of mud or rock cuttings are present, remove by air lift.
- 3.3 NOTICE OF POUR
- .1 Provide Departmental Representative 48 hours notice before each concrete pour.
- 3.4 PLACING REINFORCEMENT
- .1 Accurately place reinforcing steel and bars in the positions and to elevations indicated on the drawings and hold firmly during the placing, compacting and setting of concrete.
  - .2 Reinforcement and bars must be in place and inspected by the Departmental Representative before concrete is placed.
  - .3 Ensure cover of reinforcement is maintained during concrete placement.
- 3.5 FORMWORK
- .1 Erect formwork to CSA-A23.1/A23.2.
- 3.6 CONCRETE
- .1 Do not pour concrete on soil which has been allowed to dry out. If soil is exposed to drying for three or more days, moisten by sprinkling water on it before any concrete is placed.
  - .2 In no case deposit concrete against frozen material.
  - .3 No concrete shall be placed during rain.
  - .4 Protect freshly laid concrete from rain damage and adverse weather condition in accordance with CAN/CSA-A23.1/A23.3.
  - .5 Carry out the placing of concrete continuously from joint to joint. Unless otherwise specified vibrate the concrete mechanically.
-

- 3.6 CONCRETE  
(Cont'd)
- .6 Placement of concrete by pumping is permitted only after approval in writing of equipment and mix by Departmental Representative.
  - .7 Accurately set all necessary anchor bolts to details indicated.
  - .8 Complete work to following tolerances:
    - .1 Straight to 1:500.
    - .2 Thickness to 6 mm.
    - .3 Plumb to 1:600.
- 3.7 BOLLARDS — .1 Install bollards with new anchor bolts in locations directed by engineer on site.
- 3.8 GAS PUMP ISLAND .1 Vacate site for 48 hours to allow municipality to install buried utilities. Restore backfill materials and compact after municipality completes service installation.
- .2 Place gas pump island to grades and dimension shown. Minimum reinforcement to be 15M at 300 mm each way, placed 75 mm below surface.
- 3.9 FINISHING .1 Finish concrete to CSA-A23.1/A23.2.
- .2 Wood float at exterior locations.
  - .3 Steel trowel to smooth dense surfaces. Provide round edges
- 3.10 CURING .1 Cure concrete in accordance with CSA-A23.1/A23.2.
- .2 Provide cold weather protection during curing period.
- 3.11 VERIFICATION .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in PART 2 - PRODUCTS, by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.
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Lion's Head, Ontario  
Service Dock Repairs  
Project No. 720182

CAST IN PLACE CONCRETE

Section 03 30 00  
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PART 1 - GENERAL

- 1.1 REFERENCES .1 Canadian Standards Association (CSA International)  
.1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- 1.2 DEFINITIONS .1 Tremie concrete is placed underwater through tube called tremie pipe.  
.1 Tremie pipe has a hopper at upper end and may be open ended or may have foot valve, plug or travelling plug to control flow of concrete.  
.2 Concrete is placed in hopper and sufficient head of concrete is maintained in tremie pipe to provide desired rate of flow.
- .2 Pumped concrete method of placing concrete underwater uses concrete pump with discharge line used in similar manner to a tremie pipe.
- .3 Bottom-dump bucket method of placing concrete underwater requires use of bucket designed to discharge from bottom after it has contacted foundation or surface of previously placed concrete.
- .4 Bagged concrete method of placing underwater concrete consists of diver placing bags partially filled with dry concrete mix.
- 1.3 MEASUREMENT PROCEDURES .1 Continuous concrete seal will be measured by the linear metres based on the neat horizontal line shown on the drawings and shall include all labour, equipment and materials necessary to complete the work. Placement of salvaged concrete blocks from Pier demolition in spans between wharf timber cribs as indicated on drawings is considered incidental and will not be measured separately for payment.
- .2 Bagged concrete placed at wharf closures are considered incidental to closure sealed under Section 31 61 16.16.
-

1.4 WASTE  
MANAGEMENT AND  
DISPOSAL

- .1 Waste materials and disposal: to Section 01 74 20.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused concrete materials from landfill to local approved by Departmental Representative.
- .5 Divert chemical additive materials from landfill to official hazardous material collections site approved by Departmental Representative.
- .6 Do not dispose of unused chemical additive materials into sewer systems, into lakes, streams, onto ground or in any other location where it will pose health or environmental hazard.
- .7 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Concrete:
    - .1 Use type GU cement.
    - .2 Minimum compressive strength at 28 days: 35 MPa.
    - .3 Class of exposure: C-1.
    - .4 Maximum water cement ratio by mass: 0.45.
    - .5 Nominal size of coarse aggregate: 20 mm.
    - .6 Fine aggregate content: 42 to 45 % of total aggregate mass.
    - .7 Slump at point and time of discharge: 100 to 125 mm for pumped concrete and 0 to 25 mm for bagged concrete.
    - .8 Admixtures: to approval of Departmental Representative. Use admixtures to correct deficiencies in mix or to improve placement of concrete.
      - .1 Departmental Representative may withdraw prior approval of admixture if
-

- 2.1 MATERIALS .1 Concrete:(Cont'd)  
(Cont'd) .8 Admixtures:(Cont'd)
- conditions encountered during course of work indicate unsatisfactory results.
- .2 Do not use calcium chloride or materials containing calcium chloride.
- .2 Weld materials: to Section 05 12 35.

PART 3 - EXECUTION

- 3.1 PREPARATION .1 Where concrete must bond to existing surfaces, clean surfaces just prior to starting concrete placement.
- .1 Use water jets, mechanical scrapers or other means, and when quantities of mud or rock cuttings are present, remove by air lift.
- 3.2 INSTALLATION .1 Do concrete work in accordance with Section 03 30 00 and to CSA-A23.1/A23.2, except where specified otherwise.
- .2 Prior to placement of concrete seal, place salvaged concrete blocks from Pier demolition in neat row in spans between wharf timber cribs and to details indicated on drawings.
- .3 Place continuous concrete seal and bagged concrete to details shown on the drawings.
- .4 Place concrete in one continuous operation to full depth required.
- .1 Supply complete equipment for every phase of operation.
- .2 Provide sufficient supply of concrete to complete pour without interruption.
- .3 Fabricate and install wharf closure seals at pile P1 and P18 to prevent loss of concrete during placement.
- .4 Place underwater concrete after in water work restriction date of July 15, 2013.
- .5 Pumped concrete method.
- .1 Follow procedures as for tremie method in placing concrete using discharge line from concrete pump as tremie pipe.
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3.2 INSTALLATION  
(Cont'd)

- .5 (Cont'd)
- .2 Pump discharge line to have minimum diameter of 125 mm.
  - .3 Prior to pumping provide and install seals at the east and west limits to prevent escape of pumped concrete. Submit details of seals to Departmental Representative 7 days prior to commencement of pumping of underwater concrete.
- .6 Bagged concrete method.
- .1 Use bags made of coarsely woven material to allow concrete to bond between bags.
  - .2 Fill bags with dry concrete mix not more than 80% full before placing.
  - .3 Place each concrete bag individually so that bag is stable and securely resting on foundation material or previously placed bags.

PART 1 - GENERAL

- 1.1 REFERENCES .1 American Society for Testing and Materials International (ASTM)  
.1 ASTM C233/C233M-11, Standard Test Method for Air-Entraining Admixtures for Concrete.
- .2 Canadian Standards Association (CSA International)  
.1 CAN/CSA-A23.3-04 (R2010), Design of Concrete Structures.  
.2 CSA-A23.4-09, Precast Concrete - Materials and Construction.  
.3 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).  
.1 CAN/CSA-A3001-08, Cementitious Materials for Use in Concrete.  
.4 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.  
.5 CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- 1.2 MEASUREMENT PROCEDURES .1 Precast concrete panels will be measured by the square metre of panel installed and shall include all costs to supply, deliver, store and install including reinforcing steel and lifting devices.
- .2 Precast concrete anchor blocks will be measured by each anchor block regardless of width installed and shall include all costs to supply, deliver, store and install including reinforcing steel and lifting devices.
- 1.3 DESIGN REQUIREMENTS .1 Design precast panels and anchor blocks CAN/CSA-A23.3 and CSA-A23.4 and to carry handling stresses.
- 1.4 PERFORMANCE REQUIREMENTS .1 Length of precast panels not to vary from measured field length between H-piles length by more than minus 20 mm.
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- 1.4 PERFORMANCE REQUIREMENTS (Cont'd) .2 Cross sectional dimensions of precast panels not to vary from design dimensions by more than plus or minus 6 mm.
- 1.5 SUBMITTALS .1 Submittals in accordance with Section 01 33 00.
- 1.6 QUALITY ASSURANCE .1 Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to Departmental Representative verifying compliance that concrete provided meets performance requirements of concrete as established in PART 2 - PRODUCTS.
- 1.7 QUALIFICATIONS .1 Fabricate precast concrete panels and anchor blocks by manufacturing plant certified in appropriate category according to CSA-A23.4
- 1.8 DELIVERY, STORAGE AND HANDLING .1 Transport precast elements in an upright position with points of support and direction of reactions approximately same as when they will be in final position in work.
- .2 Handle, store and protect precast elements in order to avoid damage to concrete. Identify lifting points by inserting hooks during manufacture. Do not impose torsional or impact stresses on precast elements. Remove and replace damaged precast elements from site at no extra cost.
- .3 Submit to Departmental Representative for review of drawing indicating proposed arrangements of storing precast elements. Place precast elements on timber sills and provide additional wooden blocking to prevent concrete to concrete contact. Place blocking to ensure that precast elements sit horizontally.
- .4 Lifting insert shall not be installed on exterior vertical faces.
-

- 1.9 MANAGEMENT AND DISPOSAL .1 Waste Management and Disposal:  
.1 Separate waste materials for reuse and recycling.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Concrete:  
.1 Cement: to CAN/CSA-A3001, Type GU.  
.2 Compressive strength: 35 MPa at 28 days.  
.3 Exposure class: C-1 to CSA-A23.1/A23.2.  
.4 Aggregate size: 20 mm.  
.5 Slump: 80 mm at time of deposit, +/- 20 mm.  
.6 Air content: 6%, Table 4, Category 1.  
.7 Admixtures: air entraining to ASTM C233/C233M. Calcium chloride or compounds containing calcium chloride not permitted.  
.8 Water: to CSA-A23.1/A23.2.  
.2 Reinforcing steel: to CSA-G30.18, 400R.  
.3 Forms: to CSA-A23.4.

- 2.2 MIXES .1 Concrete:  
.1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria in accordance with CSA-A23.1/A23.2.  
.1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 - VERIFICATION.  
.2 Provide concrete mix to meet following hard state requirements:  
.1 Durability and class of exposure: C-1.  
.2 Minimum compressive strength at 28 day age: 35 MPa.  
.3 Provide quality management plan to ensure verification of concrete quality to specified performance.  
.4 Concrete supplier's certification.
-

- 2.3 MANUFACTURED ELEMENTS
- .1 Manufacture panels in accordance with CSA-A23.4.
  - .2 Mark each precast panel 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 panels.
- 2.4 FINISHES
- .1 Finish units to standard grade to CSA-A23.4.
- 2.5 SOURCE QUALITY CONTROL
- .1 Provide Departmental Representative 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 Departmental Representative for inspection and review.
  - .3 Keep complete records of supply source of concrete material, steel reinforcement, and provide to Departmental Representative for review upon request.
- PART 3 - EXECUTION
- 3.1 PRECAST WORK
- .1 Do precast concrete work in accordance with CSA-A23.4 and CAN/CSA-A23.3.
- 3.2 VERIFICATION
- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in Part 2 - Products, by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.
-

- 3.3 PRECAST PANELS
- .1 Confirm field dimension of length of each panel prior to casting panels. Fabricate panels in to detail indicated and length as determined by field measurement of pile spacing.
  - .2 Install precast concrete panels as indicated on drawings.
- 3.4 PRECAST ANCHOR BLOCKS
- .1 Excavate to limits indicated and to Section 31 23 11.
  - .2 Set precast concrete anchor blocks as indicated.
  - .3 Do not force blocks into position or subject to stresses or overloads which could cause damage.
  - .4 Replace or repair damaged precast blocks to original condition at no additional cost.
  - .5 Install to details indicated.
  - .6 Connections of blocks to be made in strict accordance with design drawings.
  - .7 Backfill with materials indicated on drawings and to Section 31 23 11.

PART 1 - GENERAL

- 1.1 WELDER QUALIFICATIONS .1 Use only welders qualified under CSA W47.1-03(R2008).
- .2 Make available to Departmental Representative current valid Canadian Welding Bureau Qualification Certificate for each welder employed on the work.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Welding materials to CSA W59-03(R2008).

PART 3 - EXECUTION

- 3.1 WELDING GENERAL .1 Welding: CSA W59-03(R2008).
- .2 Do not deviate the size, length and location of welds from the design or from details shown on reviewed shop drawings without approval of Departmental Representative.
- .3 Grind flush all welds.
- 3.2 PREPARATION .1 Surfaces to be welded shall be smooth, uniform and free from fins, tears and other defects which would adversely affect the quality of the weld.
- .2 Ensure areas within 50 mm of the weld are free from loose scale, slag, rust, grease, moisture, paint or other matter which would impair the quality of the weld.
- .3 Remove slag before welding over previously deposited metal and brush clean weld and adjacent base. This requirement applies to successive layers, successive beads and to crater area when welding is resumed after any interruption.
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- 3.2 PREPARATION (Cont'd) .4 Before welding is started from the second side remove to sound metal the root of the initial weld of all butt welds except when produced with the aid of backing. Thoroughly fuse the weld metal with the backing in all butt welds made with the use of backing of the same material as the base metal.
- 3.3 ASSEMBLY .1 Bring members to be welded into correct alignment and hold securely in position until the joint has been welded.
- .2 Carefully align abutting parts joined by butt welds.
- .3 Weld in a sequence that will balance the effects of applied heat of welding on various sides as the welding progresses.
- 3.4 WELD QUALITY .1 Weld metal to be sound throughout with no porosity or cracks on the surface of any weld or weld pass.
- .2 Ensure complete fusion between the weld metal and the base metal and between successive passes throughout the joint.
- .3 Welds shall be free from overlap and the base metal free from undercutting.
- .4 Fill all craters to the full cross section of the welds.
- .5 Fill and grind to profile any craters at the extreme ends of fillet welds.
- 3.5 TESTING .1 Give Departmental Representative 48 hours notice of when work is ready for inspection.
- .2 All welds will be subject to visual inspection requirements of CSA W59-03(R2008).
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3.6 ACCEPTANCE  
REQUIREMENTS

- .1 Welds subject to nondestructive testing unacceptable if:
  - .1 There is any imperfection within 25 mm from the beginning or end of a butt weld.
  - .2 There is any type of crack, tear, zone of incomplete fusion or incomplete penetration regardless of size and location.
  - .3 Inclusion:
    - .1 Occurs in any 25 mm of a welded joint containing two or more inclusions where the sum of the greatest dimensions of those inclusions exceed 5 mm;
    - .2 Is greater than one-third the joint thickness but in no case larger than 19 mm.
- .2 Repair defective welds by chipping, air-arc gouging or grinding out from one side or both sides. Remove all traces of defects before rewelding. Remove all traces of oxidation after air-arc gouging.

PART 1 - GENERAL

- 1.1 REFERENCES .1 American Wood-Preservers' Association (AWPA)  
.1 AWPA M2-11, Standard for Inspection of Treated Wood Products.  
.2 AWPA M4-11, Standard for the Care of Preservative-Treated Wood Products.
- .2 Canadian Standards Association (CSA International)  
.1 CAN/CSA O80 Series-08(R2012) Consolidated, Wood Preservation.  
.2 CSA O322-02(R2012), Procedure for Certification of Pressure-Treated Wood Materials for Use in Preserved Wood Foundations.
- 1.2 SUBMITTALS .1 Submit Submittal submissions: in accordance with Section 01 33 00.
- .2 Quality assurance submittals:  
.1 Submit certificates in accordance with Section 01 33 00.  
.2 For products treated with preservative by pressure impregnation submit following information certified by authorized signing officer of treatment plant:  
.1 Information listed in AWPA M2 and revisions specified in CSA O80 Series, Supplementary Requirement to AWPA M2 applicable to specified treatment.  
.2 Moisture content after drying following treatment with water-borne preservative.
- 1.3 QUALITY ASSURANCE .1 Each piece of lumber and plywood for preserved wood foundations to be identified by CSA O322 certified stamp.
- 1.4 DELIVERY, STORAGE, AND HANDLING .1 Waste Management and Disposal:  
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
-

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Preservative: to CSA-080 Series, water-borne, alkali-based (amine/ammonia).  
.1 Category type: UC3.2

PART 3 - EXECUTION

- 3.1 APPLICATION: PRESERVATIVE .1 Treat material to CSA 080 Series with retention as specified for Category Type UC3.2.  
.2 Following water-borne preservative treatment, dry material to maximum moisture content of 19% or the percentage permitted by the National Lumber Grades Authority's Standard Grading Rules for Canadian Lumber for the applicable species and size.

- 3.2 APPLICATION: FIELD TREATMENT .1 Comply with AWPA M4 and revisions specified in CSA 080 Series, Supplementary Requirements to AWPA M2.  
.2 Remove chemical deposits on treated wood to receive applied finish.

- 3.3 HANDLING OF PRESERVATIVE .1 Prior to use in field treatment, instruct personnel using material in its proper care and handling.

PART 1 - GENERAL

- 1.1 REFERENCES .1 American Society for Testing and Materials International (ASTM)  
.1 ASTM D2697-03(2008), Standard Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings.
- .2 The Society for Protective Coatings (SSPC)  
.1 SSPC-SP 2-82(R2004), Hand Tool Cleaning.  
.2 SSPC-SP 6/NACE No.3-07, Commercial Blast Cleaning.  
.3 SSPC-Vis-1-89, Visual Standard for Abrasive Blast Cleaned Steel (Standard Reference Photographs) Editorial Changes September 1, 2000 (Steel Structures Painting Manual, Chapter 2 - Surface Preparation Spec.).  
.4 SSPC-PAI, Shop, Field and Maintenance Painting of Steel.  
.5 SSPC-PA 2-04, Measurement of Dry Coat Thickness with Magnetic Gauges.  
.6 SSPC Good Painting Manual, Volume 1, 4th Edition.
- 1.2 MEASUREMENT PROCEDURES .1 Cleaning, shop painting and field painting of steel plate and associated hardware for concrete repairs will not be measured separately for payment but shall be considered included in the measurement for payment under Section 03 30 00.
- .2 Cleaning, shop painting and field painting of ladders and associated hardware will not be measured separately for payment but shall be considered included in the measurement for payment under Section 35 59 14.
- 1.3 SUBMITTALS .1 Product Data for each individual product.  
.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00.  
.2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00. Indicate VOC's content and composition for paint.
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- 1.4 WASTE MANAGEMENT AND DISPOSAL .1 Separate and recycle waste materials in accordance with Section 01 74 20.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Exterior Protective Two Coat System:
- .1 Primer coat: zinc rich epoxy primer suitable for severe weather condition.
    - .1 VOC: less than 301 g/L when mixed.
    - .2 Coats: 1.
    - .3 Dry film thickness (DFT): 50-100 microns.
    - .4 Theretical coverage: 9.2 m<sup>2</sup>/L at 75 microns DFT or greater.
    - .5 Volume of solid: 70% ± 3% or greater, to ASTM D2697.
  - .2 Top coat: Engineered siloxane.
    - .1 VOC: 275 g/L or less.
    - .2 Coats: 1
    - .3 Dry film thickness: 75-175 microns.
    - .4 Theoretical coverage: 30 m<sup>2</sup>/L at 25 microns DFT or greater.
    - .5 Volume of solids: 75% or greater, to ASTM D2697.
  - .6 Colour:
    - .1 Top 3 metres of exposed flange of HP310x79: grey.
    - .2 Safety ladder and associated hardware: safety yellow.
- .2 Sand for sandblasting: to SSPC on blast cleaning.

PART 3 - EXECUTION

- 3.1 MANUFACTURER'S INSTRUCTIONS .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
-

- 3.2 PREPARATION OF SURFACES
- .1 Preparation of metal surfaces to be painted shall be:
    - .1 Commercial blast cleaned to remove paint, rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances. Commercial Blast to SSPC-SP6.
    - .2 When cleaning by air blasting with sand, provide adequate separators and traps to remove detrimental amounts of water and oil from compressed air before reaching nozzle.
    - .3 Remove traces of blast products from surfaces, and from pockets and corners by brushing with clean brushes, by blowing with clean compressed air, or by vacuum cleaning. Do not damage partially or completed work adjacent to area being cleaned.
    - .4 Do not apply paint until prepared surfaces have been inspected and approved.
    - .5 Prior to commencing paint application the degree of cleanliness of surfaces to be in accordance with SSPC-Vis1.
- 3.3 NUMBER OF PAINT COATS
- .1 Paint prepared metal surfaces in accordance with the following:
    - .1 One prime coat to minimum dry film thickness of 0.050 mm and maximum of 0.100 mm.
    - .2 One top coat to minimum dry film thickness of 0.100 mm and maximum of 0.150 mm.
    - .3 Thickness measurements will be taken according to SSPC-2 thickness specification.
- 3.4 PROTECTION OF SURFACES
- .1 Protection of surfaces.
    - .1 Protect surfaces not to be painted and if damaged, clean and restore such surfaces as directed by Departmental Representative.
    - .2 Apply primer after surface has been cleaned and before deterioration of surface occurs.
    - .3 Clean surfaces again if rusting occurs after completion of surface preparation.
    - .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining
-

- 3.4 PROTECTION OF SURFACES  
(Cont'd)
- .1 (Cont'd)  
.4 (Cont'd)  
coats of paint. Remove contaminants from surface and apply paint immediately.  
.5 Protect cleaned and freshly painted surfaces from dust to approval of Departmental Representative.
- 3.5 MIXING PAINT
- .1 Mix ingredients in container before use and ensure breaking up of lumps, complete dispersion of settled pigment, and a uniform composition.
- .2 Mix paint often enough during application to keep pigment in suspension and composition uniform.
- .3 Mixing or keeping paint in suspension by means of an air stream bubbling under paint surface will not be permitted.
- .4 Do not dilute or thin paint for brush application; use as received from manufacturer.
- 3.6 APPLICATION
- .1 The Departmental Representative shall be notified 48 hours in advance of his intention to mix and apply a coating or coating system.
- .2 Apply paint by spraying. Use sheepskins or daubers when no other method is practical in places of difficult access.
- .3 Application related failures in coatings as described in the chapter "Coating Failures" of the SSPC Painting Manual Vol.1, shall be corrected prior to application of a subsequent coat and after the application of the top coat.
- .4 Where surface to be painted is not under cover, do not apply paint when:  
.1 Air temperature is below 5°C or when temperature is expected to drop to 0°C before paint has dried.  
.2 Temperature of surface is over 50°C unless paint is specifically formulated for application at high temperatures.  
.3 Fog or mist occur at site; it is raining or snowing; there is danger of rain or snow; relative humidity is above 85%.
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3.6 APPLICATION  
(Cont'd)

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- .4 (Cont'd)
    - .4 Surface to be painted is wet, damp or frosted.
    - .5 Previous coat is not dry.
  - .5 Provide cover when paint must be applied in damp or cold weather. Protect, shelter, or heat surface and surrounding air to comply with temperature and humidity conditions specified in 3.6.4. Protect until paint is dry or until weather conditions are suitable.
  - .6 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation during application. Prepare surface again and repaint.
  - .7 Apply paint using spraying equipment in accordance with the paint manufacture's recommendations.
    - .1 All paint coating systems shall be stored, handled, mixed, and applied according to SSPC-PA1 and the recommendations on the manufacturer's product data sheets.
    - .2 Provide and maintain equipment that is suitable for intended propose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
    - .3 Provide traps or separators to remove oil and water from compressed air and drain periodically during operations.
    - .4 Keep paint ingredients properly mixed in spray pots or containers; agitators must be used.
    - .5 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
    - .6 Immediately brush out all runs and sags.
    - .7 Use equipment recommended by manufacturer to work paint into cracks, crevices, and places which are not adequately painted by spray.
    - .8 Remove runs and sags and repair before proceeding with another coat.
  - .8 Remove paint which does not meet with the requirements of these specifications, thoroughly clean affected surfaces, and repaint at no additional cost to Contract.
  - .9 Apply each coat of paint as continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
-

- 3.6 APPLICATION .10 Shop painting:  
(Cont'd)
- .1 The maximum time between final surface preparation and prime coat application inside the shop shall be 24 hours.
  - .2 Do shop painting after fabrication and surface preparation before any damage to surface occurs from weather or other exposure.
  - .3 Unless otherwise specified, surfaces to be in contact after field erection to be shop painted prior to erection except where paint will interfere with assembly.
  - .4 Do not paint areas of steel surfaces to be in contact with concrete.
  - .5 Remove any weld spatter before painting.
- .11 Field painting:
- .1 Touch up metal which has been shop coated with same type of paint and to same thickness as shop coat.
- .12 Handling painted steel:
- .1 Do not handle painted steel until paint has dried, except for painting or stacking for drying.
  - .2 Scrape off and touch up paint which is damaged in handling, with same number of coats and kinds of paint as were previously applied to steel.
  - .3 Do not load painted steel for shipment until the paint is dry.
  - .4 Use wood blocks to minimize damage to paint films resulting from stacking members.
- 3.7 QUALITY CONTROL .1 Upon completion of the painting procedures test for dry film reading and evaluate the results as per SSPC PA 2.
- 3.8 CLEANING .1 Upon completion of painting remove surplus materials, rubbish, tools and equipment.

PART 1 - GENERAL

- 1.1 REFERENCES .1 Ontario Provincial Standard Specifications (OPSS)/Ontario Ministry of Transportation
- .1 OPSS 1004 November 2006, Ontario Provincial Standard Specification, Material Specification for Aggregates - Miscellaneous.
  - .2 OPSS 1010 April 2004, Ontario Provincial Standard Specification, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.
- 1.2 UTILITY LINES .1 Before commencing work, establish location and extent of underground utility lines in area of excavation. Notify Departmental Representative of findings.
- .2 Advise Departmental Representative to remove/re-route existing lines in area of excavation. Pay costs of such work.
  - .3 Maintain existing lines in areas of excavation which must remain active as indicated. Pay costs for this work.
  - .4 Record locations of maintained, re-routed and abandoned underground utility lines.
  - .5 Make good damage to existing utility lines resulting from work.
- 1.3 PROTECTION .1 Protect excavated earth from freezing by approved method.
- .2 Grade around excavations to prevent surface water runoff into excavated area.
  - .3 Protect bottoms of excavations from weather. Should softening in bottoms occur due to water or other causes, remove softened soil and replace with structural concrete at no additional cost.
-

1.4 MEASUREMENT  
PROCEDURES

- .1 New clear stone fill will be measured in tonnes of material placed to limits indicated and shall include all labour, equipment and materials necessary to complete the work.
- .2 New granular A will be measured in tonnes of material placed to limits indicated and shall include all labour, equipment and materials necessary to complete the work.
- .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. Supply and installation of silt fence barrier is considered incidental to excavating and backfilling of native fill and will not be measured separately for payment.
- .4 Compaction of Granular A and native backfill shall be considered incidental and not measured separately for payment.
- .5 Disposal of surplus native fill legally off site is considered included in the excavation and backfilling of native fill.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Clear stone: to Ontario Provincial Standard Specification 1004, size 19.0 mm, uniformly graded.
  - .2 Granular A: to Ontario Provincial Standard Specification 1010. Maximum size 19.0 mm.
  - .3 Rock berm: crushed limestone, uniformly graded, size from 100 mm to 450 mm.
  - .4 Native fill: excavated soil, free from roots and debris. Departmental Representative to approve excavated material before use as backfill.
  - .5 Geotextile: to Section 31 32 19.
-

PART 3 - EXECUTION

3.1 EXCAVATING

- .1 Demolish and remove existing concrete and asphalt pavement to Section 02 41 00 prior to excavating native material.
- .2 Excavate and stockpile native fill. Complete excavation and stockpiling of native fill in stages for staged installation of tie rods.

3.2 BACKFILLING

- .1 Install geotextile to details indicated and to Section 31 32 19.
- .2 Do not commence backfilling until tie rod installation has been inspected and approved by Departmental Representative.
- .3 Backfill all spaces not occupied by parts of the structure, or other permanent works, with specified material, placed as shown on the drawings.
- .4 Areas backfilled to be free from debris, snow, ice, water or frozen ground.
- .5 Place clear stone fill to details indicated.
- .6 Place native fill to details indicated.
- .7 Place granular A to details indicated.
- .8 Maintain optimum moisture content to enable compaction to attain specified density.
- .9 Compact granular "A" to 100% Standard Proctor Density. Where working space is limited, employ approved mechanical hand operated tamping devices. When such devices are employed, deposit backfill material in layers not exceeding 200 mm in thickness.

3.3 ROCK BERM

- .1 Install rock berm to details indicated.

PART 1 - GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
    - .1 ASTM D 4491-99a(2004)e1, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
    - .2 ASTM D 4595-05, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
    - .3 ASTM D 4716-04, Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
    - .4 ASTM D 4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
  
  - .2 Canadian General Standards Board (CGSB)
    - .1 CAN/CGSB-4.2 No. 11.2-M89, 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.
  
  - .3 Canadian Standards Association (CSA International)
    - .1 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
    - .2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
-

- 1.2 SUBMITTALS .1 Submit in accordance with Section 01 33 00.
- .2 Submit to Departmental Representative following samples at least 4 weeks prior to beginning Work.  
.1 Minimum length of 2 m of roll width of geotextile.
- .3 Submit manufacturer's data for geotextile including, at a minimum: physical properties, packaging and installation techniques.
- .4 Submit to Departmental Representative 3 copies of mill test data and certificate at least 4 weeks prior to start of Work, and in accordance with Section 01 33 00.
- 1.3 DELIVERY, STORAGE AND HANDLING .1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.
- 1.4 WASTE MANAGEMENT AND DISPOSAL .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
- 1.5 MEASUREMENT PROCEDURES .1 Geotextile placed will be measure in square metres of surface covered by material based on the neat plan area and shall include all labour, materials and equipment necessary to complete the work. No allowance will be made for seams and overlaps.
-

PART 2 - PRODUCTS

2.1 MATERIAL

- .1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls.
  - .1 Width: 3.5 m minimum.
  - .2 Composed of: minimum 85% by mass of polypropylene with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 60 days.
- .2 Physical properties:
  - .1 Mass per unit area: to CAN/CGSB-148.1, No.2, minimum 400 g/m<sup>2</sup>.
  - .2 Grab tensile strength and elongation: to CAN/CGSB-148.1, No.7.3.
    - .1 Breaking force: minimum 1300 N, wet condition.
    - .2 Elongation at break: maximum 105%.
  - .3 Apparent Opening Size: 0.15 mm max to ASTM D4751.
  - .4 Mullen burst strength: to CAN/CGSB-4.2, No.11.2, minimum 4100 N, wet condition.
- .3 Factory seams: sewn in accordance with manufacturer's recommendations.
- .4 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Place geotextile material where indicated on the drawings.
  - .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
  - .3 Overlap each successive strip of geotextile 600 mm over previously laid strip.
  - .4 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
  - .5 After installation, cover with overlying layer within 4 hr of placement.
-

- 3.1 INSTALLATION .6 Replace damaged or deteriorated geotextile to  
(Cont'd) approval of Departmental Representative.
- .7 Place and compact soil layers in accordance  
with Section 31 23 11.
- 3.2 CLEANING .1 Remove construction debris from Project site  
and dispose of debris in an environmentally  
responsible and legal manner.
- 3.3 PROTECTION .1 Vehicular traffic not permitted directly on  
geotextile.

PART 1 - GENERAL

- 1.1 DELIVERY AND HANDLING .1 Protect piles from damage due to excessive bending stresses, impact, abrasion or other causes during delivery, storage and handling.
- .2 Replace or repair damaged piles with steel to CSA-G40.20/G40.21-04(R2009)-General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .3 If material is stockpiled on a structure, ensure that structure is not overloaded.
- 1.2 EXISTING CONDITIONS .1 Ensure that ground conditions at pile locations are adequate to support pile installation equipment or make provision for support.
- 1.3 PROTECTION .1 Adopt safe procedures and protect public and construction personnel, adjacent structures and the work of other sections from all hazards attributable to pile driving operations.
- 1.4 SCHEDULING OF WORK .1 Submit schedule of planned sequence of installation to Departmental Representative for approval, not less than 2 weeks prior to commencement of pile Work.
- 1.5 MEASUREMENT PROCEDURES .1 No separate measurement for payment will be made under this section. Include costs in piling items.
-

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 For material requirements refer to Section 32 62 16.16.
- .2 Supply full length piles.
- 2.2 EQUIPMENT REQUIREMENTS .1 Equipment information: Supply equipment of sufficient size and capacity to adequately install the piling to the indicated depth. For impact hammers give manufacturer's name, type, rated energy per blow at normal working rate, mass of striking parts of hammer and mass of driving cap. For non-impact methods of installation such as augering, jacking, vibratory hammers or other means, give full details of characteristics necessary to evaluate performance.

PART 3 - EXECUTION

- 3.1 PREPARATION .1 Ensure that ground conditions at pile locations are adequate to laterally support the installed piles. Make provision for access and support of piling equipment during performance of work.
- .2 Unless otherwise directed, do not install piles until excavation has been completed.
- 3.2 FIELD MEASUREMENT .1 Maintain accurate records of installation for each pile, including:
- .1 Pile size, length and heat number, location of pile in pile group, location or designation of pile group.
  - .2 Sequence of piles installation in group.
  - .3 Final tip and cut-off/head elevations.
  - .4 Other pertinent information such as interruption of continuous installation, pile damage.
- .2 Provide Departmental Representative with three copies of records.
-

- 3.3 INSTALLATION
- .1 Notify Departmental Representative at least 48 hours prior to commencement of installation.
  - .2 Provide all necessary facilities for inspection and co-operate with Departmental Representative in inspecting and recording installation data at all times.
  - .3 Furnish such equipment and labour as necessary to enable Departmental Representative to install instrumentation on piles.
  - .4 Excavate existing ground to a depth of 1 metre at anchor pile locations prior to driving piles.
  - .5 Hold piles securely and accurately in position while installing.

- 3.4 INSTALLATION TOLERANCES
- .1 Install piles to the following tolerances:
    - .1 Pile heads within 15 mm of locations shown on drawings.
    - .2 Piles not more than 0.5 percent of length out of alignment.

- 3.5 DAMAGED/ DEFECTIVE PILES
- .1 Departmental Representative will reject any pile that is installed out of position or is damaged during installation or handling. Extend piles installed below cut off elevation as directed by Departmental Representative, at no cost to Departmental Representative.
  - .2 Pull out rejected piles and replace with new piles as directed.
  - .3 No extra compensation will be made for removing and replacing or other work made necessary through rejection of a defective pile damaged due to faulty workmanship.
  - .4 Where piles are damaged or caused to drift outside specified tolerance due to Piles obstructions or other causes beyond Contractor's control the remedial measures adopted will be paid by the Departmental Representative at the Contract Unit Price or in accordance with the General Conditions if no unit prices apply.

PART 1 - GENERAL

- 1.1 REFERENCES .1 2 American Society for Testing and Materials International (ASTM):
- .1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - .2 ASTM A615/A615M-12, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- .2 Canadian Standards Association (CSA):
- .1 CSA-G40.20-04/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- 1.2 SUBMITTALS .1 Submittals in accordance with Section 01 33 00.
- .2 Submit shop drawings for temporary work, shop drawings shall bear the stamp of a Registered Professional Engineer, registered in the Province of Ontario.
- .3 Quality Assurance:
- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Instructions: submit manufacturer's installation instructions.
  - .3 Submit pile driving records, as described in PART 3 - RECORDS, for review by Departmental Representative.
- 1.3 WASTE MANAGEMENT AND DISPOSAL .1 Separate waste materials for recycling in accordance with Section 01 74 20.
- .2 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
-

1.4 MEASUREMENT  
PROCEDURES

- .1 Supply and installation of HP-shaped piles will be measured by each unit supplied and shall include all labour, equipment and materials necessary to complete the work. Supply minimum 8 m long piles, splicing of piles is not permitted.
- .2 Supply and installation of channels, steel angles and steel plate welded to web of piles are considered incidental to the installation of the piles and will not be measured separately for payment.
- .3 Steel supports and guides required to place the precast concrete panels shall be considered incidental to the installation of the piles and will not be measured separately for payment.
- .4 Trimming, coping, drilling and cutting top of H-piles and anchor piles are considered incidental and shall not be measured separately for payment.
- .5 Wharf Closures including but not limited to bagged concrete, steel plates and angles will be measured by each wharf closure sealed and shall include all labour, materials and equipment necessary to complete the work.
- .6 Supply and installation of tie rods including lock nuts, hex nuts, couplers, anchor plates, plate washers, Hollow Structural Steel (HSS) spacers, pipe sleeves, other associated hardware and welding materials will be measured by each tie rod assembly satisfactorily installed.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Steel shaped piles: to CSA-G40.20/G40.21, Type and Grade 350W.
    - .1 Size and weight as indicated.
  - .2 Plate, shapes and bars: to CSA-G40.20/G40.21, Grade 350W.
  - .3 Pipe Sleeves: To ASTM A53 Grade B, yield strength 240 MPa.
-

2.1 MATERIALS  
(Cont'd)

- .4 Tie rods, hex nuts and couplers:
  - .1 to ASTM A615, Grade 517 MPa.
  - .2 Tie rods: continuously threaded to have upset threaded ends such that diameter of upset end provides 15 percent excess root area over gross area of plain tie rod.
  - .3 Tie rod hex nuts lock nuts and couplers: to have a load capacity of 15 percent in excess of capacity of tie rod.
- .5 Welding materials: to Section 05 12 35.
- .6 Granular fill: to Section 31 23 11.
- .7 Geotextiles: to Section 31 32 19.

PART 3 - EXECUTION

3.1 FABRICATION

- .1 Install pipe sleeve as indicated.
- .2 Install supports and guides for precast concrete panels installation to details indicated.
- .3 Do welding in accordance with Section 05 12 35.

3.2 INSTALLATION

- .1 Install piles in accordance with Section 31 62 00.
  - .2 Drive each pile to pile tip elevation as indicated.
  - .3 Cut off piles neatly and squarely at elevations as indicated to tolerance of plus or minus 6 mm. Provide sufficient length above cut-off elevation so that part damaged during driving is cut off.
  - .4 Remove cut-off lengths from site on completion of work.
  - .5 Trim, drill, cut and cope piles as indicated.
-

- 
- 3.3 RECORDS .1 Keep complete and accurate record of each pile driven.
- .2 Indicate:
- .1 Pile location.
  - .2 Deviations from design location.
  - .3 Cross section shape and dimensions.
  - .4 Original length.
  - .5 Ground elevation.
  - .6 Tip elevation.
  - .7 Cutoff elevation.
  - .8 Penetration in blows per meter for entire length of penetration.
  - .9 Hammer data including: rate of operation, make and size.
  - .10 Unusual pile behavior or circumstances experienced during driving such as re-driving, heaving, weaving, obstructions, jetting, and unanticipated interruptions.
- 3.4 WHARF CLOSURES .1 Install wharf closures to details indicated on drawings.
- .2 Place bagged concrete to Section 03 37 26 and to details shown on drawings.
- 3.5 TIE ROD INSTALLATION .1 Install tie rods to indicated elevations.
- .2 Fabricate tie rod connections as indicated at piles and at anchor blocks.
- .3 Demolish concrete to Section 02 41 15 and as required to install tie rods, geotextile and granular fill. Capture demolished concrete and dispose off site.
- .4 Excavated to Section 31 23 11 and to details indicated to permit installation of tie rods.
- .5 Install tie rods to indicated details. Ensure tie rod connections are snug and tight prior to backfilling.
- .6 Backfill in accordance to Section 31 23 11.

PART 1 - GENERAL

- 1.1 REFERENCES .1 American Society for Testing and Materials International (ASTM):  
.1 ASTM A123/A123M-12, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.  
.2 ASTM A307-12 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- 1.2 SUBMITTALS .1 Product Data for each individual product.  
.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00.  
.2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00. Indicate VOC's content and composition for paint.
- 1.3 SHOP DRAWINGS .1 Submit shop drawings in accordance with Section 01 33 00.
- 1.4 WASTE MANAGEMENT AND DISPOSAL .1 Separate and recycle waste materials.  
.2 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- 1.5 MEASUREMENT PROCEDURES .1 Safety ladders will be measured by the each supplied and installed and shall include all labour, materials and equipment to fabricate and install.  
.2 Timber fenders will be measured by the each supplied and installed and shall include all labour, materials and equipment to fabricate and install.  
.3 Painting of new safety ladders is considered incidental and will not be measured separately for payment.
-

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Hollow structural sections to CSA-G40.20/G40.21, Grade 350W, Class H.
- .2 Plates, shapes, and bars: to CSA-G40.20/G40.21, Grade 350W.
- .3 Timber fender hardware:
  - .1 Galvanized anchor bolts, anchor coil bolts, nuts and washers to ASTM A307.
  - .2 Clip angles to CSA-G40.20/G40.21, Grade 350W.
- .4 Galvanizing: hot dipped galvanizing with minimum zinc coating of 610 g/m<sup>2</sup> to ASTM A123/A123M.
- .5 Timber: to National Lumber Grades Authority Standard Rules for Canadian Lumber effective December 1, 2010, species and grade category as follows:
  - .1 Species: S-F-F.
  - .2 Grade: No.2 or better.
  - .3 Materials to be new. 100% of lumber to be grade specified.
  - .4 Preservative treatment: to be in accordance with Section 06 05 73.
- .6 Painting of safety ladders: to Section 09 91 15.
- .7 Weld materials: to Section 05 12 35.

PART 3 - EXECUTION

3.1 FABRICATION

- .1 Do welding to Section 05 12 35.
  - .2 Complete fabrication to details indicated.
  - .3 Finish: Neatly finish portions of work. Finish members true to line, free from twists, bends, open joints, and sharp corners and edges. Grind all sharp edges smooth.
-

- 3.2 GALVANIZING .1 Galvanized the following timber fender components to ASTM A123/A123M:  
.1 Anchor bolts, nuts and washer.
- 3.3 PAINTING .1 Paint safety ladders to Section 09 91 15.
- 3.4 SAFETY LADDERS .1 Fabricate, paint and install ladders as specified and indicated.  
.1 Painting includes all related ladder components as well as clip angles and exposed coil bolt heads.  
.2 Install steel channel to details indicated.  
.3 Anchor ladders as indicated.
- 3.5 TIMBER FENDERS .1 Fabricate and install fender bracket attachments as detailed on drawings.  
.2 Construct and install timber fenders in locations and in manner shown.

Appendix A  
**DRAFT GEOTECHNICAL INVESTIGATION  
REPORT**  
**SERVICE DOCK AND GOVERNMENT WHARF  
LION'S HEAD HARBOUR, ONTARIO**

**REPORT REF. NO. 13-048  
26 APRIL 2013**

**Prepared For:**  
Riggs Engineering  
1240 Commissioners Road West, Suite 205  
London, ON N6K 1C7

**Prepared By:**  
Alston Associates Inc.  
Toronto

**Distribution:**  
Digital Copy - Riggs Engineering

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4 SITE AND SUBSURFACE CONDITIONS ..... 2

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<b>APPENDIX A</b>	LIMITATIONS OF REPORT
<b>APPENDIX B</b>	DRAWING NO. 1 - BOREHOLE LOCATIONS BOREHOLE LOG SHEETS (BOREHOLES BH1 TO BH3)
<b>APPENDIX C</b>	GEOTECHNICAL LABORATORY TEST RESULTS FIGURE 1 - GRAIN SIZE DISTRIBUTIONS (FILL MATERIAL) FIGURE 2 - GRAIN SIZE DISTRIBUTIONS (NATIVE SAND)

## 1 INTRODUCTION

Alston Associates Inc. (AAI) has been commissioned by Riggs Engineering Ltd. (acting on behalf of the Department of Fisheries and Oceans Canada) to carry out a geotechnical investigation along sections of the dock wall at Lion's Head Harbour, Ontario that are exhibiting significant signs of instability for which remedial reconstruction works are required. Authorization to proceed with this study was given by Brian Riggs of Riggs Engineering Ltd.

It is understood that Riggs Engineering proposes construction of a new soldier pile and lagging harbour front wall, supported by a new anchor assembly and a new concrete parapet and walkway deck.

The purpose of this study was to determine the subsurface conditions at the face of the dock walls and based on these data, to provide geotechnical design recommendations associated with the proposed dock wall remedial approach.

## 2 SITE DESCRIPTION

The site is located on the north west limb of Lion's Head Harbour. The section of dock wall which is the subject of this study measures approximately 90 m in length and comprises the lower half of the southwest-facing dock wall; encompassing the Service Dock and the western limb of Government Wharf.

It is understood that the Service Dock consists of a concrete parapet and asphalt deck supported by a timber sheet pile substructure, whilst the concrete parapet and deck of Government Wharf is supported by a timber crib wall. In each case, the timber substructures are in advanced stages of decay, resulting in the loss of fill, settlement of the supported paving surface and collapse of a section of crib wall.

Anecdotal information provided by the Town's Representative at the commencement of the fieldwork investigations indicated that the wharf was entirely constructed of rock fill material consistent with the exposed rock fill breakwater at the tip of the pier.

## 3 FIELDWORK & LABORATORY TESTING

The fieldwork for this study was carried out on 26 and 27 March 2013. This work involved advancing three sampled boreholes at the site; two put down on the water side of the existing dock wall, the third put down within the wharf, set back from the dock wall by about 7 m. Riggs Engineering determined the borehole locations which are shown on the Site Plan, Drawing No. 1.

The boreholes were advanced using rotary hollow stem auger techniques. The boreholes that were positioned over water (BH1 and BH2) were effected from a temporary platform extended out from the top of the dock wall. In addition, a sounding was advanced by the dynamic cone penetration test method from about 10 m below ground surface to a depth of about 24 m in Borehole BH2.

The fieldwork was supervised by an experienced representative from this office who directed the advancement of the drilling, sampling and in situ testing; observed groundwater conditions; and prepared field Borehole Log Sheets.

---

### 3.1 Soil Sampling and Testing

Standard penetration tests were carried out at frequent intervals of depth in the boreholes to take representative soil samples and to measure the penetration index values of the various soil strata. Soil samples obtained were identified in the field; a subsequent detailed examination was made in the laboratory for final geotechnical classification of soil types.

The dynamic cone test (DCPT) involves advancing a cone with an outside diameter of 50 mm into the ground using standard penetration test (DPSH) energy. The number of blows of the striking hammer required to drive the cone through successive 300 mm depth increments was recorded and these are presented on the logs as penetration index values.

---

### 3.2 Laboratory Testing

Laboratory classification tests consisting of water content determinations and grain size distributions have been carried out on representative soil samples. The test results are reported on the Borehole Log Sheets (Appendix B) and in the attached set of figures (Appendix C). These data have been used to compliment visual inspection of soil samples, in preparing soil descriptions.

---

## 4 SITE AND SUBSURFACE CONDITIONS

Full details of the subsurface conditions contacted in each of the boreholes are given on the Log Sheets for Boreholes BH1 to BH3. The following notes provide a commentary on the site conditions and the engineering properties of the soil and bedrock materials underlying the site.

The harbour bed sediments lie at depths ranging between approximately 4.8 and 5.5m below the top of the harbour wall; the depth to the surface of the bed sediments is greater in the westerly portion of the study area (BH2). The depth of the water at the time of the drilling works was measured at 2.8 m (BH1) and 3.2 m (BH2). Soil sampling indicates that the Harbour Sediments consist of sand and gravel fill overlying native sandy silt/silt and fine sand.

---

### 4.1 Sand and Gravel Fill

Fill material comprising grey, brown and black sand and gravel with trace to some silt was contacted to a depth of about 9 m below the top of the harbour wall in both boreholes. Standard penetration tests carried out in the bed sediment recorded N-values of ranging between 3 and 22 blows/300 mm indicating a loose to compact soil condition.

The water content of the bed sediment sand and gravel fill was found to range from about 8 and 52%, typically being less than 20%.

## 4.2 Native Silt and Sand

The native harbour bed sediments comprise grey sandy silt and silty fine sand and extend to a depth of at least 15.8 m below the top of the harbour wall. Standard penetration tests carried out in the bed sediment recorded N-values of ranging between 6 and 18 blows/300 mm indicating a loose to compact condition.

The full thickness of the native soils was not proven, but based on the results of the Dynamic Cone Penetration Testing (DCPT) performed at Borehole BH2, it is considered that native soil stratum is at least 15 m thick, extending to a depth of at least 24 m of below the top of the harbour wall.

The water content of the native silt and sand ranges between 16 and 28%.

## 5 DISCUSSION AND RECOMMENDATIONS

### 5.1 General

It is understood that consideration is being given to the installation of a soldier pile and lagging harbour front wall. New H-piles (soldier piles) would be installed in front of the existing stone filled timber crib wall (Government Wharf) or timber sheet pile wall (Service Dock), with reinforced concrete infill panels spanning between the soldier piles. The gap between the new sheet pile wall and the existing walls will be backfilled with suitably sized rock fill or clear stone. A new continuous reinforced concrete parapet would be constructed at the head of the sheet pipe wall. A new asphalt walkway will then be constructed to complete the remedial works. The H-piles would be advanced into the native silt and sand stratum to provide passive resistance to the lateral loads, though active resistance to lateral load will also be provided by placement of a new continuous rock berm on the existing lake bottom. The lateral loads experienced by the upper portion of the new wall would be supported by new tie rods anchored to anchor piles set back from the harbour front wall. However, the harbour is constructed using rock fill which resisted our efforts to advance Borehole BH3. It is unlikely to be possible to drive the anchor piles through this material and consideration should therefore be given to either excavating the rock fill material and driving piles beneath, or to adopting deadman anchorage.

### 5.2 Soil and Bedrock Properties

The design of the embedded portion of soldier piles and the embedded section of the toe pins supporting a sheet pile bulkhead should be made on the basis of the available passive pressure which will be sustained by the founding soil stratum. The following table summarizes the recommended parameters for the soil strata for preliminary design purposes.

Stratum	Unit Weight, $\gamma$ (kN/m <sup>3</sup> )	Internal Angle of Friction, $\Phi$ (degrees)	Modulus of Elasticity, $E_s$ (MPa)	Lateral Modulus of Subgrade Reaction, $k_s$ (kN/m <sup>3</sup> )	Coefficient of Passive Earth Pressure, $K_p$	Coefficient of Active Earth Pressure, $K_a$
Sand and Gravel Fill	19	28	10	50	2.77	0.36
Silt & Sand	18	32	10	50	3.25	0.31

An effective width of the resisting zone of the founding soil stratum is expected to be in the range two to three times the width of the pile or pin.

### 5.3 Existing Dock Wall

The constructed bulkhead wall will be required to support the loads which will be applied by fill material placed to reconstruct the access pathway above the failure zone and to support the lateral loads which would be applied by rockfill contained in the cribs assuming that the bolted connections in the cribs have no structural value.

### 5.4 Deadmen

The lateral loads carried by the tie rods could be transferred to a set of deadmen which are constructed outside the zone of influence of the retaining wall. Assuming that no lateral load is to be carried by the retaining wall, the deadman should be placed below a line which is struck upwards and outwards from a position on the soldier piles or toe-pins which lies below the elevation of the point of zero moment in the structural support. The upward and outward line would be drawn at an angle of 40° to the horizontal from the point of zero moment. The design of the deadman would be based on the coefficient of passive earth pressure ( $K_p$ ) of 4.6. The unit weight of the resisting soils should be taken to be about 20 kN/m<sup>3</sup>.

## 6 LIMITATIONS OF REPORT

The Limitations of Report, as quoted in Appendix 'A', are an integral part of this report.

**alston associates inc.**

Prepared by:

Ollie Owens, B.Sc. FGS

Reviewed by:

Vic Nersesian, P.Eng.

---

# APPENDIX A

---

## LIMITATIONS OF REPORT

The conclusions and recommendations in this report are based on information determined at the inspection locations. Soil and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the soil investigation.

The design recommendations given in this report are applicable only to the project described in the text, and then only if constructed substantially in accordance with details of alignment and elevations stated in the report. Since all details of the design may not be known to us, in our analysis certain assumptions had to be made as set out in this report. The actual conditions may, however, vary from those assumed, in which case changes and modifications may be required to our recommendations.

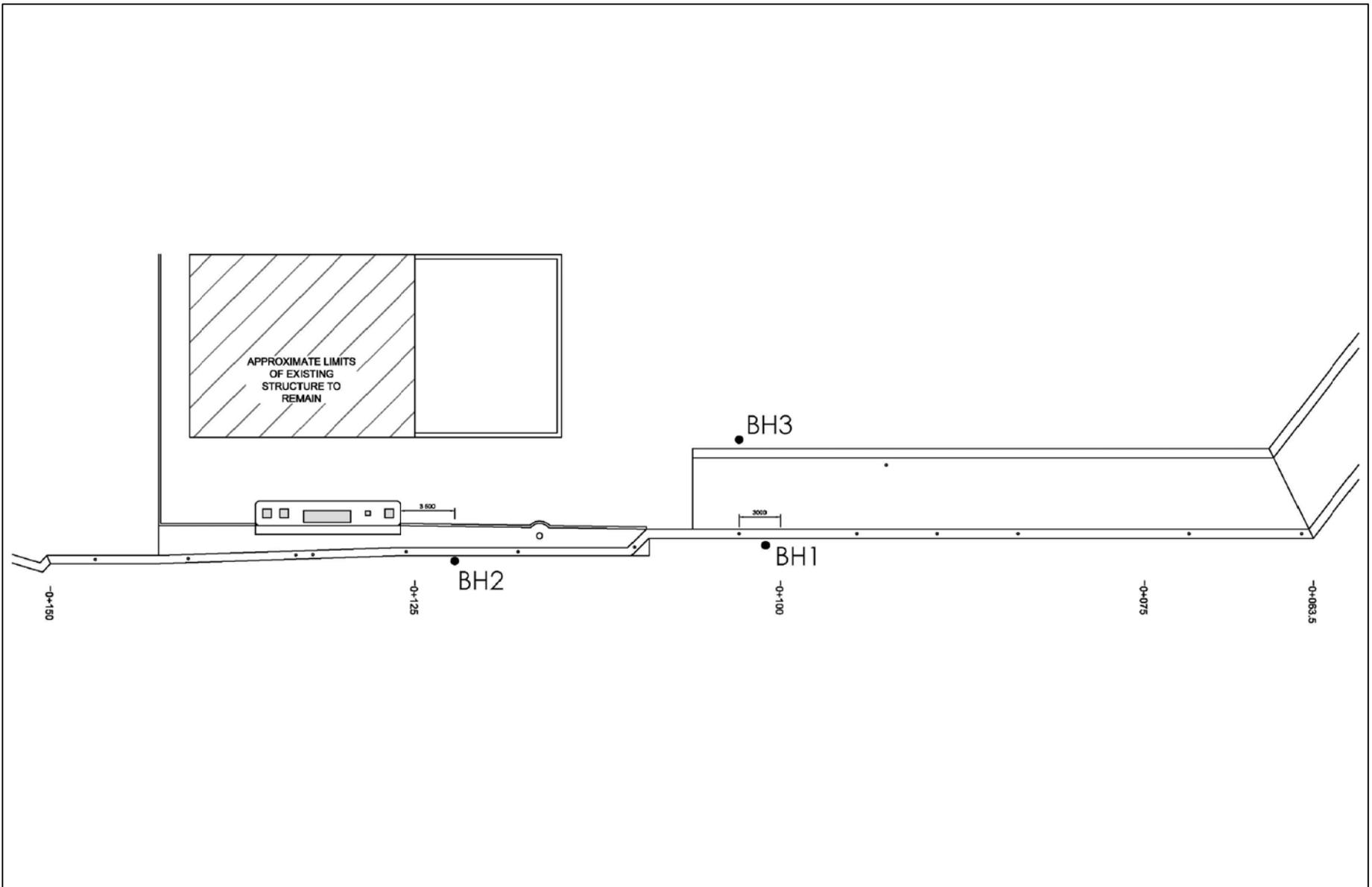
This report was prepared for Riggs Engineering on behalf of the Department of Fisheries and Oceans, Canada by Alston Associates Inc. The material in it reflects Alston Associates Inc. judgement in light of the information available to it at the time of preparation. Any use which a Third Party makes of this report, or any reliance on decisions which the Third Party may make based on it, are the sole responsibility of such Third Parties.

We recommend, therefore, that we be retained during the final design stage to review the design drawings and to verify that they are consistent with our recommendations or the assumptions made in our analysis. We recommend also that we be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the test holes. In cases where these recommendations are not followed, the company's responsibility is limited to accurately interpreting the conditions encountered at the test holes, only.

The comments given in this report on potential construction problems and possible methods are intended for the guidance of the design engineer, only. The number of inspection locations may not be sufficient to determine all the factors that may affect construction methods and costs. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work.

---

# APPENDIX B



Borehole Location Plan  
 Service Dock & Government Wharf  
 Lion's Head, ON

Drawing No. 1  
 Ref No. 13-048  
 April 2013



CLIENT: Riggs Engineering		METHOD: Augering and Split Spoon Sampling			<b>BH No.: 1</b>							
PROJECT: Service Dock and Government Wharf		PROJECT ENGINEER: OO	ELEV. (m)									
LOCATION: Lion's Head, ON		NORTHING:	EASTING:		PROJECT NO.: 13-048							
SAMPLE TYPE												
<input type="checkbox"/> AUGER		<input checked="" type="checkbox"/> DRIVEN		<input checked="" type="checkbox"/> CORING		<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	<input type="checkbox"/> SPLIT SPOON				
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT(N)	ELEVATION (m)
			N-Value (Blows/300mm)									
			40	80	120	160	20	40	60	80		
10												
10.5												
11			▲ 9				● 28				7	9
11.5												
12												
12.5			▲ 16				● 17				8	16
13												
13.5												
14			▲ 18				● 16				9	18
14.5												
15												
15.5			▲ 18				● 16				10	18
END OF BOREHOLE												

CLIENT: Riggs Engineering		METHOD: Augering and Split Spoon Sampling		<b>BH No.: 2</b>							
PROJECT: Service Dock and Government Wharf		PROJECT ENGINEER: OO	ELEV. (m)								
LOCATION: Lion's Head, ON		NORTHING:	EASTING:	PROJECT NO.: 13-048							
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON											
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)			SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT(N)	ELEVATION (m)
			40	80	120						
			N-Value (Blows/300mm)								
			20	40	60	80	▲	20	40	60	80
0											
0.5											
1											
1.5											
2											
2.5											
3											
3.5											
4											
4.5											
5											
5.5											
6			▲ 11				● 17			1	11
6.5			▲ 12				● 14			2	12
7			▲ 13				● 14			3	13
7.5			▲ 14				● 14			4	14
8			▲ 14				● 14			4	14
8.5			▲ 15				● 27			5	15
9											
9.5			▲ 6				● 20			6	6
alston associates inc. consulting engineers						LOGGED BY: NW	DRILLING DATE: 26 March 2013				
						REVIEWED BY: OO	Page 1 of 3				

CLIENT: Riggs Engineering		METHOD: Augering and Split Spoon Sampling		<b>BH No.: 2</b>								
PROJECT: Service Dock and Government Wharf		PROJECT ENGINEER: OO	ELEV. (m)									
LOCATION: Lion's Head, ON		NORTHING:	EASTING:	PROJECT NO.: 13-048								
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON												
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)	PL W.C. LL			SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT(N)	ELEVATION (m)
			N-Value (Blows/300mm)									
10			40 80 120 160	20	40	60	80	see bottom of previous page				
10.5			4								4	
11			9								9	
11.5			14								14	
12			22								22	
12.5			17								17	
13			40								40	
13.5			30								30	
14			20								20	
14.5			18								18	
15			24								24	
15.5			18								18	
16			24								24	
16.5			28								28	
17			17								17	
17.5			12								12	
18			14								14	
18.5			16								16	
19			11								11	
19.5			13								13	
			16								16	
			16								16	
			39								39	
			19								19	
			27								27	
			29								29	
			29								29	
			35								35	
			28								28	
			20								20	
			24								24	
			32								32	
			53									
alston associates inc. consulting engineers				LOGGED BY: NW		DRILLING DATE: 26 March 2013						
				REVIEWED BY: OO		Page 2 of 3						

Dynamic  
Cone  
Penetration  
Test

CLIENT: Riggs Engineering			METHOD: Augering and Split Spoon Sampling				<b>BH No.: 2</b>							
PROJECT: Service Dock and Government Wharf			PROJECT ENGINEER: OO		ELEV. (m)									
LOCATION: Lion's Head, ON			NORTHING:		EASTING:		PROJECT NO.: 13-048							
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON														
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)		PL W.C. LL				SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT(N)	ELEVATION (m)
			40	80	20	40	60	80						
			N-Value (Blows/300mm)											
			40	80	20	40	60	80						
20			40	80									53	
20.5			24	48									40	
21			29	58									24	
21.5			30	60									29	
22			46	92									30	
22.5			39	78									46	
23			44	88									39	
23.5			42	84									44	
24			30	60									42	
			36	72									30	
			26	52									36	
			22	44									26	
			26	52									22	
			28	56									26	
													28	
END OF BOREHOLE														

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consulting engineers

LOGGED BY: NW  
REVIEWED BY: OO

DRILLING DATE: 26 March 2013  
Page 3 of 3

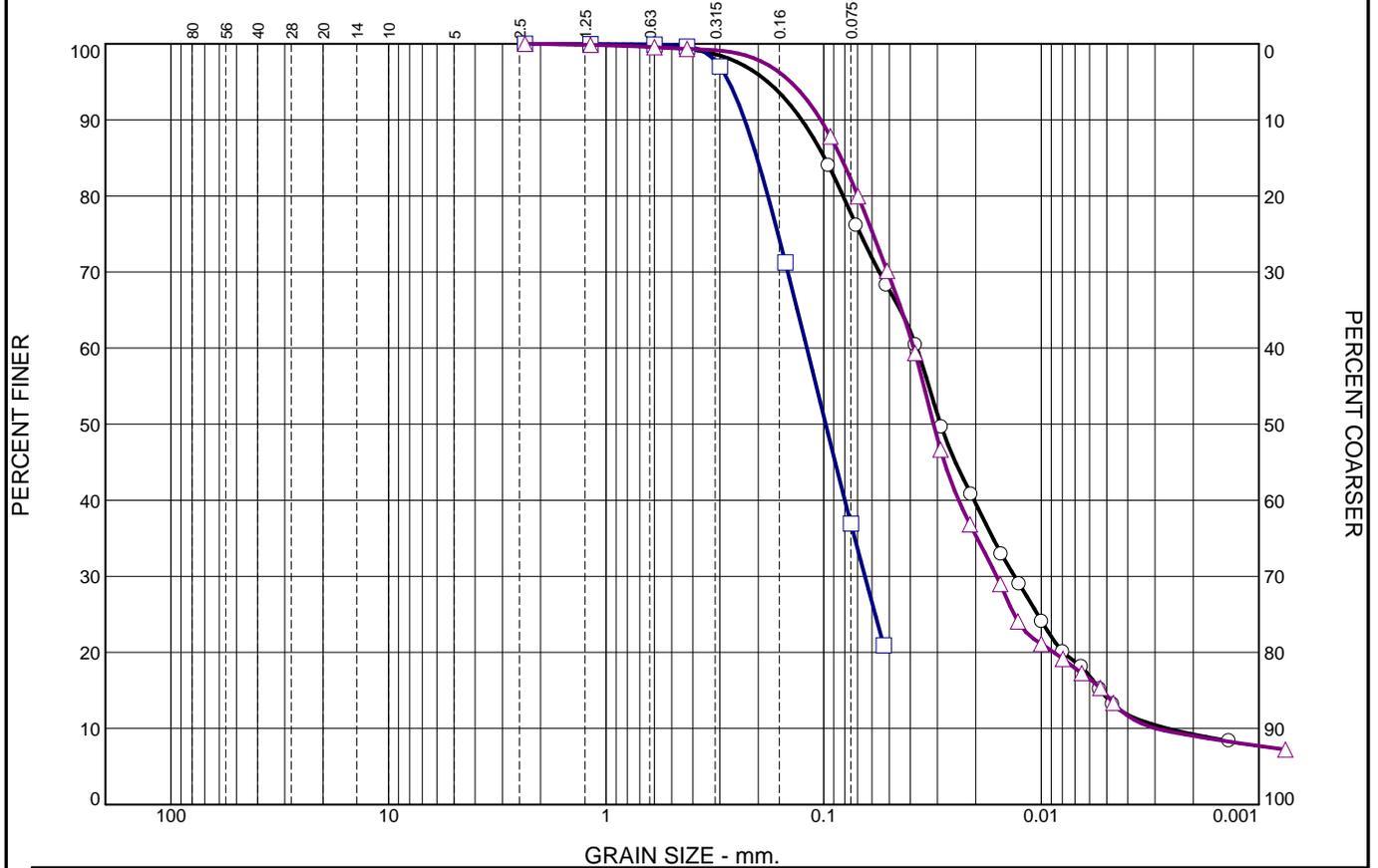
CLIENT: Riggs Engineering			METHOD: Augering and Split Spoon Sampling			<b>BH No.: 3</b>												
PROJECT: Service Dock and Government Wharf			PROJECT ENGINEER: OO		ELEV. (m)													
LOCATION: Lion's Head, ON			NORTHING:		EASTING:		PROJECT NO.: 13-048											
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON																		
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				N-Value (Blows/300mm)			PL	W.C.	LL	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT(N)	ELEVATION (m)
			40	80	120	160	20	40	60									
0													40 mm ASPHALTIC CONCRETE					
0.5			22						7				compact, dark abrown sand and gravel (FILL)		1	22		
		Borehole moved 3 m south, auger refusal at 0.76 m depth.	50/0										END OF BOREHOLE Refusal to advncement of augers at 0.76 m below ground surface.		2	50/0		
alston associates inc. consulting engineers										LOGGED BY: NW			DRILLING DATE: 27 March 2013					
										REVIEWED BY: OO			Page 1 of 1					

---

# APPENDIX C



# Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0	0	0	0	1	21	69	9		
□	0	0	0	0	0	63	37			
△	0	0	0	0	1	17	73	9		
×	LL	PL	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
○			0.0990	0.0373	0.0290	0.0133	0.0053	0.0026	1.79	14.18
□			0.2025	0.1195	0.0979	0.0647				
△			0.0831	0.0386	0.0313	0.0160	0.0052	0.0030	2.24	12.96

Material Description	USCS	AASHTO
○ SANDY SILT, trace clay □ SILT and fine SAND △ SILT, some fine sand, trace clay		

<b>Project No.</b> 13-048 <b>Client:</b> Riggs Engineering <b>Project:</b> Service Dock and Government Wharf  ○ <b>Sample Number:</b> BH 1, Sample 7 □ <b>Sample Number:</b> BH 1, Sample 9 △ <b>Sample Number:</b> BH 2, Sample 6	<b>Remarks:</b>   
---	-----------------------------

alston associates inc.  
consulting engineers

Figure 2

**Tested By:** ○ GL/NW   □ GL   △ AR      **Checked By:** JB