

SECTION 2. ANCHORING

581-2.1 GENERAL INFORMATION

581-2.1.1 ANCHORING GUIDELINES. The following paragraphs present guidelines and methods for anchoring. The anchoring conditions determine the length of anchor chain that the ship's force will use to secure the ship's position.

581-2.1.2 PRECAUTIONS. When anchoring, adhere to the following precautions and conditions:

- a. Never drop two anchors simultaneously.
- b. Maintain an anchor watch when anchored or moored to a buoy.
- c. Do not allow the anchor chain to tend across the stem (lead around the ship's bow).
- d. Do not use the anchor to stop the ship.
- e. Anchoring nomographs are based on a flat-bottom condition. Always use the correction factor for a sloped-bottom nomograph.
- f. Check target point dimensions on nomographs. Do not use reduced-sized or reprinted copies.
- g. Pay out the anchor to within 15 fathoms of seabed and free-fall the anchor the remaining distance when anchoring in depths exceeding 15 fathoms.
- h. Anchoring should not be done in depths exceeding 100 fathoms.

581-2.1.3 DESIGN CONDITIONS. Anchoring system design is based on a 70-knot wind and a 4-knot current in 40 fathoms of water, in a firm sand bottom with the wind and current bow on. The maximum force a ship exerts on the anchor line under design conditions is the horizontal force or the ship's total resistance (hull and locked propeller(s) drag and wind force), and is equal to the force exerted on ANCHORING the ship's anchor. An anchor is then selected that has a holding power equal to or greater than the ship's resistance.

NOTE

When anchoring in a mud bottom, the holding power of the anchor is less than in sand, and the ship may have a tendency to drag anchor.

581-2.1.4 ANCHOR HOLDING POWER. Anchor holding power has been determined by full-scale anchor drag tests in a firm sand bottom. It has been determined from anchor drag tests in unconsolidated sediments such as mud or a mix of mud, clay and sand, that anchors have maximum holding power in firm sand. In addition, full-scale anchor drag tests have demonstrated that the holding power of an anchor in a mud bottom is purely a function of the type of mud. However, anchors deeply embedded in mud may develop sufficient holding power.

581-2.1.5 ANCHOR CHAIN SIZE. The anchor type and size is selected based on the wind resistance force, the hull hydrodynamic drag force, the locked propeller drag force and a dynamic motion factor applied depending on ship type. The chain size reflects a factor of safety of five, based on the forces and factors above, plus the resultant tension due to the catenary effect, all of which equal the chain tension at the ship's bolster.

581-2.1.6 CHAIN LENGTH. The length of chain is determined after the chain size is selected. The controlling factor in determining the length of the chain is the requirement that the anchor shank must remain horizontal in order to develop maximum anchoring forces. This assumes that the bottom is flat and horizontal. The chain from the ship to the anchor will conform to a curve in the shape of a catenary. If the catenary is short, the chain will lift the anchor shank off the bottom and reduce the anchor holding power. The further the anchor shank lifts off the bottom, the less the anchor holding power.

581-2.1.7 SHIP'S GROUND TACKLE SIZE AND QUANTITY. The hull allowance lists specify the size, weight, amount and type of ground tackle equipment, including spares, that should be onboard in-service ships. This information is also contained in the Ship's Information Book (SIB). All discrepancies between the Coordinated Ships Allowable List (COSAL) or the SIB and the onboard ground tackle equipment should be reported to NAVSEA.

581-2.1.8 RESERVE STOCK OF GROUND TACKLE. A reserve stock of ground tackle is maintained at the Ships Parts Control Center (SPCC), Mechanicsburg, PA and the Defense General Supply Center (DGSC), Richmond, VA. The amounts of chain of various sizes, the number of chain appendages, the number, weight and type of anchors carried as stock by the various activities, and the method of replenishing stock is established by the Naval Supply Systems Command based on usage data. The home yard or assigned yard provides maintenance support for the ground tackle equipment as requested.

CAUTION

Do not use the ground tackle equipment to reduce the ship's headway. The forces will cause ground tackle equipment failures and possible loss.

581-2.1.9 REDUCING SHIP'S HEADWAY WITH GROUND TACKLE. The practice of using the ground tackle to reduce a ship's headway is dangerous and is to be avoided except under extreme emergency conditions. This practice will cause excessive forces in the ground tackle. If the forces exceed the proof test load applied by the manufacturer, the chain and appendages will undergo a plastic deformation, possibly fail or not fit the wild-cat.

581-2.2 ANCHORING NOMOGRAPHS

581-2.2.1 PURPOSE. Anchoring nomographs have been prepared to determine the minimum length of chain and the horizontal distance from the ship to the anchor for flat and sloped bottoms. These nomographs represent the equations and model test data for a particular ship class. The nomograph is a tool for determining the ship's resistance to specific current and wind conditions, and the length of chain required for a specific depth and bottom slope, without resorting to calculations. A nomograph is also used to determine the horizontal distance from the ship to the anchor. Anchoring nomographs must be requested from the Naval Ship Systems Engineering Station (NAVSSSES), Philadelphia, PA.

581-2.2.2 REQUIREMENTS. The anchoring nomographs apply only to the class of ship for which they are prepared. Do not use anchoring nomographs for any other class of ships, even if the ships have the same size anchors and chain. Requirements (a) through (d) below must be satisfied and the information available before using the anchoring nomographs: