intervals are provided in Appendices E through H. Cathodic protection systems shall be inspected where applicable.

4.1.3 Completeness

Structures and equipment that are inaccessible for inspection shall not be assumed to be satisfactory. A basis for acceptance of these areas, such as metrics or historical data, shall be established or the activity shall make them accessible for inspection. For example, structural members in the upper wing wall of a floating dry dock may need to be staged to provide for an effective inspection. Condition assessment and preventive maintenance records shall be reviewed prior to conducting control inspections to identify areas warranting closer attention during the inspection.

4.2 INSPECTION PERSONNEL

Control inspections may be conducted either by the operator's personnel or by contractors, who shall be individually qualified for their respective roles in such inspections. Inspectors shall have an engineering degree or an equivalent amount of relevant experience. Floating dry dock inspectors shall have experience in the design and operation of floating dry docks or in ship surveying. Inspection team members for graving docks, marine railways, and vertical lifts shall have experience in the design, operation, or inspection of that type of facility or similar type of structure. An individual team member for the underwater portion of the inspection shall have experience in at least two of the following areas: underwater salvage work, ship surveying, or underwater maintenance and repair of materials appropriate to the facility. A diver meeting the requirements of a recognized certification society for similar underwater inspection shall be considered to be qualified to perform the underwater portion of the survey. Control inspections shall be performed by personnel who are not accomplishing the routine maintenance of the facility.

4.3 INSPECTIONS RECORDS

Records, schedules, and other associated documentation shall be maintained. The qualifications of personnel conducting control inspections shall be kept on file with the facility operator. Inspection checklists similar to those illustrated in Appendices A through D, as applicable, shall be used to record inspection results. The checklists shall be modified to suit each facility and shall have sufficient detail to ensure representative inspection of all structures and mechanical and electrical equipment.

Structural members such as transverse and longitudinal strength members, and plating and framing for decks, bulkheads, and shells shall be listed individually by ballast tank, compartment, frame number, or other identifier. Mechanical and electrical equipment such as valves, pumps, and sluice gates shall also be listed individually. The grouping of items for an entire facility, such as "pontoon structure," "marine railway cradle structure," or "ballast valves," is insufficient. The necessity or urgency for correcting deficiencies shall be explained on the checklists. The following material condition ratings as shall be utilized:

- (A) Satisfactory (S): The condition of the item will not result in system damage and, based on measured or estimated deterioration rate, it may be expected to remain satisfactory until the next control inspection.
- (B) Marginal (M): The condition of the item will not result in major damage or, by itself, it will not make the facility unsafe to dock a ship, provided it is corrected, repaired, or replaced in a timely manner. A number of such items as a group can make the facility unsafe. This shall be evaluated by the inspector.
- (C) Unsatisfactory (U): The condition of the item may cause system damage or loss and shall be corrected, repaired, or replaced immediately (if there is a ship in dock) or prior to docking a ship (if there is no ship in dock).
- (D) Not Applicable (NA): The item listed in the checklist is not present on the dry dock. Note that as items are added, removed, or replaced from the dry dock, the inspection checklist shall be updated to reflect the configuration changes.
- (E) Not Inspected (NI): The item was not inspected as part of the survey. It is not acceptable to mark an item NI unless there is a basis for expecting the item to be in a satisfactory condition.

4.4 CORRECTION OF DEFICIENCIES

All significant deficiencies identified during control inspections, including all deficiencies rated Marginal or Unsatisfactory, shall be added to the activity's maintenance management system and tracked in that system until the deficiency is corrected. The results of the control inspection shall be evaluated to determine whether there is a need to repeat the condition assessment. This page intentionally left blank

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DOCK OPERATIONS

5.1 SCOPE OF DOCK OPERATIONS

This section of the manual defines the requirements to safely dock and undock vessels in floating dry docks, graving docks, marine railways, and vertical lifts. The requirements include documentation, operating procedures, manning, and personnel qualification procedures.

5.2 DOCUMENTATION

5.2.1 Docking Report

If contractually required, a report documenting the work performed on a vessel in dry dock shall be completed by the shipyard and submitted to the ship owner. The report shall, at a minimum, include the following information:

- (A) Docking position of vessel
- (B) Shipyard's Docking Plan
- (C) Docking condition
 - i. Docking drafts
 - ii. Docking displacement
- (D) Undocking condition
 - i. Undocking drafts
 - ii. Undocking displacement
- (E) Underwater hull work
- (F) Structural modifications
- (G) Equipment changes

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- (H) Weight changes
- (I) Condition of propulsion system
 - i. Shaft alignment
 - ii. Propeller condition
 - iii. Rudder condition

5.2.2 Instructions for a Docking Facility

A dry dock facility shall develop, maintain, and implement a series of operating procedures for the safe use of the facility. This includes, but is not limited to, the normal operation of the facility as well as emergency procedures.

5.2.3 Emergency Procedures

A dry dock facility shall develop, maintain, and implement a series of emergency procedures for the rapid response to unexpected events. This includes, but is not limited to, heavy weather plans, casualty or damage control, and contingency plans for all docking operations.

5.2.4 Log Book

A dry dock log shall be maintained at the main control station for the purpose of recording all pertinent details regarding the use of the docking facility during all dock operations, including docking evolutions, laydays, and periods when the dock is being maintained while not in use. The data contained within the log book shall include the following:

- (A) Name of dock master
- (B) Times for the commencement and completion of critical steps
- (C) Tides
- (D) Weather, including wind speed and direction and sea state, during docking evolutions
- (E) Vessel and dock drafts, if applicable
- (F) Type of power employed
- (G) Casualties, if any
- (H) Inoperable equipment

5.3 PRE-AWARD PROCEDURE

This procedure documents the capability of the shipyard's facility to adequately support and accommodate a specific class or type of vessel for the purpose of drydocking.

5.3.1 Vessel's Information

Request the following information necessary for generating a blocking plan and performing calculations from the ship owner:

- (A) Vessel's Docking Plan
- (B) Vessel's displacement and other curves of form (Hydrostatic Table)
- (C) Vessel's Trim and Stability Booklet, if available
- (D) Vessel's service requirements to include:
 - i. Electrical shore power
 - ii. Steam
 - iii. Fresh water
 - iv. Seawater cooling
 - v. Fire main
- (E) Dry dock report from prior drydocking to include:
 - i. Place and date of last docking
 - ii. Last docking position
 - iii. Paint history
 - iv. Data on ship alterations which may affect docking but are not shown in the vessel's Docking Plan

5.3.2 Blocking Calculations

Using the vessel's Docking Plan, the shipyard shall calculate the bearing load on the keel and side blocks, and confirm that these loads are within the acceptable limits of the dry dock as developed in the condition assessment. The shipyard shall submit to the ship owner a preliminary preaward set of calculations to verify the capability of the dry dock to support the docking of a class or type of vessel.

5.3.2.1 Trapezoidal Block Load. The maximum anticipated keel line load in long tons per linear foot shall be verified to not exceed the capacity of the dry dock.

5.3.2.2 Average Block Load. The shipyard shall calculate the side block and keel block pressures. These values shall be compared to ensure the block pressures do not exceed the permissible compressive stress under normal loading conditions for the particular wood type and grade used, as indicated in the *National Design Specification (NDS) for Wood Structures* (ANSI/AF&PA NDS-2005). The proportional limit loads shall be used when calculating the block stress due to the overturning moment caused by extreme wind loads and seismic ground forces. Some typical blocking wood properties are shown in Table 5-1; more precise values for the species and grade of wood can be obtained in the NDS.

Block Material	Permissible Compressive Stress Perpendicular to the Grain (psi)	Proportional Limit Perpendicular to the Grain (psi)
Douglas Fir	400	800
Red Oak	600	1,300
White Oak	600	1,300
Yellow Pine	300	700

Table 5-1. Typical Blocking Wood Properties

5.3.2.3 Maximum Hull Pressure. The maximum hull pressure can be obtained from the ship owner's Docking Plan.

5.3.2.4 Wind and Seismic Side Block Requirements. Additional loading is imparted on the blocks due to extreme wind loads and seismic ground forces based on geographical location, as determined by ASCE/SEI 7-05 (ASCE 2006). The side blocks must be capable of distributing the overturning moment according to *Naval Ships' Technical Manual* (NSTM) S9086-7G-STM-010, Chapter 997, "Docking Instructions and Routine Work in Dry Dock" (NAVSEA 1996).

5.3.3 Overturning Moments

Overturning moments caused by extreme winds and seismic events shall be used to determine the minimum number of side blocks required.

5.3.4 Shipyard's Docking Plan

Using the vessel's Docking Plan, the shipyard shall develop an inhouse Docking Plan to be submitted to the ship owner for approval. Based on the vessel–dock configuration, determine whether an alternate blocking plan that differs from the ship owner's Docking Plan is required. Unless otherwise contractually stated, the docking position should account for the previously docked positions to ensure that the vessel can be 100% paint coated. The shipyard's Docking Plan shall contain the information described in the following paragraphs.

5.3.4.1 Alternate Blocking Plan. An alternate blocking plan is required if the dock frame spacing differs from the vessel blocking plan spacing, if work items prevent the use of certain blocks, or if the vessel is damaged.

If an alternative blocking plan requires block placement other than where specified in the ship owner's Docking Plan, interpolation of side

block heights may be required and the data shall be presented according to 5.3.4.5.

The new position of the side blocks must be checked to ensure that they fall under a strength point on the vessel (usually a longitudinal girder), and over a strength point on the dock (usually a transverse frame).

The new position of all blocks must be checked to ensure that they do not interfere with any underwater hull openings or protrusions in their new positions. The new position of the blocks should be cross-checked with the "Table of Hull Openings below the Projected Docking Waterline" described in Section 5.3.4.6.

5.3.4.2 Plan View of Dry Dock with Vessel Outline. The following information must be included in the shipyard's Docking Plan:

- (A) Vessel outline shall include hull openings, appendages, and protuberances that may affect the docking.
- (B) Longitudinal and transverse position of the vessel's docking reference point or stern reference point (SRP) from a fixed reference point on the dry dock.
- (C) Blocking arrangement showing the longitudinal and transverse position, as well as spacing of the keel blocks and side blocks, from a fixed reference point on the dry dock.

5.3.4.3 Elevation View of Dry Dock with Vessel Outline. The following information must be included in the shipyard's Docking Plan:

- (A) Dock draft at full submergence, showing waterline and freeboard for floating dry docks.
- (B) Vessel outline shall include a partial body plan to include the aft perpendicular, forward perpendicular, mid-ship section, and all appendages and protuberances that may affect the docking. This includes but is not limited to ladders, propellers, and rudders.
- (C) Afloat clearance from vessel hull or appendages, whichever is lower, to the highest block. A minimum clearance of 12 inches is required between the vessel and dock blocks during the docking evolution. In a floating dock, a minimum of 12 inches of clearance between the hull and harbor bottom shall be maintained. Clearances less than 12 inches are dangerous and should be considered only in emergency situations.
- (D) Landed clearances from rudder and propeller(s) to the dock floor and clearances for shaft removal, if such work is to be performed.

5.3.4.4 Cross Section at Propeller(s)

- (A) Afloat clearances from propeller(s) to the nearest block and any block the propeller(s) may pass entering or exiting the dock. A minimum clearance of 12 inches is required between the propeller(s), dock blocks, and dock floor during the docking evolution. In a floating dock, a minimum of 12 inches clearance between the hull and harbor bottom shall be maintained. Clearances less than 12 inches are dangerous and should be considered only in emergency situations.
- (B) Landed clearances from propeller(s) to the dock floor and clearances for shaft removal, if such work is to be performed. Include details of typical sections showing buildup of keel blocks and side blocks. Details shall include baseline height, width and breadth of the block, and half-breadths.

5.3.4.5 Side Block Table of Offsets. This table is to include the distance to the aft face of each block from a fixed reference point, length (longitudinal) and breadth (transverse) of each block, as well as the heights and half-breadths (transverse location) of the critical points A, B, and C indicated on the docking plan. The slope per length of the block to determine the forward heights or the actual forward heights shall be included.

5.3.4.6 Table of Hull Openings below the Projected Docking Waterline. Using the ship owner's Docking Plan as a reference, a table shall be generated that indicates the following information:

- (A) Purpose of opening(s)
- (B) Size of opening(s)
- (C) Vertical, longitudinal, and transverse location of opening(s)

5.3.4.7 General Notes. All pertinent information shall be documented in the General Notes. This includes:

- (A) Purpose and scope
- (B) Calculated docking condition including maximum anticipated displacement, drafts, and trapezoidal loads on blocks
- (C) Docking position
- (D) Keel block information, including baseline height, typical length and breadth, and omitted blocks
- (E) Side block information, including typical length and breadth, and omitted blocks

- (F) References
- (G) Principal characteristics of the dock and vessel, including principal dimensions, displacements, and drafts

5.3.5 Shipyard's Berthing and Approach Plan

A general arrangement of the shipyard's facility shall be generated that includes the following:

- (A) Geographic location
- (B) Channel features and markers
- (C) On-shore arrangement of pertinent facilities and roadways
- (D) Crane locations, including reach arms and capacities
- (E) Pier locations and mooring capabilities
- (F) Service locations and capacities, including:
 - i. Shore power voltage and amperage
 - ii. Seawater cooling connection size and capacity
 - iii. Fire main connection size and capacity
 - iv. Potable water connection size and capacity
 - v. Steam connection size and capacity
- (G) Dry dock location
- (H) Hydrographic survey of the facility showing water depths
- (I) Approach lines of the vessel to pier-side facilities and dry dock

5.4 MANNING REQUIREMENTS

5.4.1 Docking Personnel

A manning procedure shall be developed for the docking facility. The procedure should be made available to the dock master and ship owner upon request. The procedure shall describe each station to be manned, the functions to be performed, and the qualification criteria for personnel manning those stations during all operational evolutions. The procedure shall include personnel required for casualty or damage control, emergency procedures, heavy weather plans, and contingency plans.

5.4.2 Personnel Qualification Procedure

All personnel shall be qualified through training and experience. Individual qualifications, such as described in 5.4.3.1, shall be documented and retained on file as a matter of individual personnel records. These documents shall be made available to the ship owner upon request. If an individual is qualified, or a station requires qualification through a