
PART 1 - GENERAL

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| 1.1 | <u>Related Work</u> | .1 | Refer to other Specifications Sections for related information. |
| | | .2 | Section 01 33 00 - Submissions / Shop Drawings. |
| 1.2 | <u>References</u> | .1 | ASTM A252, Specification for Welded and Seamless Steel Pipe Piles. |
| | | .2 | ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile. |
| | | .3 | ASTM A325, Specification for High-Strength Bolts for Structural Steel Joints. |
| | | .4 | ASTM A490, Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints. |
| | | .5 | CSA G40.20, General Requirements for Rolled or Welded Structural Quality Steel. |
| | | .6 | CSA G40.21, Structural Quality Steels. |
| | | .7 | CSA S16.1, Limit States Design of Steel Structures. |
| | | .8 | CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures. |
| | | .9 | CSA W47.1S1, Supplement No. 1 to W47.1. |
| | | .10 | CSA W48.1, Carbon Steel Covered Electrodes for Shielded Metal Arc Welding. |
| | | .11 | CSA W59, Welded Steel Construction (Metal Arc Welding). |
| | | .12 | CSA W59S1, Supplement No. 1, Steel Fixed Offshore Structures, to W59. |
| | | .13 | CGSB 1-GP-171M, Coating, Inorganic Zinc. |

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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 on shop drawings, at a minimum:
- .1 Materials used.
 - .2 Anchorage, field control and alignment methods.
 - .3 Design parameters.
 - .4 Tolerance for driving piles.
 - .5 Removable members.
 - .6 Alternatives.
- 1.4 Design Criteria .1 Design templates shall safely withstand the following loads:
- .1 All gravity loads to which template shall be subjected.
 - .2 Lateral loads to firmly hold pile in position when driving.
 - .3 All weather-related loads that may be applied during driving operations.
- 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 additional cost to the *Departmental Representative*.
- 1.6 Measurement for Payment .1 This item shall not be measured separately but shall be considered incidental to the Work in accordance with Section 01 29 00 - Project Particulars and Measurement.

PART 2 - PRODUCTS

- 2.1 Materials .1 Steel sections and plates: To CSA G40.20 and CSA G40.21, Grade 300W.
- .2 Welding Materials: To CSA W59.
- .3 Bolts, nuts and washers: to ASTM A307 or ASTM A325.

PART 3 - EXECUTION

- 3.1 Fabrication .1 Fabricate structural steel for templates in accordance with CSA S16.1 and reviewed shop drawings.
- .2 Welding shall be 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 that 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 and replace members in templates as necessary to drive 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 the *Departmental Representative*, move or remove templates from project site.

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- 1.2 Description of Work .1 All normal removals as required to complete the work. All items to be verified by a site visit prior to submission of 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.
- 1.2 Related Work .1 Refer to other specification sections for related information.
- .2 Section 01 33 00 - Submittal / Shop Drawings.
- 1.3 Submissions .1 Upon request, provide methodology for carrying out the work.
- .2 Provide submissions in accordance with Section 01 33 00 - Submissions / Shop Drawings.
- 1.4 Protection .1 Prevent movement, settlement or damage of adjacent structures. Provide bracing and shoring as required. In the event of damage, immediately replace such items or make repairs to approval of the *Departmental Representative* and at no additional cost to the *Departmental Representative*.
- .2 Prevent debris from going adrift and becoming a menace to navigation.
- .3 All damage to existing structures, roadways, pipelines, electrical systems, etc., not specified for removal shall be repaired at Contractor's cost to the satisfaction of the *Departmental Representative*.

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- 1.5 Measurement for Payment .1 Sitework, demolition and removals shall be measured as a lump sum in accordance with Section 01 29 00 - Project Particulars and Measurement.

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- 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 active utilities traversing site in operating condition.
- .3 Provide temporary power and lighting as required and to approval of 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 shall be to the satisfaction of the *Departmental Representative* and at no additional cost to the *Departmental Representative*.
- 3.2 Removals .1 Remove items where 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.

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3.3 Disposal of
Material

- .1 Disposal of materials not designated for salvage or re-use in work, shall be the Contractor's responsibility and these materials 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 Reinststate areas and existing works outside areas of demolition to conditions that existed prior to commencement of work and match condition of adjacent, undisturbed areas.

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- 1.1 Related Work .1 Refer to other Specification Sections for related information.
- .2 Section 01 33 00 - Submissions / Shop Drawings.
- 1.2 Submissions .1 Provide methodology including type of pile driving equipment to carry out the work.
- .2 Provide submissions in accordance with Section 01 33 00 - Submissions / Shop Drawings.
- 1.3 Existing Sub-Surface Conditions .1 Sub-surface investigation report number M023549-A1, prepared by Inspec-Sol Engineering Solutions, dated September 26, 2008, 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.
- .3 Borehole elevations are in meters and are referenced to a temporary benchmark placed on the existing concrete wheel guard, approximately where shown on the Contract Drawings.
- 1.4 Protection .1 Protect the public, construction personnel, the environment, adjacent structures and work of other sections from hazards attributes to pile driving operations or any other work operations.

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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 driving piles.

1.6 Measurement for Payment .1 This item shall not be measured separately but shall be considered incidental to the Work in accordance with Section 01 29 00 - Project Particulars and Measurement.

PART 2 - PRODUCTS

2.1 Materials .1 For material requirements refer to Section 31 62 19 - Wood Piles.

.2 Use equipment capable of handling 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 shall not be permitted unless specifically agreed to by the *Departmental Representative*.

PART 3 - EXECUTION

3.1 Equipment Requirements .1 Equipment: Prior to commencement of pile installation operation submit details of equipment for installation of piles to *Departmental Representative* for review. 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: Hammers to weigh 817 to 1,000 kg and be capable of developing a blow at normal speed of 20340 joules (Energy shall be 1500 ft·lb per inch of tip diameter). When required penetration is not obtained by

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use of hammers complying with minimum requirements, either provide larger hammer or take other measures, acceptable to the *Departmental Representative*. Drop hammers permitted. All piles damaged during driving shall be replaced at Contractor's cost.

.3 Leads: Construction pile driver leads shall provide free movement of hammer. Hold leads in position at top and bottom with guys, stiff braces or other means acceptable to the *Departmental Representative*, to ensure adequate support to pile while being driven.

.4 Followers: When permitted by *Departmental Representative*, 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 operations. Make provision for access and support of piling equipment during performance of work.

3.3 Pile Driving Records .1 Maintain accurate pile driving records for each pile (bearing and batter), including:

- .1 Type and make of hammer including stroke or related energy.
- .2 Other driving equipment including water jet, driving cap, cushion, etc.
- .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, etc.

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- .8 Record elevation taken on adjacent piles during driving of each pile.
- .2 Provide *Departmental Representative* with three copies of pile driving records.
- 3.4 Driving
- .1 Use driving caps to protect piles.
- .2 Hold piles securely and accurately in position while driving.
- .3 Deliver hammer blows in direct axis of pile.
- .4 Reinforce pile heads, if necessary.
- .5 Do not drive piles within a radius of 8 m of concrete which has been in place less than 3 days.
- .6 Redrive piles lifted during driving of adjacent piles.
- .7 Water jets:
- .1 Use of water jets only allowed with written permission from *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 690 kPa 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
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capacity of those piles by re-driving.
Re-drive where necessary after jetting
operations in area have been completed.

- .8 Cut off piles neatly and squarely at elevations indicated, after driving of all piles are 100% complete (in case re-driving of adjacent piles is required). Provide sufficient length above cut-off elevation so that damage during driving can be removed.
- .9 Remove cut-off lengths from site at completion of work.
- .10 Installation of each pile shall be subject to acceptance by the *Departmental Representative*. *Departmental Representative* shall be the sole judge of acceptability of each pile with respect to final driving resistance and depth of penetration. Prior to removal of pile driving rig from site, the *Departmental Representative* is to review and accept final driving of all piles.
- .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, to driving resistance as determined and directed by the *Departmental Representative*.

- 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 and Defective Piles
 - .1 Remove rejected piles and replace with a new, and if necessary, longer pile.

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- .2 No extra compensation shall be made for removing and replacing piles or other work made necessary through rejection of a defective pile.
- .3 *Departmental Representative* shall be the sole judge of acceptability of each pile with respect to damaged and defective piles.

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| 1.1 | <u>Related Work</u> | .1 | Refer to other Specification Sections for related information. |
| | | .2 | Section 01 33 00 - Submissions / Shop Drawings. |
| 1.2 | <u>Reference Standards</u> | .1 | ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile. |
| | | .2 | ASTM B111, Wire Nails, Spikes and Staples. |
| | | .3 | CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles. |
| | | .4 | CSA G40.21, Structural Quality Steels. |
| | | .5 | CSA W59, Welded Steel Construction (Metal Arc Welding). |
| | | .6 | CSA O56, Round wood piles. |
| | | .7 | CSA O80 Series, Wood Preservation (including CSA preliminary standard O80.31). |
| | | .8 | NLGA standard grading rules for Canadian Lumber. |
| 1.3 | <u>Submissions</u> | .1 | At least 2 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 - Submissions / Shop Drawings. |
| 1.4 | <u>Protection</u> | .1 | Avoid dropping, bruising or breaking of wood fibres. |
| | | .2 | Avoid breaking surfaces of treated piles. |

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- .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 using rope slings carried over tops of piles, by attaching to pile clamps of approved design, or by other means acceptable to *Departmental Representative*.
- .4 Treat cuts, breaks and abrasions on surfaces of treated piles, bolt holes and field cuts in accordance with CSA O80 using field-applied preservative.
- 1.5 Inspection .1 All timber piles to be inspected and accepted by *Departmental Representative* prior to being incorporated into work.
- 1.6 Measurement for Payment .1 Pile shoes shall not be measured separately but shall be considered incidental to the Work in accordance with Section 01 29 00 - Project Particulars and Measurement.
- .2 Contractor shall base the estimate of pile lengths to be supplied on the Bearing and Batter Pile Schedule shown on the drawings and shall obtain the *Departmental Representative's* acceptance before ordering piles.
- .3 Supply and driving of wood piles (bearing and batter) shall be measured in accordance with Section 01 29 00 - Project Particulars and Measurement.
- .4 Adjustments in the Contract price due to changes in number and lengths of piles shall be based on unit prices established in the Contract.

PART 2 - PRODUCTS

- 2.1 Wood Piles .1 Round Wood Piles:
- .1 Yellow pine to CSA 056, with minimum butt size of 300 mm diameter 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 CSA 056.
- 2.2 Wood Preservation and Treatment .1 Timber Treatment:
- .1 Preservative treatment to CSA 080 Series 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 shall not be permitted for piles.
 - .2 Make arrangements for timber testing by:
 - .1 Plant Inspection providing:
 - .1 Plant identification.
 - .2 Date of treatment.
 - .3 List of various pieces in the charge.
 - .4 Charge number.
 - .5 Plant assay testing results.
 - .6 Concentration and type of preservative used.
 - .7 Duration of treatment.
 - .8 Gauge retention.
 - .9 Species of wood.
 - .10 Note: Arrange with the 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.

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- .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 the plant nor field.
- .4 Timber shall 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 shall be P7 creosote as per AWPA P7.

2.3 Hardware**.1****Miscellaneous Hardware:**

- .1 Hardware shall meet the following specifications:
 - .1 Machine bolts, carriage bolts, lag bolts, drift bolts, anchor bolts, nuts and round plate washers shall meet the requirements of ASTM A307.
 - .2 Spikes shall meet the requirements of CSA B111.
 - .3 Pile shoes: Fabricated from minimum 6 mm thick steel plate. Steel plate to CSA G40.21, Grade 300W. Welding to CSA W59. No galvanizing required.
 - .4 Hot dip galvanize hardware, bolts, nuts, washers and spikes to CSA G164, with minimum zinc coating of 600 g/m².
 - .5 All hardware shall be hot dip galvanized, unless noted otherwise.

PART 3 - EXECUTION

- 3.1 Handling Timber .1 Timber shall 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 Field treat spike holes, boreholes, plugged holes, cuts and any damage to treated material using field-applied preservative, regardless of plant treatment type. Fill all unused boreholes and any other holes with tight fitting treated wooden plugs prior to any exposure to water containing marine borers.
- .3 Treat boreholes using a pressurized container with an extension rod to produce a fine spray in the holes with one application. Alternatively, a cylindrical brush may be used.
- .4 Treat field cuts and any abrasions with minimum two liberal coats of field-applied preservative, using either spray or brush.
- .5 If underwater timber is field cut or damaged, remove timber and replace or repair/treat as directed by the *Departmental Representative*.
- .6 Environmental: Ensure no spillage or excess application of field preservative. Provide workmen with sufficient training and protective gear to properly and safely handle treated materials and apply field treatment, so as to prevent undue hazard to themselves, others or the environment.

- .7 Contain all debris and leachates (films on water surface) within the area of work by using containment facilities such as floating silt booms or silt 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, or other method approved by the *Departmental Representative*.

- .2 Equip piles with metal shoes.

- 3.4 Installation
- .1 Install piles in accordance with Section 31 61 13 - Pile Foundations, General.
 - .2 During pile driving, restrain lateral movement of piles at intervals not exceeding 6 m over the length between ground surface and driving head.