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 A307-14e1, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 psi Tensile Strength.

.2 ASTM F3125/F3125-18, Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

.3 CSA G40.20/G40.21-13 (R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.4 CSA S16-14, Design of Steel Structures.

.5 CSA W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel.

.6 CSA W59-18, Welded Steel Construction.

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 CSA G40.20/G40.21, Grade 300W.

.2 Welding Materials: to CSA W59.

.3 Bolts, nuts and washers: to ASTM A307 or ASTM F3125/F3125M Grade A325.

PART 3 - EXECUTION

3.1 Fabrication .1 Fabricate structural steel for templates in accordance with CSA S16 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.

PART 1 - GENERAL

1.1 Description of Work

This Section includes but is not limited to the the following:

.1 All normal removals as required to complete the work. All items to be verified by a site visit prior to submission of a 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.

.2 The removal and disposal of the existing concrete deck.

.3 The removal and disposal of the entire ell wharf section including the existing timber wheel guard, timber decking, timber stringers, timber pile caps, fenders and sheathing, ladders, holdfasts, mooring cleats, wales, bracings, timber piles, and all items that interfere with the new work as directed. If requested, the above materials are to remain the property of the Owner and are to be carefully removed from the existing work and stockpiled on site in area(s) designated by the *Departmental Representative.*

.4 The removal of existing electrical services such as poles, panel, wires, cables, conduit, receptacle outlets, and any other services to allow for new work.

.5 The removal/reinstatement of all existing material as may be required to properly install the new work of this contract.

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*.

.2 Provide all protection measures as required to carry out work over the watercourse.

.3 Do not allow any debris or repair materials to fall into watercourse. Provide all necessary working platforms and containment systems for work above, or adjacent to, watercourse.

.4 Area below section of wharf stem slab to be demolished to be fully enclosed and sealed to capture all debris.

.5 All protection methods and procedures to satisfy these requirements are to be submitted to the *Departmental Representative* for review and approval prior to start of work.

.6 Demolished concrete must be collected and disposed of offsite in approved manner.

.7 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*.

3.2 Removal

.1 Remove items indicated.

.2 Do not disturb adjacent structures designated to remain in place.

.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.

.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.

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 Factual Geotechnical Report, Gemtec Project 10456.96-R01, dated November 30, 2018 is available for review. Note the following:
.1 Contractor shall review the complete geotechnical report and adhere to all requirements and recommendations made in the report.
.2 The geotechnical report is furnished by the Departmental Representative as a matter of information only and data in the report is not to be interpreted as descriptive of locations other than those directly at boreholes.

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.

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 Measurement for Payment

.1 This item will not be measured separately.

PART 2 - PRODUCTS

2.1 Materials

.1 For material requirements refer to Section 31 62 19, Wood Piles.

.2 Provide equipment of sufficient capacity to handle full length piles without cutting and splicing.

.3 Pile lengths indicated are based on lengths estimated to remain in completed structure.

.4 Splicing of piles will not be permitted unless specifically agreed to by the *Departmental Representative*.

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 Impact hammers: provide manufacturer's name, type, rated energy per blow at normal working rate, mass of striking parts of hammer, mass of driving cap and type and elastic properties of hammer and pile cushions. Non-Impact Hammers not acceptable unless written approval is provided by the Departmental Representative. If approved, provide full details of characteristics necessary to evaluate.

.2 Hammers to be selected on basis of driveability analysis using wave equation theory, performed by the contractor, to show that piles can be driven to levels indicated.

.1 Driveability analysis to include, but not be limited to, the following: hammer, cushion, and cap block details, static soil parameters, quake and damping factors, total soil resistance, blow count, pile stresses and energy throughput at representative penetrations.

.2 When required criteria cannot be achieved with the proposed hammer, use larger hammer and take other measures as required, acceptable to the departmental representative.

.3 All piles damaged due to over driving shall be replaced at Contractor's cost.

.3 Leads:

.1 Construction 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.

.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.

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 Field Measurement

.1 Maintain accurate records of driving for each bearing, batter and fender pile, including:
- .1 Type and make of hammer, stroke or related energy.
- .2 Pile size, length and location.
- .3 Sequence of driving piles.
- .4 Number of blows per metre for entire length of pile and number of blows per 25 mm for last 100 mm.
- .5 Final tip and cut-off elevations.
- .6 Other pertinent information such as interruption of continuous driving, pile damage.
- .7 Record elevation taken on adjacent piles during driving of each pile.

.2 Provide *Departmental Representative* with three copies of records.

3.4 Driving

.1 For bearing piles, shortest piles to be utilized first where actual conditions of driving allow. To be coordinated with Departmental Representative at time of installation.

.2 Use driving caps to protect piles.

.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 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.

.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 Design load capacity of bearing and batter piles to be as follows:

1. Assumed design pile capacity at ultimate limit states = 280 kN(C) for bearing piles, and 280 kN (C) for batter piles.
2. Contractor to determine initial pile set/refusal criteria by wave equation analysis. Work to be performed by geotechnical engineer registered or licensed in Province of Nova Scotia, Canada

.13 Fender piles to be embedded a minimum of 1000 mm into the silt/sand/gravel layer and as required to provide proper anchorage.

3.5 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.

3.6 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 Departmental Representative shall be there sole judge of acceptability of each pile with respect to damaged and defective piles.

PART 1 - GENERAL

1.1 Related Work

.1 Refer to Section 31 61 13 for general requirements for pile foundations.

.2 Refer to Section 01 33 00 for Shop Drawing/Submission requirements.

1.2 Reference Standards

.1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.

.3 ASTM F1667-18a, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.4 CAN/CSA-O56-10 (R2015), Round Wood Piles.

.5 CAN/CSA-O80 SERIES-15, Wood Preservation

.6 NLGA 2017, Standard Grading Rules for Canadian Lumber.

.7 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.8 CSA W59-18, Welded Steel Construction.

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.

.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 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.

.7 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 CAN/CSA-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 CAN/CSA-056.

.2 Timber Treatment:

.1 Preservative treatment to CAN/CSA-080 Series, Use category 5A for Marine Construction.

.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 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.

.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 ASTM A123/A123M with minimum zinc coating of 600 g/m^2.

.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 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 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.