

## SECTION 418—TIMBER STRUCTURES

### 418.01—Description

This work shall consist of furnishing and erecting timber materials required to complete a structure in accordance with these specifications and in conformity with the lines and grades shown on the plans or as established by the Engineer.

### 418.02—Materials

- (a) **Lumber and Timber:** Lumber and timber shall conform to the requirements of Section 236.
- (b) **Structural Shapes:** Rods, plates, shapes, and eyebars shall conform to the requirements of Section 226.
- (c) **Castings:** Castings shall be cast steel or gray iron, as shown on the plans, conforming to the applicable requirements of Section 224.
- (d) **Hardware:** Machine bolts, drift bolts, and dowels shall conform to the requirements of Section 226. Washers may be ogee gray iron or malleable castings or may be cut from mild steel plate as shown on the plans.  
Machine bolts shall have square heads and nuts. Nails shall be cut or round wire of standard form. Spikes shall be cut, wire, or boat spikes as shown on the plans.  
Nails, spikes, bolts, dowels, washers, and lag screws shall be black or galvanized, as specified on the plans.  
Other hardware, except malleable iron connectors, shall be galvanized in accordance with the requirements of Section 233 or cadmium plated in accordance with the requirements of ASTM A165, Type OS.
- (e) **Paint:** Paint shall conform to the requirements of Section 231.

### 418.03—Procedures

- (a) **Storing Material:** Lumber and timber on the work site shall be stored in stacks or ricks.  
Material shall be stacked at least 12 inches above the ground surface and sloped. It shall be protected from weather by a suitable covering. The ground underneath and in the vicinity of material shall be cleared of weeds and rubbish.  
Untreated material shall be open stacked, and treated material shall be close stacked.
- (b) **Treated Timber:** Treated timber shall be handled with rope slings without sudden dropping, breaking of outer fibers, or bruising or penetrating of the surface with tools such as cant hooks, peaveys, pikes, or hooks.  
Cutting, framing, and boring of treated timbers shall be performed before treatment insofar as is practicable. When treated timbers are to be placed in water infested by marine borers, as determined by the Engineer, untreated cuts, borings, or other joint framings below the high water elevation shall be avoided.  
Cuts in treated piles or timbers and abrasions, after having been carefully trimmed smooth, shall be brush coated with at least two applications of the preservative used in the treatment of the pile.  
Bolt holes bored after treatment shall be treated with a preservative. After being treated, unfilled holes shall be plugged,  
Whenever forms or temporary braces are attached to treated timber with nails or spikes, holes shall be filled by driving galvanized nails or spikes flush with the surface or by plugging as required for bolt holes.
- (c) **Untreated Timber:** Ends, tops, and contact surfaces of sills, caps, floor beams, stringers, and bracing and truss units shall be thoroughly coated with two coats of preservative before assembly. The back faces of bulkheads and other timber that will be in contact with earth, metal, or other timber shall be similarly treated.
- (d) **Treatment of Pile Heads:** After required cutting to receive caps and prior to placement of caps, pile heads shall be treated to prevent decay. Heads of timber piles shall be protected by one of the following methods, as indicated on the plans. If not otherwise indicated, Method A shall be used.
  - 1 **Method A—zinc covering:** The sawed surface shall be brush coated with three applications of a preservative. Before the cap is placed, a sheet of 12 gage (0.028 inch) zinc shall be placed on each

pile head. The sheet shall be of sufficient size to project at least 4 inches outside the pile and shall be bent down, neatly trimmed, and securely fastened to the face of the pile with large-headed galvanized roofing nails.

- 2 **Method B—fabric covering:** Heads of piles shall be covered with alternate layers of hot pitch and cotton fabric for waterproofing, using four applications of pitch and three layers of fabric. The cover shall measure at least 6 inches more in dimension than the diameter of the pile and be neatly folded down over the pile and secured by large-headed galvanized nails or by binding with at least seven complete turns of galvanized wire securely held in place by large-headed galvanized nails and staples. Edges of fabric projecting below the wire wrapping shall be trimmed to present a neat appearance.
- (e) **Holes for Bolts, Dowels, Rods, and Lag Screws:** Holes for round drift bolts and dowels shall be bored with a bit 1/16 inch less in diameter than the bolt or dowel to be used. The diameter of holes for square drift holes or dowels shall be equal to the least dimension of the bolt or dowel.

Holes for machine bolts shall be bored with a bit the same diameter as the bolt.

Holes for rods shall be bored with a bit 1/16 inch greater in diameter than the rod.

Holes for lag screws shall be bored with a bit not larger than the body of the screw at the base of the thread.
- (f) **Bolts and Washers:** A washer shall be used under bolt heads and nuts that would otherwise come in contact with wood. Bolts shall be checked after nuts have been finally tightened.
- (g) **Countersinking:** Countersinking shall be performed wherever smooth faces are required. Recesses in horizontal surfaces shall be painted with a preservative and filled with hot pitch after the bolt or screw is in place.
- (h) **Framing:** Lumber and timber shall be cut and framed to a close fit so that the joints will have an even bearing over the contact surfaces. Mortises shall be true to size for their full depth, and tenons shall fit snugly. Shimming will not be permitted in making joints, and open joints will not be accepted.
- (i) **Pile Bents:** Preparing and driving piles shall be in accordance with the requirements of Section 403.

Piles for any one bent shall be carefully selected as to size to avoid undue bending or distortion of the sway bracing. Care shall be taken in distributing piles of varying sizes to secure uniform strength and rigidity in bents of any given structure.

Cutoffs shall be accurately made to ensure a uniform bearing between the cap and piles of a bent.
- (j) **Framed Bents:**
  - 1 **Mud sills:** Untreated timber used for mud sills shall be of heart cedar, heart cypress, redwood, or other durable timber. Mud sills shall be firmly and evenly bedded to solid bearing and tamped in place.
  - 2 **Concrete pedestals:** Concrete pedestals for the support of framed bents shall be finished so that sills or posts will take an even bearing. Dowels or anchor bolts at least ¾ inch in diameter shall be set in pedestals when they are cast for anchoring sills or posts.
  - 3 **Sills:** Sills shall have a true and even bearing on mud sills, piles, or pedestals. They shall be drift bolted to mud sills or piles with bolts at least ¾ inch in diameter and extending into the mud sills or piles at least 6 inches. When possible, earth shall be removed from contact with sills so that there will be free air circulation.
  - 4 **Posts:** Posts shall be fastened to pedestals with dowels at least ¾ inch in diameter, extending at least 6 inches into the posts.

Posts shall be fastened to sills by one of the following methods, as indicated on the plans: by dowels at least ¾ inch in diameter extending at least 6 inches into posts and sills or by drift bolts at least ¾ inch in diameter driven diagonally through the base of the post and extending at least 9 inches into the sill.
- (k) **Caps:** Timber caps shall be placed with ends aligned in a manner to secure an even and uniform bearing over the tops of supporting posts or piles. Caps shall be secured by drift bolts at least ¾ inch in diameter extending at least 9 inches into the posts or piles. Drift bolts shall be in the approximate center of the post or pile.

(l) **Bracing:** Ends of bracing shall be bolted through the pile, post, or cap with a bolt at least 5/8 inch in diameter. Intermediate intersections shall be bolted or spiked with wire or boat spikes, as indicated on the plans. In all cases, spikes shall be used in addition to bolts.

(m) **Stringers:** Stringers shall be sized at bearings and placed in position so that knots near edges will be in the top portions of stringers.

Outside stringers may have butt joints with ends cut on a taper, but interior stringers shall be lapped to take bearing over the full width of the floor beam or cap at each end. Lapped ends of untreated stringers shall be separated at least 1/2 inch for the circulation of air and securely fastened by drift bolting where specified. Where stringers are two panels in length, joints shall be staggered.

Cross bridging between stringers shall be neatly and accurately framed and securely toenailed with at least two nails in each end. Cross-bridging units shall have full bearing at each end against the side of stringers. Cross bridging shall be placed at the center of each span.

(n) **Plank Floors:** Planks shall be surfaced on four sides (S4S).

Single-plank floors shall consist of a single thickness of plank supported by stringers or joists. Planks shall be carefully graded as to thickness and placed so that no two adjacent planks shall vary in thickness by more than 1/8 inch. Each plank shall be placed heart side down, firmly jacked together, and securely fastened to each joist.

(o) **Wheel Guards and Railings:** Wheel guards and railings shall be erected true to line and grade. Wheel guards, rails, and rail posts shall be surfaced on four sides (S4S). Wheel guards shall be laid in sections at least 12 feet in length.

(p) **Painting:** Rails and rail posts, untreated timber, or timber treated with a preservative shall be painted with three coats of paint.

Metal parts, except hardware, shall be given one coat of shop paint and, after erection, three coats of field paint.

Timber shall be painted with No. 11 paint.

**418.04—Measurement and Payment**

**Lumber and timber** will be measured in units of 1,000 foot-board-measure (MFBM) for materials placed in the finished structure and will be paid for at the contract unit price per MFBM. Computations for lumber quantities will be based on nominal sizes, complete-in-place. No other allowance for waste will be made.

**Structural steel** will be paid for in accordance with the requirements of Section 407.

**Painting timber structures**, when a pay item, will be paid for at the contract lump sum price. When not a pay item, the cost thereof shall be included in the price for other appropriate pay items.

These prices shall include preparing surfaces and preservative treatment.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Lumber (Treated or untreated)	MFBM
Painting timber structures	Lump sum