

BUNYON 6

PART II. FLOATING DRYDOCKS

Section I. TYPES

FI.01 PONTOON DRYDOCKS DEFINED

Floating pontoon drydocks are structures consisting principally of a main wharf-like deck and vertical side towers assembled from the standard pontoon units. They are submerged by admitting a controlled amount of water to the deck pontoons and raised by expelling the water with compressed air. The tower pontoons act as stabilizers to keep the drydock level while the deck is under water.

FI.02 CAPACITIES OF DRYDOCKS

There are four sizes of floating pontoon drydocks varying in capacity from 100 to 800 tons. Dimensions and other data are given in Table 3.

TABLE 3

Sizes and Capacities of Drydocks

	Size, pontoons			
	4 x 15	6 x 24	6 x 30	12 x 30
Capacity, long tons	100	325	400	800
Length of deck, ft	87	140	175	215
Width of deck, ft	28	43	43	55
Draft over deck, ft				
Two-high stabilizers	13	13	13	
Three-high stabilizers	20	20	20	20
Hgt over deck, cent. g. max load, ft	7	13	14.5	
No. of compressors needed:				
If 100 cfm at 25 psi	4	8	9	
If 210 cfm at 100 psi	2	4	4	9
If 315 cfm at 100 psi		3	3	7

*Numbers 5 or below include 1 spare; numbers above 5 include 2 spares.

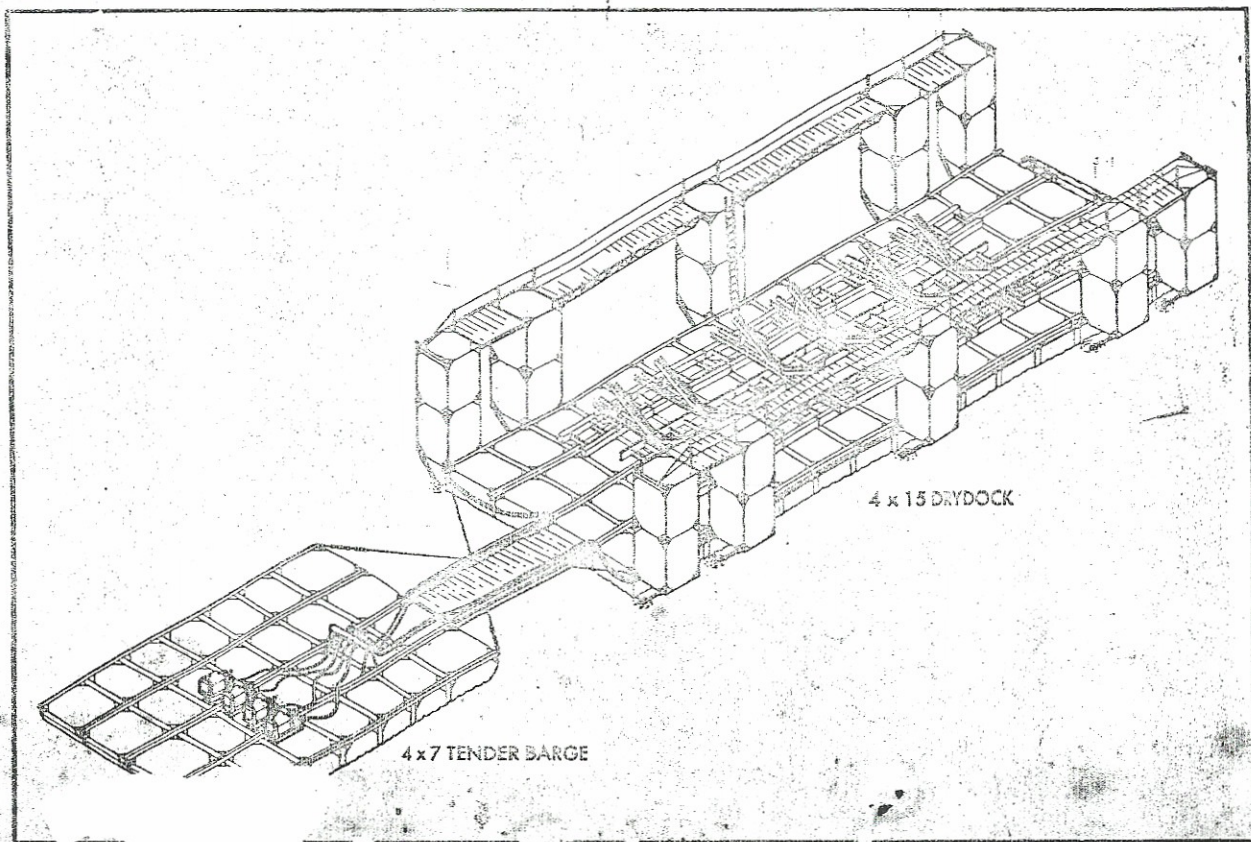


FIG. 39
A 4x15 Drydock and 4x7 Tender Barge

F1.03° 4 x 15 DRYDOCK

1. GENERAL. The 4 x 15 pontoon drydock (dwg. 142,267) consists of a deck made up of four strings of fifteen pontoons each. It has ten stabilizer towers, five on each side. Each tower is made up of two pontoons stacked end to end. A 20-ft ramp hinged at both ends connects the drydock deck to a 4 x 7 tender barge (assembled as de-

scribed in Parts B and C), which is made up of four strings of seven pontoons each. This combination is used for drydocking PT boats and other craft up to 125 tons displacement. It draws 28 in. of water when light and 52 in. when fully loaded. It requires 18 ft of water in which to submerge its deck 12 ft, its maximum safe submergence. (A PT boat requires 27 minutes to complete a full docking cycle, i.e., docking and undocking.)

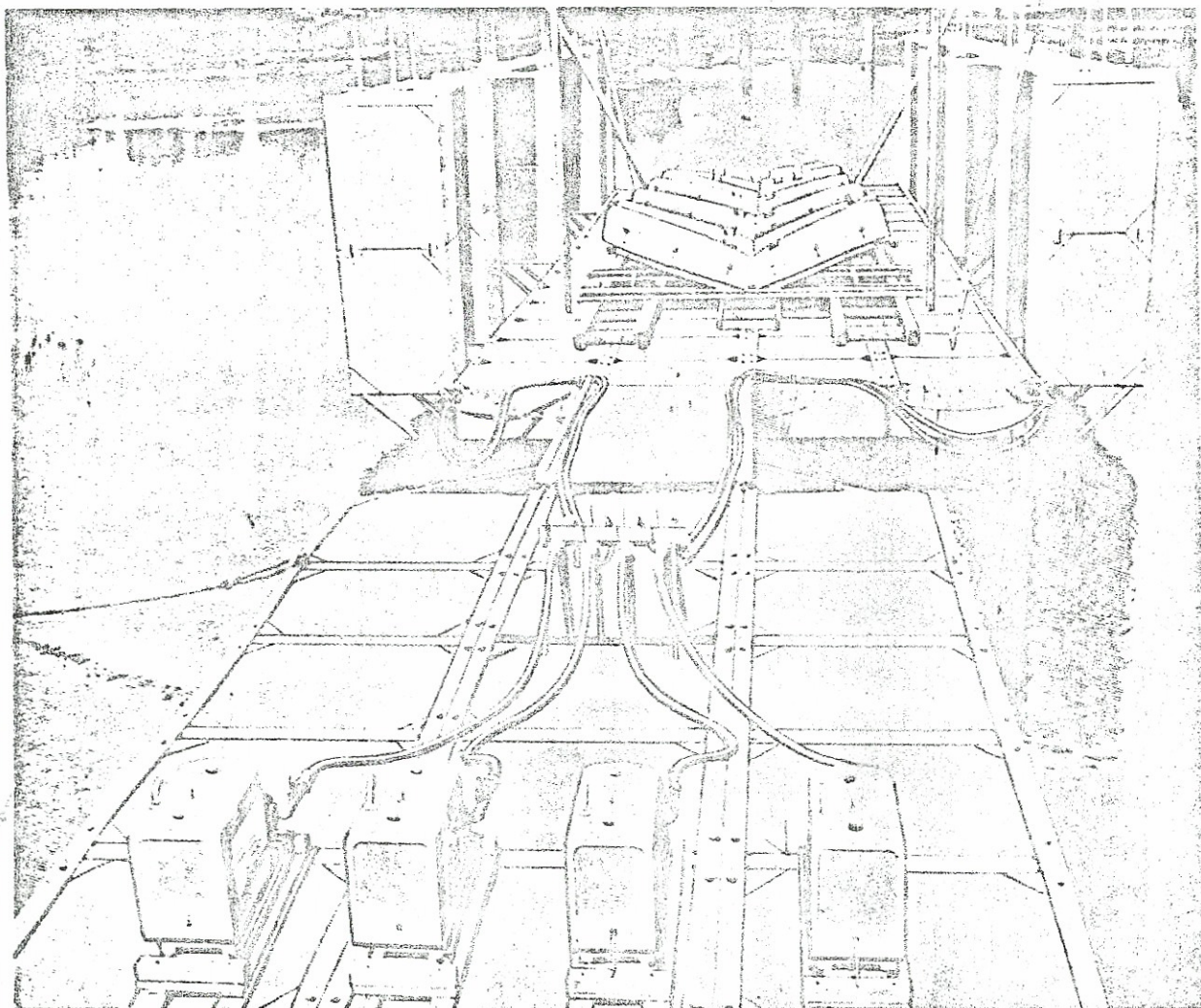


FIGURE 40

A 4 x 15 Pontoon Drydock and 3 x 7 Tender

2. DRYDOCK DECK ASSEMBLY. The 4 x 15 drydock structure is generally assembled as described in Parts A and B. The proper length of deck assembly angle is obtained by splicing a 6-in. B13 angle between the ends of two 6-in. B1 angles. The water inlet piping connections must be placed

during assembly. In making up each string, the sides of the pontoons having plugs must face in the same direction. As each pontoon is placed, the plug in the lower left-hand corner farthest from the deck (Plug A in sketch) should be removed, and a 2-in. street ell screwed in its place. A 2-in.

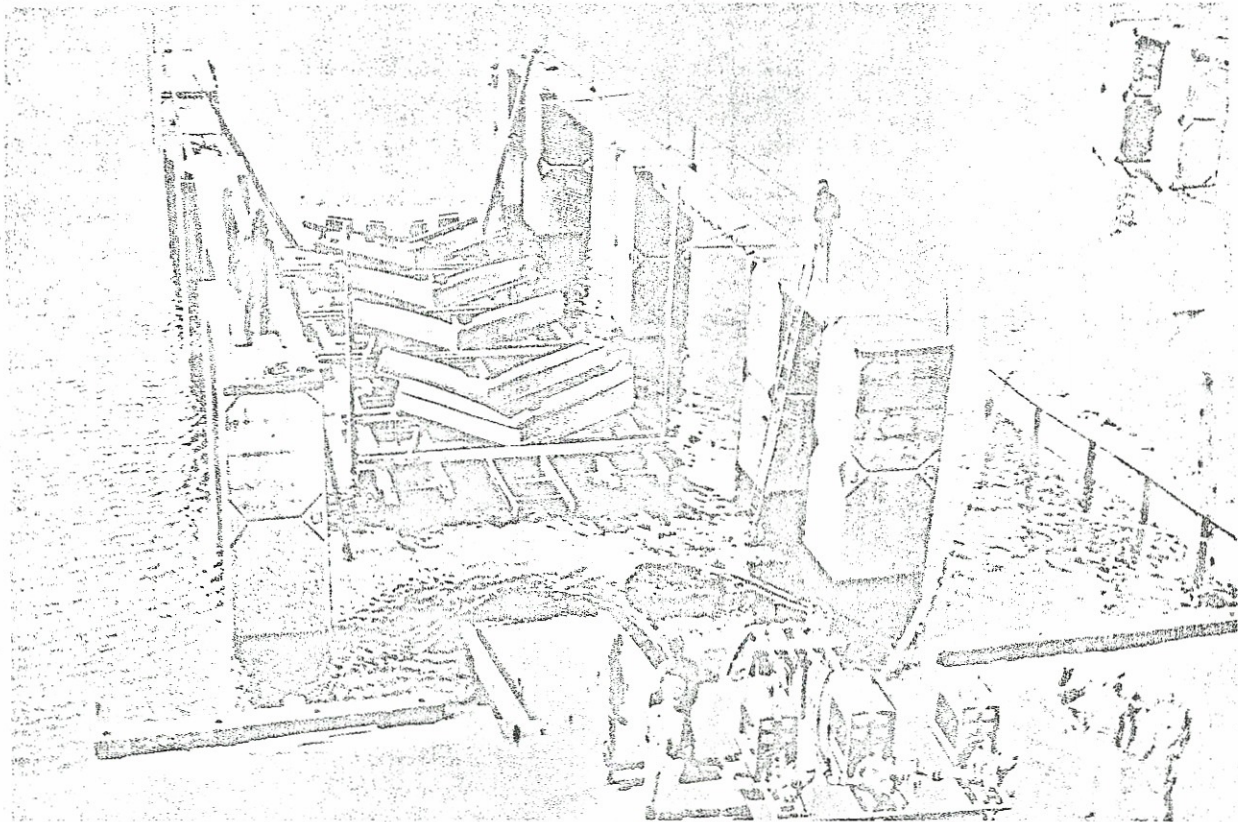


FIGURE 41

A 4 x 15 Drydock with PT Boat Cradle

pipe, 4 ft 7 in. long, is next screwed into the ell and disposed toward the deck. The strings are completed and launched as with other assemblies. After launching, air inlet connections are placed. Plug B is removed and a 2 x 1 bushing is installed. A 1-in. street ell is screwed into the bushing, and a quick make-and-break air hose coupling is screwed into the ell. When the strings have been brought together, links and pins are placed and the tie rods are installed. These are the same as those used in a 4 x 12 barge.

3. ERECTION OF STABILIZER TOWERS (METHOD 1). The stabilizer towers are made up of two pontoons connected end to end by means of four clip angles (A28) and secured by A6 bolts. Towers are placed on each side of the drydock adjacent to the first and third pontoons from each end and also at the center. Bracket angles are attached in pairs to the deck angles at these points prior to erection of the towers. Each bracket angle is attached by means of a link and pin. Prior to the assembly of each tower, all of the plugs in each tower pontoon should be checked for tightness

since leakage would tend to destroy their usefulness as stabilizers.

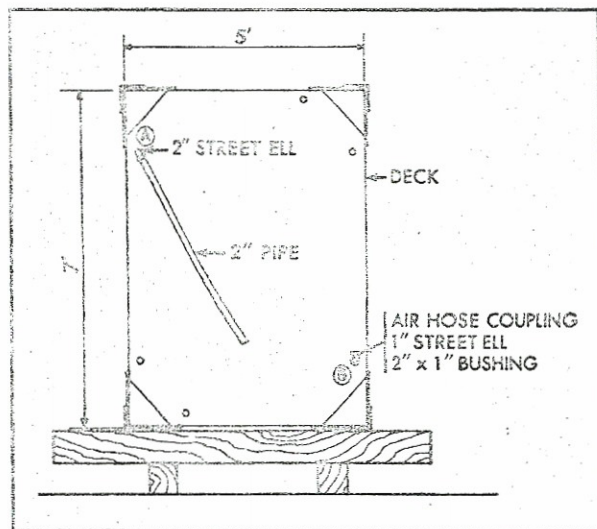


FIGURE 42

Plug-Side of a T&B Pontoon Modified for Use in a 4 x 15 Drydock Deck

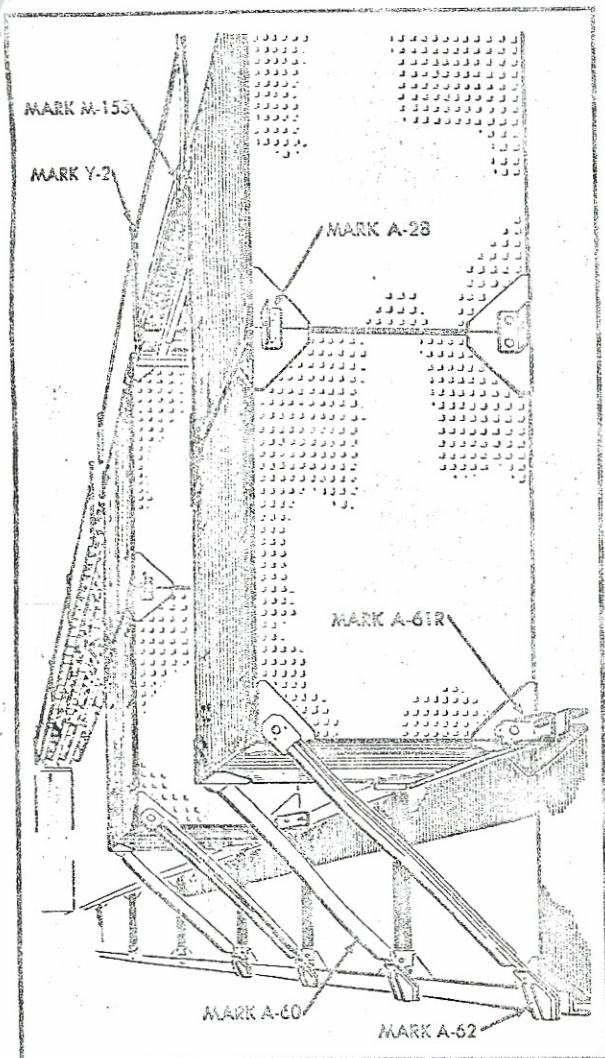


FIGURE 43

Pontoon Drydock Stabilizer Parts

To erect the towers, stand one pontoon on end, with the seven foot dimension vertical. Loosely bolt the A28 angles to the upper corner straps, set the upper pontoon in place inside the A28 angles, screw the four A6 bolts into the corner straps of the upper pontoon, and tighten all bolts in both pontoons.

Next attach a pair of bracket angles (A61), faced right and left, to the side deck angle at a tower location, using links and pins for fastening. The two outrigger struts (A60) should then be attached. Each of these is fastened to brackets (A61), which are secured to the bilge angle by a link and pin. The tower may next be lifted and

held in place with a crane while being attached to the A61 bracket angles and outrigger struts by A6 bolts. If no crane is available, the tower may be assembled in the water and then floated into place between the A61 brackets. These brackets are bolted loosely so that by using a block and tackle and an A-frame from the deck of the drydock, the tower may be pivoted about the bolts, raised into position, and attached to the A60 struts. All bolts should then be tightened. Depth marks (lines spaced at 6-in. intervals) should be painted on each corner tower so that they are visible at all times from the tender barge. These help the operator to maintain the drydock level and to show the depth of submergence.

4. ERECTION OF STABILIZER TOWERS (METHOD 2). Another method of erecting the stabilizer towers is to use their buoyancy to raise them to a vertical position. It is necessary first to assemble the deck of the drydock complete with piping, hose connections, tender barge, connecting bridge, compressors, and manifold. Bracket angles (A61) are attached to the outside deck angles by links and pins at the points where the towers are to be erected. A strut connector (A62) is attached to the bilge angle below each bracket angle. An A60 outrigger strut is bolted to each strut connector.

The tower pontoons, two or three to each tower as the case may be, are attached to each other in the water by A28 clip angles. One end of a 3/4-in. wire cable preventer with an eye at each end is attached by an A6 bolt to each tower at what will be a lower outboard corner when the tower is erected. This cable is 6 ft 5 in. long from the inside of one eye to the center line of the shackle pin by which it is attached at the other end. The towers are then floated carefully into position between their respective bracket angles so that the pipe mains of the air feed system are not damaged. The towers are attached to the brackets by A6 bolts. These bolts are run down so that they lack about one thread of being tight. The free end of the 3/4-in. preventer cable is then fastened by a shackle to a bolt hole in the A62 strut connector.

A 1/2-in. wire cable preventer 26 ft 8 in. in over-all length (23 ft 8 in. long for a 1-pontoon-high tower, and 30 ft 11 in. for a 3-pontoon-high tower), with a hook at one end and an eye at the other is hooked to the far assembly angle of the third joint opposite one side of each tower. The hook should be wired to the angle to prevent its slipping off. A messenger line from the eye in the

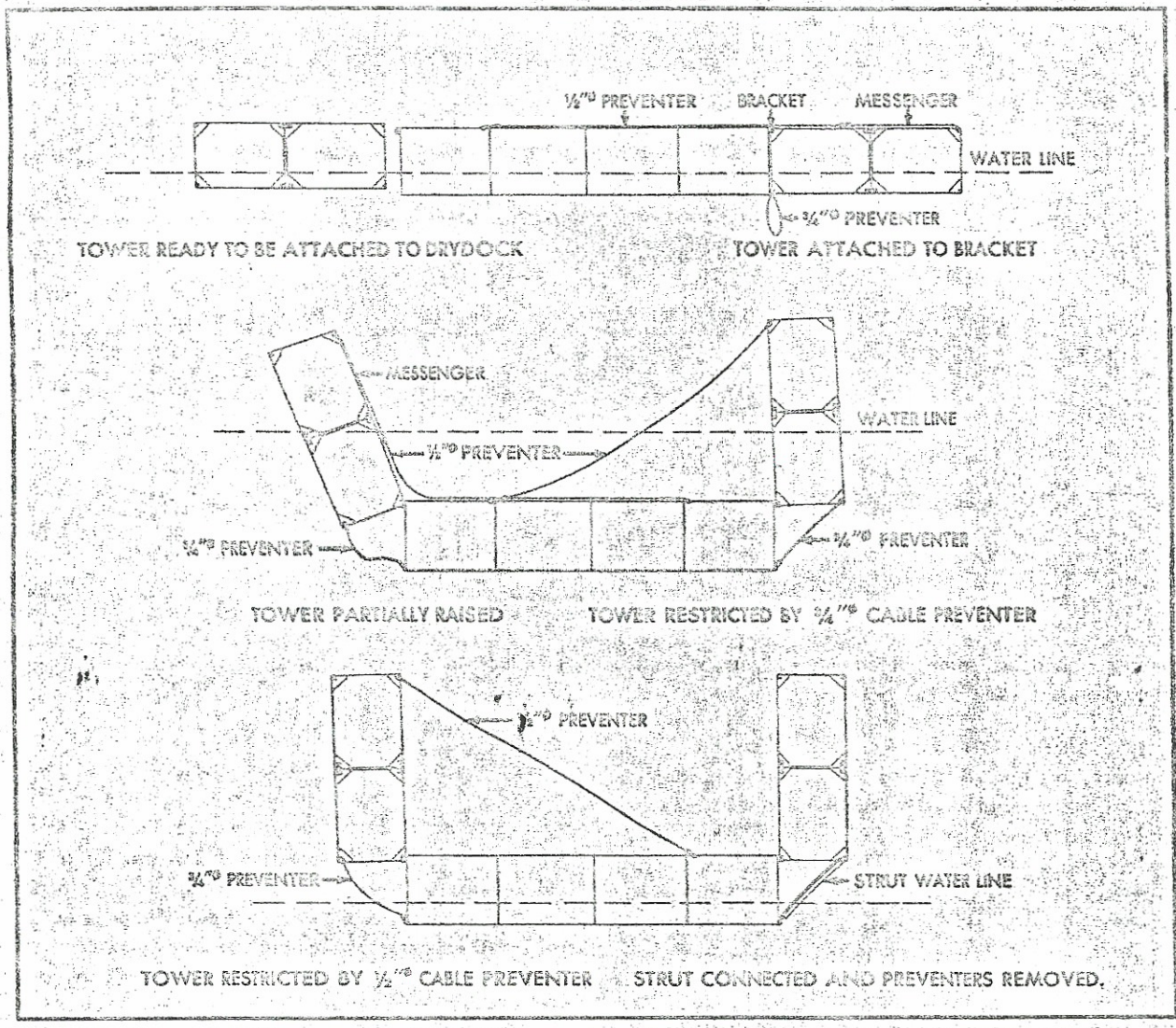


FIGURE 44

Erection of Drydock Towers by Buoyancy Method

other end of the preventer is secured to what will be the top of the tower.

When the drydock is submerged, all pontoon towers rise to an upright position. Men in boats approach each tower and, by taking in on the messenger line, bring up the 1/2-in. preventer cable. This is secured to a top corner of the tower by an A6 bolt through the eye.

When the drydock is next raised, all towers are in an approximately vertical position and are prevented from falling inboard by 1/4-in. cables and outboard by 1/2-in. cables. Enough slack is provided in the cables so that whatever adjustment in the position of the towers is needed to connect the A60 outrigger struts can readily be made.

5. CATWALKS. The next operation should be the erection of the catwalks. They rest on and are bolted to seat angles (A185), which are secured to the top corner straps of the upper tower pontoons by A6 bolts. The long catwalks consist of a sectional four-panel wood deck supported by three parallel open-web steel joists (A67) and braced laterally by three X-braces (A186). If a crane is available, they are assembled on the deck and then lifted into position and bolted to the seat angles. The pieces, however, may be assembled in place if desired. The wood panels for the end spans are next placed and bolted. At the same time that the seat angles are placed, stanchions for the catwalk life lines should be attached to the tops of the

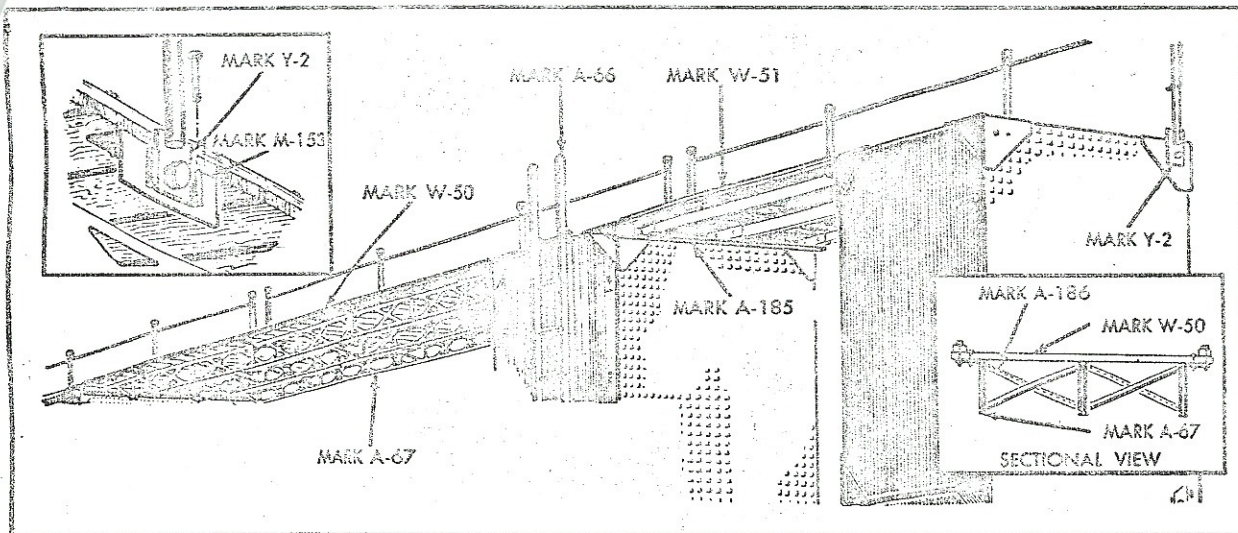


FIGURE 45

Parts for Penton Drydock Stabilizer Catwalk

tower pontoons. Life lines should be installed between stanchions after placing the catwalk.

6. RAMPS. At the desired ramp location, standard hinges (A40 and A41) are attached to the deck angles at one end of the drydock and one end of the tender barge. This connection is made by removing the end A6 bolt from the deck angle and bolting down the hinge plate. The ramp is made up of two steel stringers or beams (S2 and S2A), which support a sectional wood panel deck. It is assembled on the deck of either the barge or the drydock and is then lifted into place. The ends of the ramp stringers fit into the hinges on the barge and the drydock and are secured by means of hinge pins (A70). (See dwg. 146,492.) Hinges are described under Accessories in Part H. Diagonal cross-bracing consisting of $\frac{3}{8}$ -in. cables is next installed between the tender barge and the drydock.

7. PIPING. The 2-in. pipe mains should be assembled on the deck of the drydock in accordance with the piping drawing furnished with the shipment. Standard pipe hangers (H3) are attached at several points along the sides of the drydock and the pipe mains are installed. Quick make-and-break air hose couplings are connected to the tees in the main piping, and the proper length air hose is then installed between the headers and the pontoon air inlets. The pipe mains are next connected with the hoses from the manifold

on the tender barge and the drydock is ready for operation.

8. BOAT SUPPORTS AND KEEL BLOCKS. Adjustable boat supports and keel blocks (dwg. 187,484) are furnished for the support of PT boats and similar craft in the 4 x 15 floating drydock. The equipment consists of 24 wood and 11 steel blocking frames, which clamp to the deck assembly angles and form a base for six adjustable steel boat supports built into crossframes that rest upon them. The crossframes are secured to the wooden blocking frames by means of hook connectors or dogbolts. The member that supports the boat chock is hinged to the crossframe at its lower end and supported by a post at its other end. The post is provided with a number of pin holes to allow for adjustment in elevation. The entire crossframes assembly may be moved and fastened at any point on the blocking frames by means of the dogbolts. The chocks, which are wooden members shaped to conform to the cross section of the hull and padded where they come in contact with it, rest on and fasten to the boat supports. The chocks are not furnished with the boat supports. They are fabricated in the field from dimensions on the docking plans that accompany each of the hull types to be docked. Sometimes the chocks on the shipping cradle of the boat are suitable.

FIG. 04 6 X 24 DRYDOCK

The 6 x 24 drydock (dwg. 146,164) is made up

of six strings of 24 pontoons each and has eight stabilizer towers, two pontoons high, along each side. In making up the longer pontoon strings necessary for this structure, reinforcing splice plates (M50) are welded to each leg of the assembly angles at each splice between the 8-in. angles.

The piping on this drydock differs from that on smaller drydocks in that there are eight groups of pontoons through which control may be exercised rather than the four groups previously described. Also the pipe headers, rather than hose, are used between the side headers and the individual pontoons of each group. Pipe hangers (H5) are used to carry the four pipe mains alongside, hangers (H3) are used where one main has to be carried,

and hangers (H4) are used on the end of the drydock where the hoses from the tender barge are connected to the drydock pipe mains.

F1.05 6 X 30 DRYDOCK

The 6 x 30 drydock (dwg. 146,165) varies only slightly from the 6 x 24. The six strings are 30 pontoons in length, and 14 of the usual double-pontoon stabilizer towers are provided along each side.

Piping, pipe hangers, and hose are similar to those of the 6 x 24 dock. Six-wide structures with heavy loads concentrated at the center build up high stresses in the tie rods. These should be inspected for adequacy of welding and reinforced if necessary.

Section 2. OPERATION

F2.01 TENDER BARGE AND AIR SUPPLY

Compressors, an air manifold, and control valves are located on the tender barge attached to the drydock by means of a ramp or walkway hinged at both ends. Hoses lead from the barge to pipe mains along the sides of the drydock, and pipe or hose connections are made from the mains to each deck pontoon.

To submerge the drydock, two-in. pipes (sea cocks), connected at the bilge of each pontoon by means of a two-in. street ell, are lowered into the water, and the valves on the air lines at the manifold are opened. This permits water to flow into the pontoons and causes the drydock to sink. Control must be exercised at the valves in order to maintain the drydock on a level keel. Each valve controls the air supply for a group of pontoons so that any excessive list or trim of the drydock can be curbed by closing one or more of the valves. It is advisable to keep one or more of the compressors in operation when the dock is submerging. If seriously uneven sinking develops, compressed air can be supplied to the group of pontoons to return the dock to level. When the drydock has been submerged to the desired depth, all valves are closed. Back pressure develops in the pontoons to prevent additional inflow of water, thus maintaining the drydock level.

F2.02 DOCKING A SHIP

The docking of a ship may take place as soon as

sinking has been stopped. When the ship has been guided to its proper position with respect to its cradle, all compressors should be started and the air supply valves opened gradually until the dock rises sufficiently to seat the ship on its blocks. The flow of compressed air into the pontoons expels the water and raises the dock. The same careful control of the drydock trim as is used during submerging needs to be exercised during raising. The critical time is at the instant the deck breaks water. The operator should watch all corners and try to have the dock completely level at that instant. When six or eight inches of freeboard are attained, the swing pipes may be raised and the compressors shut off. They should not be shut off when the deck is below water, for the drydock will slowly heel to one side if unattended in this position.

F2.03 LIFTING ONE END OF SHIP TOO LARGE FOR DRYDOCKING

Recent demands have required the docking of certain vessels by pontoon drydocks whose lifting capacity is less than the weight of the ship. Such situations have been handled by lifting one end of the ship at a time. The propellers and rudder, for example, can be raised out of the water by using the dock at the stern of the ship.

When a pontoon drydock is used in this way, the opposite end of the ship trails in the water and the deck has a longitudinal slope. Because of this

slope the lower pontoons in each zone of control can give only partial buoyant support.

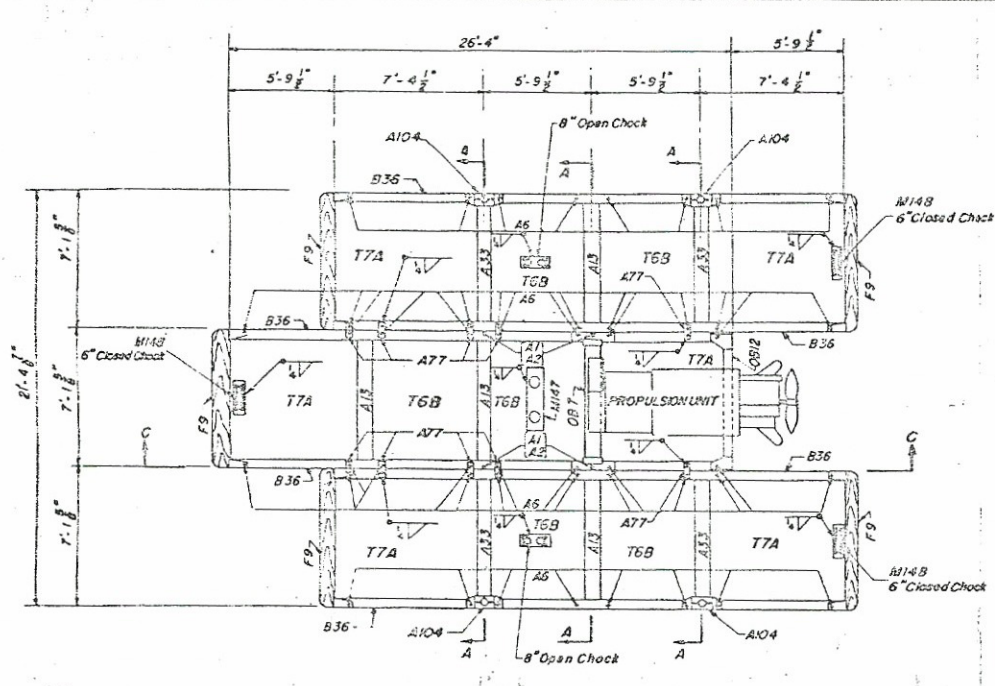
To avoid this loss of lifting power, pontoon drydocks intended for or liable to such use should be piped for inclined lifting. This requires placing the pipe mains at the level of the catwalk and providing a valve for each branch running from the main to the pontoons. These valves on the branches will then be accessible from the catwalk when the dock is submerged or when one end is submerged. When the dock is being raised, air first starts to blow through the drain hole of the highest pontoon of each zone. When air bubbles appear, the air valve at the catwalk (on the branch to the pontoon that is blowing) should be closed so that the air to the pontoons in the same zone is forced farther down the slope of the drydock. By following this procedure, the operator can obtain practically the full lifting power of the drydock even when it is used in an inclined position.

F2.64 THAWING FROZEN DRYDOCK PIPING

During the winter season in northern latitudes drydock facilities frequently become coated with ice and/or snow, or residual water within the piping freezes up. As a consequence, the facilities are unavailable when needed. This situation can be relieved by means of a simple live steam de-icing process.

No equipment is needed that is not usually available at advanced bases. Two or more portable boilers, a few fittings, a small quantity of steam piping, and several tarpaulins are all that are necessary.

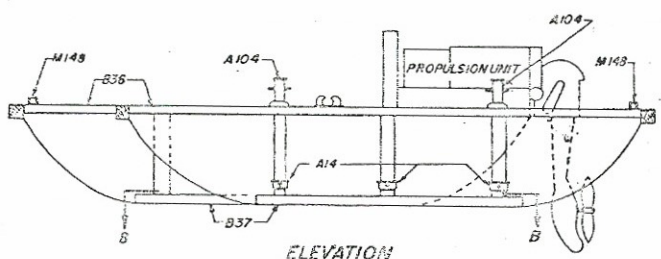
The steam piping is connected directly to the air manifold on the deck of the tender barge, the tarpaulins are laid to cover the drydock deck, and the steam is turned on. The drydock may be thawed out in sections by regulating the flow of steam from the manifold. (See Appendix D for moving picture reference.)



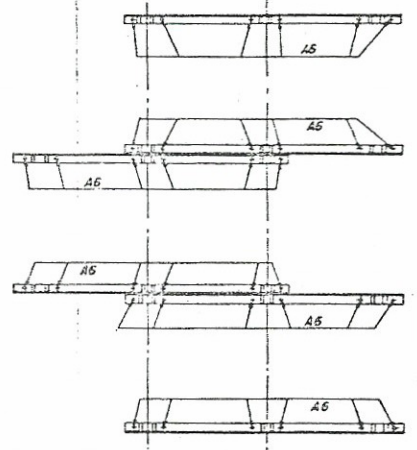
DECK PLAN



SECTION A-A

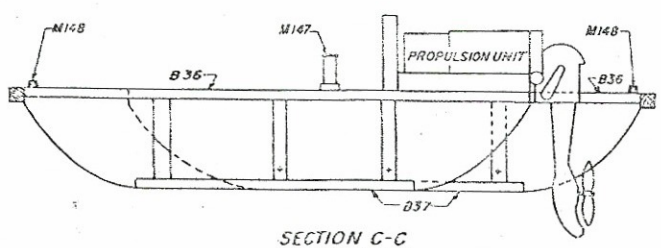


ELEVATION



SECTION B-B

SHOWING BOTTOM ANGLES B37



SECTION C-C

BILL OF MATERIAL

ITEM NO.	MARK	DESCRIPTION	Y&D DWG NO.	U M I	QUANTITY		ASSEMBLY OR SHS NO.
					REQD	SHIP	
5-1	A1	LINK	146199	EA	4	8	C12-L-2020
5-2	A2	PIN LINK	DO	EA	4	8	C12-P-1727
5-3	A3	WEDGE	DO	EA	72	80	C12-W-530-53
5-4	A4	BOLT WEDGE	DO	EA	72	80	C12-W-998
5-5	A5	NUT HANDWHEEL	DO	EA	72	80	C12-N-770
5-6	A6	BOLT ASSEMBLY	146401	EA	84	92	Y12-B-623-125
5-7	A10	BOLT TIE ROD	DO	EA	6	10	Y12-B-621-255
5-8	A12	TIE ROD MEMBER W/ PIN & COTTER	146403	EA	3	4	C12-T-599-690
5-9	A13	CLOSURE DECK	143066	EA	4	4	C12-C-190-850
5-10	A33	CLOSURE DECK	DO	EA	4	4	C12-C-190-89
5-11	A14	TYE TIE ROD	146402	EA	6	8	C12-T-835
5-12	A17	BOLT END	146404	EA	12	15	Y12-B-621-140
5-13	A20	PLUG PIPE 2"	142875	EA	—	5	C45-P-756
5-14	A29	TIE ROD MEMBER END W/ PIN & COTTER	146403	EA	3	4	C12-T-599-675
5-15	A30	TIE ROD MEMBER END	DO	EA	3	4	C12-T-599-680
5-16	B104	BITT: ALL PURPOSE	146179	EA	4	4	Y12-B-607-25
5-17	A77	PLATE TIE	146401	EA	10	12	C12-P-2761
5-18	B36	ASSEMBLY ANGLE TOP	124957	EA	6	6	C12-A-600-528
5-19	B37	ASSEMBLY ANGLE BOTTOM	DO	EA	6	6	C12-A-600-450
5-20	F9	FENDER	146297	EA	5	5	Y12-F-462-15
5-21	M47	BITT DOUBLE	146179	EA	1	1	Y12-B-600-500
5-22	M48	CHOCK CLOSED, 6", CAST STEEL	146608	EA	3	3	Y12-C-645-500
5-23		CHOCK OPEN, 6", CAST STEEL		EA	2	2	Y12-C-667-25
5-24	T6B	PONTOON RECT. STEEL	142875	EA	6	6	C9-P-130
5-25	T7A	PONTOON CURVED END, STEEL	146178	EA	6	6	C9-P-133
5-26		ANCHOR MOORING, BU SHIPS MK II (LWT) 150# BU SHIPS DWG NO. 632466		EA	1	1	66-A-1568-150
5-27		CHAIN ANCHOR, CLOSE LINK, W1, WELDED, 5/8" 1-SHOT, (90 FT) TWO (2) 3/4" END LINKS & 1/8" SHACKLE	146261	EA		2	C6-C-405
5-28		PROPELLING UNIT - OUTBOARD MODEL O-2D INCLUDING ONE (1) OB1 & ONE (1) OB2	146274	EA	1	1	C9-P-56950
5-29		TOOL SET - PONTOON ERECTION (1 REQD FOR EACH 100 PONTOONS OR LESS)					5056

REFERENCE DRAWING	10	9	8	7	6	5	4	3	2	1
REVISION	DATE	APPD	DESCRIPTION						BY	
DEPARTMENT OF THE NAVY WASHINGTON D.C.										
BUREAU OF YARDS & DOCKS										
DES			N. L. EQUIPMENT							
DRAWN <i>E. King</i>			PONTOON TUG							
CHK <i>F. Kieferle</i>			WITH OUTBOARD PROPULSION UNIT							
LDR <i>M. Anderson</i>			ERECTION DIAGRAM & DETAILS							
SUPV <i>M. Anderson</i>			APPROVED <i>Martin W. Schost</i> DATE <i>1/1/17</i> FOR CHIEF OF BUREAU							
HEAD <i>Collins</i>										
WCA <i>Collins</i>										
ENGR. CHIEF <i>Collins</i>										
PROJ MGMT <i>Collins</i>										
DIRECTOR <i>Collins</i>										
ASSEMBLY NO.	38N		SHEET 1 OF 1		NO. Y.		Y&D DRAWING NO. 509679			