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USACE / NAVFAC / AFCEA UFGS-02398 (May 2003)  
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Preparing Activity: NAVFAC Superseding  
UFGS-02398N (September 1999)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 25 June 2004

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SECTION 02398

PIER TIMBERWORK  
05/03

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NOTE: This guide specification covers the requirements for timber piers and timber work on other than timber piers.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

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NOTE: This specification also includes requirements for framing of timber bearing and fender piles to other pier work where required. Specification requirements for timber bearing and fender piles will be found in Section 02458 TIMBER PILES for fresh water use and in Section 02461 WOOD MARINE PILES for marine use. Due to the severity of salt water environment, glued laminated wood is not included in this guide specification.

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NOTE: On the project drawings, show:

1. Location, size, thickness, and stress rating of timbers
2. Size and spacing of fasteners
3. Soil data, where required.

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PART 1    GENERAL

1.1    REFERENCES

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NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest guide specification. Use of SpecsIntact automated reference checking is recommended for projects based on older guide specifications.

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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

AWPA C2	(2001) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes
AWPA M4	(2001) Standard for the Care of Preservative-Treated Wood Products
AWPA M6	(1996) Brands Used on Forest Products
AWPA P2	(2001) Standard for Creosote Solutions
AWPA P5	(2002) Standard for Waterborne Preservatives

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M	(2002) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2003) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 307	(2002) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-P-21035	(RevB; Notice 2) Paint, High Zinc Dust Content, Galvanizing Repair (Metric)
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U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-W-410	(Rev E) Wire Rope and Strand
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1.2    SUBMITTALS

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NOTE: Submittals must be limited to those necessary

for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

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NOTE: Do not require shop drawings on new construction unless the contract drawings show insufficient detail. Generally, on repair construction, no shop drawings are needed, except where drawings contain no details.

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#### Pier timberwork

Submit drawings of treated timber showing dimensions of cut, framed, or bored timbers.

#### SD-06 Test Reports

Timber preservative inspection

## Delivery inspection list

### SD-07 Certificates

#### MSDS and CIS

#### 1.3 DELIVERY AND STORAGE

Open-stack untreated timber and lumber material on skids at least 300 mm 12 inches aboveground, in a manner that will prevent warping and allow shedding of water. Close-stack treated timber and lumber material in a manner that will prevent long timbers or preframed material from sagging or becoming crooked. Keep ground under and within 1.5 m 5 feet of such piles free of weeds, rubbish, and combustible materials. Protect materials from weather. Handle treated timber with ropes or chain slings without dropping, breaking outer fibers, bruising, or penetrating surface with tools. Do not use cant dogs, peaveys, hooks, or pike poles. Protect timber and hardware from damage.

#### 1.4 QUALITY ASSURANCE

##### 1.4.1 MSDS and CIS

Provide Material Safety Data Sheets (MSDS) and Consumer Information Sheets (CIS) associated with timber pile preservative treatment. Contractor shall comply with all safety precautions indicated on MSDS and CIS.

##### 1.4.2 Timber Preservative Inspection

Submit the inspection report of an independent inspection agency, for approval by the Contracting Officer, that offered products complying with applicable AWPA Standards. Identify treatment on each piece by the quality mark of an agency accredited by the Board of Review of the American Lumber Standard Committee.

##### 1.4.3 Delivery Inspection List

Field inspect and submit a verification list of each treated timber member and each strapped bundle of treated lumber indicating the wording and lettering of the quality control markings, the species and the condition of the wood. Do not incorporate materials damaged in transport from plant to site. Inspect all preservative-treated wood, visually to ensure there are no excessive residual materials or preservative deposits. Material shall be clean and dry or it will be rejected due to environmental concerns.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Lumber and Timbers

##### 2.1.1.1 Solid Sawn

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**NOTE: Specify stress rating or assure that stress rating is shown on the drawings. Allow a design factor for reduction of tensile strength due to preservative treatment.**  
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Provide solid sawn lumber and timbers of stress-rated Southern Pine or Douglas Fir-Larch, with a stress rating [of [\_\_\_\_\_] MPa [\_\_\_\_\_] psi] [as indicated], and identified by the grade mark of a recognized association or independent inspection agency using the specific grading requirements of an association recognized as covering the species used. The association or independent inspection agency shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Use commercial grade lumber for secondary members such as decking, joists and railings.

#### 2.1.1.2 Preservative Treatment

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**NOTE: Preservatives and preservative treatment:**  
Wherever possible, use the same type of treatment  
for both timbers and piling on the job.

1. For timber in contact with salt water or salt  
water splash: pressure treat with either creosote,  
or water-borne preservative, or dual treat with  
creosote and water-borne preservative.

2. For wood not in contact with salt water or salt  
water splash:

a. Water-borne preservative, for most timber work,  
especially where contact with human skin is evident.

b. Creosote, to be considered for heavy industrial  
piers where color, odor, etc. of creosote is not  
objectionable and where contact with human skin is  
not likely to occur.

3. Usage: In general, treatment type will be  
determined by the marine borers prevalent in the  
locality. Consult with the EFD applied biologist to  
determine local marine borers and the most  
appropriate AWP treatment, for the location and use.

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Fabricate lumber and timbers before preservative treatment. Each piece of treated lumber or timber shall be branded, by the producer, in accordance with AWP M6. Treat wood to be used in contact with salt water or salt water splash in accordance with AWP C2 (Material Subject to Marine Borer Exposure) with [creosote] [water-borne preservative] [dual treated, with creosote and water-borne preservative]. For wood not in contact with salt water or salt water splash, treatment shall be in accordance with AWP C2 (For Above Ground, Soil Contact or Fresh Water Use) with [water-borne preservative (AWP P5) except that chromated zinc chlorides, pentachlorophenol-ammoniacal systems, and alkyl ammonium compounds will not be allowed] [creosote AWP P2)]. The Contractor shall be responsible for the quality of treated wood products.

#### 2.1.2 Hardware

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**NOTE: Give special attention to corrosion  
protection of hardware used with timber preserved**

with water-borne salts. Specify protection ranging from simple coatings to changing of the hardware metals dependent upon the required use and critical features of the hardware. Hot-dip galvanized hardware and fasteners will usually suffice in such cases.

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Bolts with necessary nuts and washers, timber connectors, drift pins, dowels, nails, screws, spikes, and other fastenings. Bolts and nuts shall conform to ASTM A 307. Provide cast-iron ogee, malleable iron washers, or plate or cut washers where indicated. Provide bolts with washers under nut and head. Provide timber connectors and other metal fastenings of type and size shown. Hot-dip galvanize [hardware] [\_\_\_\_\_].

#### 2.1.2.1 Wire Rope and Fittings

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NOTE: Give special attention to corrosion protection of hardware used with timber preserved with water-borne salts. Specify protection ranging from simple coatings to changing of the hardware metals dependent upon the required use and critical features of the hardware. Hot-dip galvanized hardware and fasteners will usually suffice in such cases.

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FS RR-W-410, [Type I, Class 2] [Type III, Class 2 or 3]. Provide staples of 10 mm 0.375 inch diameter zinc-coated steel at least 125 mm 5 inches long. Provide clips or clamps of zinc-coated steel.

#### 2.1.2.2 Zinc-Coating

Galvanize steel specified or indicated by the hot-dip process in accordance with ASTM A 123/A 123M or ASTM A 153/A 153M, as applicable.

### PART 3 EXECUTION

#### 3.1 CONSTRUCTION

Cut, bevel, and face timbers prior to plant preservative treatment. In addition to the contract clause entitled "Accident Prevention" provide protective equipment for personnel fabricating, field treating, or handling materials treated with creosote or water-borne salts. Refer to paragraph entitled "MSDS and CIS."

##### 3.1.1 Framing

Cut and frame lumber and timber so that joints will fit over contact surface. Secure timbers and piles in alignment. Open joints are unacceptable. Shimming is not allowed. Bore holes for drift pins and dowels with a bit 2 mm 1/16 inch less in diameter than the pin or dowel. Bore holes for truss rods or bolts with a bit 2 mm 1/16 inch larger in diameter than rod or bolt. Bore holes for lag screws in two parts. Make lead hole for shank the same diameter as shank. Make lead hole for the threaded portion approximately two-thirds of the shank diameter. Bore holes in small timbers for boat or wire spikes with a bit of the same diameter or smallest dimension of the spike to prevent splitting.



Counterbore for countersinking wherever smooth faces are indicated or specified.

### 3.1.1.2 Fender Systems

Face fender piles to receive chocks. Use only full-length timbers for chocks and tightly fit against fender piles. Face fender piles to provide a flat bearing against wales. Splice wales in location in a manner [as existing] [as indicated]. Additional splicing of wales will not be permitted. Bevel tops of fender piles outboard as indicated. Wrap pile clusters with wire rope. Fasten wire rope with clips and staples.

### 3.1.1.3 Bulkheads

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**NOTE: Assure that the drawings show bulkheads of sufficient height and width to prevent damage from erosion both to the side and from beneath the bulkhead. Where soil pressure against the bulkhead is high, special anchorage measures may be needed, such as tiebacks with concrete or timber dead-men or bulkhead piles.**  
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Make timber bulkheads at land end of pier of height and width indicated. Provide special anchorage such as bulkhead piles or dead-men, as indicated.

### 3.1.1.4 Framed Bents

#### 3.1.1.4.1 Footings

Bed mudsills to bearing and tamp in place. Finish concrete pedestals for support of framed bents so that the sills will have even bearing.

#### 3.1.1.4.2 Posts and Timbers

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**NOTE: Recommend use of 25 mm one inch diameter dowels, bolts, and drift bolts in underwater or splash zone conditions.**  
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Provide even bearing for sills on mudsills, piles, or pedestals. Drift bolt sills to mudsills, piles, or pedestals with bolts of at least [20] [24] mm [3/4] [one] inch [the indicated] diameter that extend into mudsills, piles, or pedestals at least 0 mm 6 inches. Cast dowels or bolts into concrete pedestals. When indicated, remove earth from contact with sills to provide for free air circulation. Saw posts for framed bents to proper length (vertical or batter) and provide even bearing on pedestals or sills. Fasten posts to sills with dowels of at least [20] [25] mm [3/4] [one] inch [the indicated] diameter extending at least 150 mm 6 inches into posts.

### 3.1.1.5 Bracing

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**NOTE: Recommend use of 25 mm one inch diameter dowels, bolts, and drift bolts in underwater or splash zone conditions.**

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Align bents before bracing is placed. Provide bracing of sufficient length to provide a minimum distance of 200 mm 8 inches between outside bolt and end of brace. Bracing and girts shall bear firmly against piles or timber to which secured. Place fillers to avoid bending the bracing more than 25 mm one inch out of line when bracing bolts or other fastenings are drawn up tight. Built-up fillers will not be permitted. Make filler a single piece of the same treated lumber as that in the brace, with a width of at least 150 mm 6 inches and a length of at least 300 mm 12 inches. Bolt ends of bracing through pile, post, or cap with a bolt of at least [20] [25] mm [3/4] [one] inch [the indicated] diameter. Bolt or boat spike intermediate intersections as indicated.

#### 3.1.6 Caps

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**NOTE: Recommend use of 25 mm one inch diameter dowels, bolts, and drift bolts in underwater or splash zone conditions.**

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**NOTE: This paragraph is based on timber caps on timber piles. Delete or modify this paragraph as necessary to accommodate other systems.**

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Prior to placing caps, prepare tops of posts or piles according to paragraphs entitled, "Field Treatment." Place timber caps to secure bearing over tops of supporting posts or piles and to secure even alignment of their ends. Secure caps by drift bolts of at least [20] [25] mm [3/4] [one] inch [the indicated] diameter extending at least 225 mm 9 inches into posts or piles. Place drift bolts in the center of pile or post.

#### 3.1.7 Stringers

Place crown up and, if possible, the better edge of deck stringers down. Tops of stringers shall not vary from a plane more than will permit bearing of the floor on stringers. Butt-joint and splice outside stringers, but lap interior stringers to take bearing over full width of cap or floor beam at each end. Break joints if stringers cover two spans. Toenail or drift bolt stringers as indicated. Stringers may be of sufficient length to cover two spans, except on sharp horizontal curves. Between stringers, frame and toenail cross-bridging or solid-bridging at each end with at least two nails for cross-bridging and four nails for solid-bridging. Make size and spacing of bridging as indicated.

#### 3.1.8 Decking

Make decking of a single thickness of plank supported by stringers or joists. Unless otherwise indicated, lay plank with heart side down and with tight joints. Spike each plank to each joist or nailing strip with at least two spikes. Provide spikes at least 101 mm 4 inches greater than the thickness of plank. Place spikes at least 63 mm 2 1/2 inches from edges of the plank. Cut ends of planks parallel to center line of pier. Grade planks as to thickness and lay so that adjacent planks vary less than 2 mm 1/16 inch.

### 3.1.9 Wheel Guard and Railing

Lay wheel guards in sections at least 3.6 m 12 feet long; bolt through floor plank and through outside stringer or nailing piece with 20 mm 3/4 inch bolts spaced 1.2 m 4 feet or less apart. Bevel wheel guards on pier side as shown. Provide wheel guard material surfaced on four sides (S4S) on the top edge and pier side. Provide surfaced (S4S) material for railings.

### 3.1.10 Fastening

Vertical bolts shall have nuts on the lower end. Where bolts are used to fasten timber to timber, timber to concrete, or timber to steel, bolt members together when they are installed and retighten immediately prior to final acceptance of contract. Provide bolts having sufficient additional threading to provide at least 31 mm per m 3/8 inch per foot thickness of timber for future retightening. [Provide timber connectors of types indicated. Install split-ring and shear-plate connectors in pre-cut grooves of the dimensions [shown] [as recommended by the manufacturer]. Force toothed-ring and spike-grid connectors and clamping plates into the contact surfaces of timbers joined by means of proper pressure tools; at joints, embed connectors of these types simultaneously and uniformly.]

### 3.1.11 Wrapping Pile Clusters and Dolphins

Fasten ends of wire rope with two zinc-coated clips or clamps. Draw piles together, and bear on adjacent piles and structure as shown. Provide and draw uptight through bolts before wrapping is finally secured. Attach wire rope to piles [with staples] [as indicated].

## 3.2 FIELD TREATMENT

### 3.2.1 Timberwork

Field treat cuts, bevels, notches, refacing and abrasions made in the field in treated piles or timbers in accordance with AWP A M4, MSDS and CIS. Wood preservatives are restricted use pesticides and shall be applied according to applicable standards. Trim cuts and abrasions before field treatment. Paint depressions or openings around bolt holes, joints, or gaps including recesses formed by counterboring, with [hot creosote oil] [preservative treatment used for piles or timber]; and after bolt or screw is in place, fill with hot pitch or a bitumastic compound.

### 3.2.2 Piling and Post Protection

In accordance with AWP A M4, immediately after pile or post tops are cut off and prior to placement of pile cap, protect pile or post top with several heavy applications of the same preservative used to treat the pile or post, or else copper naphthenate solutions containing a minimum of 2 percent copper metal may be used with treated products. Seal ends with a heavy application of coal-tar pitch or other appropriate sealer.

### 3.2.3 Galvanized Surfaces

Repair and recoat zinc coating which has been field or shop cut, burned by welding, abraded, or otherwise damaged to such an extent as to expose the base metal. Thoroughly clean the damaged area by wire brushing and remove traces of welding flux and loose or cracked zinc coating prior to painting. Paint cleaned area with two coats of zinc oxide-zinc dust paint conforming

to MIL-P-21035. Compound paint with a suitable vehicle in a ratio of one part zinc oxide to four parts zinc dust by weight.  
-- End of Section --