

## ARTICLE XII – FENDER SYSTEM REPAIRS

12.1 GENERAL – The work to be done under this Article consists of repairing the entire rubber tire fender system for Pier 3 at Hilo Harbor. The work includes, but is not limited to the following:

- A. Remove existing fender system, including tire bumpers and fastenings, vertical lagging, rubbing blocks, upper wales, lower wale and Type “I”, “II”, and “III” bolts.
- B. Furnish and install new Type “I”, “II”, and “III” bolts.
- C. Furnish and install new 14-inch by 14-inch upper wales of the various lengths.
- D. Furnish and install new 4-inch by 6-inch rubbing blocks with 3-inch by 4-inch by 3/8-inch steel angle at all new tire bumper assemblies.
- E. Furnish and install new spacer blocking as required.
- F. Furnish and install new vertical lagging as required.
- G. Reinstall previously removed tire bumpers using new chains, shackles, grommets, and fasteners.
- H. Furnish and install new tire bumper assemblies where shown on the plans including new chains, shackles, grommets, and eye bolts.
- I. Drill various sized holes in tires for installation of new tire grommets and 3-inch drain holes.
- J. Furnish and install new miscellaneous fastening hardware such as boat spikes, lag screws, wire nails, etc., as required.

12.2 OBSTRUCTIONS TO NAVIGATION – Should the Contractor, during the progress of work, lose, dump, sink, or misplace any material, plant, machinery, or equipment in harbor waters, and if in the opinion of the State Harbor Master it becomes a danger or obstruction of navigation, the Contractor shall recover and remove immediately.

### 12.3 MATERIALS

- A. Timber - All new timber, including timber wales, rubbing blocks, spacer blocks, and vertical lagging, shall be rough select structural grade and subject to American Wood Protection Association Standard U1-17 in category UC5C Waters. Treatment of coastal Douglas fir and plywood solid sawn material for

ammoniacal copper zinc arsenate treatment is to have a retention of 2.5 pounds per cubic foot (pcf) and for creosote treatment is to have a retention of 25 pcf.

Timber shall be Douglas fir, straight, free from splits, checks or other defects, which may weaken the member structurally. The Contractor shall furnish a certificate from the supplier certifying to the treatment of the lumber.

All surfaces of pressure coat tar creosote treated lumber cut after treatment shall be treated with “Jasco Termin-8” or approved equal.

- B. Rubbing blocks at tire bumper assemblies shall be 6-inch by 4-inch Douglas fir rough select construction grade, sound, dry, undamaged and free of cracks, splits, checks and other defects. The Contractor shall furnish a certificate from the supplier certifying to the treatment of the lumber.
- C. Spacer blocks shall be marine, exterior grade, Douglas Fir Plywood Association B/B plywood, or approved equal, and shall be treated as specified above for rubbing blocks. Finished thickness may be built up of two 3/4-inch-thick pieces. **All plywood shall meet the U.S. Product Standard PS-1 and glued only with waterproof glue. The Contractor shall furnish a certificate from the supplier certifying to the treatment of the lumber.**
- D. Miscellaneous Timber Fasteners such as boat spikes (button head), nails, lag screws, and common wire nails shall be hot dip galvanized.
- E. Eye Bolts – 3/4-inch Crosby Shoulder Nut Eye Bolt with working in-line working load limit of 7,200 pounds or approved equal. Use teal colored Simpson Strong-Tie SET-XP high strength anchoring adhesive epoxy when installing eyebolts.
- F. Ogee Washers shall be hot dip galvanized, ogee pattern, cast iron. Size to fit new stud bolts.
- G. Type “I”, “II”, and “III” Bolts - Shall be fabricated from round bars conforming to American Society for Testing and Materials (ASTM) A-36 standard and threaded a minimum of three inches at both ends. The bolts shall be furnished with cast iron ogee washers and hex nuts as required. Nuts shall conform to ASTM A-307. Washers and nuts shall be hot dip galvanized. The bolts shall be hot dip galvanized after fabrication.
- H. Chain for hanging tires shall be hot dip galvanized dock fender (mooring) chain, sized as shown on the plans. For the 1/2-inch dock fender chain, the minimum working load limit shall be 9,000 pounds. Existing chain may be accepted for use in place of new chain and shall be individually inspected and approved by the

Construction Engineer or Harbor Agent prior to use in the newly repaired fender system. It is the Contractor's responsibility to verify the length of chain necessary to completely repair the fender system, with any additional chain placed in a location deemed appropriate by the Construction Engineer and Harbor Agent for storage and future use.

- I. Shackles shall be forged, hot dip galvanized steel, anchor shackle with bolt, nut, and stainless-steel cotter pin. Five-eighths-inch anchor shackle shall have a minimum working load limit of three tons, and 7/8-inch anchor shackle shall have a minimum working load limit of 6.5 tons.
- J. Rubbing Angles – Steel rubbing angles shall be fabricated as shown on the plans and the structural steel used shall conform to ASTM A-36 and shall be hot dip galvanized in accordance with ASTM A-123.
- K. Tire Grommets – Grommet assemblies shall be fabricated as shown on the plans and the structural steel used shall conform to ASTM A-36 and shall be hot dip galvanized in accordance with ASTM A-123. All welding shall conform to the requirements of the American Welding Society. Pipe used in grommets shall be standard weight (Schedule 40) steel pipe. The entire assemblies shall be hot dip galvanized after fabrication in accordance with ASTM A-123. Bolts, nuts, and washers shall be hot dip galvanized conforming to ASTM A-307.
- L. Structural Steel – Grommet assemblies and steel rubbing angles shall be fabricated as shown on the plans and the structural steel used shall conform to ASTM A36. All welding shall conform to the requirements of the American Welding Society. Pipe used in grommets shall be standard weight (Schedule 40) steel pipe. The entire assembly shall be hot dip galvanized after fabrication in accordance with ASTM A-123.
- M. Cold Galvanizing Compound - Cold galvanizing compound shall be “ZRC Cold Galvanizing Compound” as manufactured by ZRC Worldwide or approved equal.
- N. Tires – The existing rubber tires from the fender system shall be reused in the newly repaired fender system after being inspected and approved by the Construction Engineer and Harbor Agent. **New rubber tires must be between 5 to 7.5 feet in diameter and between 2 to 3 feet in width.** Newly provided worn tires may be accepted for use in place of new tires and shall be individually inspected and approved by the Construction Engineer or Harbor Agent prior to use in the newly repaired fender system. It is the Contractor's responsibility to provide enough satisfactory worn or brand-new tires to completely repair the fender system, with any additional tire fenders placed in a location deemed appropriate by the Construction Engineer and Harbor Agent for storage and future use.