

PART 1 - GENERAL

<u>1.1 Related Sections</u>	.1	Section 01 35 44 Environmental Protection Procedures for Marine Work.
	.2	Section 01 74 21 Construction/Demolition Waste Management & Disposal.
	.3	Section 02 41 13 Site Work, Preparation and Removal.
	.4	Section 31 32 21 Geotextiles.
	.5	Section 35 31 24 Rock Protection.
<u>1.2 Description</u>	.1	Work under this section consists of all operations and materials related to excavation and backfilling.
<u>1.3 Measurement Procedures</u>	.1	Include excavation and backfilling costs in Construction/ Demolition item of Section 02 41 13 Site Work, Preparation and Removal.
	.2	Include all other backfilling costs in respective material sections.
<u>1.4 References</u>	.1	American Society for Testing and Materials International (ASTM)
	.1	ASTM C117-13, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
	.2	ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
	.3	ASTM D422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.
	.4	ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m ³).
	.5	ASTM D1557-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m ³).
	.6	ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
	.2	Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

1.5 Definitions

- .1 Unclassified excavation: excavation of deposits of whatever character encountered in work. This includes concrete foundations, rubble, wood debris and other obstructions encountered during excavation.
- .2 Waste material: excavated material unsuitable for use in work or surplus to requirements.
- .3 Unsuitable materials:
 - .1 Weak, chemically unstable, and compressible materials.
 - .2 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136:
 - .2 Sieve sizes to CAN/CGSB-8.2 Table:

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

1.6 Existing conditions

- .1 Existing surface features:
 - .1 Conduct, with Departmental Representative, condition survey of existing, service poles, wires, site features, asphalt pavement, concrete slab, survey bench marks and monuments which may be affected by work.
 - .2 Protect existing surface features from damage while work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
- .2 Buried services:
 - .1 Before commencing work establish location of buried services on and adjacent to site.

- .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
 - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .5 Prior to beginning excavation work, notify Departmental Representative and authorities having jurisdiction. Establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during work.
 - .6 Confirm locations of buried utilities by careful test excavations.
 - .7 Maintain and protect from damage, water, electric, telephone and other utilities and structures encountered.
 - .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing.
 - .9 Record location of maintained, re-routed and abandoned underground lines.
- .3 Existing buildings and surface features:
- .1 Conduct, with Departmental Representative, condition survey of existing structures, catch basins, drains, service poles, wires, survey bench marks and monuments which may be affected by work.
 - .2 Protect existing surface features from damage while work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
- 1.7 Submittals
- .1 Make submittals in accordance with Section 01 33 00 Submittal Procedures.
 - .2 Quality Control: in accordance with Section 01 45 00 Testing and Quality Control:
 - .1 Submit condition survey of existing conditions as described in article 1.6 Existing Conditions, of this Section.
 - .2 Submit to Departmental Representative a written

- notice when bottom of excavation is reached.
- .3 Submit to Departmental Representative testing inspection results and report as described in PART 3 of this Section.
- .3 Preconstruction Submittals:
- .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
 - .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, and location plan of relocated and abandoned services, as required.
- .4 Samples:
- .1 If requested by the Departmental Representative, submit samples of stockpiled excavated granular fill in accordance with Section 01 33 00 Submittal Procedures.
 - .2 Submit 70 kg samples of type of fill specified, including representative samples of excavated material, if requested by the Departmental Representative.
 - .3 Ship samples prepaid to Departmental Representative, in tightly closed containers to prevent contamination and exposure to elements.
- 1.8 Quality Assurance
- .1 Do not use backfill materials until written report of soil test results are reviewed by Departmental Representative.
 - .2 Health and Safety Requirements:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29 Health and Safety Requirements.
- 1.9 Waste Management and Disposal
- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 Construction/ Demolition Waste Management and Disposal.
 - .2 Divert excess materials from landfill to local quarry for reuse as directed by Departmental Representative.

PART 2 - PRODUCTS

2.1 Materials

- .1 Filter fabric: As specified under Section 31 32 21 Geotextiles.
- .2 Granular Fill: Granular Fill for use as backfilling is to be excavated materials salvaged and stockpiled on site, subject to approval of Departmental Representative.
- .3 Core Stone: As specified under Section 35 31 24 Rock Protection.
- .4 Filter Stone: As specified under Section 35 31 24 Rock Protection.
- .5 Trenching Materials:
 - .1 Bedding material for normal dry trench conditions: Crushed stone as specified under Section 32 11 23 Granular Base.
 - .2 Bedding material in wet trench (“drainage stone”): gradation as follows:

<u>ASTM Sieve size</u>	<u>% passing</u>
20.0 mm	100
14.0 mm	40 – 80
10.0 mm	20 – 62
5.0 mm	0 – 20
2.5 mm	0 – 10
0.08 mm	0 – 3

- .3 Common backfill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

PART 3 - EXECUTION

3.1 Site Preparation

- .1 Set out pertinent lines, grades and levels required for excavation and backfill work. Maintain accuracy of line and grade stakes during work.
- .2 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

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- .3 Excavate materials as indicated on plans and as required to complete the work.
- 3.2 Temporary Erosion and Sedimentation Control
- .1 If requested by the Departmental Representative, provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- 3.3 Preparation/Protection
- .1 Protect existing features in accordance with Section 01 10 10 General Instructions, and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative's approval.
- .4 Protect natural and man-made features required to remain undisturbed.
- .5 Protect buried services that are required to remain undisturbed.
- 3.4 Stockpiling
- .1 Salvaged materials are to be stockpiled on the site in locations approved by Departmental Representative.
- 3.5 Excavation
- .1 Excavate to lines, grades, elevations and dimensions as directed by Departmental Representative.
- .2 Keep excavated and stockpiled materials safe distance away from edge of excavation.

- .3 Restrict vehicle operations directly adjacent to open excavations.
 - .4 Dispose of surplus and unsuitable excavated material at an approved land based disposal site.
 - .5 Do not obstruct flow of surface drainage or natural watercourses.
 - .6 Notify Departmental Representative when bottom of excavation is reached.
 - .7 Obtain Departmental Representative's approval of completed excavation.
 - .8 Remove unsuitable material from bottom of excavation including those that extend below required elevations to extent and depth as directed by Departmental Representative.
 - .9 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
 - .10 Install filter fabric in accordance with Section 31 32 21 Geotextiles.
- 3.6 Fill Types and Compaction
- .1 Use types of fill as indicated or specified in related sections. Compaction densities are percentages of maximum densities obtained from ASTM D698.
- 3.7 Bedding and Surround of Underground Services
- .1 Place and compact granular material for bedding and surround of underground services as indicated.
 - .2 Place bedding and surround material in unfrozen condition.
- 3.8 Backfilling
- .1 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved of construction below finish grade.
 - .2 Areas to be backfilled to be free from debris, snow, ice,

water, and frozen ground.

- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Reinstatement of granular fill:
 - .1 Place granular fill materials using methods which do not lead to segregation or degradation of aggregate.
 - .2 Place material to full width in uniform lifts not exceeding 300 mm.
 - .3 Shape each layer to a smooth contour and compact to specified density before succeeding layer is placed.
 - .4 Remove and replace portion of a layer in which material becomes segregated during spreading.
 - .5 Compact to a density not less than 95% in accordance with ASTM D698, (Standard Proctor).
 - .6 Shape and roll alternately to obtain a smooth, even and uniformly compacted base.
 - .7 Apply water as necessary during compacting to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
 - .8 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.
 - .9 Finished surface of reinstalled granular fill shall be within plus or minus 10 mm of established grade, but not uniformly high or low.
 - .10 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .5 Backfilling around installations:
 - .1 Place bedding and surround material as specified in related sections.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
 - .3 Place layers simultaneously on both sides of installed work to equalize loading. Difference

not to exceed 600 mm.

- .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval is obtained from Departmental representative.
 - .2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental representative.

3.9 Restoration

- .1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .3 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

3.10 Quality Assurance
Inspection and
Testing

- .1 Testing of materials and compaction will be carried out by Testing Agency designated by Departmental Representative. Frequency of tests will be determined by Departmental Representative.
- .2 Departmental Representative will pay for services of testing laboratory.
- .3 Inspection and testing by the Soil Testing Agency and/or Departmental Representative will not augment or replace Contractor quality control nor relieve the Contractor of contractual responsibilities.

————— END OF SECTION —————

PART 1 - GENERAL

- 1.1 Related Sections .1 Section 31 23 10 Excavation and Backfill.
.2 Section 35 31 24 Rock Protection.
- 1.2 Description .1 This section specifies requirements for:
.1 The fabrication and installation of a debris and sediment containment curtain including its maintenance for the duration of work and removal.
.2 The supply and installation of synthetic non-woven filter fabric to be used in the reinstatement of the rock protection below the new marginal wharf.
- 1.3 Measurement Procedures .1 Debris and Sediment Containment Curtain (Debris Sediment/Curtain): The fabrication, installation and maintenance of the debris and sediment containment curtain for the duration of the work will be paid for as a lump sum, including the cost for the removal and disposal of the floating containment curtain upon completion of the work.
.2 Filter Fabric: The supply and installation of filter fabric will be measured as a lump sum item.
.3 Damaged material shall be replaced at no cost to the owner.
- 1.4 References .1 American Society for Testing and Materials International, (ASTM)
.1 ASTM D 4101-10, Standard Specification for Polypropylene Injection and Extrusion Materials.
.2 ASTM D 4491-99a(2009)e1, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
.3 ASTM D 4595-09, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
.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 (November 2004), Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
 - .2 CAN/CGSB-148.1, Methods of Testing. Geosynthetics.

- 1.5 Submittals
 - .1 Submit samples in accordance with Section 01 33 00 Submittal Procedures.
 - .2 Submit to the Departmental Representative the following samples at least 2 weeks prior to commencing work: manufacturer's specifications on the filter fabric and debris/sediment containment curtain proposed to be used.

- 1.6 Delivery, Storage and Handling
 - .1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

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

PART 2 - PRODUCTS

- 2.1 Materials
 - .1 Filter Fabric to be synthetic fiber and be rot proof, unaffected by action of oil or salt water and not subject to attack by marine life, insects, or rodents. Filter fabric to be of non-woven construction supplied in rolls of minimum 3.0 metres width.
 - .1 Filter fabric for the Floating Debris Containment Curtain to following properties:
 - .1 Mass(g/m²) 250 to 270
 - .2 Tear (N) 500
 - .3 Tensile Strength (N) 950
 - .4 Elongation at Break(%) 70-100
 - .5 Mullen Burst Strength (kPa) 2500
 - .6 Opening Size (um) 50 to 150

- .7 Permeability ($K \text{ cm s}^{-1}$) 2.7×10^{-1} .
- .2 Filter fabric for the reconstruction of the wharf structures to have the following properties:
 - .1 Mass (g/m^2) 380
 - .2 Tear (N) 500
 - .3 Tensile Strength (N) 1,200
 - .4 Elongation at Break (%) 50
 - .5 Opening Size (μm) 50 to 250
 - .6 Permeability ($K \text{ cm s}^{-1}$) 1.0 to 2.5×10^{-1} .
- .3 Contractor shall note that the material may become buoyant.
- .4 Seams: to be in accordance with manufacturer's recommendations.
- .5 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

PART 3 - EXECUTION

- 3.1 Debris and Sediment Containment Curtain Installation
 - .1 The debris and sediment containment curtain will be installed before the excavation, filter stone and core stone removal work begins and it will remain in place for the duration of the work.
 - .2 Remove and replace fabric damaged or deteriorated as directed by Departmental Representative.
 - .3 Any fabric damaged to be replaced at no additional cost.
 - .4 The floating debris containment curtain will not be removed until approved by the Departmental Representative.
- 3.2 Filter Fabric Installation
 - .1 Place geotextile material by unrolling in orientation, manner and locations indicated and retain in position with securing pins and washers, weights or other method as approved by Departmental representative.
 - .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
 - .3 Overlap each successive strip of geotextile minimum of

600 mm over previously laid strip.

- .4 Pin successive strips of geotextile with securing pins or fasteners as recommended by manufacturer.
- .5 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material.
- .6 After installation, cover with overlying layer within 4 hours of placement.
- .7 Replace damaged or deteriorated geotextile to approval of Departmental Representative.

3.3 Protection

- .1 Vehicular traffic is not permitted directly on geotextiles.

END OF SECTION

PART 1 - GENERAL

- 1.1 Related Sections .1 Section 31 62 19 Timber Piles.
- .2 Section 31 63 19 Rock Sockets for piles
- 1.2 Description .1 This section specified the general requirements for the materials, equipment and installation of the treated timber piles.
- 1.3 Measurement Procedures .1 There will be no measurement for payment under this section. Work included in this section will be included in pay items in Section 31 62 19 Timber Piles for treated timber bearing, batter and fender piles.
- 1.4 Submittals .1 Provide submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Submit the following to the Departmental Representative for review at a maximum of 7 days after notice of award of bid:
- .1 Details of installation methods and equipment.
 - .2 Details of grout mix for rock sockets.
 - .3 Sequence and details of grouting operation.
 - .4 Spacer details for positioning piles in rock sockets.
 - .5 Details of method used to hold piles in place at the specified tolerance while the grout cures.
 - .6 Details of method of pinning tips of fender piles into surface of bedrock.
- No piling work is to commence on site prior to review by the Departmental Representative.
- .3 Product Data: submit manufacturer's printed product literature, specifications and datasheet.
- .4 Sub-surface investigation report: when site conditions differ from those indicated by borehole logs supplied, submit written notification to Departmental Representative and await further instructions.

- .5 Submit schedule of planned sequence of pile installation to Departmental Representative for review, as specified.

- .6 Piling Records: the Contractor shall keep records of the installation of each pile and submit two signed copies of the record to the Departmental Representative not later than noon of the next working day after the pile was installed. The record shall give the following information in an approved format:
 - .1 Pile reference number.
 - .2 Date and time of installation.
 - .3 Pile type and size.
 - .4 Date of grouting.
 - .5 Position of pile in the works and rock level at pile position.
 - .6 Drilling rates and material encountered (rock sockets).
 - .7 Toe level.
 - .8 Depth and level of top of rock socket.
 - .9 Length and toe level of temporary casing.
 - .10 Length of timber pile.
 - .11 Grout mix.
 - .12 Volume of grout in pile socket (actual and theoretical).
 - .13 Details of obstructions, delays and other interruptions to sequence of work.
 - .14 Grouting pressure used, as applicable.
 - .15 Contours of bedrock inferred from drill hole logs.
 - .16 Any other data requested by the Departmental Representative.

On completion of all piling works, submit to the Departmental Representative two copies of record piling plan showing, as appropriate, the position, identity number, size, verticality, orientation and level of top and bottom of each pile installed.

1.5 Delivery,
Storage and Handling

- .1 Deliver, store and handle materials in accordance with manufacturer's instructions.

- .2 Protect piles from damage due to excessive bending

stresses, impact, abrasion or other causes during delivery, storage and handling.

- .3 Replace damaged piles as directed by Departmental Representative.

1.6 Existing Conditions

- .1 The Contractor must make his own evaluation of soil conditions.

1.7 Scheduling

- .1 Provide schedule of planned sequence of installation to Departmental Representative for review, not less than two weeks prior to commencement of pile placement.

PART 2 - PRODUCTS

2.1 Materials

- .1 Material requirements for piles are specified in Section 31 62 19 Timber Piles.
- .2 Supply full length piles as indicated and provide equipment to handle full length piles without cutting and splicing.
- .3 Spliced piles will not be permitted.
- .4 Material requirements for rock sockets, casings and grout are specified in Section 31 63 19 - Rock Sockets for piles.

PART 3 - EXECUTION

3.1 Preparation

- .1 Protection:
 - .1 Protect adjacent structures, services and work of other sections from hazards due to pile installation operations.
 - .2 Arrange sequencing of pile installation operations and methods to avoid damages to adjacent existing structures.
 - .3 When damages occur, remedy damaged items to restore to original or better condition at own expense.
- .2 Ensure that existing ground conditions at pile locations are adequate to support pile installation operation.

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- .1 Make provision for access and support of piling equipment during performance of work.
 - .2 Contractor to assess state of access structure(s) for load carrying capability.
- 3.2 Installation
- .1 Installation of each pile will be subject to review by Departmental Representative.
 - .1 Department Representative will be sole judge of acceptability of each pile with respect to final installation capacity, alignment and orientation.
- 3.3 Application
- .1 Cut off piles neatly and squarely at elevations as indicated on drawings.
 - .2 Remove cut-off lengths from site on completion of work.
- 3.4 Installation Tolerances
- .1 Piles to be within tolerances specified in section 31 62 19 Timber Piles.
- 3.5 Obstructions
- .1 Where obstruction is encountered that causes sudden unexpected change in specified tolerances, proceed as directed by Departmental Representative.
- 3.6 Repair and Restoration
- .1 Pull out rejected piles and replace with new piles.
 - .2 No extra compensation will be made for removing and replacing or other work made necessary through rejection of defective piles.

END OF SECTION

PART 1 - GENERAL

- 1.1 Related Sections
- .1 Section 05 50 00 Metal Fabrications.
 - .2 Section 06 30 00 Treated Dimension Timber.
 - .3 Section 31 61 13 Pile Foundations, General Requirements.
 - .4 Section 31 63 19 Rock Sockets for Piles.
- 1.2 Description
- .1 This section specifies the materials, preparation and installation of treated timber bearing, batter and fender piles.
- 1.3 Measurement Procedures
- .1 Treated Timber Bearing Piles – Supply: The supply of the treated timber bearing piles, meeting the contract specifications, will be measured in units (Unit) delivered to site, in lengths indicated on plans, to the approval of the Departmental Representative.
 - .2 Treated Timber Bearing Piles – Installation: The installation of the treated timber bearing piles will be measured by the unit (Unit) acceptably installed in the work to the approval of the Departmental Representative.
 - .3 Treated Timber Batter Piles – Supply: The supply of the treated timber batter piles, meeting the contract specifications, will be measured in units (Unit) delivered to site, in lengths indicated on plans, to the approval of the Departmental Representative.
 - .4 Treated Timber Batter Piles – Installation: The installation of the treated timber batter piles will be measured by the unit (Unit) acceptably installed in the work to the approval of the Departmental Representative.
 - .5 Treated Timber Fender Piles – Supply and Installation: The supply and installation of the treated timber fender piles will be measured by the unit (Unit) acceptably

installed in the work to the approval of the Departmental Representative.

- .6 Rock socketing required for the installation of the treated timber bearing and batter piles is to be included for payment under articles 1.3.2 and 1.3.4, respectively.
 - .1 Socket clean-out, sounding and pile setting to be incidental to work and will not be measured separately for payment.
 - .2 Spiders and spacers to be incidental to the work and will not be measured separately for payment.
 - .3 Sounding and diver inspection to be incidental to the work and will not be measured separately for payment.
- .7 Shoes, cap plates, straps, anchor dowels, cut-off and preservative treatment to be incidental to supply of piles and will not be measured separately for payment.
- .8 Mobilization of equipment to be incidental to supply of piles and will not be measured separately for payment.
- .9 Departmental Representative will establish actual number and lengths of piles installed from installation records.

1.4 References

- .1 Canadian Standards Association (CSA International)
 - .1 CAN3-O56 – M79 (R2012), Round Wood Piles (Metric version).
 - .2 CSA-O80 Series – 97(R2012), Wood Preservation.
 - .1 CSA-O80.18 – 97(2002), Pressure Treated Piles and Timbers in Marine Construction.

1.5 Action and Informational Submittals

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data: submit manufacturer's printed product literature, specifications and datasheet.

- .3 Equipment: Prior to pile installation, submit list and details of equipment for use in installation of piles for review by Departmental Representative.
 - .4 Quality assurance submittals:
 - .1 Certificates: submit certificates signed by manufacturer certifying that preservative treated timber piles comply with specified performance characteristics and physical properties.
- 1.6 Waste Management and Disposal
- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 Construction/Demolition Waste Management and Disposal.
 - .2 Do not dispose of preservative treated wood through incineration.
 - .3 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill as approved by Departmental Representative.
 - .4 Dispose of unused wood preservative material at official hazardous material collections site.
 - .5 Do not dispose of unused preservative material into sewer system, into streams, lakes, onto ground or in other location where they will pose health or environmental hazard.

PART 2 - PRODUCTS

- 2.1 Materials
- .1 Pile branding: brand treated piles to indicate producer, in accordance with AWPA M6.
 - .2 Round wood piles: to CAN3-O56, with minimum butt size of 300 mm and tip diameter related to length as indicated in table A-1 of CAN3-O56.
 - .1 Order length of piles as indicated.
 - .3 Type of peeling: Machine Turned.

	.4	Pile species: Douglas Fir, Southern Yellow Pine, Jack Pine, and Red Pine.
	.5	Piles to be one piece. Splices not permitted.
	.6	Departmental Representative will be the sole judge of quality and dimension of piles.
<u>2.2 Equipment</u>	.1	Pile hammer: select and use pile hammer of sufficient weight and energy to pin top of fender piles, without damage, into bedrock surface as indicated on plans.
<u>2.3 Preservative Treatment</u>	.1	Preservative Treatment: to CSA-O80.18.
<u>2.4 Pile Shoes</u>	.1	Fabricate point type of 6 mm steel plates, fully welded and sized to adequately cover full pointed area of pile. Provide each plate with 5 nail holes. Fabricate in accordance with Section 05 50 00 Metal Fabrications.
<u>2.5 Accessories</u>	.1	Reinforcing bars for timber pile anchor dowels to be supplied as per Section 03 20 00 Concrete Reinforcing.
PART 3 - EXECUTION		
<u>3.1 Manufacturer's Instructions</u>	.1	Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.
<u>3.2 Protection</u>	.1	Avoid dropping, bruising or breaking of wood fibres.
	.2	Avoid breaking surfaces of treated piles.
	.3	Do not damage surfaces of treated piles below cutoff elevation.
	.4	Treat cuts, breaks or abrasions on surfaces of treated piles, bolt holes and field cuts in accordance with CSA-O80 Series.
<u>3.3 Wood Preservation</u>	.1	Treat wood piles with wood preservative treatment as specified.

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- 3.4 Preparation
- .1 Select piles in each bent for uniformity of size and straightness to facilitate placing of brace timbers.
 - .2 Protect fender pile heads during driving and hold in position by using a combination cushion-driving head and pilot. Closely fit driving heads to top of pile, and extend down sides of pile for at least 75 mm. Where necessary, protect pile heads by means of heavy steel straps of wrought iron rings.
 - .3 Equip fender piles with metal shoes.
- 3.5 Installation
- .1 Install piles in accordance with Section 31 61 13 Pile Foundations, General Requirements.
 - .2 Restrain lateral movement of fender piling, during driving.
 - .3 Cut off fender piles giving a bevel of 4H:1V.
 - .4 Treat exposed ends of cut off piles with two liberally brushed coats of CCA Preservative allowing sufficient interval between applications to permit total absorption.
 - .5 Environmental Concern: ensure no spillage or excess application of field preservative. Provide workmen with sufficient training and protective gear to properly and safely handle the treated materials and to apply field treatment, so as to prevent undue hazard to themselves, others, or the environment.
- 3.6 Bracing
- .1 Install bracing as indicated in Section 06 30 00 Treated Dimension Timber.
- 3.7 Timber Pile Anchor Dowels
- .1 Install reinforcing bars (2 per pile) through the tops of all bearing and batter piles as indicated.
 - .2 Reinforcing bars to be driven through predrilled holes of same diameter as the bars.
- 3.8 Application/Driving – Fender Piles
- .1 Place cap and cushion block combination capable of protecting pile head between top of pile and ram to

prevent impact damage to pile.

- .2 Replace block if it is damaged, split, highly compressed, charred or burned or has become spongy or deteriorated, with a new block.
- .3 Block helmet: uniformly transmit energy to pile and minimum loss of energy.

3.9 Pre-Augering

- .1 Pre-augering, or drilling socket into bedrock surface to pin bottom of fender piles in place is an acceptable alternate to driving, subject to approval of procedure and method by Departmental Representative.

3.10 Tolerances in Installation

- .1 Variation of not more than 6 mm per 300 foot of pile length from vertical for plumb piles or more than 13 mm per 300 mm per foot of pile length from required angle for batter piles permitted.
- .2 Center of butts: within 50 mm of location indicated.
- .3 Manipulation of piles will not be permitted.
- .4 In addition to complying with tolerances stated above, clear distance between pile heads and pile cap edges to be a minimum of 125 mm.
- .5 Provide additional reinforcement and concrete to maintain required minimum clear distance with prior approval of Departmental Representative.
- .6 Redesign of pile caps or additional work required due to improper location of piles is responsibility of Contractor as reviewed by Departmental Representative.
- .7 Redrive heaved piles to required tip elevation.
- .8 Remove and replace damaged piles, mislocated piles, driven out of alignment piles and provide additional piles, driven as directed.

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

END OF SECTION

PART 1 - GENERAL

- 1.1 Related Sections
- .1 Section 03 37 26 Underwater Placed Concrete.
 - .2 Section 31 61 13 Pile Foundations, General Requirements.
 - .3 Section 31 62 19 Timber Piles.
- 1.2 Description
- .1 This section specifies the requirements for the drilling, clean-out, preparation and grouting of the rock sockets for the installation of the treated timber bearing and batter piles.
- 1.3 References
- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A 252-98 (2007), Standard Specification for Welded and Seamless Steel Pipe Piles.
 - .2 Canadian Standards Association (CSA International)
 - .1 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
 - .2 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding).
 - .3 CSA-G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.
- 1.4 Payment Procedures
- .1 There will be no measurement for payment under this section. Work under this section will be included in pay items in Section 31 62 19 Timber Piles for treated timber bearing and batter piles.
- 1.5 Submittals
- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Product data: submit manufacturer's printed product literature, specifications and datasheet.
 - .3 Shop Drawings:
 - .1 Indicate methods of construction and

- operational sequence.
- .2 Submit each drawing complete with signature and stamp of qualified professional engineer registered or licensed in province of New Brunswick, Canada.
 - .4 Quality assurance submittals:
 - .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 for review to Departmental Representative three copies of piling records as described in Section 31 61 13 - Pile Foundations, General Requirements.
 - .4 Equipment lists: submit to Departmental Representative, list of equipment for installation of rock sockets before beginning work.
 - .1 Provide details sufficient to evaluate performance of equipment.
 - .2 Include details of equipment for excavating, drilling, cleaning out pipe sleeves and rock sockets, installation of timber piles and grouting of sockets.
- 1.6 Waste Management and Disposal
- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
 - .2 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- PART 2 - PRODUCTS
- 2.1 Materials
- .1 Grout: Underwater placed concrete in accordance with Section 03 37 26 - Underwater Placed Concrete.
 - .2 Materials for temporary casing: pipe sections to ASTM

A 252, Grade 2.

- .3 Additional materials, including spiders, spacers and anchor dowels installation guides: as reviewed by Departmental Representative.

PART 3 - EXECUTION

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

- 3.2 Installation/Sockets
 - .1 Secure equipment in position during drilling. Use template to position pipe casing for drilling sockets.
 - .2 After pipe casing is driven to and seated in bedrock, remove overburden inside casing down to top of rock.
 - .3 Drill sockets into sound bedrock to depth as indicated.
 - .4 Departmental Representative to determine elevation of top of sound rock.
 - .5 Drill socket to minimum depth as indicated.
 - .6 After drilling is completed, clean out socket.
 - .7 Clean out material adhering to inside surface of casing and rock socket by high pressure water jets or airlifts.
 - .8 After socket has been cleaned out and inspected, allow to stand for 24 h and inspect again for intrusion of material. Repeat clearing out and injection process as deemed necessary by the Departmental Representative.
 - .9 Temporary Casing:
 - .1 Temporary casing shall be lowered at the same time as the hole is drilled. The embedded depth of temporary casing below the founding level (casing embedment depth) shall be 500 mm minimum or such other depths as required to avoid caving of soil at the interface of soil and

- .2 Temporary casing shall be free from distortion, internal projections and hardened grout.
- .3 The minimum clearance (cover) between the casing and the timber pile shall be 75 mm. The Contractor shall submit his proposed spacer details to the Departmental Representative for review.
- .4 Extraction of the temporary casing shall only be carried out after the completion of grouting.
- .5 If the temporary casing cannot be extracted for whatever reasons, pressure grouting shall be carried out at the peripheral of the temporary casing to fill up gaps between the pile and surrounding soils. The Contractor shall submit his proposed method of pressure grouting to the Departmental Representative for review.

3.3 Welding

- .1 Weld in accordance with CSA W59.
- .2 Welding certification of companies in accordance with CSA W47.1.

3.4 Grouting

- .1 Grout in accordance with manufacturer's instructions and procedures.
- .2 Grout in drilled socket up to elevation as indicated, as soon as possible after installing timber pile.
- .3 Use grout mix that has been demonstrated to produce 35 MPa strength at temperature prevailing in rock socket at time of installation.
 - .1 Grout mix and grouting procedures to be to approval of the Departmental Representative.
 - .2 Water for grout shall be clean fresh water having a temperature not exceeding 30°C nor less than 5°C.
- .4 Hold timber pile securely in position so that it does not move during grouting and until grout has attained specified strength.
- .5 Place grout in one continuous operation to fill socket

up to specified level.

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| <u>3.5 Underwater Concrete Filling of Rock Sockets</u> | .1 | Encasement of pile in rock socket using 35 MPa concrete in accordance with Section 03 37 26 - Underwater Placed Concrete is an acceptable alternate method to pressure grouting. |
| | .2 | Procedures to be as approved by Departmental Representative. |
| <u>3.6 Temporary Casing Removal</u> | .1 | Remove temporary casing down to top of harbour bottom (top of grout). |
| <u>3.7 Field quality control</u> | .1 | Site tests and inspection:
.1 Provide method and equipment for inspection of each socket to ensure that sockets are properly cleaned out.
.2 Co-operate with and assist Departmental Representative to inspect each pile and socket. |

————— END OF SECTION —————