DRYDOCKING

1 SCOPE

1.1 Scope. This Standard Specification describes the requirements for the Contractor to drydock and undock Coast Guard vessels.

1.2 Appendices. The following appendices apply to this standard specification:

TITLE	APPENDIX
Requirements For Calculations	A
Requirements For Facility Inspection	B
Checklists	C
Pumping Plan For Floating Docks	D

2 APPLICABLE DOCUMENTS

MIL-STD-1625C(1), Safety Certification Program for Drydocking Facilities and Shipbuilding Ways for U.S. Navy Ships, Revision C, Notice of change 1, 30 DEC 1992

ABS Rules for Steel Floating Drydocks, American Bureau of Shipping, Publication #11, 1977

3 REQUIREMENTS

3.1 GENERAL REQUIREMENTS FOR CERTIFICATION – A drydock must be first be certified by the U.S. Coast Guard MLCP(v) to be used to drydock a U.S. Coast Guard vessel. The certification methods/documents listed below must show that the dock/lifting facility has sufficient lifting capacity and structural strength to safely handle a given class of cutter within the trim and stability requirements. Additionally the pre-award calculation requirements of Appendix A must be satisfied based on the cutter full load condition. If not, then alternate docking and cutter loading plans must be provided prior to certification. U.S. Coast Guard certification of a Contractor's drydock can be achieved by one of the following:

NOTE: Loading considerations:
Loads that cannot be removed:

- Operating fluids in any machinery system (lube oil, hydraulic oil, etc)
- Crew and effects
- Provisions
- Other loads considered part of Lightship not otherwise mentioned
- Ammo

Loads that, while part of lightship, MAY be removed at the contractor's expense without other provisions made:

- Anchors and Chain
- Small Boats
- Machinery or equipment undergoing removal as part of the subject availability
- Paint and flammable stores

Loads that, while part of variable loads, may only be removed at the Contractor's expense WITH other provisions made:

- Sewage (alternative facilities must be provided if the contractor's proposed loading requires the sewage collection or holding tanks be kept empty)

- Potable Water (alternative facilities must be provided if the contractor's proposed loading requires the potable water tanks be kept empty)
- Grey Water (alternative facilities must be provided if the contractor's proposed loading requires the gray water collection or holding tanks be kept empty)

3.1.1 Submit a copy of current NAVSEA certification to the U.S. Coast Guard, MLCP(vpl) to verify full compliance with MIL-STD-1625.

NOTE: If the Contractor is certified under MIL-STD-1625, while under contract with the U.S. Coast Guard:

- Sections 1.2.4 and 4.10.5 of MIL-STD-1625 do not apply; and
- The number of dockings a dockmaster must experience during a specified time period, as required by Appendix C, Section 10.2.a of MIL-STD-1625, is changed to: one docking shall have been conducted within the previous 9 months.

3.1.2 Submit a copy of current ABS (American Bureau of Shipping) certification to the U.S. Coast Guard, MLCP(vpl) to verify full compliance with ABS Rules for Steel Floating Drydocks.

3.1.3 Conduct the validation requirements of Appendix B and submit all findings to the U.S. Coast Guard, MLCP(vpl) for review and acceptance.

NOTE: Any changes to the dock structure during the certified period shall be reported on a post-overhaul report to be reviewed and approved by the U.S. Coast Guard, MLCPAC(vpl) prior to drydocking.

NOTE: The Coast Guard certification of a dock per this instruction remains in effect as long as the NAVSEA 1625 or ABS certification used to gain such certification remains current. For docks certified using the inspection checklist of Appendix B, the certification remains valid as long as satisfactory surveys of the dock are done per the inspection cycle of para 2.2 of Appendix B (i.e. 2 or 3 yrs depending on the age of the dock).

3.2 GENERAL - The Contractor shall drydock and undock the designated vessel in a drydock that has been certified by the Coast Guard per paragraph 3.1 above, using the applicable Work Item in the work package and accomplish the requirements below.

3.3 SCHEDULED EVENTS

3.3.1 Pre-docking events - The Contractor shall accomplish the following:

3.3.1.1 Pre-Award Calculations - - The Contractor shall provide to the Contracting Officer a preliminary Pre-award set of calculations, as described in Table 1 of Appendix A. These calculations shall be based on the vessel full load information

3.3.1.1.1 Vessel's information – Curves of form, Bonjean Curves (where available) and Full Load Conditions will be provided in the specification package. Additionally, the Coast Guard will provide trim and stability calculator (FCCS software and data files). Contractor must sign a software release form prior to issuance of said software. Mail completed form to USCGC MLCP(vs-hull), attention: Greg Santos. Any additional information necessary for performing drydock calculations should be requested from the Contracting Officer. Be aware that the Contracting Officer will normally provide the information within 72 hours of receiving the written request.

3.3.1.2 Seventy-two hours before docking - Submit all calculations required by Appendix A, 72 hours prior to docking. These calculations shall be base on the as docked loading condition of the cutter. The estimated arrival loading conditions will be provided to the Contractor no later than one week prior to docking. If the cutter's displacement must be reduced from the projected arrival conditions to meet the capacity limitation

of the dock/lifting facility the Contractor shall include an offload/transfer plan with the 72-hour stability calculation.

3.3.1.3 Twenty-four hours before docking - Convene the pre-docking conference a minimum of 24 hours prior to docking (see paragraph 3.4 (Pre-docking conference)).

3.3.2 Docking events - The Contractor shall accomplish the following:

3.3.2.1 Seventy-two hours before undocking - Submit the undocking calculations required in Appendix A.

3.3.3 Undocking conference - At the undocking conference, the Contractor shall accomplish the following:

3.3.3.1 Stability and block loading calculations - Submit to the COR calculations required in Appendix A, including the effect of all dock master authorized weight additions, removals or shifts as a result of ship's actions or the contracted scope of work.

3.4 PRE-DOCKING CONFERENCE - At the pre-docking conference, accomplish the following:

3.4.1 Drydock certification submittal - Submit certification to the COR verifying that the drydock is suitable to lift the vessel. Ensure that the drydock is certified for docking a vessel of the dimensions specified in the Principal Characteristics section of the specification package, by one of the following:

· MIL-STD-1625.
· American Bureau of Shipping (ABS).
· An independent, registered/licensed Professional Engineer, who shall complete the appropriate sections of Appendix B.

3.4.2 Certification inclusions - Regardless of the type of certification provided, submit to the COR, in writing, the following information regarding the docking facility, as applicable:

· Fire alarm locations
· Emergency power plan
· Emergency ballast/dewatering pumping plan showing pump locations

3.4.3 Drydocking procedure documentation - Provide to the COR a written drydocking procedure, which shall include the following:

· A short statement of operating practices, safety requirements, and yard security plans.
· The flooding and pumping plan for the drydock (guidance for preparation of a pumping plan is provided in Appendix D).
· Specific list and trim of the vessel during docking and undocking.
· Any special precautions or actions characteristic to the docking facility, the docked vessel, or a combination there of.

3.4.4 Discuss all items on the Pre-Docking Conference checklist in Appendix C, to the satisfaction of the COR.

3.5 OPERATIONAL NOTES

3.5.1 Combined Dockings - Double dockings may be accomplished provided the U.S. Coast Guard vessel is made watertight prior to flooding the drydock to accept another vessel during the cutters availability.

3.5.2 Crane Locations – During drydocking on a floating drydock, cranes may be located anywhere along the wingwalls of the drydock but must be lashed down during the docking and undocking evolution. The pumping plan shall refelct the required tank levels to compensate for the crane's location at that position.

The crane may be operational during docking and undocking, while remaining lashed down, to load or unload ballast, as required.

APPENDIX A

REQUIREMENTS FOR CALCULATIONS

1 SCOPE

1.1 This appendix describes the particular requirements for the Contractor to perform drydock calculations.

2 REQUIREMENTS

2.1 General - The Contractor shall submit a minimum of three sets of drydock calculations for approval: Pre-award, Docking and Undocking. Ensure that all calculations are done under the supervision of a Registered Professional Engineer.

2.2 Pre-award calculations - The Contractor shall provide to the Contracting Officer a preliminary Pre-award set of calculations, as described in Table 1. Be aware that the only block loading calculation required for Pre-award calculations is the trapezoidal block loading. The Pre-award calculations do not reflect the arrival condition of the vessel. The calculations shall provide the loading capacity of the drydock (strength of the drydock) in LT/ft. If facility limitations require lifting at less than full load displacements, describe in detail the heaviest feasible loading condition. - If extension beam(s), Docking Towers and Stern Shores, etc. are used to transfer docking loads, calculations shall show drydock deck reactions in long tons (LT), distributed load on drydock deck in LT per ft., and the system's capability to withstand the maximum load against bending and shear, both at the point of contact on the structure for the maximum load, and column buckling, if applicable.

NOTE: Pre-award calculations are required to prove the Contractor can dock the vessel. Once a Contractor has submitted the Pre-award calculations for a class of vessel, the calculations need not be submitted again unless the block height has increased, the vessel has significantly changed, or the docking facility has been modified. The Stability and Trim calculation software used by the Coast Guard, FCCS, and the associated data files are available upon submission of a software release form.

2.3 Docking calculations - The Contractor shall submit the calculations as described by Table 1, for the condition of the vessel as it enters the drydock. Ensure that any work that is performed by the Contractor or vessel crew after arrival at Contractor's facility, prior to docking, that affects the stability condition is incorporated into the calculations. Submit all calculations to the Contracting Officer 72 hours before docking.

2.4 Undocking calculations - The Contractor shall submit calculations, as described by Table 1, at the undocking conference, at least 72 hours before undocking. If there have been no significant changes to the vessel or dock during the availability, the Contractor may request a waiver from this requirement.

NOTE: All stability calculations must include the vertical center of gravity above the keel (KG), metacenter height above the keel (KM), metacentric height (GM) and drafts for the cutter and cutter/dock system if applicable.

2.5 Blocking calculations - The Contractor shall provide the following blocking calculations.

· Knuckle load
· Loading per foot (average and trapezoidal)
· Number of side blocks required for hurricane forces

NOTE: The only blocking calculation required for vessels utilizing cradles is the loading per foot (trapezoidal) calculation.

2.5.1 Allowable block timber stresses - Provide the safe allowable block timber stresses for side blocks and keel blocks.

2.5.2 Additional blocks - The Contractor may propose additional keel and side blocks, if needed to ensure block loadings are not exceeded during any anticipated underwater body work. Be aware that additional blocking shall be considered an alternate blocking arrangement and must meet the requirements in (2.5.3 (Alternate blocking).

2.5.3 Alternate blocking arrangement - Submit an alternate blocking arrangement for approval to the Contracting Officer at, if the blocking arrangement shown on the vessel's docking plan does not match the drydock's construction or the docking plan shows keel or bilge blocks as interferences to scheduled work. Ensure the moved blocks rest on adequate dock and ship structure. Provide calculations for determining the heights and loadings of the modified blocks, and a clear sketch showing, in relationship to the vessel, the number, size and spacing of the modified blocks

2.5.4 Bilge block hauling - If applicable, ensure hauling of bilge blocks occurs with a minimum ship GM of one (1) foot. Drafts of the cutter shall be included in the calculations. NOTE: The line of action of the normal force for all blocking passes through the middle one-third of the block as shown in Figure A-1.

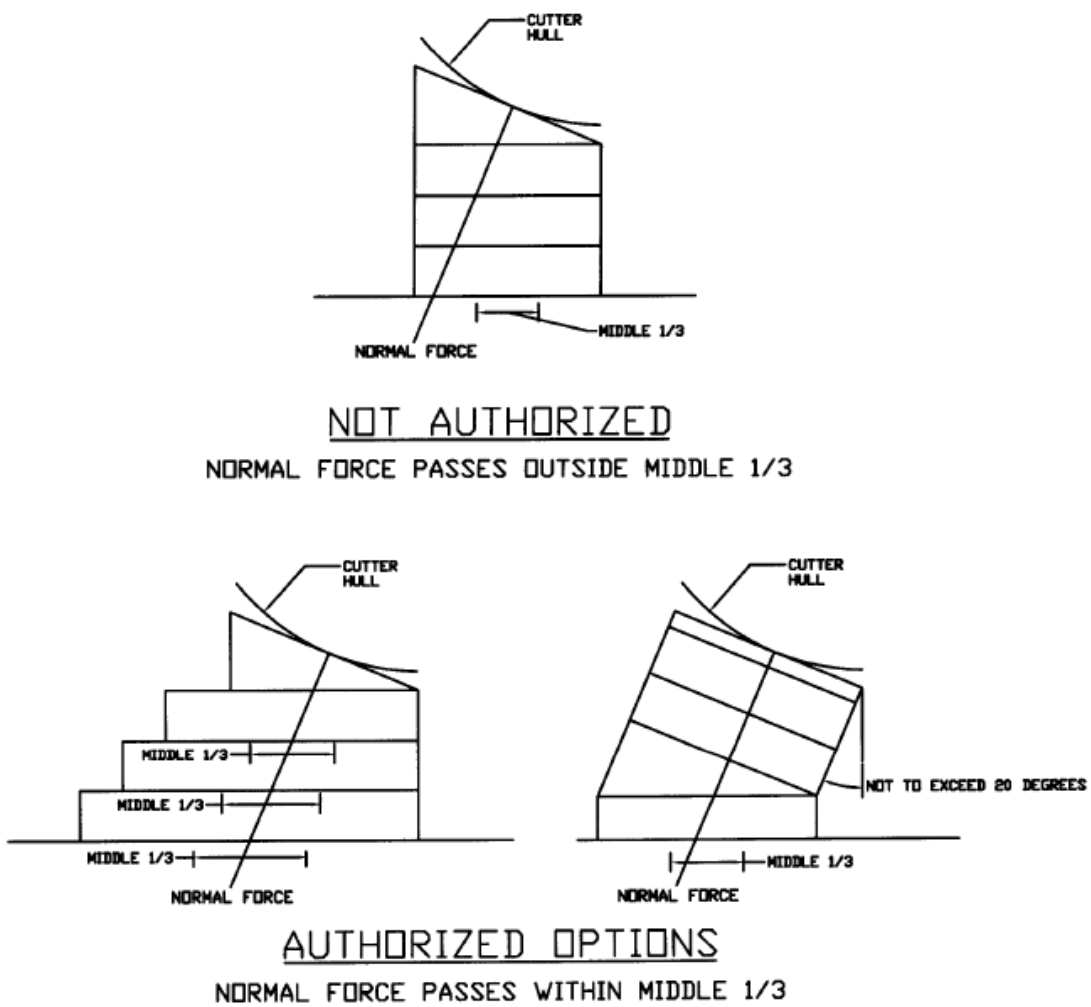


Figure A-1, Bilge Block Construction

2.6 GM requirements - The Contractor shall ensure that the ship-dock system complies with the following GM requirements:

a. For docks with lifting capacities of 10,000 long tons (LT) or less, the minimum GM of ship/dock system shall be 5 feet for all portions of the planned lift. As a safety precaution, for conditions other than planned, the ship-dock system shall have a minimum GM of 2 feet with a level trim condition with the pontoon deck below the water surface.

b. For docks with capacities greater than 10,000 LT, minimum GM shall be in accordance with Figure 4 of MIL-STD-1625.

2.7 Stabilizing moment - For marine railways and building ways, the Contractor shall submit additional calculations for overturning and stabilizing moments. Ensure that the stabilizing moment is at least 25% greater than the overturning moment, and that moments take into account wind and current loads. See Figure 10 of MIL-STD-1625.

2.8 TRIM CONSIDERATIONS - The maximum allowable trim between the blocks and keel shall not exceed 1 foot per 100 feet of length during the landing of the vessel. Once the vessel is fully landed, a maximum ship/dock trim of 4 feet per 100 feet of length shall not be exceeded at any time. When it is necessary or desirable to dock a cutter with appreciable trim, both the total load on the knuckle block and the maximum unit stress at the after end of the knuckle block must remain within permissible limits. These permissible values will in turn depend upon the mechanical properties of the dock block timbers, in a direction perpendicular to the grain. If required, when docking in a floating dock, the dock may be trimmed to match the cutter's trim.

2.9 LIST CONSIDERATIONS - A cutter entering dry dock should be without list. If practicable, all list should be eliminated before attempting to dock the cutter. If examination of the cutter by the docking activity's representatives is not possible before docking, the Commanding Officer of the cutter shall inform the activity of the amount of list, and its probable cause. This information shall be furnished sufficiently in advance of the time of docking to permit safe docking arrangements to be made without delaying the docking.

2.10 Pumping Plan - The Contractor shall submit to the COR a plan detailing the drydock tank levels for each stage of required stability calculations. Ensure that each tank is dewatered in proportion to the load distributed above the tank. Be aware that pressing up or emptying dock ballast tanks non-proportionally to obtain adequate GM, by minimizing free surface effect, is not acceptable. See Appendix D, it provides formulas for pumping plans.

2.11 Travel lift and crane calculations - The Contractor shall calculate the load on each strap or lifting cable. Ensure that the load is based on the weight distribution of the vessel.

TABLE 1. DOCKING CALCULATIONS REQUIREMENTS

CALCULATIONS	Notes	TYPE OF DRYDOCK			
		Floating	Graving	Marine Railway	Vertical Lift
Blocking (2.5)	1, 2	X	X	X	X
Stability for vessel afloat	2	X	X	X	X
Vessel stability for keel touch		X	X	X	X
Draft at instability		X	X	X	X
Vessel's GM when side blocks are hauled (2.5.4)		X	X	X	X
System stability when water is at top of blocks	1, 2	X			
System stability when pontoon deck is awash	1, 2	X			
System stability when pontoon deck breaks surface		X			
System stability when the GM is less than 5 feet (2.6)	1, 2	X			
Stabilizing moment (2.7)	2	X		X	X
Pumping plan (2.8)	1, 2	X			

1. Required for Pre-award calculate
2. Calculations required for all classes of 110 WPB's and barges and vessels with flat bottoms. See 2.9 (Travel lift and crane calculations) for guidance on required calculations.

APPENDIX B

REQUIREMENTS FOR FACILITY INSPECTION

1 SCOPE

1.1 This appendix describes the particular requirements for the Contractor to perform drydock facility inspections.

2 REQUIREMENTS

2.1 Inspection checklists - The Contractor shall use the attached checklists to survey the Contractor facilities. Use additional sheets if necessary.

2.2 Checklist validation - The survey may be conducted by a Marine Surveyor that has a minimum of 5 years of experience. The Contractor shall have the completed checklists validated by a registered Professional Engineer. **NOTE:** The inspection cycle is based on the age of the dock, and is shown in the table below.

AGE OF DOCK	PERIODICITY
Less than 10 years	3 years
Over 10 years	2 years

2.3 Applicability - The Contractor shall complete the general section and all applicable sections of the checklists. The Checklists cover:

· Floating Drydocks.
· Graving Drydocks.
· Marine Railways.
· Vertical Lifts.
· Travel Lifts/Cranes.

INSPECTION CHECKLISTS FOR DRYDOCKING FACILITIES CERTIFICATION

The Contractor shall use the attached checklists to survey their facilities. The following is a list of the minimum facility requirements with integrated inspection checklists for each type of docking facility.

All "required" equipments or equipment that the Contractor intends to use must be "satisfactory" at the time of contract award and remain so throughout the availability performance period.

I hereby certify the material and operational conditions of the docking facility identified as _____, owned and operated by _____, are safe foe docking vessels within the facility's rated capacity on this the _____ day of _____, in the year of _____.

Date: _____

Registration No. _____

Signature of Registered Professional Engineer: _____

Inspection Checklist for General Requirements (All Types)

Inspected by _____ Date _____

Facility ID. _____ Sheet No. _____ of _____

ITEMS INSPECTED	CONDITION					REMARKS
	U	M	NA	NI	S	
Block Hauling Mechanism						(Mark all that apply)
Sheaves						
Tracks						
Chain/cable						
Pawls						
Structural members						
Ratchets						
Hauling winches/motors						
Slides						
Communication Systems (One of the below is required)						(Mark all that apply – Pass/Fail)
Public address system						
Radios						
Alarms						
Sound powered phones						
Dial telephone						
Bull Horn						

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for General Requirements (All Types)

ITEMS INSPECTED	CONDITION					REMARKS
	U	M	NA	NI	S	
Electrical Systems and Equipment Electrical power system shall support maximum load, developed by simultaneous operation of the dewatering pumps, fire protection pumps, valve opening and closing mechanisms, hauling machinery, communications equipment, lighting, alarms, and any other support equipment or systems necessary for the safe operation of the facility.						
Main power source (One of the below is required)						(Required)
Shore power						
Diesel gen. Set						
Back-up power source						(Optional)
Shore power						
Diesel gen. Sets						
Electrical power distribution						(Required)
Lighting for operations & security						(Required)
Ship grounding straps						(Required)
Welding machine grounds						(Required)
FIRE PROTECTION SYSTEM (One of the below is required)						(Required)
Installed fire protection system compliant with Occupational Safety and Health Administration (OSHA) regulations						
Memorandum of agreement with a local fire department ensuring that that fire department can arrive at the facility within 30 minutes of receiving the alarm.						

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for General Requirements (All Types)

ITEMS INSPECTED	CONDITION					REMARKS
	U	M	NA	NI	S	
FITTINGS/CONNECTIONS						(Mark all that apply)
Cleats						
Bollards						
Chocks						
Gratings						
Ringbolts						
Platforms						
Watertight doors, hatches, portlights and manholes						
Gudgeon and pintle connections						
Bolted connections						
Attachments						
Reinforcements						
SHIP/DOCK HANDLING SYSTEMS AND EQUIPMENT (One of the below is required)						(Mark all that apply)
Capstans						
Winches						
Trolleys						
Translation chains and cables						
UNDERWATER INSPECTION Has there been an inspection performed within the last 5 years?						Required

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Floating Drydocks

Inspected by _____ Date _____

Facility ID. _____ Sheet No. _____ of _____

General Description. Attach a drawing of the dock showing general construction. Supply on the drawing or in a table the tank sizes, volumes and locations.

LOA (ft)	
BOA (ft)	
Distance between wing walls (ft)	
Wing wall height (ft)	
Wing wall length (ft)	
Pontoon height (ft)	
Pontoon width (ft)	
The maximum water depth over the pontoon deck accounting for silt and tidal changes. (ft)	Max Depth: Tidal Range:
Maximum wind and current under which docking and undocking can be safely conducted. Determined by Contractor's SOP.	Max Wind: Max Current:
Maximum rated capacity of the drydock and the maximum load per foot.	Max Capacity (LT): Max LT/FT:
Maximum differential water levels permitted on tank bulkheads.	FT:
A current estimated weight & KG shall show the drydock in the light operating condition with all ballast tanks at the residual water levels. A correction shall be added for deck load, marine growth and silt accumulation in the tanks.	Current WT (LT): Current KG:

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Floating Drydocks

ITEMS INSPECTED	CONDITION					REMARKS
	U	M	NA	NI	S	
BALLASTING SYSTEM						(Required)
Do pumps operate?						(Pass/Fail)
Ballast and deballast in less than eight hours.						(Pass/Fail)
Do valves operate?						(Pass/Fail)
DEFLECTION DETECTION SYSTEM **(Describe system if applicable)**						(Optional)
DRAFT BOARDS Draft boards showing depth of water over pontoon deck at the wingwalls near the four inboard corners and at mid-length on the port and starboard sides.						(Required - Pass/Fail)
METHOD FOR DETERMINING TANK LEVELS						(Mark all that apply. One of the below is required)
Tank level indicators						
Sounding tubes						
HULL STRUCTURE Metal structural members shall have no more than 25% wastage. Wood structural members shall be free of wood rot, marine bores and deemed in good condition.						
Pontoon deck						
Pontoon sides/ends						
Pontoon bottom						
Wingwalls sides/ends						
Wingwall top deck						
Safety/machinery decks						
Interior Ballast/trim/ buoyancy tanks						

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Floating Drydocks

ITEMS INSPECTED	CONDITION					REMARKS
	U	M	NA	NI	S	
HULL STRUCTURE (cont.)						
Trusses/girders/frames/ beams						
Longitudinals						
Swash bulkheads						
Watertight bulkheads						
Fuel/water tanks						
Coatings						
MOORING SYSTEM						(Required)
SECURE WT HANDLING EQUIPMENT The weight handling securing systems shall be demonstrated to verify that these systems are adequate to hold under conditions of maximum list and trim.						(If applicable)
STABILITY AND BUOYANCY CRITERIA Docking facility shall meet the following freeboard and buoyancy characteristics.						Mark as applicable
Open-ended drydocks The minimum achievable freeboard of the pontoon deck of the drydock (excluding pits) with the rated maximum load lifted shall be 12 inches. During normal operation, nine inches of freeboard is permissible.						

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Floating Drydocks

ITEMS INSPECTED	CONDITION					REMARKS
	U	M	NA	NI	S	
Closed-ended drydocks Minimum freeboard with the rated maximum load lifted shall be nine inches, measured from the sill of the stern (or bow) gates.						
Drydocks in the fully ballasted down condition During controlled ballasting of the drydock, the minimum freeboard (measured from the top deck at side) shall be 12 inches.						Required (Pass/Fail)
The facility must have an emergency plan or data demonstrating that failure of a pump or loss of pumping capacity will neither put the drydock out of operation nor cause damage to either the drydock or a ship in drydock.						Required (Pass/Fail)

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Graving Drydocks

Inspected by _____ Date _____

Facility ID. _____ Sheet No. _____ of _____

General Description. No drawing required.

Length of floor (ft)	
Width of dock opening (ft)	
Depth of dock (ft)	
The maximum water depth over the drydock sill, while accounting for tidal ranges and silt accumulation.	Max Depth: Tidal Range:
Maximum wind and current under which docking and undocking can be safely conducted. Determined by Contractor's SOP.	Max Wind: Max Current:
Facility's rated capacity in total weight and LT/ft.	Max Capacity (LT): Max LT/FT:

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Graving Drydocks

ITEMS INSPECTED	CONDITION					REMARKS
	U	M	NA	NI	S	
BALLASTING SYSTEM						(Required)
Do pumps operate?						(Pass/Fail)
Ballast and deballast in less than twelve hours.						(Pass/Fail)
Do valves operate?						(Pass/Fail)
STRUCTURES Inspect for significant cracks, leakage, spalling, inward/outward movement of vertical surfaces, upward or downward displacement of floor, and settlement of soil around dock.						(Mark all that apply)
Coping						
Walls						
Galleries						
Altars						
Service tunnels						
Floor						
Aprons						
Caisson seats						
Drainage culverts						
Drainage tunnels						
Flooding tunnels						
Discharge tunnels						
Pressure relief system						

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Graving Drydocks

ITEMS INSPECTED	CONDITION					REMARKS
	U	M	NA	NI	S	
CAISSON						(Required)
Shell plating/Sheathing						
Structural framing						
Bulkheads						
Deck plating						
Top deck coverings						
Fenders						
Backing for seals						
Seals						
Fixed ballast						
DRAFT BOARDS Draft boards showing depth of water over dock floor near the four inboard corners and at mid-length on the port and starboard sides.						(Pass/Fail)
PUMP HOUSES General Condition						(Pass/Fail)

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Marine Railway

Inspected by _____ Date _____

Facility ID. _____ Sheet No. _____ of _____

General Description. No drawing required.

LOA of cradle (ft)	
Width between wingwalls of cradle (ft)	
Width between rails (ft)	
The maximum water depth over the cradle floor, while accounting for silting and tidal ranges.	Max Depth: Tidal Range:
Maximum wind and current under which docking and undocking can be safely conducted. Determined by Contractor's SOP.	Max Wind: Max Current:
Facility's rated capacity in total weight and LT/ft.	Max Capacity (LT): Max LT/FT:

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Marine Railways

ITEMS INSPECTED	CONDITION					REMARKS
	U	M	NA	NI	S	
CRADLES						(Required)
General conditions						
Decking						
Block bearers						
Elevated frameworks						
Under deck frameworks						
Drawhead girder						
Bottom chords						
Bitumastic enamel on steel						
Preservative on wood						
Wheel bearing supports						
DRAFT BOARDS Draft boards showing depth of water over cradle floor at the wingwalls near the four inboard corners and at mid-length on the port and starboard sides.						(Pass/Fail)
GROUNDWAYS & RAILS Inspect above water portion and splash zone						(Required)
Alignment of tracks						
Settlement of tracks						
Piles						
Stringers						
Cross bracing						
Track plates & fasteners						
Rail & fasteners						
Chain guides						

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Marine Railways

ITEMS INSPECTED	CONDITION					REMARKS
	U	M	NA	NI	S	
GROUNDWAYS & RAILS (cont.)						
Mud & silt conditions						
Wheels						
Wheel bearings						
Rollers						
Roller spindles						
Roller frames						
Spacer blocks						
Wood filler pieces						
CHAINS, CABLES & SHEAVES Inspect for fit and percentage of wear						(Required)
Inhaul chains or cables						
Outhaul chains or cables						
Inhaul sheaves						
Outhaul sheaves						
Chain connecting links						
Sheave fasteners						
Chain slack & fit						
HAULING MACHINERY Inspect for lubrication, condition, fit and foundation						(Required)
Gearing						
Shafting						
Bearings						
Sprockets and wildcats						
Cable drums						
Frames						
Electric brakes						

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Marine Railways

ITEMS INSPECTED	CONDITION					REMARKS
	U	M	NA	NI	S	
HAULING MACHINERY (cont.)						
Hand brakes						
Locking pawls						
Clutches						
Safety guards						
Electric motors						
Diesels/gas engines						
Steam/compressed air drives						
Controllers						
Speed limit devices						
Control boards						
Switches						
Safety devices & alarms						

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Vertical Lifts

Inspected by _____ Date _____

Facility ID. _____ Sheet No. _____ of _____

General Description. No drawing required.

LOA of platform (ft)	
BOA of platform (ft)	
Width between rails (ft)	
The maximum water depth over the lifting platform, while accounting for tidal ranges and silt accumulation.	Max Depth: Tidal Range:
Maximum wind and current under which docking and undocking can be safely conducted. Determined by Contractor's SOP.	Max Wind: Max Current:
Facility's rated capacity in total weight and LT/ft.	Max Capacity (LT): Max LT/FT:

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Vertical Lifts

ITEMS INSPECTED	CONDITION					REMARKS
	U	M	NA	NI	S	
HOIST Inspect for unusual running noises, lubrication, condition of wire rope, and foundations						(Required)
Motors						
Gears						
Brakes						
Wire ropes						More than 2 broken wires per wire rope requires replacement.
Bearings						
Drums						
Foundation platform						
Anchorage						
Piles						
Lubrication system						
Wiring						
PLATFORM Inspect for soundness of structure						(Required)
Main transverse beams						
Secondary transverse beams						
Longitudinal beams						
Stiffeners						
Decking						
Sheaves						
Bearings						
Sheave housings						
Tracks						
Pins Tracks						

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Vertical Lifts

ITEMS INSPECTED	CONDITION					REMARKS
	U	M	NA	NI	S	
CRADLES Inspect for soundness of structure						(Required)
Main transverse beams						
Secondary transverse beams						
Stiffeners						
Longitudinal beams						
Wheels/rollers/roller plates						
Roller spindles/wheel axles						
Block bearers						
TRANSFER SYSTEM Inspect for unevenness in heights of tracks, excessive corrosion, hitching mechanism						(Required)
Tracks						
Hauling device						

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Travel Lifts/Cranes

Inspected by _____ Date _____

Facility ID. _____ Sheet No. _____ of _____

General Description. No drawing required.

LOA of travel lift (ft)	
Height from ground to cross bar (ft)	
Max allowable width of vessel (ft)	
Distance from ground to high water level (ft)	
Length of lifting cables (ft)	
Single or double upper cross tree	
The maximum draft, while accounting for tidal ranges and silt accumulation.	Max Draft: Tidal Range:
Maximum wind and current under which docking and undocking can be safely conducted. Determined by Contractor's SOP.	Max Wind: Max Current:
Travel Lift's overall rated capacity and strap capacity.	Max Capacity (LT): Strap Capacity (LT):

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Travel Lifts/Cranes

ITEMS INSPECTED	CONDITION					REMARKS
	U	M	NA	NI	S	
DRIVE MECHANISM Inspect brakes, tires, wheels, bearing, emergency brake						(Required)
HOIST						(Required)
Transmission motor & Brake						
Emergency Brake						
Trolley & hoist block						
Transverse reducer and motor						
Wire						
Straps/Slings/Preventers						
Sheaves						
Drum						Minimum of two wraps on drum at lowest position
HYDRAULICS Hoses, fittings, tank, motor, valves, pump & fluid levels						(Required)
ENVIRONMENT						(Required)
Overhead clearance						
Road surface						
Final blocking surface						
STRUCTURE Top Beam, column platform, side beam						(Required)

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

Inspection Checklist for Travel Lifts/Cranes

ITEMS INSPECTED	CONDITION					REMARKS
	U	M	NA	NI	S	
PIER FACILITY						(Required)
Surface Condition						
Pilings						
Stops						
LOAD TEST						(Required)
Load applied:						
Date of Test:						
Rated Capacity:						

U-Unsatisfactory M-Marginal NA-Not applicable NI- Not inspected S-Satisfactory

Note: All marginal and unsatisfactory items shall be addressed in remarks. Attach additional sheets as necessary.

APPENDIX C

CHECKLISTS

1 SCOPE

1.1 This appendix provides checklists for the docking and undocking procedure.

2 REQUIREMENTS

2.1 Inspection checklists - The following checklists are to be completed by the COR. They are provided for the Contractor's information.

2.2 Applicability - The checklists below are designed to be generic as possible. Some items may not apply to the docking or blocking method being used. The checklists cover:

· Pre-docking Conference checklist.
· Pre-docking Dock Inspection.
· During & Post Docking Inspection.
· Pre-Undocking Conference Check List.
· Undocking Evolution.

PRE-DOCKING CONFERENCE CHECK LIST

ITEM	SAT	UNSAT
DOCUMENTATION TO BE PROVIDED		
Current Dock Certification		
Operating practices, safety requirements, and yard security plans.		
Docking Calculations		
Blocking Arrangement (If different from docking plan)		
Docking Procedure		
FACILITY SAFETY EQUIPMENT		
Fire alarm locations		
Emergency power		
Emergency ballast/dewatering pumps		
REVIEW		
The flooding and pumping plan for the drydock. (allowable trim and deflection)		
Specific list, trim and drafts of the vessel during docking. (Grounding, when blocks are hauled) Critical Draft - _____		
GM of ship dock system all phases (Floating DD only -Not less than 5' except on docks of greater than 10,000 LT capacity)		
Block Loading -Trapezoidal, Knuckle		
Any special precautions or actions characteristic to the docking facility, the docked vessel, or a combination.		
High/low water, currents, weather		
Communications plan		
Tug plan		
Cutter entry plan (Line handlers, fenders)		
Cutter clearance above keel blocks, side blocks and other potential obstructions		
Docking position		
Procedure for positioning cutter in dock		
When to secure ship's power		
Use of divers		
Arrange time for block inspection		
Time & Date of Drydocking _____		
CUTTER CONDITION		
Verify cutter load condition (tanks, drafts, displacement)		
All equipment retracted		
Verify Temporary Services/hookups		
Drafts:FWD_____, MID_____, AFT_____		

PRE-DOCKING DOCK INSPECTION

ITEM	SAT	UNSAT
FOUNDATION BLOCK -TIMBER		
Check timber for excessive crushing, warping, cracking, rot and degraded material		
Note amount of wear from spiking and dogging		
Evaluate the condition of the interfacing between blocks in the stack		
Note condition of the fasteners in the blocks		
Note arrangements for preventing tripping and floating of blocks		
FOUNDATION BLOCK -CONCRETE		
Structural damage due to over loads		
Corrosion of steel reinforcement		
Concrete for cracking, spalling and exposed rebar		
FOUNDATION BLOCK – STEEL		
Evaluate the loss of steel due to corrosion		
Look for cracks in welds		
Deformed structure		
BLOCKS – GENERAL		
Soft Caps min thickness 2" & no crush		
Spacing & location as per blocking arrangement (+/-1/2" transversely +/-1" longitudinally, +/-1/4" height)		
KEEL BLOCKS		
Sight keel block line for alignment and fit		
Keel block height meets requirement		
Keel Profile applied to keel block offsets		
BILGE BLOCKS		
Sight bilge block line for alignment and fit		
Bilge blocks are required dimensions		
Bilge block construction. (Normal force passes through middle 1/3 of all blocks, no gaps, cribbing if over 6')		
MISCELLANEOUS		
Crane clearance		
Check overhead interferences and clearances		
Depth of water (Tide dependent)		
Condition of the working floor for debris, unevenness etc.		
Note mooring system, possibility of streaming		
Note draft/trim devices in use		
Condition of fendering		
(WHEC) Bow thruster has been retracted		
(WHEC) Lock propeller shafts in the docking position. Docking position marks should appear on the shaft just forward of the line shaft bearings		

PRE-DOCKING DOCK INSPECTION – cont'd

ITEM	SAT	UNSAT
Verify all applicable equipment (e.g., propulsion equipment, steering gear) is secured and tagged out in accordance with the General Requirements.		
All overboard discharges secured		
(210/282 WMEC) Verify pre-docking shaft alignment checks have been taken.		
(110/87 WPB) Taken face-to-face Shaft Reduction gear/Engine alignment readings. Coordinate with Definite Item "Underwater Body Inspection".		
(110 WPB) Secured CAPAC system prior to docking		
(110 WPB) Secured seachest		
(110 WPB) Remove batteries from battle lanterns		
(110 WPB) Retract speed doppler		
(87 WPB) Ensure sewage tank is pumped and flushed		

DURING & POST DOCKING INSPECTION

ITEM	SAT	UNSAT
DURING DOCKING EVOLUTION		
Time & date bow crosses sill. _____, _____		
Cutter came in smoothly. Could it have hit any underwater obstacles?		
Position of the cutter is correct.		
Correct draft of dock when cutter grounds		
Correct drafts of dock & cutter when cutter is landed		
Check for cutter list and alignment		
Correct draft of cutter when bilge blocks are hauled		
All bilge blocks were hauled fully		
Draft of cutter when setting down on pre-set bilge blocks		
Keel Centered on keel blocks		
Trim and docking plan being followed		
POST DOCKING EVOLUTION		
Proper Contact area (Wedges may be required) If inadequate area refloat (Less than 80%)		
Drafts of dock		
(FWD_____, MID_____, AFT_____)		
Does dock have a hog or sag?		
Are any blocks hitting appendages?		
Any appendages not shown on docking plan or in wrong location?		
Excessive crush of blocks? Location:_____		
Verify correct position of cutter on blocks		
Ensure side haul blocks are locked in position		
Damage to cutter		

PRE-UNDOCKING CONFERENCE CHECK LIST

ITEM	SAT	UNSAT
DOCUMENTATION TO BE PROVIDED		
Recorded Weight Shifts during availability		
Undocking Calculations		
Undocking Procedure		
UNDOCKING REPORT		
Transducer cover removed and returned to Coast Guard Inspector		
Zincs uncovered and free of paint		
Shaft rope guard & fairwaters in place		
Hull opening blanks & plugs removed		
Sea chest strainers are bolted in place and lockwired		
Sea valves & waster pieces are properly installed and are in the closed position		
All underwater body work has been completed		
Dock is free of all debris and blasting material		
REVIEW		
The flooding and pumping plan for the drydock. (allowable trim and deflection)		
Specific list, trim and drafts of the vessel during undocking. (when side blocks are hauled)		
GM of ship dock system all phases(Floating DD only -Not less than 5' except on docks of greater than 10,000 LT capacity)		
High/low water, currents, weather		
Communications plan		
Tug plan		
Temporary services disconnection		
Cutter exit plan (Line handlers, fenders)		
Cutter clearance above keel blocks, side blocks and other potential obstructions		
Pier Location & Temporary services hookup		
Where personnel will be stationed (All hull openings that were worked on)		
Procedure if immediate re-docking is required		
Is ballast required for undocking?		
Time & Date of Undocking _____, _____		
CUTTER CONDITION		
Verify cutter load condition (tanks, drafts, displacement) Perform Tank sounding within 12 hours of undocking.		
MISCELLANEOUS		
Hull paint curing times have been met in accordance with manufacturer's instructions, or 24 hours have expired since the final coat of paint, whichever is greater. Final dry film paint thickness readings have been recorded		
Verify draft marks are painted in		
All sea chest strainer plates are bolted in place and lock-wired, and inlet plugs have been removed		

PRE-UNDOCKING CONFERENCE CHECK LIST- CONT'D

ITEM	SAT	UNSAT
All propeller protective coverings removed		
All void plugs are in place and pulled up tight. Hardening of plugs witnessed by Coast Guard Inspector		
All yard lifting pads are removed and paint is repaired		
Propulsion shaft seals and rudder packings are in place and checked		
Propellers are free of paint or contamination		
Coating system is free of foreign paint or contamination		
Underwater coating is undamaged		
Overboard discharge openings are clear of obstructions		
Grounding wires removed		
Obtain CO's permission to undock the cutter		
Ablative coating system is free of foreign paint or contamination		
All fairwaters and rope guards and their securing hardware are in place and protective coverings are removed		
(WAGB) Contractor provide manlift or scaffolding to allow ship's force to conduct pitch verification test		
(WAGB/WHEC/WMEC) C.P. propellers are at zero pitch and shafts locked so that the bottom propeller blades are 45 degrees from vertical. Tape is removed from C.P. blade/hub O-ring seal slot. Lock wire is welded to dunce cap end plate retaining bolts		
(WAGB) Propeller hub oil drain plugs are pulled up tight and keepers tack welded into place		
(WHEC) Shaft rubber covering is applied and dried, and is not damaged or cut		
(WHEC) Propulsion shaft seals and rudder packings are in place and checked. Lower rudder bearing protective wrappings are removed		
(WHEC/WMEC) Propellers, bow thruster, and hull coating system are free of foreign paint or contamination		
(WHEC) Verify docking position marks on propeller shafts		
(WPB) Sea scoops are properly oriented		
(WPB) Speed log transducer clear of paint		

UNDOCKING INSPECTION

ITEM	SAT	UNSAT
DURING UNDOCKING EVOLUTION		
All equipment retracted		
Verify Temporary Services/disconnection		
Personnel at hull openings		
Stopped at correct draft for hauling side blocks		
Hauled ALL side blocks FULLY		
Detection of any leaks		
Cutter exited smoothly. Could it have hit any underwater obstacles?		
Time & date bow crosses sill _____,_____		
Drafts:FWD_____, MID_____, AFT_____		
Damage:		

APPENDIX D

PUMPING PLAN FOR FLOATING DOCKS

1 GENERAL - Preparation of a pumping plan is a prerequisite for each docking of a U.S. Coast Guard cutter in a floating dock. Procedures for preparation of a pumping plan are required to be included in the certification report. These procedures shall be prepared to include items described in this appendix.

2 OBJECTIVES - The pumping plan shall be prepared to satisfy, the following objectives:

(a) Ensure that the dock has the required lifting capacity, to lift the cutter in its desired longitudinal position with respect to the dock, taking into account the residual silt and water in the tank.
(b) Ascertain that, during the docking evolution, neither the cutter by itself nor the cutter-dock combination will become unstable.
(c) Ensure that structural integrity of the dock will be maintained during the docking evolution:

(1) The longitudinal bending moment and deflection remain within the acceptable range.
(2) In case of multi-section docks, the connections are not overstressed.
(3) The bulkheads forming the tank boundaries will not be over stressed because of excessive differential loading.
(4) The dock blocking is not overloaded.

2.1 Plan content - In order to satisfy these objectives, the pumping plan shall define:

(a) The water levels tanks after completion of docking.
(b) Water levels in the tanks at intermediate drafts of the dock at which cutter status shall be checked.
(c) Observation to be made in the cutter at intermediate drafts mentioned in item (b).
(d) Deflection gauge readings and other items to be checked at the intermediate drafts.

2.2 Critical stages - When developing a pumping plan, in addition to determining the tank levels for the five phases of operation on Figure D-1, special attention shall be given to the stages when:

(a) The cutter touches the blocks.
(b) Stability of the cutter becomes critical.
(c) Stability of cutter-dock system becomes critical.

3 PUMPING PLAN DEVELOPMENT – A pumping plan shall be prepared in accordance with 3.1 through 3.2.4.

3.1 Planning – The following steps shall precede preparation of a pumping plan:

(a) Examination of cutter data, including its docking drawing, curves of form and light cutter weight distribution.
(b) Cutter survey, including information on variable weights, cutter's drafts, and abnormalities (such as heavy lifts, trim, or hull damage).
(c) Calculation of the cutter's displacement and LCG at the time of docking, using current cutter's draft readings. Calculations of required changes in the variable weights in the cutter to correct: list, trim, and excessive free-surface effects. Calculations shall include stability calculations described in Appendix A.
(d) Dock survey, to determine effects of accumulated silt in tanks on available lifting capacity.
(e) Examination of the required blocking, which determines the longitudinal location of the cutter with respect to the dock and its center of gravity above the pontoon deck.

3.2 Distribution of lifting capacity (pumping plan) – If strength and stability requirements are not violated, the amount of water that shall be removed from each tank may be calculated (see 3.2.3). Note that a pumping plan is for guidance only. The docking officer or master must monitor the deflection and drafts of the dock to ensure that they are within limits and are appropriate for the phase of operation. For large or sectional docks, or when docking a cutter with extremely high loading at one end, consideration of moments between tanks or dock sections may have to be taken into account in preparing the pumping plan. A properly prepared pumping plan can make the docking operation much safer.

3.2.1 Distribution of cutter weight – The distribution of the cutter's weight as shown on the longitudinal strength drawing (20 station weight) will indicate how the cutter's weight is distributed on the deck. General types of loading are:

(a) Keel bearing is uniform and continuous.
(b) Keel bearing is non-uniform, such as a cutter with a partial bar keel, long overhangs, highly concentrated weight in some compartments of the cutter, or keel bearing interrupted by hull projections or by use of a separate docking skeg.

3.2.2 Calculations of cutter loading on the dock – For loadings that are not continuous and uniform, a more rigorous method to determine the load distribution may be required. Figure D-2 depicts a cutter on a dry dock. For this very general case, the blocking is assumed to be continuous and uniform and the load distribution may be approximated as follows (see Figure D-2):

If A< B, load distribution is trapezoidal:

$$\text{Load}_{max} = \frac{W}{L_K}\left(1 + \frac{A}{B}\right)$$

$$\text{Load}_{min} = \frac{W}{L_K}\left(1 - \frac{A}{B}\right)$$

$$\text{Slope} = \frac{\text{Load}_{max} - \text{Load}_{min}}{L_K}$$

If A> B, load distribution is triangular:

$$W_E = W$$

L_E = length of effective keel bearing = 1.5 L_K – 3A

$$\text{Load}_{max} = \frac{4\,W_E}{3(L_K - 2A)}$$

$$\text{Slope} = \frac{\text{Load}_{max}}{L_E}$$

NOTE: For the condition just after keel contact, the keel loading is regularly triangular and the above may be used to calculate the loading by:

W_E = W (displacement at trimmed waterline 2 feet below the docking draft.)

3.2.3 Amount of water to be removed from a tank – The amount of water to be removed from a tank to lift the cutter may be determined from the load distribution shown on Figure D-2 as follows:

x = distance to the center of gravity of a given tank from the after end of the keel blocking.

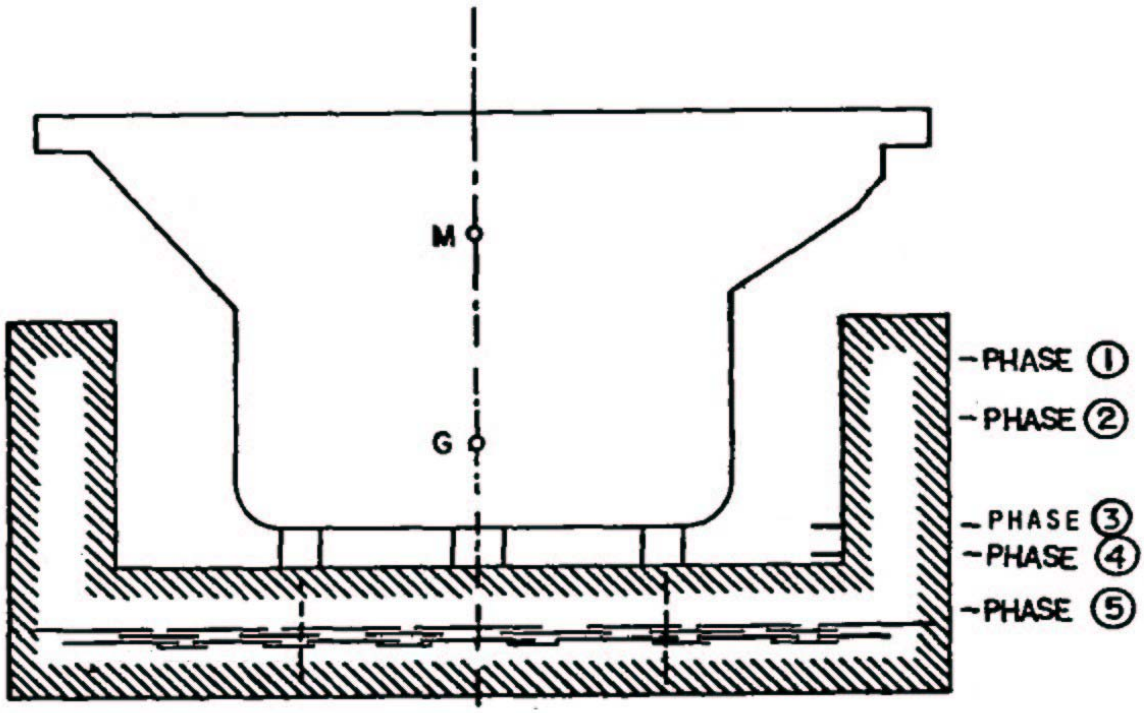
w = average loading over a tank = $\text{Load}_{max}\left(1-\frac{x}{L_K}\right) + \text{Load}_{min}\left(\frac{x}{L_K}\right)$.

d = length of keel blocking over a tank.

wd = weight of water to be removed from a tank.

Figure D-3 depicts an alternate method of determining the amount of water to be removed from the tanks by using a table.

3.2.4 Adjusted tank water levels to lift cutter – Using the curves of ballast distribution for lifting the dock without a cutter (see Figure D-4), the amount of water each tank must contain to hold the dock at a specified draft may be determined. Adjust these values for the amount of water to be removed to lift the cutter by either the method shown on Figure D-5 or on a form such as depicted on Figure D-6. These adjusted water levels for the five phases of operation, together with any critical stages, make up the pumping plan to dock the cutter. Note that this discussion addresses properly lifting the cutter such that only those tanks, which support the cutter's weight, are adjusted. The other tanks would be at the required levels for lifting the dock without a cutter. However, adjustment to these tank levels may be necessary to correct moments between tanks or sections, or to adjust the list, trim, or deflection of the dock.



Phase 1 - Fully ballasted-down condition. In this phase, the ship is floating independently and the dry dock is in the submerged condition before the ship bears on the blocks.

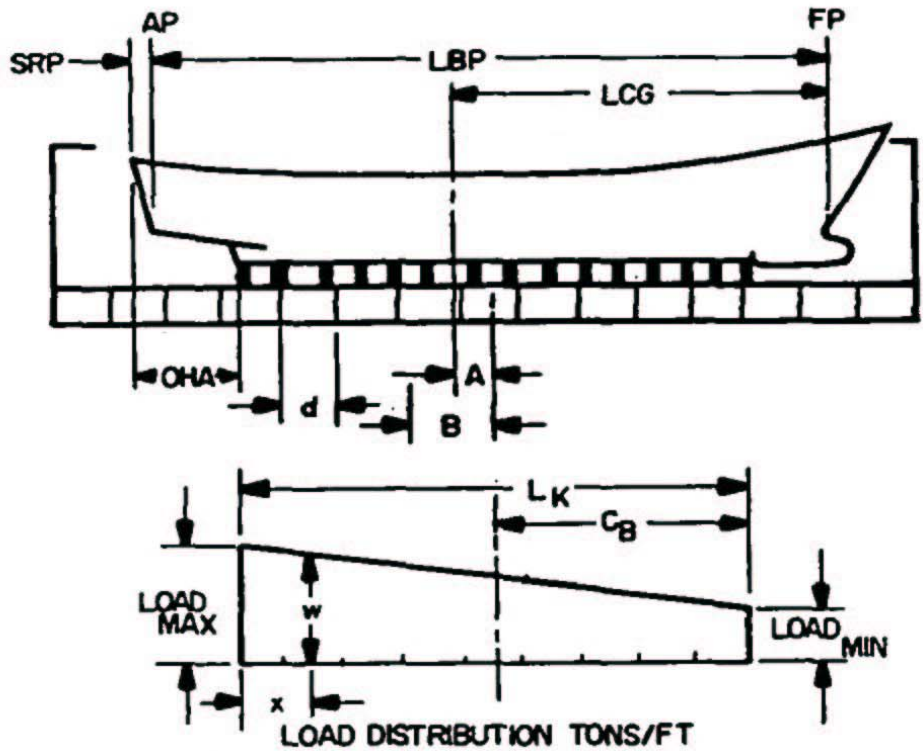
Phase 2 - Partial liftoff. This phase begins as the ship starts bearing on the blocks and part of the ship's weight is supported by the floating dock.

Phase 3 - Ship keel at water level. This phase begins when the ship's keel is about to leave the waterplane.

Phase 4 - Top of pontoon at water level. This phase is when the water level between the wing walls is just above the top of the pontoon.

Phase 5 - Normal operating condition. Top of pontoon is above the water level. Liquid ballast is at a minimum.

Figure D-1, Phases in the docking evolution for stability calculations.



LBP = length between perpendiculars of ship

SRP = distance from after perpendicular (AP) to point from which distance to keel blocks is measured

LCG = distance from forward perpendicular (FP) to ship's longitudinal center of gravity

OHA = length of overhang from SRP to first after keel block

W = displacement of ship

L_K = length of keel blocking

$C_B = \frac{L_K}{2}$ = distance from the end of keel blocking to the center of blocking

$B = \frac{L_K}{6}$ = distance from center of blocking to the approximate center of the loading trapezoid

$A = C_B - (LBP - SRP - LCG - OHA)$ = distance from ship's LCG to the center of blocking

d = length of keel blocking over a tank

w = average loading over a tank

x = distance from the after end of keel blocking to the center of gravity of a tank

Figure D-2, Cutter load distribution on dock.

①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪
Tank	Bulkhead	Distance from 1st KB to BKD	Slope of load curve	③ x ④	Load/point L aft - ⑤ 2/	Distance btwn load pts in ⑥	Ave load per tank $\frac{L_a + L_f}{2}$ 3/	Weight/tic ⑦ x ⑧	Specific volume of water 4/	Gallons of water to be removed
10	1st keel block 1/									
	10,9									
9										
	9,8									
8										
	8,7									
7										
	7,6									
6										
	6,5									
5										
	5,4									
4										
	4,3									
3										
	3,2									
2										
	2,1									
1										
	Last keel block 1/									

1/ For shorter keel blocking lengths, the block may not extend across all tanks. In these cases, the first keel block and last keel block points are referenced over the tanks on which they are located.
2/ Load/points are the first keel block, tank bulkheads and last keel block.
3/ L_A - aft load point over tank and L_F - forward load point over tank.
4/ Fresh water 269.3 gal/ton and salt water 261.8 gal/ton.

Figure D-3, Sample table for water to be removed from tank for lifting a cutter.

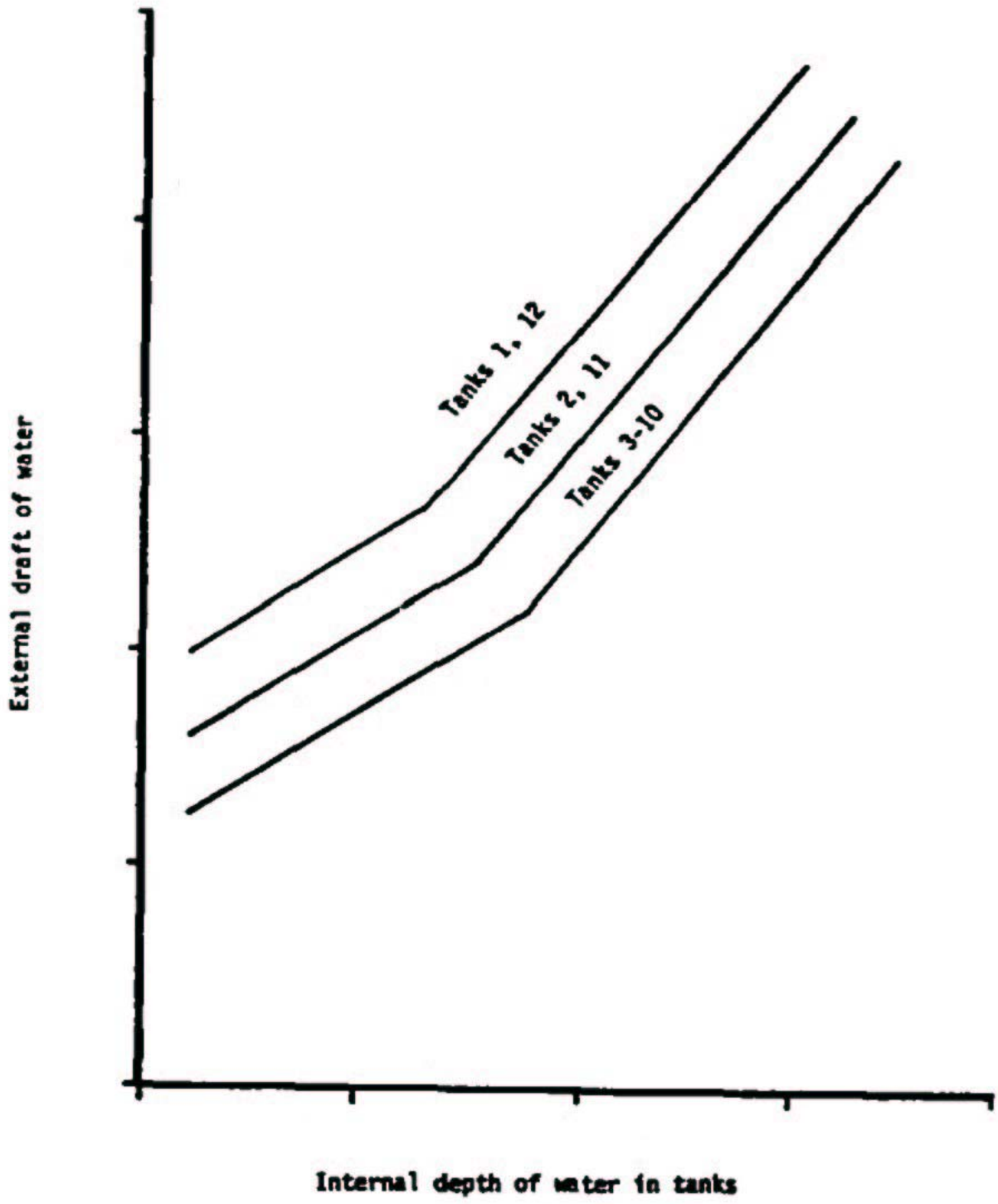
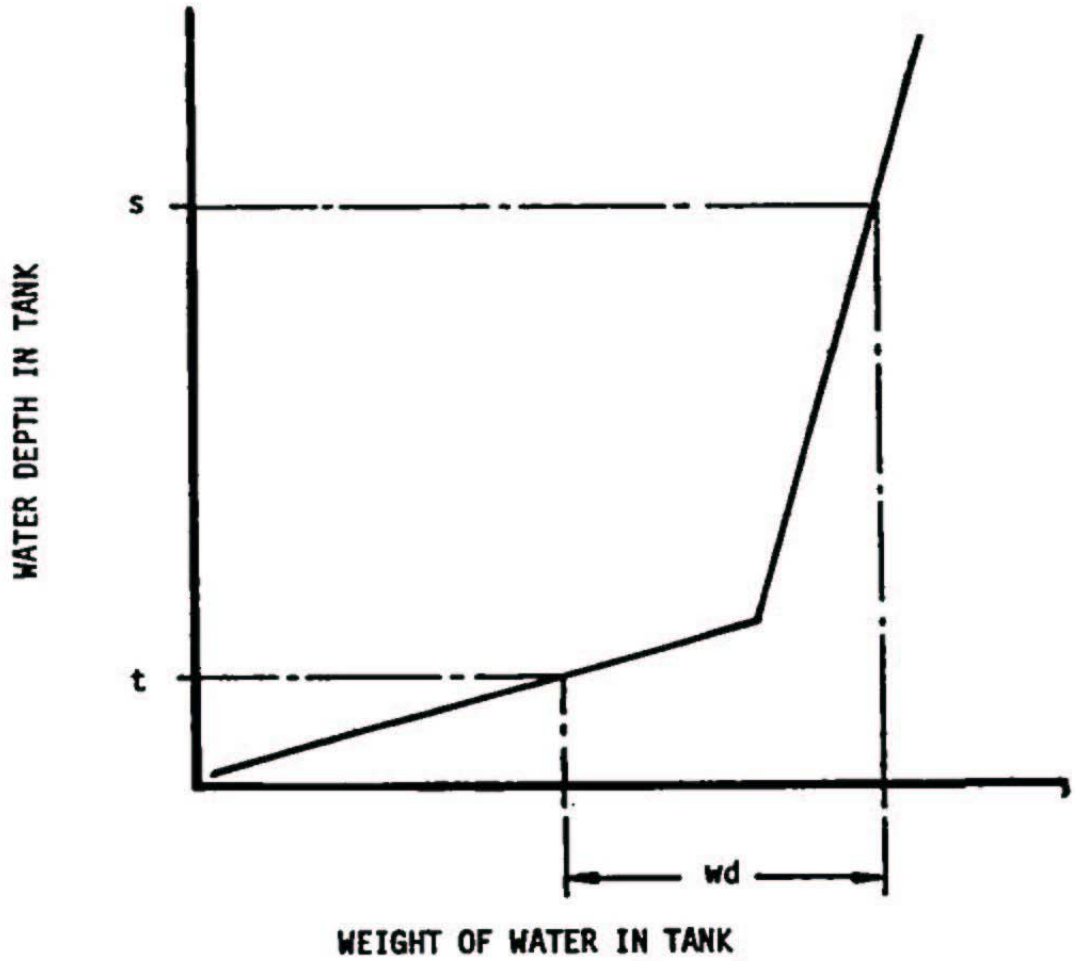


Figure D-4, Ballast distribution for lifting dock without cutter.



s = TANK SOUNDING FOR LIFTING EMPTY DOCK

t = TANK SOUNDING FOR LIFTING SHIP IN DOCK

wd = WEIGHT OF WATER TO BE REMOVED TO LIFT THE SHIP

Figure D-5, Tank sounding calculation

DRAFT _____

Tank	Tank level	Gallons per sounding	Water -1/2 out	Gallons per sounding	Tank level
10P					
10S					
9P					
9S					
8P					
8S					
7P					
7S					
6P					
6S					
5P					
5S					
4P					
4S					
3P					
3S					
2P					
2S					
1P					
1S					

Figure D-6, Sample format for required tank levels.