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PART 1 - GENERAL

- 1.1 Related Work
- .1 Refer to other Specification Sections for related information.
  - .2 Refer to Section 01 33 00 for Shop Drawing/Submission requirements.
- 1.2 Source Approval
- .1 Source of materials to be incorporated into work or stockpiled requires acceptance.
  - .2 Inform *Departmental Representative* of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.
  - .3 If, in opinion of *Departmental Representative*, materials from the proposed source do not meet, or cannot reasonably be processed to meet specified requirements, procure an alternative source to demonstrate that materials from source in question can be processed to meet specified requirements.
  - .4 Should a change of material source be proposed during work, advise *Departmental Representative* 4 weeks in advance of proposed change to allow sampling and testing.
  - .5 Acceptance of material at source does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.
- 1.3 Production Sampling
- .1 Aggregate will be subject to continual sampling during production.
  - .2 Provide *Departmental Representative* with ready access to source and processed material for purpose of sampling and testing.
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- 1.4 Measurement for Payment .1 This item will not be measured separately.

PART 2 - PRODUCTS

- 2.1 Materials .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material or other deleterious substances.
- .2 Flat and elongated particles are those whose greatest dimension exceeds four times their least dimension.
- .3 Fine aggregates satisfying requirements of applicable section shall be one, or a blend of following:
- .1 Natural sand
  - .2 Manufactured sand
  - .3 Screening produced in crushing of quarried rock, boulders, gravel or slag
  - .4 Coarse aggregates satisfying requirements of applicable section shall be one of following:
    - .1 Crushed rock or slag
    - .2 Gravel composed of naturally formed particles of stone.

PART 3 - EXECUTION

- 3.1 Development of Aggregate Source .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as directed by the *Departmental Representative*.
- .2 Clear, grub and strip an area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
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- .3 When operating in stratified deposits use excavation equipment and methods that will produce a uniform, homogeneous aggregate.
- .4 When excavation is completed, provide drains or ditches as required to prevent surface standing water.
- .5 Trim off and dress slopes of waste material piles and leave site in a neat condition.
- 3.2 Processing
- .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
- .2 Blend aggregate if required to obtain gradation requirements specified. Use approved methods and equipment.
- .3 Blending to increase percentage of crushed particles or decrease percentage of flat and elongated particles is permitted.
- .4 Wash aggregates if required to meet specifications. Use only equipment accepted by *Departmental Representative*.
- 3.3 Handling
- .1 Handle and transport aggregates to avoid segregation, contamination and degradation.
- 3.4 Stockpiling
- .1 Stockpiling aggregates on stabilized, clean and well drained surfaces.
- .2 To ensure that no material other than stockpiled aggregate is used, do not incorporate bottom 250 mm of stockpile into work, if aggregates are stockpiled on ground.
- .3 Stockpile far enough apart to prevent intermixing.
- .4 Reject intermixed or contaminated materials. Remove and dispose of rejected materials as directed within 48 hours of rejection.
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- .5 Stockpile materials in uniform layers of thickness as follows:
    - .1 Max 1 m for coarse aggregate and base course materials.
    - .2 Max 2 m for fine aggregate and subbase materials.
    - .3 Max 1.5 m for other materials.
  - .6 Complete each layer over entire stockpile area before beginning next layer.
  - .7 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
  - .8 Coning of piles or spilling of material over edges of pile will not be permitted.
  - .9 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.
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PART 1 - GENERAL

- 1.1 Related Work
- .1 Refer to other Specifications Sections for related information.
  - .2 Refer to Section 01 33 00 for Shop Drawing/Submissions requirements.
- 1.2 References
- .1 ASTM A252-10 (or latest edition), Specification for Welded and Seamless Steel Pipe Piles.
  - .2 ASTM A307-14 (or latest edition), Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
  - .3 ASTM A325M-14 (or latest edition), Specification for High-Strength Bolts for Structural Steel Joints.
  - .4 ASTM A490M-14A (or latest edition), Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints.
  - .5 CAN/CSA-G40.20-13 (or latest edition), General Requirements for Rolled or Welded Structural Quality Steel.
  - .6 CAN/CSA-G40.21-13 (or latest edition), Structural Quality Steels.
  - .7 CAN/CSA-S16.14 (or latest edition), Limit States Design of Steel Structures.
  - .8 CSA W47.1-09 (R2014 or latest edition), Certification of Companies for Fusion Welding of Steel Structures.
  - .9 CSA W47.1S1-M1989, Supplement No. 1-M1989 to W47.1-1983.
  - .10 CSA W48.1-M1991 (or latest edition), Carbon Steel Covered Electrodes for Shielded Metal Arc Welding.
  - .11 CSA W59-13 (or latest edition), Welded Steel Construction (Metal Arc Welding).
  - .12 CSA W59S1-M1989, Supplement No. 1-M1989, Steel Fixed Offshore Structures, to W59-M1989.
  - .13 CGSB 1-GP-171M-79 (or latest edition), Coating, Inorganic Zinc.
  - .14 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
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- 1.3 Shop Drawings .1 Submit shop drawings in accordance with Section 01 33 00 - Submissions/Shop Drawings.
- .2 Indicate the following items:
- .1 Material
  - .2 Anchorage, field control and alignment methods
  - .3 Design parameters
  - .4 Tolerance for driving pile
  - .5 Removable members
  - .6 Alternatives
- 1.4 Design Criteria .1 Design templates to safely withstand following loads:
- .1 All gravity loads to which template shall be subjected.
  - .2 Lateral loads to firmly hold pile in position when driving.
- 1.5 Protection .1 Protect templates from damage. Repair damage to templates, formwork or concrete arising from operations to satisfaction of *Departmental Representative* at no extra cost.
- 1.6 Measurement for Payment .1 No measurement will be made under this section. Include costs in items of work that require templates.

PART 2 - PRODUCTS

- 2.1 Materials .1 Steel sections and plates: to CAN/CSA-G40.20 and CAN/CSA-G40.21, Type 350 W.
- .2 Welding Materials: to CSA W59.
- .3 Bolts, nuts and washers: to ASTM A307 or ASTM A325M.
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PART 3 - EXECUTION

- 3.1 Fabrication
- .1 Fabricate structural steel for templates in accordance with CAN/CSA-S16.1 and reviewed shop drawings.
  - .2 Welding in accordance with CSA W59.
  - .3 Welding companies shall be qualified under provisions of CSA W47.1.
- 3.2 Positioning
- .1 Position and hold template in location to receive piles with an accuracy which will ensure piles are within tolerances specified.
  - .2 Before driving batter piles set templates to within 10 mm of elevations indicated on shop drawings.
- 3.3 Placing Batter Piles
- .1 Remove members in templates as necessary to place batter piles. Replace members prior to placing other batter piles or driving of batter piles. Indicate members to be removed for this operation on shop drawings. Mark them "Removable".
- 3.4 Removal of Templates
- .1 Avoid any damage to piling when removing templates.
  - .2 When instructed by *Departmental Representative* move templates from project site.
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PART 1 - GENERAL

- 1.1 Description of Work This Section includes but is not limited to the following:
- .1 All normal removals as required to complete the work. The contractor shall be held to have visited the site and to have become familiar with the existing conditions prior to submitting tender. All available plans of the existing structure are available for viewing at the Project Manager's office, 2nd floor, 1713 Bedford Row, Halifax, N.S. Drawings are depiction of the structure only and should not be considered an as-built drawing. The composition and condition of the existing structure may vary.
  - .2 Any derricks, gas lines or buildings to be removed by others unless otherwise indicated.
  - .3 All site preparation required to complete the work.
- 1.2 Related Work
- .1 Refer to other specification sections for related information.
  - .2 Refer to Section 01 33 00 for Shop Drawing/Submission requirements.
- 1.3 Submissions
- .1 Methodology:
    - .1 When requested provide methodology for carrying out the work
  - .2 Provide submission in accordance with Section 01 33 00.
- 1.4 Protection
- .1 Prevent movement, settlement or damage of adjacent structures. Provided bracing and shoring as required. In event of damage, immediately replace such items or make repairs to approval of *Departmental Representative* and at no additional cost to *Departmental Representative*.
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- .2 Prevent debris from going adrift and becoming a menace to navigation.
- .3 All damage to existing structures, roadways, pipelines, electrical systems not specified for removal to be repaired at the Contractor's cost to the satisfaction of the *Departmental Representative*.
- 1.5 Measurement for Payment
- .1 Sitework, demolition and removals will be measured in accordance with Section 01 29 00.
- PART 2 - PRODUCTS Not applicable.
- PART 3 - EXECUTION
- 3.1 Preparation
- .1 Inspect site and verify with *Departmental Representative* items designated for removal and items to be preserved.
- .2 Locate and protect utility lines. Preserve in operating condition active utilities traversing site.
- .3 Provide temporary power and lighting as shown on the plan or as required by the *Departmental Representative*.
- .4 Existing fill and vent pipes, oil waste tanks and underground storage tanks to be protected from any damages. All repairs to damages as a result of Contractor's operations to be at his cost and to the satisfaction of the *Departmental Representative*.
- 3.2 Removal
- .1 Remove items indicated.
- .2 Do not disturb adjacent structures designated to remain in place.
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- .3 At end of each day's work, leave work in safe condition so no part is in danger of toppling or falling.
- 3.3 Disposal of Material
- .1 Disposal of materials not designated for salvage or re-use in work, will be the contractor's responsibility, and must be disposed of off-site. Existing rock ballast shall not be used within new work.
- .2 The material to be disposed is to be transported and disposed of in an environmentally acceptable manner to the satisfaction of the *Departmental Representative*, and in accordance with any local, Municipal, Provincial and Federal restrictions and regulations.
- 3.4 Restoration
- .1 Upon completion of work, remove debris, trim surfaces and leave work site clean.
- .2 Reinstate areas and existing works outside areas of demolition to conditions that existed prior to commencement of work. Match condition of adjacent, undisturbed areas.
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PART 1 - GENERAL

- 1.1 Related Work .1 Refer to other Specification Sections for related information.
- .2 Refer to Section 01 33 00 for Shop Drawing/Submission requirements.
- 1.2 Reference Standards .1 ASTM C127-15 (or latest edition) Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.
- .2 AASHTO T85-14 (or latest edition) Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate.
- 1.3 Submissions .1 Product Data/Samples:  
.1 Provide samples of materials proposed for the work.
- .2 Methodology:  
.1 Provide methodology for carrying out the work.
- .3 Provide submissions in accordance with Section 01 33 00.
- 1.4 Measurement for Payment .1 Rock mattress will be measured in accordance with Section 01 29 00.
- .2 Rip Rap will be measured in accordance with Section 01 29 00.
- .3 Prices will include the entire cost of supplying and placing the material in the work, rough grading as necessary, the levelling and finish grading of the crib seat mattress, taking soundings, diving inspections, all as shown on the drawings, and as specified.
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PART 2 - PRODUCTS

- 2.1 Materials
- .1 Hard durable crushed quarried rock, free from silt, clay, organic matter and other foreign substances and free from splits, seams or defects likely to impair its soundness during handling or under action of water.
  - .2 Specific gravity of not less than 2.65 when tested to ASTM C127 or AASHTO T85.
  - .3 Mattress material will be 50 - 150 mm angular crusher run rock or screened semi-angular quarry run rock, free from fines. Top surfaces may be smaller, subject to approval of *Departmental Representative*, to facilitate levelling.
  - .4 Rip Rap will be sized as shown on drawings and will be free of seams that would affect its durability.

PART 3 - EXECUTION

- 3.1 Preparation
- .1 Dredge and remove existing material in accordance with Section 35 20 23 in the area where crushed rock mattress is to be placed.
  - .2 Sound area and record elevation of material on which mattress will be placed before placing mattress material and/or rip rap.
- 3.2 Placement
- .1 Do not place rock fill or mattress material until bottom area has been accepted by *Departmental Representative*.
  - .2 Place mattress material to avoid segregation of material sizes. Do not drop material through water.
  - .3 Do not place material under poor weather conditions. Place immediately prior to planned placement of timber cribs.
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- .4 Level top surface of mattress to specified grade. Use a sweep beam suspended from a barge as a screed to level surface of each mattress layer. Other methods of levelling may be employed subject to acceptance by *Departmental Representative*.
- 3.3 Tolerances
- .1 Surface of bearing layer to be within 50 mm of elevation indicated and variation in elevation over whole area of bearing layer not to exceed 75 mm.
- .3 Surface of riprap layer to be within 50mm of elevation indicated and variation in elevation over the whole area of riprap layer not to exceed 75mm. Elevations shall not be uniformly high or low.
- .2 Other layers to be within 100 mm of lines shown.
- 3.4 Protection
- .1 Take into account anticipated weather conditions and degree of exposure of site in setting requirements for protection.
- .2 Schedule and carry out construction so that each phase of work is not left exposed longer than necessary.
- .3 The Contractor should note that the work site is subject to water level variations due to tidal action.
- .4 The Contractor will be responsible to replace any mattress lost due to storms, tidal erosion or by his own activities.
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PART 1 - GENERAL

- 1.1 Related Work
- .1 Refer to other Specification Sections for related information on aggregates, mattress, and miscellaneous items.
  - .2 Refer to Section 01 33 00 for Shop Drawing/Submissions requirements.
- 1.2 Reference Standards
- .1 CAN/CSA-080-08 (R2012 or latest edition)- Wood Preservation (including CSA preliminary standard 080.31-M1989).
  - .2 AWWA P7-85 (or latest edition), Creosote for Brush or Spray Treatment for Field Cuts (American Wood Preservers Association).
  - .3 NLGA standard grading rules for Canadian Lumber 1980 edition or most recent edition at time of tendering.
  - .4 CAN/CSA-G164-M92 (or latest edition) - Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .5 ASTM A307-14 (or latest edition), Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
  - .6 ASTM B111-1974 (or latest edition), Wire Nails, Spikes and Staples
  - .7 ASTM A123-15, Standard Specification for Zinc (Hot Dip Galvanized) Coatings in Iron and Steel Products.
- 1.3 Submissions
- .1 At least two weeks prior to finalizing timber order, submit drawings, clearly indicating assembly of timber pieces for construction of cribwork wharf. Show splice locations, splice details, fastening arrangements.
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- .2 Submit detailed methodology for field treatment, crib building, launching, setting and ballasting.
  - .3 Provide submissions, in accordance with Section 01 33 00.
- 1.4 Measurement for Payment
- .1 Timber cribwork will be measured in accordance with Section 01 29 00.

PART 2 - PRODUCTS

- 2.1 Materials
- .1 Timber: Graded and stamped to National Lumber Grading Authority (NLGA) No. 1 Structural. Eastern Hemlock, Western Hemlock or Douglas Fir Species, only, will be used.
  - .2 Timber Treatment:
    - .1 Preservative treatment to CAN/CSA-080 Series - M89 for Marine Construction Coastal Waters. Where assay retentions are not indicated, they are to be taken as 1.5 times the indicated gauge retention. Use one type and color of treatment throughout unless otherwise indicated.
    - .2 Make arrangements for timber testing by:
      - .1 Plant Inspection: Provide treatment plant identification, date of treatment, list of various pieces in the charge, charge number, plant assay testing results, concentration and type of preservative used, duration of treatment, gauge retention, species of wood; and make arrangements with the treatment plant to locate bundles, move bundles, break open bundles and carry out other measures to facilitate the inspection.
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- .2 Field Inspection: Providing same information as above and facilitating the inspection in the field.
  - .3 Filling in and submitting a preprinted form, agreed to by the *Departmental Representative*, containing the above information.
  - .3 The *Departmental Representative* may test in the plant or in the field or may choose to not test some charges at either the plant or the field.
  - .4 Timber will be protected during handling, shipping, offloading and field handling, by use of suitable equipment and procedures. Use rope or fabric strap slings on site for moving bundles or individual timbers, rather than metal grabs, chains or cables.
  - .3 Miscellaneous Hardware  
Hardware must meet the following specifications:
    - .1 Machine bolts, lag bolts, drift bolts, anchor bolts, nuts, round plate washers: to ASTM A307.
    - .2 Spikes: to CSA B111.
    - .3 Hot dip galvanized hardware, bolts, nuts, washers and spikes to CSA G164, with minimum zinc coating of 600 g/m<sup>2</sup>,.
    - .4 All hardware will be galvanized unless otherwise shown on plans.
  - .4 Ballast Stone:  
Minimum specific gravity of 2.65. Supply hard durable stone containing no organic material, silt, clay or foreign substances. Ballast stone to be graded with maximum sizes not exceeding 400 mm on any side and minimum size not less than 250mm.
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PART 3 - EXECUTION

- 3.1 Crib Construction
- .1 Timber supplied to be precut to required length, per reviewed drawings prior to preservative treatment.
  - .2 Boreholes for drift bolts to be 1.5mm smaller in diameter than bolt and for full length of bolt. Boreholes for machine bolts to be same diameter as bolts. Boreholes for lag bolts to be same diameter as shank for unthreaded portion and 0.70 times the shank diameter for the threaded portion. Threaded portion of lag bolts will be installed using a wrench, not by driving.
  - .3 Construct timber cribwork to height indicated in crib building methodology, prior to placing in work.
  - .4 Bottom timbers: Secure three courses of bottom timbers together with machine bolts at every intersection with each other and vertical posts. Splice locations shown on plans.
  - .5 Splices: Provide at locations and per details shown on plans or reviewed drawings, if changed.
  - .6 Ballast floor: Place ballast floor, as indicated. Omit ballast floor in bays, as shown on plans.
  - .7 Longitudinals: Secure longitudinals to intersection of cross ties with drift bolts and to intersection of vertical posts with machine bolts, as shown on plans.
  - .8 Crossties: Secure crossties to intersection of longitudinals with drift bolts and to intersection of vertical posts with machine bolts, as shown on plans.
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- .9 Vertical posts: To be in one length from bottom of cribwork, unless splice details are shown on plans.
- .10 Fillers: Place filler timber as indicated. Secure fillers with drift bolts to timbers immediately below.
- 3.2 Handling Treated  
Timber
- .1 Handle treated material to avoid damage causing Timber alteration in original treatment.
- .2 Treat in field, spike holes, boreholes, plugged holes, cuts and any damage to treated material, using Copper naphthenate, as specified herein, regardless of plant treatment type.
- .3 Provide methodology pertaining to heating and application. Apply to dry surfaces for maximum benefit.
- .4 Treat boreholes, using a pressurized container with an extension rod, to produce a fine spray in the holes with one application. Alternately a cylindrical brush may be used.
- .5 Treat field cuts and any abrasions with minimum of two liberal applications, using either spray or brush.
- .6 In addition, field cuts and underwater damaged areas will receive a coating of plastic compound, capped with lead flashing secured with galvanized roofing nails. Plastic compound not to be water soluble and is subject to approval.
- .7 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
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hazard to themselves, others, or the environment.

- .8 Contain all debris and leachates (films on water surface) within the area of the work by using containment facilities such as floating booms or screens.

### 3.3 Preparation

#### .1 Mattress:

- .1 Level top of levelling course, using a sweep beam capable of sweeping the entire width of the mattress in one operation. Once sweeping is done and elevations taken on a grid consisting of every meter along a crosstie location and the same along lines one half meter each side of and parallel to the cross ties, have a diver carry out an inspection to locate hollows, humps, extent of mattress and to check side slope stability. Touch up, resweep and repeat the above procedure until the mattress is within the tolerances specified. If any delay what-so-ever exists between final touch-up and crib setting, repeat the above procedure - starting with elevations - immediately prior to placing crib.

- .2 Alternate methods of levelling subject to acceptance by *Engineer*.

#### .2 Setting Crib:

- .1 Prior to setting crib, mark locations on all crib vertical posts of known distances above bottom of lowest crosstie, so that elevations of bottom of crib can be easily determined using the tide or survey equipment. Once crib bottoms out on the falling tide, and prior to placing any ballast, have a diver check bearing at each crosstie location. At same time, determine elevation of bottom of crib at each crosstie location along the perimeter

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and down the middle. If diver report is flawless and crib is located within tolerances in all respects, commence ballasting. Provide crib setting report, showing the above information.

3.4 Ballasting

- .1 Place ballast stone in a manner which will not damage timber cribwork. As a minimum, the top courses of timber will be protected with planks. *Engineer* to accept placing methodology.
- .2 When placing the crib, ballast the bays containing the ballast floors with sufficient (less than 1 meter) ballast to just start setting of the crib. Have crib rechecked for bearing and elevation. If there is no need to refloat, then ballast these bays just sufficiently and evenly to prevent floatation. Then ballast the bays containing no ballast floor to L.N.T. unless otherwise shown. Thereafter ballast crib uniformly throughout, ensuring ballast differential is maintained at less than two meters.

3.5 Tolerances

- .1 Construction crib overall dimensions to within tolerance of 1 in 300.
  - .2 Locate crib within 50 mm of location indicated.
  - .3 Adjoining cribs to line up exactly.
  - .4 Final bottom elevation of fully ballasted crib to be 0 to 150 mm below the elevation indicated on the plans.
  - .5 Refloat a crib out of alignment, not correctly located or at wrong elevation. Repair mattress, prior to resetting.
  - .6 Some settlement of the crib structure is anticipated into the mattress. Prior to installation of the upper courses of timbers
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and the concrete deck, check the elevations and provide any shimming necessary, to ensure that the elevations, as shown on the drawings, are met.

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PART 1 - GENERAL

- 1.1 Related Work
- .1 Refer to other Specification Section for related information.
  - .2 Refer to Section 01 33 00 for Shop Drawings/Submissions requirements.
- 1.2 Submissions
- .1 Methodology:
    - .1 Provide methodology including type of pile driving equipment to carry out the work.
  - .2 Provide submissions in accordance with Section 01 33 00.
- 1.3 Existing Sub-Surface Conditions
- .1 Sub-surface investigation reports may be available for viewing at the *Departmental Representative's* office and at the offices of Public Works and Government Services Canada, 1713 Bedford Row, Halifax, NS.
  - .2 Notify the *Departmental Representative* immediately if subsurface conditions at site differ from these indicated.
  - .3 **The site is known to contain cobbles and boulders. Contractor shall be prepared to advance through cobbles and boulders as required. There are numerous cobbles and boulders in existing structure and underlying soils.**
- 1.4 Protection
- .1 Protect public and construction personnel, adjacent structures and work of other sections from hazards attributes to pile driving operations or any other operations.
  - .2 The contractor shall provide loading information to the *Departmental Representative* for review on any construction equipment they intend to deploy on the wharf at least two weeks before deployment.
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- .3 Contractor to submit construction methodology and provide a stamped letter from a professional engineer registered in Nova Scotia confirming the proposed construction equipment is within design capacity of all structures that will be loaded by such equipment.
- .4 Traffic or tracked equipment, if approved by the Departmental Representative, will not be permitted without two layers of rubber mat or a layer of 150 mm thick timber runners.
- .5 Deck surface shall be protected from damages caused by leakage/spillage of oils and lubricants from equipment.
- .6 No construction equipment shall be placed on the existing 402 structure.

1.5 Scheduling of Work

- .1 Submit schedule of planned sequence of driving to *Departmental Representative* for review, not less than 2 weeks prior to commencement of pile driving for structure.

1.6 Delivery, Storage And Handling

- .1 Protect piles from damage due to excessive bending stresses impact, abrasion or other damages during storm and handling.
- .2 Replace damaged piles to the satisfaction of the *Departmental Representative*.

PART 2 - PRODUCTS

2.1 Materials

- .1 Supply full length steel H piles as indicated in accordance with Section 31 62 18 - Steel H Piles.
- .2 Provide equipment of sufficient capacity to handle full length piles without cutting and splicing.

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- .3 Pile lengths indicated are based on lengths estimated to remain in completed structure, plus a 1.0 metre cut-off allowance.
  - .4 Do not splice piles without written permission of *Departmental Representative*. When permitted, provide details for *Departmental Representative* review. Design details of splice to bear dated signature stamp of professional engineer registered or licenced in the Province of Nova Scotia, Canada.
  - .5 Welding materials: to CSA W48.1

### PART 3 - EXECUTION

#### 3.1 Equipment Requirements

- .1 Equipment information: prior to commencement of pile installation operation, submit to *Departmental Representative* for review, details of equipment for installation of piles. 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.
  - .2 Hammer:
    - .1 Hammers to be capable of developing a blow at normal speed of 42,500 joules. When required penetration is not obtained by use of hammers complying with minimum requirements, either provide larger hammer or take other measures, acceptable to *Departmental Representative*. Drop hammers are permitted. All piles damaged due to over driving to be replaced at the Contractor's cost.
    - .2 When required penetration is not obtained by use of hammers complying with minimum requirements, either provide larger hammer or take other measures, acceptable to *Departmental*
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*Representative.* Drop hammers are permitted. All piles damaged due to over driving to be replaced at the Contractor's cost.

.3 Leads:

.1 Construct pile driver leads to provide free movement of hammer. Hold leads in position at top and bottom, with guys, stiff braces, or other means approved by *Departmental Representative*, to ensure support to pile while being driven.

.2 Length: except for piles driven through water, provide length of leads so that use of a follower is unnecessary.

.3 Swing leads:

.1 Firmly guy top and bottom to hold pile in position during driving operation. Method to be reviewed by *Departmental Representative*.

.4 Followers:

.1 When permitted, provide followers of such size, shape, length and mass to permit driving pile in desired location to required depth and resistance. Provide followers with socket or hood carefully fitted to top of pile to minimize loss of energy and prevent damage to pile.

.5 Allowable design load capacity of pile as follows:

.1 Assumed geotechnical pile capacity at ultimate limit states = 1437.5 kN (C).

3.2 Preparation

.1 Ensure that conditions at pile locations are adequate to support pile driving operation. Make provision for access and support of piling equipment during performance of work.

3.3 Pile Driving Analyzer

.1 *Departmental Representative* to arrange for Pile Driving Analyzer (PDA) testing.

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- .2 Contractor to notify Departmental Representative of pile driving operations at least seven (7) days in advance of work.
- .3 If a pile is suspect of meeting refusal on a boulder within the native soils, PDA testing shall be conducted to confirm capacity.
- .4 Contractor shall allow adequate time for Departmental Representative to perform PDA testing as required by the Departmental Representative.
- 3.4 Field Measurement
- .1 Maintain accurate records of driving for each pile, including:
- .1 Type and make of hammer, stroke or related energy.
  - .2 Other driving equipment including water jet, driving cap, cushion.
  - .3 Pile size, length and location.
  - .4 Sequence of driving piles.
  - .5 Number of blows per metre for entire length of pile and number of blows per 25 mm for last 100 mm.
  - .6 Final tip and cut-off elevations.
  - .7 Other pertinent information such as interruption of continuous driving, pile damage.
  - .8 Record elevation taken on adjacent piles during driving of each pile.
  - .9 All measurements, observations and calculations associated with pile driving analyser and wave equation analysis.
- .2 Provide *Departmental Representative* with three copies of records.
- 3.5 Driving
- .1 Use driving caps to protect piles. Reinforce pile heads if necessary. Piles with damaged heads as determined by *Departmental Representative* will be rejected.
- .2 Use steel drive shoes to protect pile toes during driving to the approval of the *Departmental Representative*.
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- .3 Hold piles securely and accurately in position while driving.
  - .4 Deliver hammer blows in direct axis of pile.
  - .5 Reinforce pile heads if necessary.
  - .6 Do not drive piles within a radius of 8 m of concrete which has been in place less than 3 days.
  - .7 Redrive piles lifted during driving of adjacent piles.
  - .8 Use of water jet:
    - .1 Use water jets only with written permission of *Departmental Representative*.
    - .2 When water jets are permitted number of jets and volume and pressure of water must be sufficient to freely erode material immediately adjacent to pile. Plant must be capable of delivering water pressure of at least 690kPa as measured at two 20 mm nozzles.
    - .3 Restriction: stop jetting at a minimum of 1 m above tip elevation of piles previously driven within 2 m of jet, except where piles are to be carried to rock surface. Drive piles down beyond depth of jetting until required resistance is obtained. If there is evidence that jetting has disturbed load-bearing capacities of previously installed piles, restore bearing capacity of those piles by re-driving. Redrive where necessary after jetting operations in area have been completed.
  - .9 Cut off piles neatly and squarely at elevations indicated. Provide sufficient length above cut-off elevation so that part damaged during driving is cut off.
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- .9 Remove cut-off lengths from site on completion of work.
- .10 Installation of each pile will be subject to acceptance by *Departmental Representative*. *Departmental Representative* will be sole judge of acceptability of each pile with respect to final driving resistance and depth of penetration. *Departmental Representative* to accept final driving of all piles prior to removal of pile driving rig from site.
- .11 Shape bottom of pile so that shoe will have full bearing on pile prior to driving. Install pile shoes using spikes as shown.
- .12 Drive each pile to a minimum penetration of tip elevation indicated on the drawings, or to driving resistance, as determined by the *PDA testing*.
- .13 Wood fender piles have to be driven to competent soil to develop the required lateral resistance. The required driving resistance is 4 blows for the last 25mm of pile penetration.
- 3.6 Driving Tolerances
- .1 Pile heads to be within 50 mm of locations indicated.
- .2 Piles not to be more than 2% of length out of alignment.
- 3.7 Obstruction
- .1 Where obstruction is encountered that causes sudden and unexpected change in penetration resistance or deviation from specified tolerances, advise the *Departmental Representative* and submit for their review the Contractor's proposed method(S) for achieving specified penetrations and tolerances. Incorporate review comments in the proposed method(s) and proceed with the work.
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- 3.8 Damaged or Defective Piles
- .1 Remove rejected pile and replace with a new, and if necessary, a longer pile.
  - .2 No extra compensation will be made for removing and replacing or other work made necessary through rejection of a defective pile.
- 3.9 Penetration
- .1 Protect adjacent structures, services and work of other section from hazards due to pile driving operations.
  - .2 Arrange sequencing of pile driving operations and methods such that no damage occurs to adjacent existing structures. If damaged remedy damaged items to restore to original or better condition at own expense.
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PART 1 - GENERAL

1.1 Related Sections

- .1 Section 01 33 00 - Submissions/Shop Drawings.
- .2 Section 01 74 11 - Cleaning.
- .3 Section 31 61 13 - Pile Foundations, General Requirements.

1.2 Measurement Procedures

- .1 Supply and installation of H-piles will be measured in accordance with Section 01 29 00.
- .2 Consider pile shoes as incidental to installation of piles.
- .3 Mobilization of equipment will be considered incidental to installation of piles.
- .4 Actual number and lengths of piles installed will be established by *Departmental Representative* from piling records.
- .5 Adjustments in contract price due to changes in number and lengths of piles will be based on unit prices established in Contract.

1.3 References

- .1 CSA W47.09 (R2014) Certification of Companies for Fusion Welding of Steel Structures.
  - .2 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
  - .3 CSA W59-13, Welded Steel Construction (Metal Arc Welding) (Metric Version).
  - .4 CSA W59S1-M1989 (R1998), Supplement No.1-M1989, Steel Fixed Offshore Structures to W59-M1989, Welded Steel Construction (Metal Arc Welding).
  - .5 CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality
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Steel/Structural Quality Steels.

1.4 Shop Drawings

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submissions/shop drawings.
- .2 Indicate: pile shoes.
- .3 Each drawing submitted shall bear the signature and stamp of qualified Professional Engineer registered or licensed in the Province of Nova Scotia, Canada.

1.5 Test Reports

- .1 Furnish mill test reports indicating yield and chemical analysis of steel piles if requested by *Departmental Representative*.

1.6 Existing Sub-Surface Conditions

- .1 Sub-surface investigation reports are available for viewing at the *Departmental Representative's* office and at the offices of Public Works and Government Services Canada, 1713 Bedford Row, Halifax, NS. Relevant borehole logs are included on the drawings.
- .2 Notify the *Departmental Representative* immediately if subsurface conditions at site differ from these indicated.
- .3 **The site is known to contain cobbles and boulders. Contractor shall be prepared to advance through cobbles and boulders as required. There are numerous boulders and cobbles in existing structure and underlying soils.**

1.7 Measurement For Payment

- .1 Consider shoes and cap plates incidental to installation of piles.
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- .2 Supply of steel h-piles will be measured in accordance with Section 01 29 00.
  - .3 Installation of steel h-piles will be measured in accordance with 01 29 00.
  - .4 Mobilization of equipment will be considered incidental to installation of piles.
  - .5 Base tender on number and lengths of piles indicated on the plan.
  - .6 *Departmental Representative* will establish actual number and lengths of piles installed from driving records.
  - .6 Adjustments in contract price due to changes in number and lengths of piles will be based on unit prices established in Contract.

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.

PART 2 - PRODUCTS

2.1 Materials

- .1 Steel H piles: to CSA-G40.20/G40.21, Type and Grade 350W. Size and weight as indicated on drawings.
  - .2 Welding materials: to CSA W48.
  - .3 Pile driving shoes: Pruyne points - HP-75600 or approved equal.
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PART 3 - EXECUTION

3.1 Installation

- .1 Install piling in accordance with Section 31 61 13 - Pile Foundations, General Requirements.
- .2 Hold piles securely and accurately in position during installation.
- .3 Prior to commencement of pile installation operation, submit to *Departmental Representative* for approval, details of equipment and method to be used for the installation of piles.
- .4 Cut off piles squarely at required elevation.
- .5 Touch up scratches on uncoated surfaces with two applications of coal tar epoxy, before and after driving.

3.2 Welding

- .1 Weld to CSA W59 and CSA W59S1.
- .2 Welding certification of companies: to CSA W47.1 and CSA W47.1S1.

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.
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- 3.4 Cleaning .1 Proceed in accordance with Section 01 74 11  
cleaning.
- .2 On completion and verification of  
performance of installation, remove surplus  
materials, excess materials, rubbish, tools  
and equipment.
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PART 1 - GENERAL

- 1.1 Related Work
- .1 Refer to other Specification Sections for related information.
  - .2 Refer to Section 01 33 00 for Shop Drawing/Submission requirements.
- 1.2 Reference Standards
- .1 CAN/CSA-080 Series M89 (or latest edition)- Wood Preservation (including CSA preliminary standard 080.31-M1989).
  - .2 AWPA P7-85 (or latest edition)- Creosote for Brush or Spray Treatment for Field Cuts (American Wood Preservers Association).
  - .3 NLGA standard grading rules for Canadian Lumber 1980 edition or most recent edition at time of tendering.
  - .4 CAN/CSA-G164-M92 (or latest edition) - Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .5 ASTM A307-14 (or latest edition), Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
  - .6 ASTM B111-1974 (R2003 or latest edition), Wire Nails, Spikes and Staples.
  - .7 CAN/CSA-G40.21-13 (or latest edition), Structural Quality Steels.
  - .8 CSA W59-13 (or latest edition), Welded Steel Construction (Metal Arc Welding).
  - .9 ASTM A123-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .10 CAN/CSA-056-10 (R2015), Round Wood Piles.
- 1.3 Submissions
- .1 At least two weeks prior to finalizing timber order, submit a schedule of pile lengths for review.
  - .2 Submit methodology for field treatment.
  - .3 Provide submissions in accordance with Section 01 33 00.
- 1.4 Protection
- .1 Avoid dropping, bruising or breaking of wood fibres.
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- .2 Avoid breaking surfaces of treated piles.
  - .3 Do not damage surfaces of treated piles below cut-off elevation by boring holes or driving nails or spikes into them to support temporary material or staging. Support staging in rope slings carried over tops of piles or by attaching to pile clamps of approved design.
  - .4 Treat cuts, breaks or abrasions on surfaces of treated piles, bolt holes and field cuts in accordance with CAN/CSA-080 using Copper naphthenate.
- 1.5 Inspection
- .1 All timber piles to be inspected and accepted by *Departmental Representative* prior to being incorporated in the work.
- 1.6 Measurement for Payment
- .1 Consider shoes and cap plates incidental to installation of piles.
  - .2 Supply of timber piling will be measured in accordance with Section 01 29 00.
  - .3 Installation of timber piling will be measured in accordance with Section 01 29 00.
  - .4 Supply of timber fender piles will be measured in accordance with Section 01 29 00.
  - .5 Mobilization of equipment will be considered incidental to installation of piles.
  - .6 Base tender on number and lengths of piles indicated on the plan.
  - .7 *Departmental Representative* will establish actual number and lengths of piles installed from driving records.
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- .8 Adjustments in contract price due to changes in number and lengths of piles will be based on unit prices established in Contract.

PART 2 - PRODUCTS

2.1 Materials

- .1 Round Wood Piles: Red pine to CAN3-056, with minimum butt size of 300 mm and tip diameter in accordance with Table A-1. Order length to suit conditions indicated. *Departmental Representative* shall be sole judge as to quality and dimension of piles or equal to CAN3-056.
- .2 Timber Treatment:
- .1 Preservative treatment to CAN/CSA-080 Series - M89 for Marine Construction Coastal Waters. Where assay retentions are not indicated, they are to be taken as 1.5 times the indicated gauge retention. Creosote preservative will not be permitted for fender piles.
- .2 Make arrangements for timber testing by:
- .1 Plant Inspection: Provide treatment plant identification, date of treatment, list of various pieces in the charge, charge number, plant assay testing results, concentration and type of preservative used, duration of treatment, gauge retention, species of wood; and make arrangements with the treatment plant to locate bundles, move bundles, break open bundles and carry out other measures to facilitate the inspection.
- .2 Field inspection: Providing same information as above and facilitating the inspection in the field.
- .3 Filling in and submitting a preprinted form, agreed to by the
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*Departmental*                      *Representative,*  
containing the above information.

.3 The *Departmental Representative* may test in the plant or in the field or may choose to not test some charges at either the plant or the field.

.4 Timber will be protected during handling, shipping, offloading and field handling, by use of suitable equipment and procedures. Use rope or fabric strap slings on site for moving bundles or individual timbers, rather than metal grabs, chains or cables.

.5 Field treatment: Copper naphthenate as per AWPA.

.3 Miscellaneous Hardware: Hardware must meet the following specifications:

.1 Machine bolts, drift bolts, nuts, round plate washers: to ASTM A307

.2 Spikes: to CSA B111

.3 Pile shoes: fabricated from steel plate minimum 6 mm thickness. Steel plate to CSA-G40.21, Grade 300W. Welding to CSA W59. No galvanizing required.

.4 Hot dip galvanize bolts, nuts, washers and spikes to CSA G164 with minimum zinc coating of 600 g/m<sup>2</sup>.

.5 All hardware galvanized unless otherwise shown on plans or specified.

2.2 Wood Preservation .1 Wood piles are to be treated with wood preservative treatment as specified.

### PART 3 - EXECUTION

3.1 Handling Timber .1 Timber will be protected during handling, shipping, offloading and field handling, by use of suitable equipment and procedures. Use rope or fabric strap slings on site for

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moving bundles or individual timbers, rather than metal grabs, chains or cables.

3.2 Handling  
Treated Timber

- .1 Handle treated material to avoid damage causing alteration in original treatment.
  - .2 Treat in field, spike holes, boreholes, plugged holes, cuts and any damage to treated material, using Copper naphthenate, as specified herein, regardless of plant treatment type.
  - .3 Provide methodology pertaining to heating and application. Apply to dry surfaces, wherever possible.
  - .4 Treat boreholes, using a pressurized container with an extension rod, to produce a fine spray in the holes with one application. Alternately a cylindrical brush may be used.
  - .5 Treat field cuts and any abrasions with minimum of two liberal applications, using either spray or brush.
  - .6 In addition, field cuts and underwater damaged areas will receive a coating of plastic compound, capped with lead flashing secured with galvanized roofing nails. Plastic compound not to be water soluble and is subject to approval.
  - .7 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.
  - .8 Contain all debris and leachates (films on water surface) within the area of the work
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- by using containment facilities such as floating booms or screens.
- 3.3 Preparation
- .1 Protect 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.
  - .2 Equip piles with metal shoes.
- 3.4 Installation
- .1 Install piles in accordance with Section 31 61 13.
  - .2 During driving restrain lateral movement of piling at intervals not exceeding 6 m over length between ground surface and driving head.
  - .3 Cut off fender piles giving a bevel of 4H:1V. Cut off bearing piles horizontally.
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