

**ITEM 16551.02 M - TREATED TIMBER PILES**  
**ITEM 16551.01 M - TREATED TIMBER TEST PILES**

**DESCRIPTION**

Under this work, the Contractor shall furnish and place piles of the type and size and at the locations indicated on the plans, or where ordered by the Engineer.

**MATERIALS**

Materials for piling shall conform to the requirements of the following subsections:

Treated Timber Piles	720-02
Pile Shoes	720-05

In addition to the requirements specified in the preceding Subsections the following shall apply:

**A. Test Piles.** The quality and dimensions of the test piles must be truly representative of the stock to be driven.

**B. Minimum Diameter.** Timber piles used as foundation piles for highway, utility or pedestrian structures shall have a minimum butt diameter of 300 mm.

**CONSTRUCTION DETAILS**

**A. Storage, Handling and Inspection.** The method of storing and handling of piles shall be such as to avoid damage to the piles. Piles will be first inspected at the creosoting plant and subject to further inspection upon arrival at the job site.

**B. Site Preparation.** Do not drive piles until after the excavation is completed to the finished grade at the bottom of the footing. Remove material forced up by driving, fill depressions caused by driving and establish the correct elevation of foundation before placing footing concrete, unless otherwise shown on the plans.

**C. Preparation of Piles**

- 1. Shoes.** Saw the pile toe square so that, when cut off, the end is perpendicular to the longitudinal axis of the pile or tapered to a point not less than four 100 mm in diameter. Shod the piles with metal shoes when indicated on the plans. Carefully shape the toe of the pile to secure an even and uniform bearing on the shoe.
- 2. Butts.** The butts of the piles shall be sawed square.
- 3. Splices.** Piles shall not be spliced.

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**D. Equipment for Driving Piles**

1. General - Drive piles with equipment which has the prior approval of the Deputy Chief Engineer for Structures Design and Construction (D.C.E.S.). The Contractor shall submit to the D.C.E.S., Form BD-138, "Pile Driving Equipment Data," for approval. The D.C.E.S. will require 15 working days upon receipt for review. Each separate combination of pile and pile driving equipment proposed by the Contractor requires the submission of a corresponding BD-138.

The minimum rated striking energy of the hammer to be used in driving timber piles is 9.5 kJ per blow.

Hammers having greater striking energy may be used upon approval by the D.C.E.S., with the restriction that a maximum rated striking energy of 21 kJ per blow be specified. These hammers shall produce a minimum of 20 blows/300 mm and a maximum of 60 blows/300 mm at the Ultimate Pile Resistance shown on the Contract Plans. However, if in the opinion of the D.C.E.S., satisfactory results are not obtained with the hammer furnished by the Contractor, a hammer meeting the approval of the D.C.E.S. shall be furnished and used at no additional cost to the State.

2. Air/Steam Hammers - Provide sufficient boiler or compressor capacity at all times to maintain the rated speed of air/steam hammers during the full time of pile driving. Maintain the valve mechanism and other parts of a single or double-acting hammer such that the number of blows per minute for which the hammer is designated, is satisfied.
3. Diesel Hammers - Maintain the valves, pumps, ports, rings, and other hammer parts such that the following condition for which the hammer is designated is satisfied:

<b>Hammer Type</b>	<b>Designated Condition</b>
Single Acting	Length of Stroke or Blows per Minute
Double Acting	Bounce Chamber Pressure

Provide all Diesel Hammers with an acceptable means of measuring hammer energy. When pressure gages are included as normal equipment, they shall be furnished and maintained in operable condition. Provide the Engineer with manufacturer's charts and graphs that are required to calibrate hammer energy. Arrange easy access to the pressure gages so that readings may be conveniently taken by the Engineer.

A double acting hammer not operating at the required bounce chamber pressure shall be removed promptly from the work site. It shall be replaced by a hammer acceptable to the Engineer at no cost to the State.

4. Use an approved hammer cushion block to transfer pile hammer energy to the pile. Equip each hammer with a helmet/drive head to fit the type of pile to be driven.

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5. Pile driving leads shall be constructed in such a manner as to afford freedom of movement of the hammer. The use of either swinging or hanging leads will be permitted provided the pile or leads are properly supported during driving and the required final position and batter of pile is achieved. In the event the Engineer determines that the use of swinging or hanging leads is producing unsatisfactory results, he may require the Contractor to hold the leads in position with guys or braces to give the required support. The Contractor may, as an alternative, replace the unsatisfactory equipment with equipment having fixed leads.

Pile driving leads shall be of sufficient length so that the use of a follower will not be necessary. The driving of piles with followers will generally not be permitted and shall be done only with written permission and direction of the D.C.E.S.

When directed by the Engineer, use either approved steel or wooden spuds to penetrate consolidated material or obstructions in the upper 3 meters in order to assist in driving the piles to the required depth and resistance. Augers may be used for this purpose when written permission is obtained from the D.C.E.S.

6. Water jets and vibratory hammers shall not be used in driving any pile, unless written approval is given by the D.C.E.S. Piles installed with a water jet or vibratory hammer shall be impact driven to secure the final penetration.

**E. Methods of Driving.** The driving of piles shall be done with an air/steam, diesel, or hydraulic hammer. Piles shall be driven starting from the center of the foundation and proceeding outward from this point, or starting at the outside row and driving progressively across the foundation.

**F. Length of Piles**

1. **General.** When no test piles are used, the length of piles will be determined in the field using the driving criteria established by the D.C.E.S. The pile lengths shown on the plans are for estimating purposes only. Piles may be completely driven in one operation or, if directed by the D.C.E.S., may be partially driven and allowed to set from 2 to 24 hours (or as indicated on the Contract Plans) before driving is resumed.
2. **Test Piles.** Where specified, test piles will be driven to determine the lengths of foundation piles to be used. The location, number, lengths, and methods of driving test piles may be changed as directed by the D.C.E.S. at any time during the progress of the work.

Test piles that are driven within the structure limits may, if properly located in accordance with the plans, be used as foundation piles. Test piles shall be similar in shape and section to those that are to be used subsequently for foundation piles.

When test piles are used, furnish and place in the leads, piles of the lengths shown on an itemized list furnished by the Engineer. This order list will be furnished after completion of all test piles in the substructure unit.

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**G. Allowable Variation in Pile Alignment.** Piles shall be truly vertical or accurately battered as indicated on the Contract Plans. The top of any pile driven its full length into the ground shall not vary from the plan location by more than 100 mm, unless otherwise shown on the Contract Plans. The top of any pile partially exposed or included in an integral abutment shall not vary from the plan location by more than 25 mm, unless otherwise shown on the Contract Plans. In addition, piles may have a variation at their toe of not more than 20 mm per meter from the vertical or from the batter shown on the Contract Plans or permitted by the D.C.E.S.

**H. Defective Piles.** All piles forced up by any cause shall be driven again, as directed by the Engineer.

The following shall be causes for rejection of a pile:

1. Pile location or batter is incorrect.
2. Pile damaged from any cause whatsoever.
3. Pile fails to attain the driving criteria determined by the D.C.E.S., or the driving resistance shown on the Contract Plans.
4. Pile toe elevation is not within the limits called for on the Contract Plans, or specified by the Engineer.
5. Pile is determined by the Engineer to be unserviceable for other reasons related to the furnishing and installing of the pile.
6. Piles that are split, splintered or broomed from driving operations.
7. Any pile broken by reason of internal defects (even if placed in the leads), or improper driving.
8. Pile which is driven so that when cut off, the butt is below the elevation fixed by the Contract Plans or established by the Engineer.

Do not place footing concrete until all piles within the footing are inspected by the Engineer. Remove such rejected piles or at the option of the Engineer an adjacent pile may be driven if this can be done without impairing the structure.

**I. Cutting Off Piles.** Cut off the tops of all piles at the elevation indicated on the Contract Plans, or as established by the Engineer. The cut shall be clean and to a true plane, in accordance with the detail shown on the Contract Plans. All cut off lengths shall become the property of the Contractor.

**J. Included Work.** Backfill all cavities left by the pile driving operation as specified by the Engineer.

**METHOD OF MEASUREMENT**

**Test Piles.** The quantity of each type of test pile to be paid for under this work will be the number of linear meters of test pile ordered placed in the leads by the Engineer.

**Piles.** The quantity of piles to be paid for under the work specified will be the number of linear meters of piles placed in the leads, in accordance with the Engineer's order list.

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In the calculations for the lengths of pile which will appear on the order list, no allowance will be made for any lengths of pile above the cut off elevation. Any additional lengths of pile above the cut off elevation necessary to facilitate the Contractor's operation shall be at his own expense. When field conditions necessitate a change to the ordered length for piles, the minimum change in length specified shall be 1.5 meters.

**BASIS OF PAYMENT**

**Piles.** The unit price bid per linear meter for each of the respective pile items includes the cost of furnishing all labor (including the manipulation of pile driving equipment and materials), materials and equipment (excluding pile driving equipment) necessary to complete the work as prescribed in the Specifications including the following additions:

**A. Structure Excavation.** Work associated with the removal of any material forced up above the foundation by the driving of piles shall be included in the cost of the pile.

**B. Defective Piles.** No payment will be made for piles rejected in accordance with the requirements of **CONSTRUCTION DETAILS - H. Defective Piles** of this Specification.

**C. Backfilling.** Payment for backfilling of all cavities left by the extraction of damaged piles or from auger holes or soil deformations necessary to place piles shall be included in the work for the respective pile item.

**D. Redriving Piles.** The cost of driving piles that are forced up by any cause shall be included in the unit price bid for the respective pile item.

**E. Ordering Piles.** Any piles ordered by the Contractor prior to receipt of the Engineer's order list shall be the Contractor's responsibility and expense.

**F. Pile Shoes, etc.** The cost of furnishing and using pile shoes, followers, augers or spuds shall be included in the unit price bid for the respective pile item.

**Progress Payments for Piles.** Progress payments will be made when the piles are properly installed in accordance with the plans, specifications and orders of the Engineer. Payment will be made, at the unit price bid, for eighty (80) percent of the quantity properly installed exclusive of cutting off piles. The balance of the quantity will be paid for upon completion of the work including the cutting off of piles.