

PART 1 - GENERAL

1.1 RELATED WORK .1 Section 31 62 19 - Timber Piles.

1.2 DELIVERY, STORAGE AND HANDLING .1 Protect piles from damage due to excessive bending stresses, impact, abrasion or other causes during delivery, storage and handling.

.2 Replace damaged piles to satisfaction of Departmental Representative.

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

PART 2 - PRODUCTS

2.1 MATERIALS .1 Material requirements for piles are specified in Section 31 62 19.

.2 Supply or fabricate full length piles as indicated and provide equipment to handle full length piles without cutting and splicing.

.3 Do not splice piles without written permission of Departmental Representative. When permitted, provide details for Departmental Representative's review.

Design details of splice to bear dated signature stamp of professional engineer registered or licensed in province of Newfoundland and Labrador.

### PART 3 - EXECUTION

#### 3.1 EQUIPMENT

- .1 Prior to commencement of pile installation, submit to Departmental Representative for review, details of equipment for installation of piles.
  - .1 Impact hammers: give 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.
- .2 Hammer:
  - .1 Hammers to be selected on basis of driveability analysis using wave equation theory, performed to show that piles can be driven to levels indicated.
  - .2 The driveability analysis shall include, but not be limited to, the following: hammer, cushion, and capblock details; static soil parameters; quake and damping factors, total soil resistance, blow count, pile stresses and energy throughput at representative penetrations.
  - .3 Driveability analysis to be submitted to the Departmental Representative for approval of the hammer or hammers.
  - .4 When required criteria can not be achieved with the proposed hammer, use larger hammer and take other measures as required.

.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. Performance of the leads will be subject to assessment of Departmental Representative. Any remedial action required will be at the Contractor's own expense.

.4 Follower:

.1 Follower must be used for driving of all piles.

.2 Provide follower with dynamic impedance (EA/c) equal to that of pile and of shape and length enabling driving of pile in specified location to required depth and resistance. Provide follower with socket or hood carefully fitted to the pile head to minimize loss of energy and prevent damage to pile.

.3 Where follower is to be used, drive applicable test piles using similar follower.

.4 Proper design and performance of follower will be subject to the assessment of Departmental Representative.

3.2 PREPARATION

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

3.2 FIELD  
MEASUREMENTS

.1 Maintain accurate and daily records of driving for each pile, including:  
.1 Type and make of hammer, rated energy,

observed stroke, and observed blows per minute.

.2 Other installation equipment including details on use of pile cushion, follower, and water jet.

.3 Pile size and length, location of pile in pile group, and location or designation of pile group.

.4 Time for start and finish of driving pile and sequence of pile driving for piles in group.

.5 Penetration for own weight and own weight and weight of hammer, number of blows per 300 mm of penetration from start of driving and penetration for four (4) consecutive series of blows when approaching termination of driving of pile.

.6 Toe elevation upon termination of driving pile and final toe and cut-off elevations upon completion of pile group.

.7 For open-toe pipe piles, record length from ground surface outside pile to soil surface inside pipe.

.8 Records of restriking.

.9 Result of inspection of pile by means of inspection probe.

.10 Other pertinent information, such as interruption of continuous driving, observed pile damage, etc.

.11 Records of elevations of adjacent piles before and after driving of pile.

.12 Record all information on forms provided by Departmental Representative.

.2 Provide Departmental Representative with three (3) copies of the records.

3.3 PILE INSTALLATION .1 Use driving helmet to protect pile head.

.2 Hold pile securely and accurately in

position while driving.

- .3 Deliver hammer impacts concentrically and in direct alignment with pile taking care to avoid forcing pile laterally or bending pile.
- .4 Reinforce pile heads, if necessary.
- .5 Advance all piles to full supply length with top elevation as shown on drawings. If piles cannot be driven to full supply length, driving the piles to a penetration resistance as specified in Clause 3.9 may be accepted by the Departmental Representative.
- .6 Exercise care when driving piles adjacent to existing structures to ensure that no contact between pile and structure takes place.
- .7 Restrike piles which have settled or heaved during driving of adjacent piles. No additional compensation will be made for pile restruck due to such settlement of heave.
- .8 Restrike piles as directed by Departmental Representative.
- .9 Cut-off of piles shall be accepted only where approved by Departmental Representative. Cut-off piles neatly and squarely at elevations indicated.

3.4 TEMPORARY BRACING  
AND/OR TEMPLATES

- .1 Provide bracing and/or templates necessary for bracing and/or installation of piles.
- .2 Bracing and/or templates must be capable of

providing the necessary support to piles during initial installation and restriking operations.

- .3 Remove temporary bracing and templates upon completion of work.
- .4 Plant, labour, equipment, material, and supervision costs related to providing temporary bracing and/or templates are incidental to the piling work and no additional compensation will be made.

### 3.5 OBSTRUCTION

- .1 Where obstruction is encountered that results in a sudden, unexpected change in penetration resistance and deviation from specified tolerances, the Contractor may be required to perform one or all of the following:
  - .1 Removal of obstruction.
  - .2 Extraction, repositioning and redriving.
  - .3 Addition of extra piles.
- .2 If in the opinion of Departmental Representative work done as per Clause 3.5.1 could not have been reasonably anticipated by the Contractor, additional compensation for work done will be considered for payment.

### 3.6 JETTING

- .1 Use water jetting only with authorization/permission of Departmental Representative.
- .2 When water jetting is authorized/permitted, the jetting system used must be sufficient to freely erode and remove the soil material immediately adjacent to the pile without creating a crater around pile causing it to drift.

- .3 Submit all details of jetting including plant description, the number and size of jet nozzles, volume and pressure of water, and size and length of water hoses and pipes to Departmental Representative for approval.
- .4 Restriction: stop jetting at a minimum of 1 metre above expected final toe elevation and at a minimum of 1 metre above the toe elevation of piles previously driven within 2 metres of jetted pile, except where piles are carried to bedrock. Drive piles down beyond depth of jetting until required penetration resistance is obtained. If there is evidence that jetting has disturbed previously installed piles, restore capacity of those piles by restriking. Restrike for verification where necessary after jetting operations in area have been completed. No additional compensation will be made.

### 3.7 WORKING LOAD

- .1 All piles are to be driven to full supply length. If the piles cannot be driven to the full supply length without damage, the Departmental Representative will consider an acceptable pile driving resistance. The Contractor is to note that the required working load of each pile is 175 kilonewtons.

### 3.8 FINAL PENETRATION RESISTANCE

- .1 Installation of each pile will be subject to approval of Departmental Representative, who will be sole judge of acceptability of pile with respect to final penetration resistance, depth of penetration, or other criteria. If the piles cannot be driven to full supply length, the Departmental Representative will approve final penetration resistance of all piles prior to removal of pile driving equipment from site.

- .2 If the piles cannot be driven to full supply length, drive piles to a final penetration such that a minimum count of 30 is achieved. The four (4) final consecutive penetrations of 150 mm, should be recorded and provided to the Departmental Representative. Alternatively, a penetration resistance of at least 200 blows for a penetration smaller than 300 mm, or to a penetration smaller than 25 mm for two (2) consecutive series of 50 blows, (whichever occurs first) shall also be considered acceptable. Prior to taking final penetration resistance, drive piles without interruption for a sufficient interval to break or prevent development of soil set-up. When required by Departmental Representative, restrike. No additional compensation will be made for restriking.

### 3.9 TOLERANCES

- .1 Pile, at design elevation, to be no more than 2 % of length out of alignment.
- .2 If in the opinion of Departmental Representative piles are placed beyond tolerances specified, the Contractor may be required to remove such piles and install new piles to the specified tolerances at his own expense.

### 3.10 DAMAGED OR DEFECTIVE PILE

- .1 Departmental Representative will reject any pile found to be defective or damaged.
- .2 Remove rejected pile and replace with a new and if necessary, longer pile, as directed by the Departmental Representative.
- .3 Remove rejected pile and fill hole as directed by Departmental Representative.

- .4 Leave rejected pile in place and cut off as directed by Departmental Representative.
- .5 Leave rejected pile in place and place adjacent pile as directed by Departmental Representative.
- .6 No extra compensation will be made for removing and replacing or other work made necessary through rejection of a defective pile.