Section 709. TIMBER STRUCTURES

709.01. Description. This work consists of providing, fabricating, and placing structural timber, lumber, timber piling, hardware, castings, and other accessories in structures consisting entirely, or in part, of timber.

709.02. Materials. Provide materials in accordance with the following:

Structural Steel 906
Miscellaneous Metals 908
Hardware 908
Structural Timber and Lumber 912
Timber Piles 912
Preservative Treatments 912

709.03. Construction.

A. **Storage of Materials.** Store lumber and timber to prevent contamination from dirt and water.

Closely stack treated material to prevent long timbers or pieces with small cross sections from sagging or becoming crooked. If the Engineer directs, cover the pile with a layer of tarpaper, or equivalent, and at least a 1-inch layer of sand or earth to protect the pile from long exposure to direct sunlight or possible fire hazard.

B. **Workmanship.** Drive nails and spikes to set the heads flush with the surface of the wood. Do not make deep or frequent hammer marks in surfaces or edges of timbers.

Tighten bolts to draw all fastened parts together. Workmanship on metal parts must be in accordance with subsection 707.03.

C. **Framing and Placing Treated Timber and Piling.**

1. **Handling.** Avoid damaging the edges of timbers or exposing untreated wood. Do not use peavies, cant hooks, timber dogs, or other pointed tools on treated timber. Use clamps on timber or piling to support staging or other construction facilities. The Engineer will not allow temporary bolting, spiking, or nailing of treated timbers.

2. **Framing and Boring.** Cut, frame, and bore treated timbers as close to plan dimensions as possible before treatment. Cut and frame lumber and timber so the joints will have even bearing over the entire contact surfaces.

   Do not shim in making joints, unless approved by the Engineer. The Engineer will not accept open joints.

If the Engineer allows the use of shims, use pressure treated timber shims.

Bore holes for hardware in accordance with Table 709-1.

Table 709-1
Hardware Hole Sizes

Hardware	Hole Size
Round Driftpins and Dowels	$^{1}/_{16}$ in < diameter of the pin or bolt
Square Driftbolts or Dowels	Equal to the smallest dimension of the bolt or dowel
Machine Bolts and Rods	$^{1}/_{16}$ in > the diameter of the bolt or rod
Lag Bolts	≤ the body of the bolt at the root of the thread

3. **Pile Driving.** Provide and drive piling for timber construction in accordance with section 705.

4. **Sills.** Splice sills only as approved by the Engineer. Bed sills as shown on the plans. If placing sills directly on the foundation soil, provide a continuous firm and uniform bearing for the full length of the sill and carefully tamp in position with backfill material. If required, construct a mortar bed to ensure a uniform and even bedding on hard foundation soil, using a 1:2 mix of cement and sand. Spread the mortar so it is at least 3 inches thick under the full bearing area of the sill, and embed the sill in the mortar 1 inch. Bed grillages or mats to allow uniform bearing of sills. Finish the top surface of concrete pedestals smooth and to a single plane to provide uniform and even bearing for sills or posts. Size sills to a single plane at the bearings of posts.

5. **Field Treatment.** Trim and coat field cuts, except pile cutoff; daps; field bored holes; and abrasions in treated piles, lumber, and timber in accordance with subsection 912.03.

   Coat with at least two coats of preservative allowing at least 2 hours between applications. After cut-off, treat the tops of the treated timber piles, in accordance with subsection 912.03. Apply three coats of preservative in accordance with the manufacturer's recommendations. Plug unfilled holes, after treating, with preservative treated plugs.

6. **Caps.** Size caps and bring them to a uniform thickness and even bearing on piles or posts. Place the side with the most sap wood, downward. Fasten caps to posts or piles with the drift bolts extending an equal distance into cap and post or pile.

   After installing the caps, trim portions of the pile extending beyond the pile caps to drain off water, and treat in accordance with subsection 709.03.C.5.

7. **Posts.** Saw posts to the required length for their position (vertical or batter) and to even bearing on the cap and sill.

8. **Braces.** Frame and fasten sash and sway bracing, and longitudinal bracing to piles or posts. To accommodate variation in the size of piles, use filling pieces between braces and the piles of a bent, and securely fasten and face to obtain bearing against piles. Fit braces from the bottom, and cut to length at the top. Treat the cut surface in accordance with subsection 709.03.C.5.

9. **Stringers.** Size stringers at bearings to a uniform depth and place in position so knots near edges will be in the top portion of the member; otherwise, turn the edges with the most sapwood down. Lap interior stringers to take bearing over the full width of the cap or floor beams. Frame cross bridging between stringers to a full bearing against the sides of the stringers and nail in place.

10. **Floor Plank.** Ensure floor planks are at least 10 inches wide. Plane base plank and plank for single plank floors on one side and one edge (S1S1E) and closely lay them with the surfaced side down. Ensure surface or top course plank are surfaced on four sides (S4S). Stagger joints in base plank or surface plank. Nail base plank at both edges at all points of support. Nail surface or top course plank at both edges at intervals no greater than 9 inches. Provide nails or spikes with a length equal to twice the thickness of the material through which they are driven. Cut planks to a neat line parallel to the sides or ends of the floor.

11. **Curbs.** Surface timber for curbs and scupper blocks on four sides (S4S) with a 1 inch wide chamfer at the inside upper corner of curbs. Place them as shown on the plans and bolt in place. Make half-and-half joints in curb timbers and lap at least 12 inches. Where using scupper blocks, place curb joints immediately above a scupper block.

12. **Railings.** Frame timber railings, including posts and braces, to straight lines. Use straight material, free of blemishes and surface on four sides (S4S).

13. **Miscellaneous Hardware.** Countersink the heads of screws or bolts to prevent interference with assembling work. Treat recesses formed for countersinking with preservative in accordance with subsection 709.03.C.5.

    Proportion plate and cast washers to develop the full strength of the bolt. Provide washers and heads of domehead bolts with a diameter at least 3.5 times the diameter of the bolt. Provide square washers

with at least one side at least 3.5 times the diameter of the bolt. Use washers on bolts with a diameter of at least ½ inch, or use special bolt heads and nuts that provide equivalent bearing surface and strength.

14. **Prefabricated Dowel Laminated Timber Panels.** Drill dowel holes after cutting timber members to length, but before treatment. Fabricate the panels and fully assemble them at the fabrication plant. Match-mark the panels before shipment.

709.04. Measurement and Payment.

Pay Item	**Pay Unit**
Structure, Timber (Structure No.)	Lump Sum
Timber and Lumber, Treated, Furn and Place	Thousand Board Feet
Hardware, Misc. (Structure No.)	Lump Sum

If the contract contains the pay item **Structure, Timber**, the Department will not pay for miscellaneous hardware separately but will consider this to be included in the unit price for **Structure, Timber**. The cost of timber piling and excavation, necessary for construction of timber structures, is included in the unit price for **Structure, Timber**.

If the contract does not contain the item **Structure, Timber**, the Engineer will measure, and the Department will pay for timber piling in accordance with subsection 705.04. The cost of excavation for construction of timber structures is included in the unit price for **Timber and Lumber, Treated, Furn and Place**.

The Engineer will base measurement for **Timber and Lumber, Treated Furn and Place** on the nominal widths and thicknesses and the actual lengths of the material in the completed work.