

## **PILES & PILE DRIVING**

### **I. SCOPE**

The work under this section shall consist of furnishing all materials, driving, cutting off, etc., all timber piles as indicated and detailed on the drawings and as specified herein.

### **II. MATERIALS**

- II.1. All timber piles shall be 14" minimum butt diameter and 8" minimum tip diameter round piles conforming to Class B, ASTM Designation D25-73 unless otherwise noted on the drawings. Species shall be southern pine suitable for a design stress of 1,200 PSI in accordance with ASTM D2899-70 T.
- II.2. All piles above the permanent water table shall be treated with CCA to a minimum retention of .6 lbs. per cubic foot. All piles below the permanent water table may be untreated. Submit treatment list to Design Consultant for approval prior to installation.

### **III. PILE DRIVING**

#### **III.1. PREPARATION FOR DRIVING:**

##### **III.1.1. Caps:**

- III.1.1.1. Cushion or cap blocks shall consist of a single block of hardwood of proper shape and dimension to fit the hammer. The grain of the block shall be perpendicular to the axis of the pile. If laminated materials are used, the strength of such material shall be equal to or greater than hardwood.
- III.1.1.2. The use of wood chips, small wood blocks, shavings or any similar material will not be permitted.
- III.1.1.3. The continuous or frequent introduction of materials to cushion the hammer blows will be prohibited.
- III.1.1.4. Details of the cap block will be submitted to the Design Consultant for approval before piles are driven.

##### **III.1.2. Collars:**

- III.1.2.1. Collars or bands to protect piles against splitting and brooming, where necessary, shall be provided.

##### **III.1.3. Shoes:**

- III.1.3.1. When necessary, the piles shall be shod with metal shoes of approved design, the points of piles being carefully shaped to secure an even and uniform bearing on the shoes.

#### **III.2. DRIVING:**

##### **III.2.1. Hammers:**

- III.2.1.1. The hammer used for driving all types of timber pilings, whether in foundations, pile bents, fenders, or bulkheads, shall be either a power hammer, developing energy per blow of not less than 7,000 foot pounds, or a gravity hammer weighing not less than 3,000 pounds.

- III.2.1.2. The hammer used shall be operated at the pressure and speed recommended by manufacturer.
- III.2.1.3. Type of hammer to be used shall be furnished to the Design Consultant for approval before work begins.
- III.2.1.4. No blow count or set measurement will be made if the hammer is not working properly.
- III.2.1.5. In order to minimize thermodynamic losses in transmission with the use of steam or air hammers, the source of the steam or air shall be no farther than 150 feet from the hammer measured along the hose and piping carrying the steam or air to the hammer.

III.2.2. Water Jets:

Water jets may be used in starting and driving piles only with the permission of the Engineer and under such conditions as he may impose. In any case jetting will not be permitted in the last five (5) feet of driving.

III.2.3. Bearing Values:

- III.2.3.1. Timber piles shall be driven to a minimum bearing value of twenty (20) tons as determined by the Engineering News Record formula, given below:

$$R = 2WH/(S + 1.0) \text{ for gravity hammers}$$

or

$$R = 2E/(S + 0.10) \text{ for power hammers}$$

Where:

R = Safe bearing value in tons.

\*S = The average penetration per blow, in inches.

H = Height of hammer fall, in feet.

W = Weight of striking part of hammer in tons.

E = Energy per blow of hammer, in foot - tons; (which shall be the product W x H, for single-acting hammers and the manufacturer's rated capacity for the speed used in driving, for double-acting hammers. The energy per blow for combustion hammers shall be determined in accordance with the manufacturer's recommendations).

- \* Generally, the average penetration per blow will be determined by computing the penetration per blow average through one foot of penetration. Where it is considered necessary by the Engineer, the average penetration per blow may be determined by averaging the penetration per blow through the last 10 to 20 blows of the hammer. The Design Consultant will calculate the driving resistance for all piles and will furnish this data to the Contractor. Actual depth of driving shall be subject to approval of the Engineer.

- III.2.3.2. Generally, piles shall be driven until the required bearing has been continuously maintained for five feet, or to practical or absolute refusal. Practical refusal is defined as a penetration per blow which is less than one-third the penetration per blow required to produce bearing resistance when that penetration per blow is maintained and not exceeded for two

feet of penetration. Absolute refusal is defined as the point at which penetration can no longer be achieved.

- III.2.3.3. Cutting Off – All piles shall be sawed off at the elevation determined in the field. Broken, split, or misplaced piles shall be drawn and replaced. No splicing shall be done. Piles driven below the cut off grade shall be withdrawn and replaced by new, and if necessary, longer piles. After cutting has been done, the heads of piles shall be treated with Copper Napthanate.

#### **IV. TOLERANCES**

- IV.1. All piles shall be driven with a variation of not more than 1/8 inch per foot from the vertical or better, as shown on the plans. A maximum deviation of 3 inches will also be permitted from the design plans position.
- IV.2. Pile driving rigs shall have firmly supported leads extending down to the lowest point the hammer must reach. A suitable driving cap shall be provided to prevent undue damage to the top of the pile, and to hold the pile center under the hammer.

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