

NAVAL SHIPS' TECHNICAL MANUAL

CHAPTER 600

**HULL OUTFITTING
EQUIPMENT**

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CHAPTER 600**SECTION 16****INTRODUCTION****600-13.1**

This chapter covers Hull Outfitting equipment. The Hull Outfitting equipment included in this volume are ladders, personnel safety protection and miscellaneous equipment such as windows. This information does not take precedence over equipment specific Planned Maintenance System requirements, technical manuals or standard drawings.

SECTION 17

LADDERS.

600-17.1 INTRODUCTION.

This section covers accommodation ladders, brows, inclined ladders, vertical ladders, pilot's ladders, Jacob's ladders, side ladders, and embarkation ladders. The safety requirements are addressed in this subsection and the maintenance, inspection, testing, and repair for all equipment is covered at the end of each subsection.

600-17.1.1 Vertical Ladder Safety Requirements. Ladders greater than 2.44 m (8 ft.) in length shall be braced back to the bulkhead or other support structure with intermediate support clips spaced no more 1.83 m (6 ft.) from the other support clips. Ladders installed on masts, kingposts or other similar topside structures or which have lengths greater than 5.18 m (17 ft.), shall be provided with a climber safety rail system. Vertical ladders located in machinery room spaces shall be made of steel to comply with fire safety regulations. The bottom rung or tread of all vertical ladders shall not exceed 381 mm (15 in.) above the deck. Aluminum vertical ladders shall not be welded to their support clips; they shall be mechanically fastened as shown on the drawing.

600-17.1.2 Inclined Ladder Safety Requirements. Unguarded openings between the upper end of the ladder's handrails, or chains and adjacent liferails or structure shall be a maximum of 127 mm (5 in.). Ladder landings at the top and bottom of inclined ladders shall be a minimum of 914.4 mm (36 in.). The distance from the top tread (back edge) and hatch or ship's structure shall not exceed 50.8 mm (2 in.). Head guards shall be provided on overhead obstructions when the vertical headroom between ladder tread and the obstructions is less than 1.9 m (6.2 ft.). To comply with fire safety regulations, inclined ladders located in machinery spaces shall be made of steel.

600-17.1.3 Pilot's Ladder Safety Requirements. The pilot's ladder must rest firmly against the hull of the vessel and be clear of overboard discharges. When overboard discharges are located forward of the ladder station, discharges shall be secured before rigging the ladder until after the pilot has embarked (or debarked). Two man ropes, a safety line and an approved floatlight must be at the point of access and be immediately available for use during boarding operations. Liferail stanchions must be installed to provide the pilot a handhold to access the deck. For ships with bulwarks, a ladder and handrail as shown on drawing 804-5000900 must be attached to provide safe access to the deck. Rigging of the equipment and embarkation and debarkation of a pilot must be supervised in person by a deck officer. Both the equipment overside and the point of access must be illuminated during night operations.

600-17.1.4 Maintenance, Inspection, Testing And Repair. General guidance for maintenance, inspection, testing, and repair is provided at the end of each subsection for the various types of ladders. Refer to equipment-specific manuals, PMS, and drawings, as applicable, for more specific information.

600-17.2 ACCOMMODATION LADDERS.

600-17.2.1 Overview. An accommodation ladder system is a stowable inclined ladder assembly which, when deployed, allows over the side debarkation or embarkation of personnel from an upper deck level on the ship to smaller crafts and boats along side the ship at the water level (see figure [600-17.1](#)). In port, the ladder system (feathering tread ladder only) can also serve as a brow from ship to pier.

600-17.2.2 Drawings. There are two sets of U.S. Navy Type drawings for fabrication and installation of accommodation ladder systems for the surface fleet, the 1.7 million drawing series and the more recent 2.2 million drawing series. All future fabrication and installation of accommodation ladders shall be in compliance with the 2.2 million series. The 1.7 million series is retained for repair or replacement of existing ladders only. Refer to the ship's drawing index (SDI) and conduct on-board inspections to determine which ladder system was provided. An exception to this is on aircraft carriers which utilize sponson or transom mounted ladder systems; refer to the ship specific drawings for fabrication and installation details.

600-17.2.2.1 Drawings, 1.7 Million Series. The following accommodation ladder drawings are Type drawings. They are guidance drawings used by shipbuilders and manufacturers for the fabrication and installation of accommodation ladders aboard U.S. Navy ships. On the drawings, items marked with an asterisk (*) are mandatory. Slight differences can exist between ladder systems of the same ship class depending upon the manufacturer of the ladders.

BUSHIP 1749040 LADDER ARRANGEMENT
 BUSHIP 1749041 LADDER, FEATHERING TREAD
 BUSHIP 1749042 LADDER, FIXED TREAD
 BUSHIP 1749043 UPPER ROTATING PLATFORM
 BUSHIP 1749044 LOWER PLATFORM
 BUSHIP 1749045 BOAT FENDER, SMALL SHIPS
 BUSHIP 1749046 BRIDLE ARRANGEMENT
 BUSHIP 1749047 BAIL BRACKET
 BUSHIP 1749048 LADDER HANDRAILS
 BUSHIP 1749039 BOAT FENDER, LARGE SHIPS

600-17.2.2.2 Drawings, 2.2 Million Series.

NAVSHIP 2255401 LADDER, ARRANGEMENT (OPERATING W/AMPHIBIOUS CRAFT)
 NAVSHIP 2255406 LADDER, ARRANGEMENT
 NAVSHIP 2255402 LADDER, FEATHERING TREAD
 NAVSHIP 2255407 LADDER, FIXED TREAD
 NAVSHIP 2255404 UPPER ROTATING PLATFORM
 NAVSHIP 2260825 INTERMEDIATE ROTATING PLATFORM
 NAVSHIP 2255403 LOWER PLATFORM, BOAT FENDERS & SHELL BUMPERS (OPERATING W/AMPHIBIOUS CRAFT)
 NAVSHIP 2255405 LOWER PLATFORM, BOAT FENDER & SHELL BUMPERS
 NAVSHIP 2255408 LADDER HANDRAILS
 NAVSHIP 2255400 BRIDLE, BAIL BRACKET AND ASSEMBLIES
 NAVSHIP 2260981 DUAL LADDER ARRANGEMENT

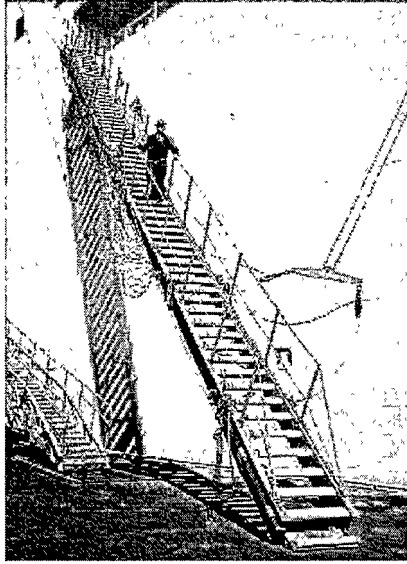


Figure 600-17.1. Accommodation Ladder

600-17.2.3 Fixed or Feathering Tread Ladder System. Accommodation ladders can be categorized as two types or styles; fixed tread ladder systems, and feathering tread ladder systems. They share common components except for the distinguishing feature or component of the ladder. Major components of a feathering tread ladder assembly are: upper rotating platform, feathering tread ladder (pivoting treads), lower platform, shell bumpers, boat fenders, bail bridle, and a load carrying davit or bail bracket. A fixed tread ladder assembly consists of the same components except the ladder has fixed (non-pivoting treads). A fixed tread accommodation ladder system is used for ships with little or no draft change, the ladder remains at a fixed angle of inclination with the treads being level, whereas, the feathering tread ladder system is used for ships which experience moderate to significant draft changes. A feathering tread ladder can be rigged at various angles of inclination, to compensate for the operational changes in the ship's draft. The ladder treads will rotate or pivot to remain level regardless of the ladder's angle. Feathering tread ladders can also serve as a debarkation/embarkation brow from ship to pier. When used pier side, the lower platform, bail bridle, load carry davit or bail bracket, shell bumpers and boat fenders are removed and stowed. A single pier roller is attached to the bottom of the ladder to allow the ladder to move with the ship's movement due to tide changes.

600-17.2.3.1 Applicable 1.7 Million Series Ladder Drawings. For existing ships using 1.7 million series ladder system the accommodation ladder arrangement for either fixed or feathering tread ladder systems shall be in compliance with drawing, BUSHIP 804-1749040.

600-17.2.3.2 Applicable 2.2 Million Series Ladder Drawings. For existing and new construction ships using 2.2 million series ladder system the accommodation ladder arrangement for all ships using either fixed or feathering tread ladder systems, except those handling amphibious craft, shall be in compliance with drawing, NAVSHIP 804-2255406. For ship handling amphibious craft, drawing, NAVSHIP 804-2255401 shall be used.

600-17.2.4 Dual Ladder System. Ships with large freeboard surfaces may require a dual ladder system in compliance with drawing, NAVSHIP 804-2260981. Dual ladders are required if a single ladder would require over forty treads to reach the lower platform level. The major components of a dual ladder system consist of an upper rotating platform, fixed tread upper ladder, intermediate rotating platform, feathering tread lower ladder, lower platform, shell bumpers, boat fenders, bail bridles and several load carrying davits or bail brackets.

600-17.2.5 Lower Platform and Fenders. For existing ships using 1.7 million series ladder system the lower platform shall be in compliance with drawing, BUSHIP 804-1749044. Boat fenders shall be provided for destroyers and smaller ships in compliance with drawing, BUSHIP 804-1749045. For auxiliaries and larger ships,

boat fenders shall be in compliance with drawing, BUSHIP 804-1749039. For existing and new construction ships using 2.2 million series ladder system the lower platform and boat fenders in compliance with drawing, NAVSHIP 804-2255403, shall be used for all ships except those handling amphibious craft. For ships handling amphibious craft, drawing, NAVSHIP 804-2255405 shall be used.

600-17.2.6 Accommodation Ladder Inspection, Maintenance and Repairs. Inspection and preventative maintenance of the accommodation ladder system shall be accomplished in compliance with the applicable preventative maintenance schedule (PMS) for the ship class. Repairs or replacement of accommodation ladders are to be accomplished by an Industrial Maintenance Activity (IMA) or Depot level activity.

600-17.2.7 Accommodation Ladder Test Requirements. Accommodation ladder systems shall be statically load tested while fully rigged for use, after major repair and for new installations. Ladder systems shall also be rigged to the operating position, unrigged and stowed to demonstrate adequacy of handling and stowage facilities and satisfactory mating of components.

600-17.2.7.1 Accommodation Ladder 1.7 Million Series Test Procedure. This section is for accommodation ladders fabricated and installed in compliance with the 1.7 million drawing series. The ladder system shall be static load tested while fully rigged for use. Testing shall be as follows:

WARNING

Test personnel shall strictly adhere to all Depot and IMA level safety precautions including, but not limited to, all WARNING and CAUTION notes contained in the section.

WARNING

All unauthorized personnel shall be kept clear from test areas for duration of testing.

WARNING

Do not attempt repairs to the accommodation ladder nor any associated fittings while under test loads.

CAUTION

Test loads shall be applied slowly to prevent impact loading. Do not exceed specified load by more than 5%.

- a) Rig each bail bracket or davit in the operational (working) position. Only bail brackets or davits, which support the ladder system in its operational position are to be independently tested with the following test load. Calculate the bail bracket or davit test load as outlined by the following steps:
 - 1) Determine the reaction load, which would be supported by the bail bracket or davit as a result of the test loads only.

- 2) Determine the reaction load, which would be supported by the bail bracket or davit as a result of the weights of the ladder, lower platform, fendering system, and the bail assembly.
- 3) The test load shall be the total of 1) plus two times 2).
 - b) Suspend the static load as determined in step 3) from the bail bracket or davit padeye. Hold test load for a minimum of ten minutes. Remove test load and inspect the bail bracket or davit and support structure. Any evidence of permanent deformation to the bail bracket, davit or supporting structure shall constitute failure of the test.
- b) After successful bail bracket or davit test, rig ladder system in its operational position, suspended at an angle of 50 degrees with the horizontal. Apply a uniformly distributed static load of 136 kg (300 lb.) on each ladder tread and a uniformly distributed static load of 104.13 kg/m (70 lbs./ft.) on the upper platform, intermediate platform (if applicable) and lower platform. Hold test load for a minimum of ten minutes. Remove the test load and inspect the ladder, platforms, bail brackets, bail assembly and supporting structure. Any evidence of permanent deformation to the ladder, platforms, bail brackets, bail assembly and supporting structure shall constitute failure of the test.
- d) Return the ladder system and handling equipment to their stowed position.

600-17.2.7.2 Accommodation Ladder 2.2 Million Series Test Procedure. This section is for accommodation ladders fabricated and installed in compliance with the 2.2 million drawing series. The ladder system shall be static load tested while fully rigged for use. Testing shall be as follows:

WARNING

Test personnel shall strictly adhere to all Depot and IMA level safety precautions including, but not limited to, all WARNING and CAUTION notes contained in the section.

WARNING

All unauthorized personnel shall be kept clear from test areas for duration of testing.

WARNING

Do not attempt repairs to the accommodation ladder nor any associated fittings while under test loads.

CAUTION

Test loads shall be applied slowly to prevent impact loading. Do not exceed specified load by more than 5%.

- a) Rig each bail bracket or davit in the operational (working) position. Only bail brackets or davits, which support the ladder system in its operational position are to be independently tested with the following test loads. Calculate the bail bracket or davit test load as outlined by the following steps:
 - 1) Determine the reaction load, which would be supported by the bail bracket or davit as a result of the test loads only.

- 2) Determine the reaction load, which would be supported by the bail bracket or davit as a result of the weights of the ladder, lower platform, fendering system, and the bail assembly.
 - 3) The test load shall be the total of 1) plus two times 2).
- b) Suspend the static load as determined in step 3) from the bail bracket or davit padeye. Hold test load for a minimum of ten minutes. Remove test load and inspect the bail bracket or davit and support structure. Any evidence of permanent deformation to the bail bracket, davit or supporting structure shall constitute a failure of the test.
 - c) After successful bail bracket or davit test, rig ladder system in its operational position, suspended at an angle of 50 degrees with the horizontal. Apply a uniformly distributed static load of 149.7 kg (330 lb.) on each ladder tread and a uniformly distributed static load of 327.27 kg/m (220 lb./ft.) on the upper platform, intermediate platform (if applicable) and lower platforms. Hold test load for a minimum of ten minutes. Remove test load and inspect the ladder, platforms, bail brackets, bail assembly and supporting structure. Any evidence of permanent deformation to the ladder, platforms, bail brackets, bail assembly and supporting structure shall constitute a failure of the test.
 - d) Return ladder system and handling equipment to their stowed positions.

600-17.3 VERTICAL LADDERS.

600-17.3.1 Overview. (See figure 600-17.2). Vertical ladders are used where limited space is available to provide access to cranes, masts, kingposts, trunks, tanks and important operating parts of machinery and systems. They are installed in compartments serving overhead scuttles or hatches for emergency escape or as the primary entrance for compartments infrequently entered. These ladders also serve as backup ladders to the portable inclined ladders at hatchway locations where the inclined ladders are removed for handling of stores or shipping of equipment.

600-17.3.2 Vertical Ladder Description and Types. Vertical ladders are assembled from two vertical side stringers or rails separated and connected by horizontal rungs or treads, spaced every 304.8 mm (12 in.). Navy standard ladders are predominately 304.8 mm (12 in.) wide. Recent OSHA standards have mandated ladders to be 356 mm (14 in.) wide, therefore new ships and ships undergoing conversion will be getting this wider ladder. Vertical ladders shall be steel for all machinery space ladders, ladders for fuel tanks (except gasoline) and other tanks capable of being flooded with seawater. Stainless steel ladders shall be used for fresh water tanks, and brass ladders for gasoline tanks, pump rooms and access trunks to pump rooms. Glass reinforced plastic (GRP) ladders shall be used for CHT tanks, and for topside locations when EMI reduction is necessary, and where nonmagnetic materials are needed to minimize magnetic signature. Stainless steel ladders can also be used to reduce magnetic signature. All ladders when installed against a bulkhead or similar structure shall have a minimum of 152.4 mm (6 in.) clearance between the structure and the backside of the rung or tread for foot clearance. Ladders installed on masts, kingposts or other similar topside structures or which have lengths greater than 5.18 m (17 ft.), shall be provided with a climber safety rail system, except in emergency escape trunks.

600-17.3.3 Vertical Ladder Drawings. Vertical ladders are fabricated and installed in compliance with the following Standard or Type drawings. On Type drawings, items marked with an asterisk (*) are mandatory.

NAVSHIP 805-1460280 for aluminum ladders;

NAVSHIP S1604-860091 for steel; stainless steel and brass ladders

NAVSHIP 803-5184098 for glass reinforced plastic (GRP) ladders.

600-17.3.4 Vertical Ladder Inspection, Maintenance and Repairs. Inspection and preventative maintenance of vertical ladders shall be accomplished in compliance with the applicable preventative maintenance schedule (PMS) for the ship class. All metallic ladders should be inspected for weld cracks and weld deterioration where the rungs or treads are attached to the side stringers or rails. GRP ladders shall be checked throughout for cracks or deterioration of material. All ladder support clips should be inspected for damage weld cracks or weld deterioration. The side stringers or rails should be inspected at their support clip connections. All mechanical fasteners shall be present, tightened and shall be corrosive resistant steel (CRES). Inspect rung or treads for wear. For ribbed tread aluminum ladders and GRP ladders, when the leading edge (nose) of the rung or tread has worn, the ladder can be detached and turned front to back to expose an unworn leading edge. GRP ladders, when mounted symmetrically about their centerline (refer to General Note 10 of drawing, NAVSEA 5184098), can be detached

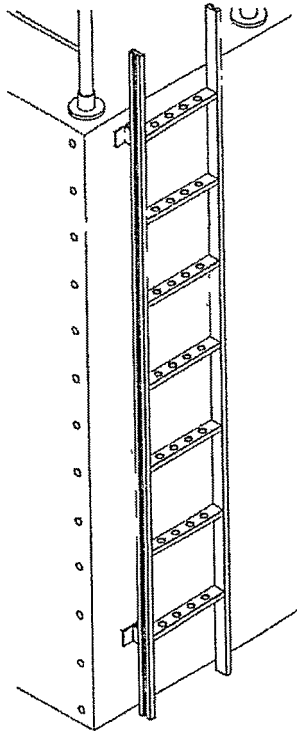


Figure 600-17.2. Vertical Ladder

and turned upside down to expose a fresh tread surface. Repairs or replacement of vertical ladders are to be accomplished by an Industrial Maintenance Activity (IMA) or Depot level activity.

CAUTION

Aluminum vertical ladders are predominately fabricated from 6061-T6 aluminum alloy. Welding shall not repair damaged aluminum ladders, nor shall any items be attached to the ladder by welding.

600-17.3.5 Vertical Ladder Testing. Only GRP vertical ladders are periodically tested in compliance with the test criteria on the drawing.

600-17.4 INCLINED LADDERS.

600-17.4.1 Overview. (See figure 600-17.3). Inclined ladders are used to provide access to machinery spaces, living spaces, passageways, hangar decks, and flight decks where considerable personnel traffic is anticipated. Inclined ladders are also used for compartments that must be entered frequently, such as issuing rooms and storerooms and where frequent access is required to compartments for the care and operation of machinery and electronic equipment.

NOTE

Ladders and treads located in a machinery space shall be constructed of steel for fire safety regulations.

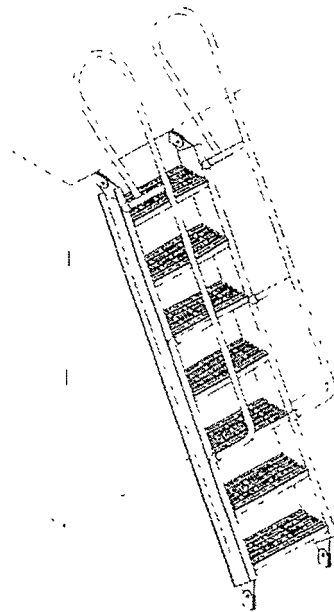


Figure 600-17.3. Inclined Ladder

600-17.4.2 Inclined Ladder Description and Types. Inclined ladders are assembled from two side stringers, separate, and connected by horizontal treads or steps. Handrails and safety chains mounted to the side stringers contain personnel within the ladder and assist as hand holds during ascent or descent. Inclined ladders are mounted between two decks or platforms and are installed on an incline. All interior inclined ladders shall be installed between a 50 and 60-degree angle from the deck. Exterior inclined ladders shall be installed at an angle of 50-degrees from the deck. Vertical clearances from the tread nose to any overhead obstruction shall be a minimum of 1.9 m (6 ft.-3 in.). Where minimum headroom is not achievable because of structural arrangement, a head guard shall be provided on the obstruction in compliance with drawing, NAVSHIP 804-1749113. Inclined ladders shall be 609.6 mm (24 in.) wide. Where it is not possible to install 609.6 mm (24 in.) wide ladders, due to structural restrictions, ladder width may be reduced accordingly. Inclined ladders mounted to decks or platforms with camber shall be shimmed level. The top tread of inclined ladders shall be 228.6 mm (9 in.) wide. All other treads shall be 152.4 mm (6 in.) wide on ladders installed at 50 to 60-degree angle to the deck and 101.6 mm (4 in.) wide on ladders installed at more than a 60-degree angle to the deck.

600-17.4.3 Inclined Ladder Drawings. Inclined ladders are assembled and installed in compliance with or in compliance with the following Standard or Type drawings. On Type drawings, items marked with an asterisk (*) are mandatory.

- a) NAVSHIP S1604-860039 and S1604-860040 for steel ladders, except ladder treads (aluminum cap treads) shall be in compliance with MIL-T-24638, TYPE II and installed in compliance with drawing, NAVSEA 803-5959202.
- b) NAVSEA 804-1749113 for aluminum ladders, except ladder treads (aluminum full tread) shall be in compliance with MIL-T-24638, TYPE I and installed in compliance with drawing, NAVSEA 803-5959202.
- c) NAVSEA 804-5184099 for Glass Reinforced Plastic (GRP) ladders.
- d) NAVSEA 803-5959202 for compound filled treads, both cap and full tread designs. (Used for all new construction of both steel and aluminum ladders)
- e) NAVSHIP S1604-860041 for aluminum & steel treads (used for replacement of existing treads only)

600-17.4.4 Inclined Ladder Construction Material. On all steel construction ships, inclined ladders throughout the ship shall be steel with aluminum cap treads installed over steel sub-bases. On ships with aluminum superstructure, inclined ladders throughout the ships (except machinery spaces) shall be aluminum with aluminum full treads. For all ships to comply with fire safety regulations, inclined ladders located in machinery spaces shall be steel with aluminum cap treads installed over steel sub-bases. The aluminum cap treads in compliance with MIL-T-24638, TYPE II, are also designed to be used as replacement treads and will fit over the various aluminum and steel ladder treads originally installed by NAVSHIP S1604-860041 on older ships. Refer to drawing NAVSEA 803-5959202 for installation details of the MIL-T-24638-type replacement cap treads. GRP inclined ladders shall be used where nonmagnetic materials are needed to minimize magnetic signature or when EMI reduction is necessary. Stainless steel inclined ladders can also be used to reduce magnetic signature.

600-17.4.5 Inclined Ladder Inspection, Maintenance and Repairs. Inspection and preventive maintenance shall be accomplished in compliance with MRC's for the ship class. Ladders, treads, and associated handrails and chains shall be inspected to ensure there are no loose, missing, or damaged parts or hardware. All mechanical fasteners shall be present, tightened and shall be corrosive resistant steel (CRES). Ladder-to-deck connections shall be inspected for soundness weld cracks or welds deterioration. Ladder treads shall be inspected for wear. For metallic treads, when the leading edge (nose) of the tread has worn, the tread can be reversed to expose an unworn leading edge. If both edges are worn, the tread shall be replaced. For GRP treads, when the tread cover (leading edge on the tread) has worn, replace with new tread cover.

NOTE

To maintain consistent footing, tread types should not be mixed on any individual ladder.

Repairs or replacement of inclined ladders are to be accomplished by an Industrial Maintenance Activity (IMA) or Depot level activity, except tread replacement which can be accomplished ship's force personnel.

600-17.4.6 Inclined Ladder Testing. Only GRP inclined ladders are periodically tested in compliance with the test criteria on the drawing.

600.17.5 PILOT LADDERS.

600.17.5.1 Overview. (See figure 600-17.4). Pilot ladders are to be used against the shell for embarking and debarking pilots. One pilot ladder is provided for each ship, to allow the river pilots to board the ship. Each ship shall have a pilot ladder station both port and starboard.

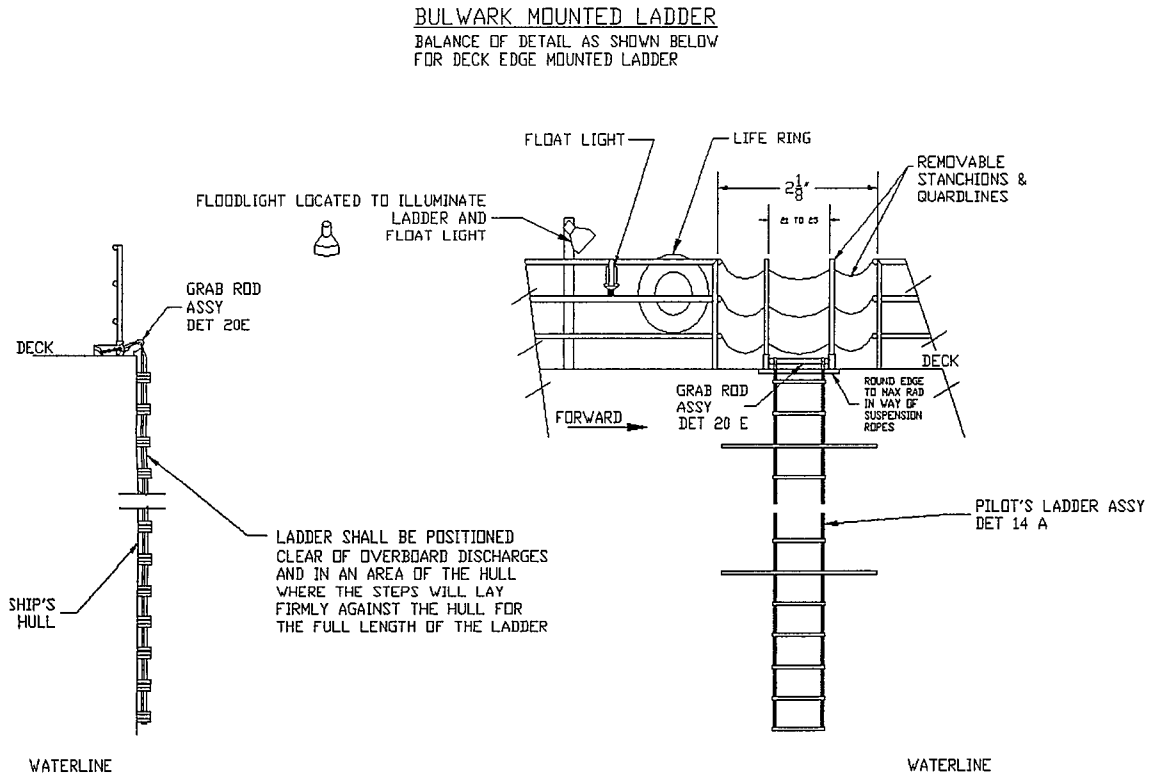


Figure 600-17.4. Pilot's Ladder

600-17.5.2 Description. Pilot ladders are assembled and installed in compliance with drawing, NAVSHIP 804-50009000. Two locations shall be provided, one port and one starboard, for the installation of this ladder and they shall be so placed that when deployed the ladder will be clear of overboard discharge and in an area of the hull where the steps will lay firmly against the hull for the full length of the ladder. The pilot ladder has flat rungs and spreader bars.

600-17.5.3 Pilot Ladder Maintenance. The equipment shall be kept clean and in good working order. Each damaged step or spreader step on a pilot ladder shall be replaced in kind with an approved replacement step or spreader step, prior to further use of the ladder. The replacement step or spreader step shall be secured by the method used in the original construction of the ladder, and in compliance with manufacturer instructions. Inspect rope ladder for deterioration, wear, weakened splices, distortion, loose whippings or loose fittings.

600-17.5.4 Pilot Ladder Testing Requirements. Pilot ladder assemblies and components shall be tested in compliance with and meet the requirements of Code of Federal Regulations 46, Subpart 163.003 prior to use aboard ship.

600-17.6 JACOB'S LADDER.

600-17.6.1 Overview. (See figure 600-17.5). A Jacob's ladder is a casual rope ladder with rounded wooden rungs for going up and down the side of the ship, usually for one-time or short-term use. A Jacob's ladder is used on boat booms for access to small ships.

600-17.6.2 Description. Drawing NAVSEA 804-5959234 provides guidance for the construction of a Jacob's ladder. This drawing provides for the labeling of the ladder, the type of rope and cord and wooden parts for the ladder, and the testing requirements.

600-17.7 SIDE LADDERS.

600-17.7.1 Overview. (See figure 600-17.7 and figure 600-17.8). A side ladder is a vertical ladder used by the crew to embark and debark to or from ship's boats (for use on destroyers and smaller ships).

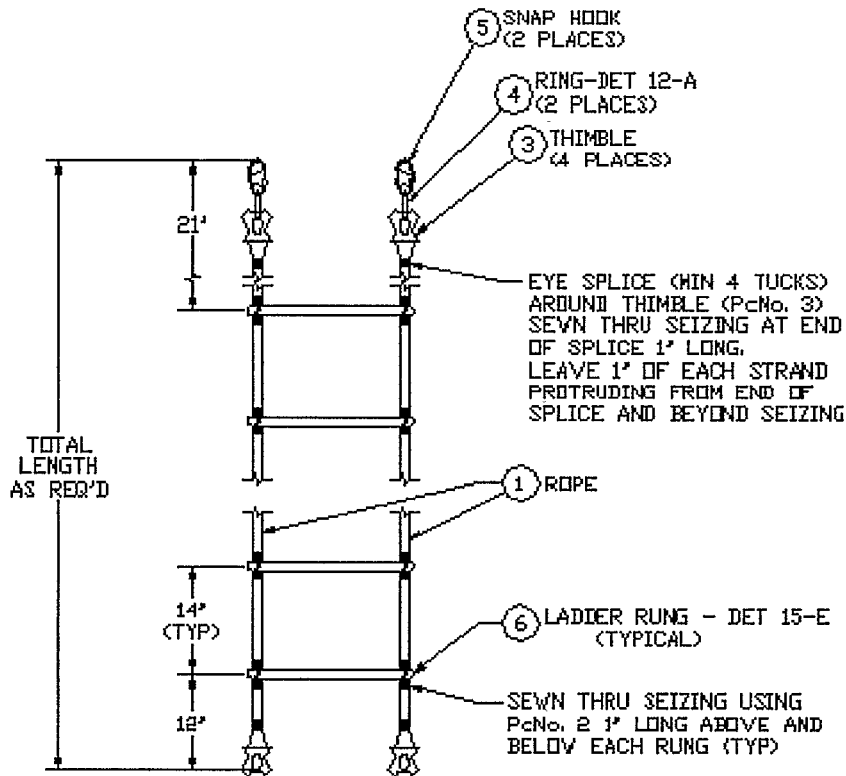


Figure 600-17.5. Jacob's Ladder Assembly

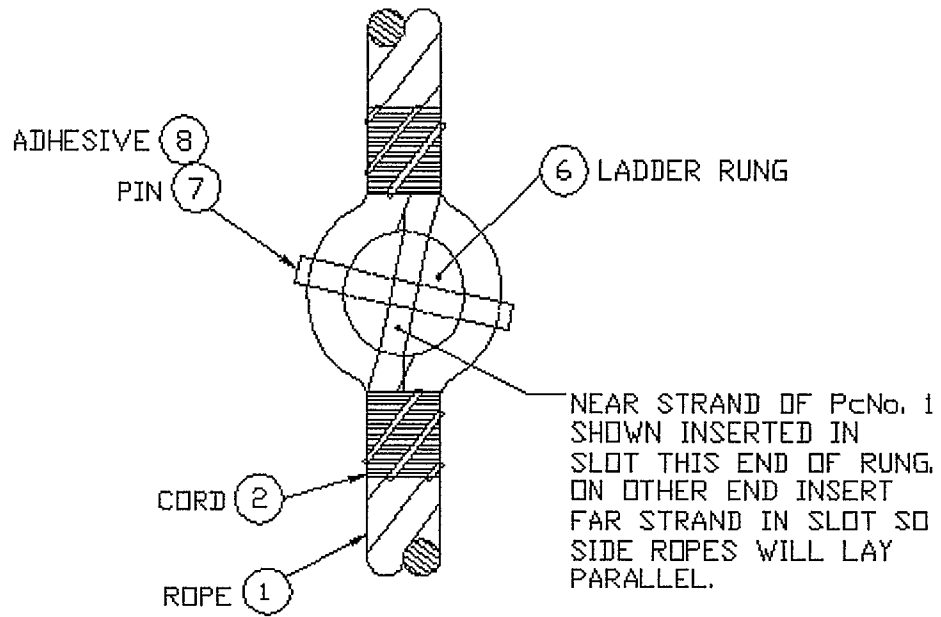


Figure 600-17.6. Jacob's Ladder Rung Connection

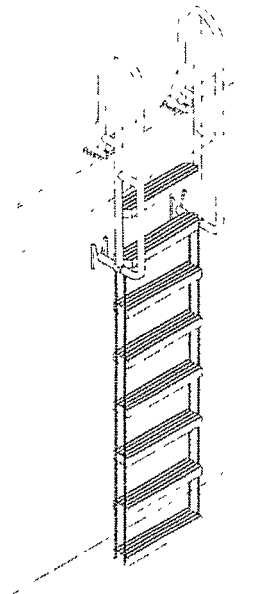


Figure 600-17.7 Fixed and Flexible Side Ladder

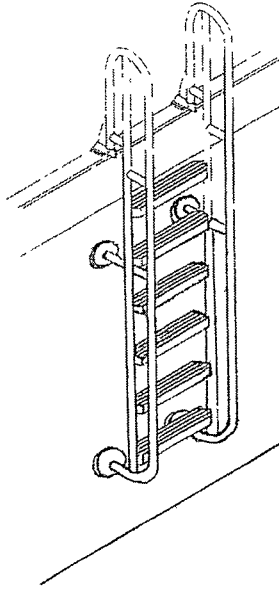


Figure 600-17.8 Fixed Side Ladder

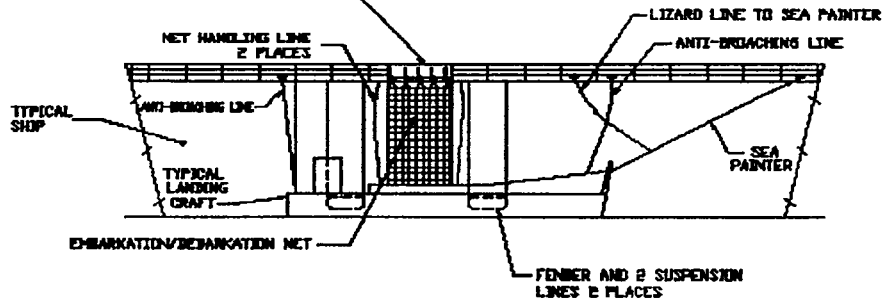
600-17.7.2 Description. There are two types of side ladders. One is fixed and flexible (see figure 600-17.7) and is detailed in drawing, BUSHIPS 805-1363660. The second type is fixed all the way for use on ships with more than 7 feet freeboard (figure 600-17.8) and is detailed in drawing, BUSHIPS 805-1363174.

600-17.8 EMBARKATION/DEBARKATION LADDERS.

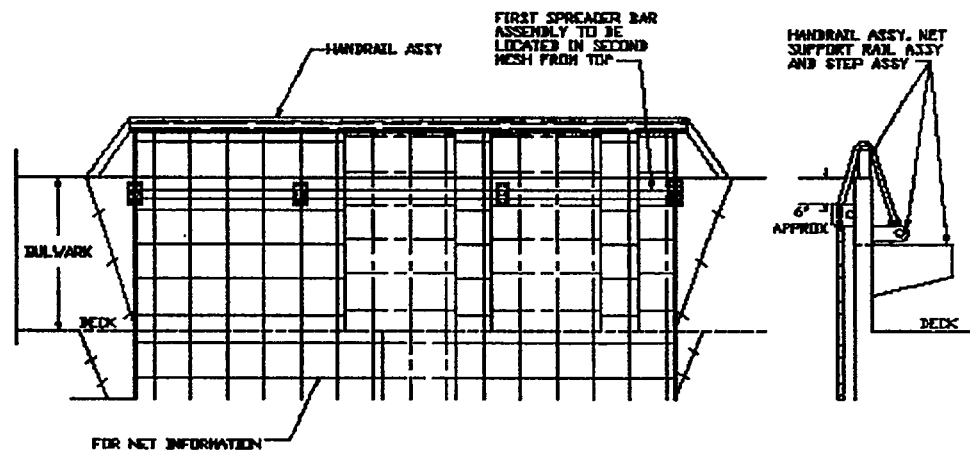
600-17.8.1 Overview. (See figure 600-17.9). An embarkation/debarkation ladder is a large rope ladder used over the side of the ship for embarking or debarking numerous people at one time.

600-17.8.2 Description. A typical ladder and mooring arrangement for boats involved in embarkation/debarkation operations is shown in figure 600-17.9. Details of the construction of the ladder including handrail assemblies are shown in drawing, NAVSEA 804-5184225.

PROVIDE PORTABLE LIFERAILS OR LIFELINES AS REQUIRED FOR ACCESS TO THE EMBARKATION/DEBARKATION STATION. PROVIDE A TEMPORARY SAFETY LINE FOR USE WHEN EMBARKATION/DEBARKATION OPERATIONS ARE IN PROGRESS



NOTE: THIS DETAIL INDICATES THE MINIMUM TACKLE REQUIRED FOR SAFE EMBARKATION/DEBARKATION OPERATIONS AND IS FOR GUIDANCE ONLY. DETAIL ARRANGEMENT, SIZING OF LINES AND SELECTION OF FITTINGS SHALL BE DONE BY THE SHIPYARD OR BY THE SHIP'S FORCE TO SUIT SPECIFIC SHIPS.



BULWARK MOUNTED NET ARRANGEMENT

Figure 600-17.9. Embarkation Ladder

SECTION 18

PERSONNEL SAFETY PROTECTION.

600-18.1 INTRODUCTION.

Personnel safety devices covered in this section are the climber safety rail system, liferails, lifeline and guardline assemblies, and safety nets. The safety requirements are addressed in this subsection and the maintenance, inspection, testing, and repair for all equipment is covered at the end of the section

600-18.1.1 Climber Safety Rail Safety Requirements.

WARNING

Comply with ship's regulations for working aloft.

A parachute-type safety harness shall be used for inspections and performance of PMS on safety climber rails. Conduct a visual inspection of the safety harness, safety lanyard, working lanyard, and attachments prior to each use.

600-18.1.2 Maintenance, Inspection, Testing And Repairs. Subsections are provided for each Personnel Safety Protection system or device to provide general guidance for maintenance, inspection, testing, and repair. Refer to equipment-specific manuals, PMS, and drawings, as applicable, for more specific information.

600-18.2 CLIMBER SAFETY RAIL SYSTEM.

600-18.2.1 Overview (Figure 600-18.1 through Figure 600-18.3). Climber Safety Equipment shall be in compliance with FED SPEC RR-S-1301 (FAA), TYPE I-Rigid Type Carrier. The Climber safety rail is a fall prevention system that provides positive safety for workers aloft. The climber safety rail is a notch-tube attached to the structure, but not to the ladder the worker is ascending or descending. At all times the worker must wear a safety belt with a sleeve that attaches to the safety rail notch-tube. All ladders less than 356 mm (14 in.) wide must have the rail mounted on the side, while ladders 356 mm (14 in.) wide or more must have the rail mounted in the center. While U.S. Navy ships have ladders 305 mm (12 in.) wide, this policy was established in anticipation of the fleet changing to OSHA standard 406 mm (16 in.) wide ladders. This system provides the worker safe movement; any slip or fall is instantly stopped. It also meets OSHA standards. The Climber Safety Rail System is used at each permanently installed topside vertical ladder where a fall hazard exists such as the mast, kingpost and other topside structures providing access to a fall-hazardous location where a safety harness is to be worn.

600-18.2.2 Description. The Climber Safety Rail System is installed in compliance with drawing, NAVSHIPS 804-4563125. The Climber safety rail is the main component and comes in 6m (20ft.) lengths made from CRES 304, P/N 526-103-001. The extension rail for the climber safety rail system, CRES 304, P/N 802-103-054, is 1.37 m (54 in.) in length and attaches to the top of the rail so the worker can reach the deck without disconnecting and permits the worker to rotate 360 degrees to a safe area. The ladder and the climber safety rail shall have

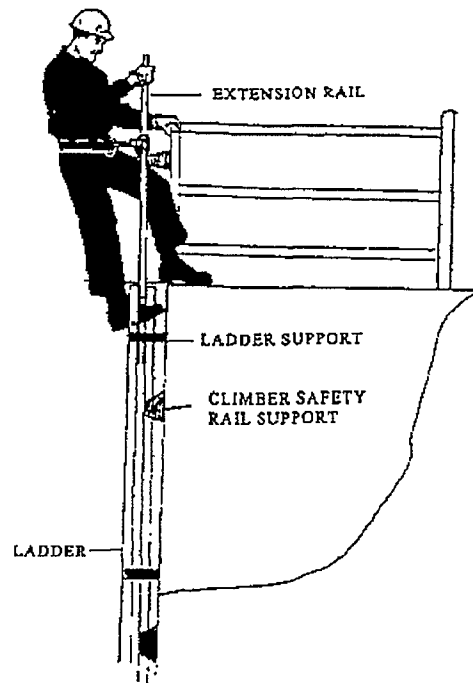


Figure 600-18.1 Climber Safety Rail System

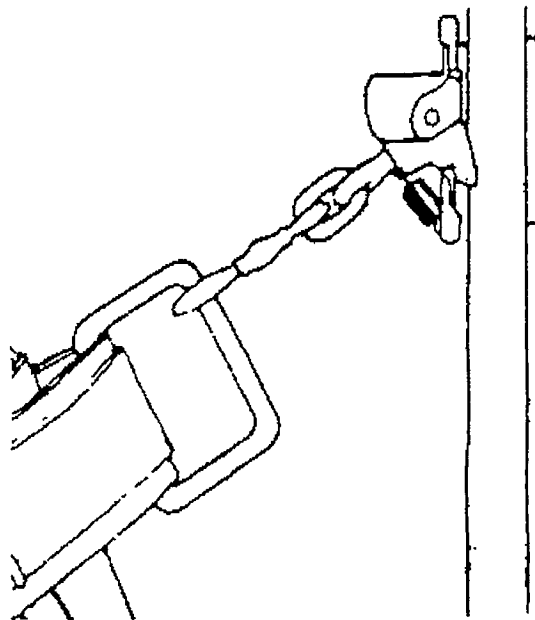


Figure 600-18.2 Climber Safety Sleeve

independent support systems as shown in figure 600-18.1 which also shows typical mounting details; for additional information see the standard drawing. The ladder-rung clamp is made from CRES 304, P/N 024-103-001 and is used to attach the safety climber rail to the ladder for a temporary repair only. This device will be removed

when Intermediate Maintenance Activity or Shipyard services are available to make the installation according to the standard drawing. The climber safety sleeve has a locking pawl that is the key to the life saving action (see figure 600-18.2). The Pawl is in an unlocked position as the worker climbs and the Pawl locks instantaneously when the worker is not in a normal climbing position (see figure 600-18.3). The Pawl is housed inside the sleeve and is secured by stainless steel pins, P602-100-001. The climber safety sleeve is detailed in figure 600-18.2. The safety snap attaches the sleeve to the front "D" ring of the safety belt. The sleeve attaches to the safety notch rail to provide smooth travel on the rail. The climber Safety Harness is designed to distribute the impact force of a fall over the thighs, buttocks, chest and shoulders of the worker. The harness is constructed of woven nylon reinforced with leather grommets. It features forged steel buckles, front and back "D" rings and adjustable padded straps. The climber safety lanyard is made of 13mm (0.5in.) diameter nylon rope with double locking snaps at each end. It allows the worker to attach the lanyard to the structure, ladder rung or padeye.

600-18.2.3 Climber Safety Rail System Maintenance and Repair. Safety climber rails and sleeves shall be inspected, cleaned, and lubricated semi-annually in compliance with applicable MRCs. Repairs are to be accomplished by an Intermediate Maintenance Activity or shipyard.

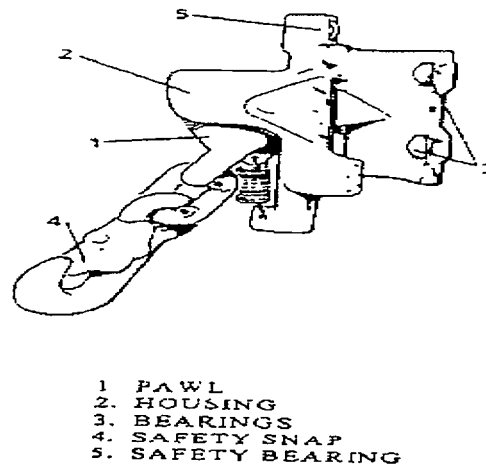


Figure 600-18.3. Climber Safety Pawl

600-18.2.4 Climber Safety Rail System Testing. Conduct static load and operational tests for ladder climber safety assemblies in compliance with applicable MRCs.

600-18.3 LIFERAILS, LIFELINES, AND GUARDLINE ASSEMBLIES.

600-18.3.1 Overview. Lifelines and liferails shall be installed parallel to the deck along deck edges and walkways, and around open hatches, elevator openings in flight decks, and antenna platforms. They shall also be installed along other boundaries wherever there is danger of personnel falling overboard, falling to lower levels in the ship, or becoming enmeshed with hazardous operating machinery. To comply with EMI and IMI reduction requirements of MIL-STD-1310, liferails, lifelines, and guardline supports constructed of metallic materials shall be bonded to the ship's hull.

600-18.3.2 Liferails. Liferails are a rigid barrier, usually permanently fixed, but can be hinged or portable, and are installed along deck edges or platforms.

600-18.3.2.1 Liferail Systems Requirements. Liferail systems shall be three courses high, spaced on 356 mm (14 in.) centers from the deck. On upper levels inboard of the shell and around hatchways or other deck open-

ings, the railings shall be two courses high, spaced 533 mm (21 in.) on centers from the deck, unless they are on heavy traffic routes in which case the railings shall be three high. Unguarded openings between adjacent liferail or lifeline sections or an end section and adjacent structure shall be kept to a minimum and in no case be greater than 127 mm (5 in.). Liferails shall be made in compliance with drawing, NAVSEA 804-5184155. (Figure 600-18.4.)

600-18.3.2.2 Liferail Inspection. All deck sockets for fixed and portable stanchions shall be hammer tested for soundness and strength of welds. Portable liferails shall be shipped and unshipped to demonstrate satisfactory condition, fit, stowage and interchangeability of duplicate parts.

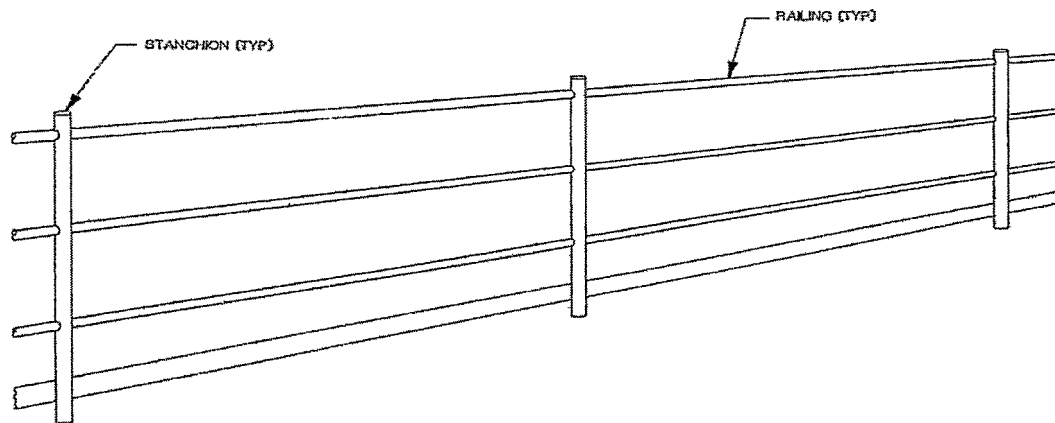


Figure 600-18.4. 3-High Liferail System

600-18.3.2.3 Liferail System Testing. All testing shall be in compliance with drawing, NAVSEA 804-5184155.

600-18.3.3 Lifelines. Lifelines are portable safety barriers rigged along deck edges and deck openings and in areas from which all obstructions must be readily removable for action, exercises or operations. Lifelines shall be made and tested in compliance with drawings, NAVSEA 804-5184155 and NAVSEA 804-5959308.

600-18.3.3.1 Lifeline System Requirements. Lifeline systems shall be, a minimum of 1.83 m (6 ft.) and a maximum of 15.24 m (50 ft.) in length. They shall be three courses high, and spaced 356 mm (14 in.) to centers from the deck. Where these lifelines are installed on weather decks subject to green seas or heavy weather, such lifelines shall be spaced five courses high at 178 mm (7 in.), 178 mm (7 in.), 178 mm (7 in.), 178 mm (7 in.), and 356 mm (14 in.) to centers measured from the deck. Lifelines shall be made in compliance with drawings, NAVSEA 804-5184155 and NAVSEA 804-5959308. (Figure 600-18.5.)

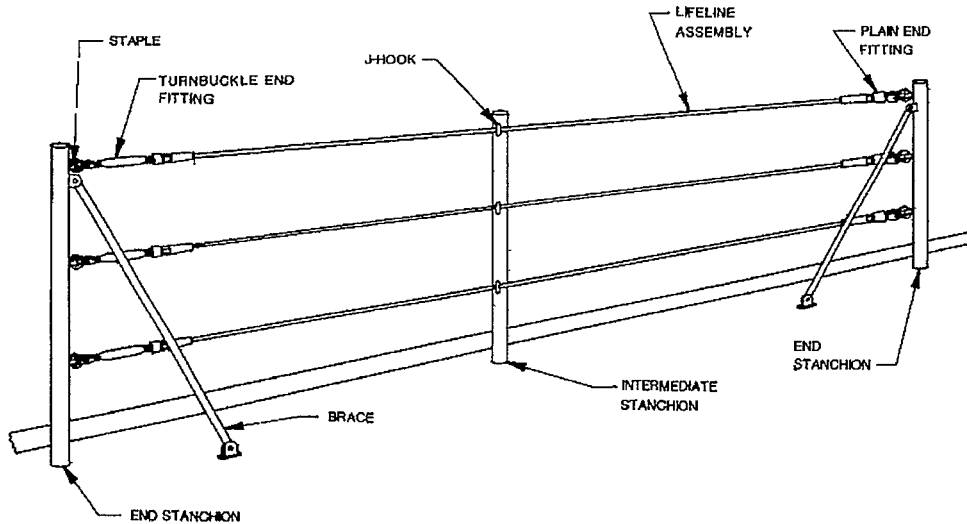


Figure 600-18.5. 3-High Lifeline System

600-18.3.3.2 Lifeline Inspection. Lifelines shall be shipped and unshipped to demonstrate satisfactory condition, fit, stowage and interchangeability of duplicate parts.

600-18.3.3.3 Lifeline System Testing. All stanchion staples shall be shop tested before installation by isolating the stanchion and pulling on the staple as required in the NAVSEA standard drawing. All testing shall be in compliance with drawings, NAVSEA 804-5184155 and NAVSEA 804-5959308. (Figure [600-18.6](#) through Figure [600-18.9](#))

600-18.3.4 Heavy Weather Lifelines. Heavy weather lifelines are portable lifelines provided to enable personnel to safely traverse open decks during impending or actual storm conditions. They shall be a single course rope located 1.98 m (6 ft., 6 in.) above the deck, supported by portable lifeline stanchions. Heavy weather lifelines shall be in compliance with drawings, NAVSHIP 805-2636908 and NAVSHIP 805-2636909. (Figure [600-18.10](#))

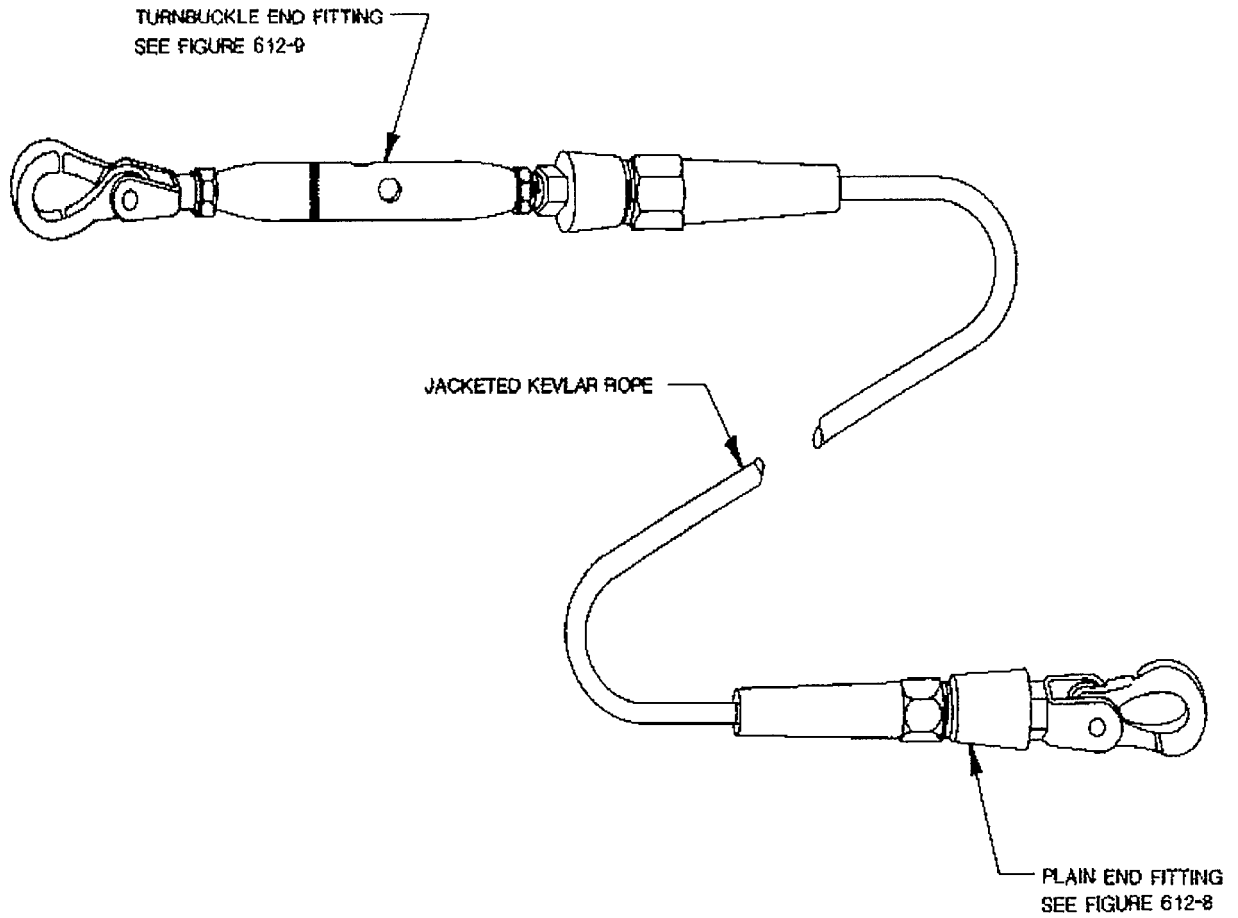


Figure 600-18.6. Kevlar Lifeline Systems

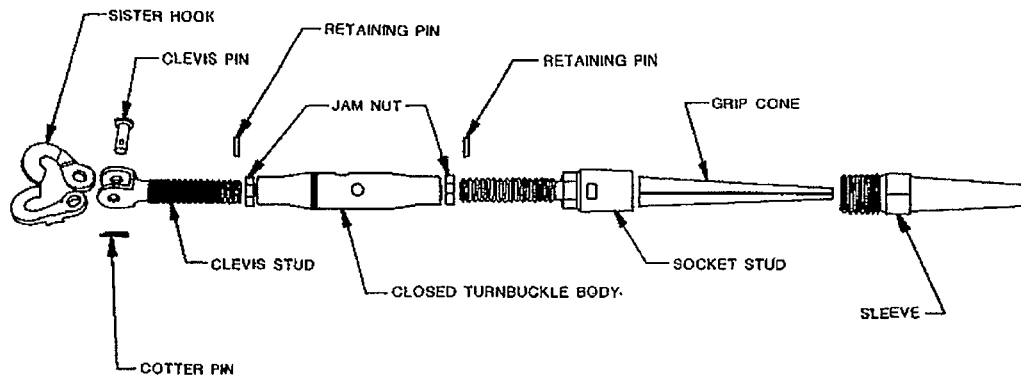


Figure 600-18.7. Kevlar Lifeline End Fitting

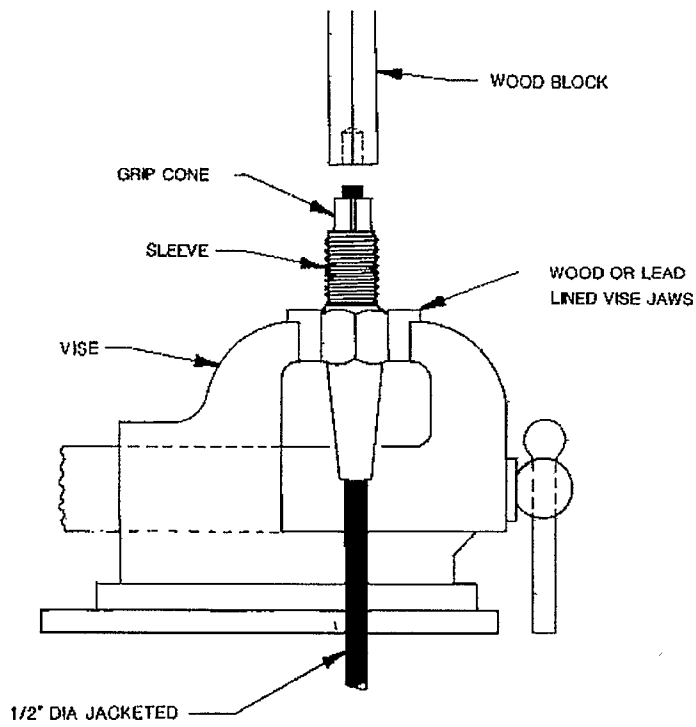


Figure 600-18.8. Details Of Assembling Lifeline and End Fitting

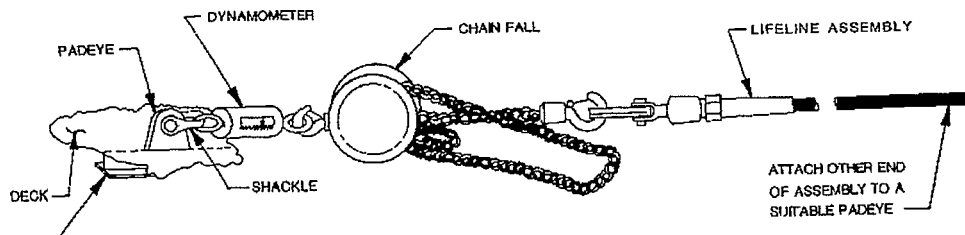


Figure 600-18.9. Lifeline Test Configurations

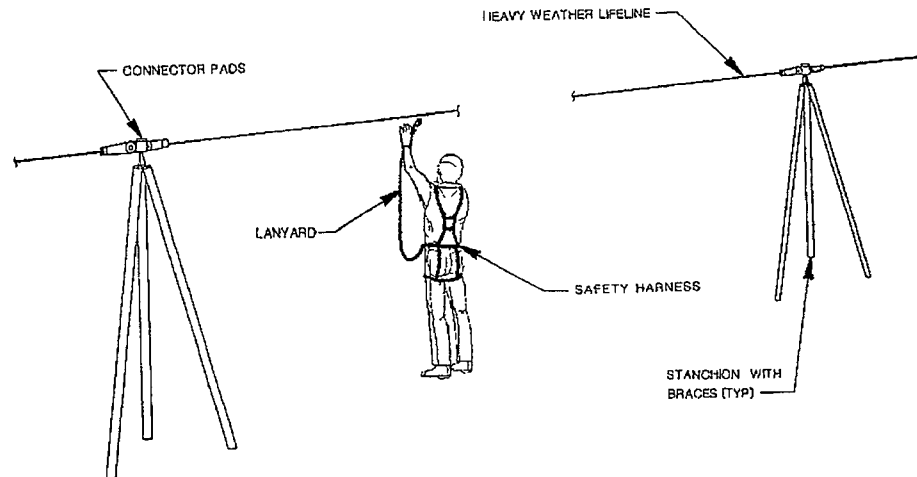


Figure 600-18.10. Heavy Weather Lifeline

600-18.3.4.1 Heavy Weather Lifeline Inspection. Lifelines shall be shipped and unshipped to demonstrate satisfactory condition, fit, stowage and interchangeability of duplicate parts.

600-18.3.4.2 Heavy Weather Lifelines Testing. All testing shall be in compliance with drawings, NAVSHIP 805-2636908 and NAVSHIP 805-2636909.

600-18.3.5 Guardline Assemblies. These are portable rope or chain systems for ready access openings through lifelines or liferails.

600-18.3.5.1 Guardline Assemblies Requirements. Access openings with under 1.83 m (6 ft.) in length of liferails and lifelines in such locations as in way of accommodation ladders, hatch openings and other deck openings used for egress and ingress, shall be fitted with short lengths of guardline assemblies. The number and courses of rope or chain shall be the same in number and height from the deck as the adjacent courses of liferail or lifeline. The maximum length of openings protected by rope or chain shall not exceed 1.83 m (6 ft.). (See Figure 600-18.11 and Figure 600-18.12.)

600-18.3.5.2 Guardline Assemblies Testing. All guardlines and fittings for installation around hatchways and across accesses and similar protected openings in liferails and lifelines, shall be tested as an assembly before installation. A static load of 499kg (1100 lbs.) shall be applied and held for a minimum of 10 minutes. This test shall apply for all materials used for guardlines under 1.83 m (6 ft.). There shall be no evidence of failure, deformation or impairment of function upon removal of the load.

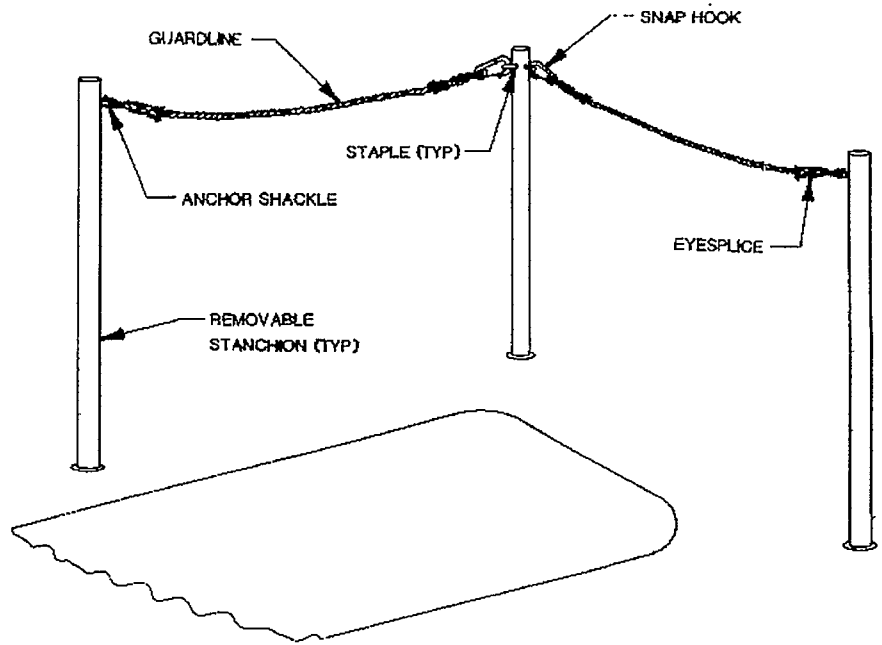


Figure 600-18.11. Guardline Around Hatchway

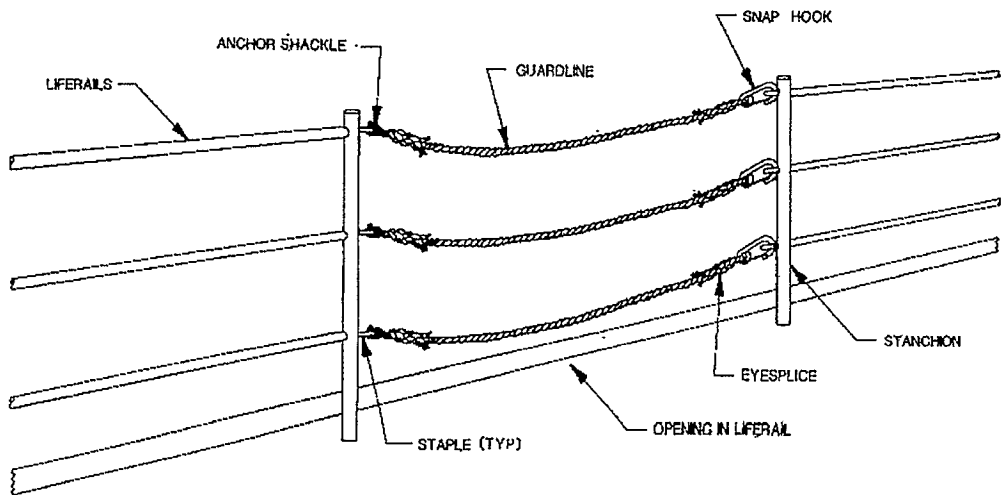


Figure 600-18.12. Guardline In Liferail System

600-18.4 SAFETY NETS.

600-18.4.1 Overview. Safety nets are a horizontal safety system, fixed or hinged, installed around boundaries where liferails or lifelines would interfere with deck or aircraft operations or in access trunks or hatchways extending through three or more decks. They are installed along boundaries wherever there is danger of personnel falling overboard or falling to lower levels in the ship. To comply with EMI and IMI reduction requirements of MIL-STD-1310, safety nets constructed of metallic materials shall be bonded to the ship's hull.

600-18.4.2 Safety Net Construction. Safety nets shall be constructed of nylon netting, except that CRES netting shall be used in areas of heat and blast of guns, missiles or jet engines.

600-18.4.3 Safety Net Testing. For testing safety nets, apply one 454 kg (1000 lb.) load uniformly distributed over the center of the net. The load shall be held for 10 minutes. There shall be no evidence of failure, deformation or impairment of function upon removal of the load.

600-18.4.4 Deck Edge Safety Nets (Figure 600-18.13). Deck edge safety nets shall be installed around exposed boundaries where liferails or lifelines would interfere with deck or aircraft operation. Deck edge safety nets shall be hinged or fixed according to the level or operation required. Where hinged deck edge safety nets are used as lifelines in their "up" position, they shall meet the height above the deck requirements for lifelines. Wherever lifelines, liferails and safety nets are installed adjacent to one another, the safety net shall either overlap the area protected by lifelines or liferails by a minimum of 0.914 m (3 ft.) or else the space between the lowered safety net frames and liferails or lifelines shall be fitted with sections of safety netting. Safety nets shall be in compliance with drawing, NAVSEA 803-5000902 for the CRES netting, drawing, NAVSEA 803-5184097 for the nylon netting.

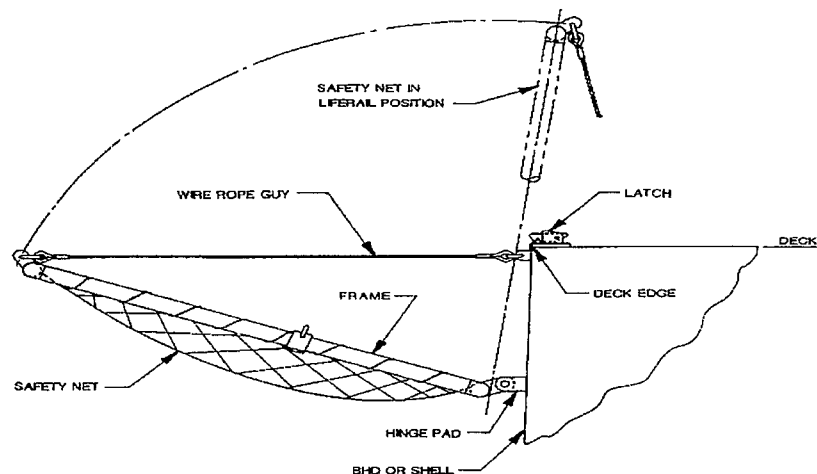


Figure 600-18.13. Deck Edge Safety Nets

600-18.4.4.1 Deck Edge Safety Nets Testing. Test steel, CRES, and aluminum frames and nylon/CRES nets and filler nets after installation. All loads shall be applied independently.

600-18.4.5 Trunk Safety Nets (Figure 600-18.14). Safety nets fitted in trunks shall be portable and sized so that when installed, the sag with no weight shall be 101.6 mm (4 in.). Nets shall not be installed in machinery space escape trunks. Vertical ladders in trunks longer than 5.18 m (17 ft.) shall be protected with portable safety nets. The highest net shall be within 0.610 m (24 in.) of the top ladder rung unless otherwise specified. Trunk safety nets shall be in compliance with drawing, NAVSEA 803-5184163.

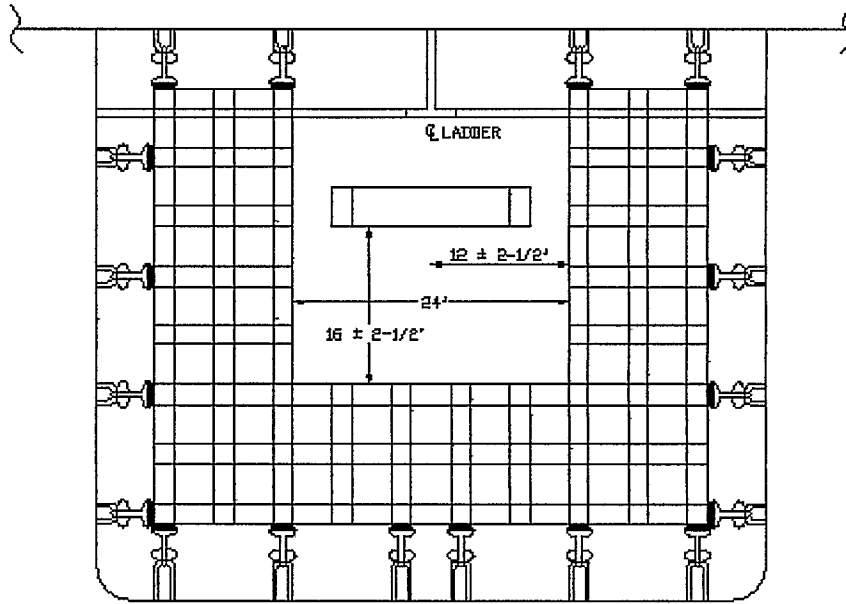


Figure 600-18.14. Trunk Safety Nets

600-18.4.5.1 Trunk Safety Nets Testing. All testing shall be in compliance with drawing, NAVSEA 5184163.

600-18.4.6 Filler Nets Testing. For testing filler nets, apply one 227 kg (500 lb.) load downward at the center of the net and hold for 10 minutes. There shall be no evidence of failure, deformation or impairment of function upon removal of the load.

600-18.4.7 Pendants Testing. All testing shall be in compliance with drawings, NAVSEA 5184097 and NAVSEA 5000902.

SECTION 19 MISCELLANEOUS

600-19.1 INTRODUCTION.

This section covers miscellaneous fittings such as airports and fixed portlights, non-icing electrically heated windows, and window wiper systems. The safety requirements are addressed in this subsection and the maintenance, inspection, testing, and repair for all equipment in this section is addressed at the end of each subsection.

600-19.1.1 Safety Requirements. For non-icing, electrically heated windows, the following caution should be adhered to:

CAUTION

High voltages capable of causing serious injury or death are used in electrically heated windows and control boxes. Use extreme caution when servicing windows and controllers.

For the spinning windows, the following caution should be adhered to:

CAUTION

Do not attempt to stop the rotating glass by hand or other means even when the motor switch is OFF. It will take a short while for the rotating glass to slow down and stop; this is normal behavior.

When inspecting spinning windows, the following warning should be adhered to:

WARNING

Comply with ship's regulations for working above deck; wear safety harness and line.

600-19.1.2 Maintenance, Inspection, Testing and Repair. Subsections provided below are designed as guidance for maintenance, inspection, testing, and repair. Refer to equipment-specific manuals, PMS, and drawings, as applicable, for more specific information.

600-19.2 AIRPORTS AND FIXED PORT LIGHTS.

600-19.2.1 Overview. An airport is an opening in the side or superstructure of a ship, usually circular, and fitted with a hinged frame in which a glass is secured. A fixed port light is an opening in the side or superstructure of a ship, usually circular, and fitted with a glass in a fixed frame. The purpose of the airport is to provide

light and ventilation to and vision from the interior of the ship. The purpose of the fixed port light is to provide light to and vision from the interior of the ship. Airports and fixed port lights shall be clear, heat-treated glass, in accordance with MIL-G-2697.

600-19.2.2 Airport and Fixed Port Light Types. Details for airports shall be in accordance with NAVSEA Drawings 804-5184212, 804-5184213 and 804-5184214 for 254 mm (10 in.), 305 mm (12 in.), and 406 mm (16 in.) airports. Details for fixed port lights shall be in accordance with hull type drawings for 305 mm (12 in.) and 406 mm (16 in.) port lights. Fixed lights in firezone doors and in doors of machinery space Enclosed Operating Station (EOS) shall be single light of polished wire-mesh glass, FED Spec DD-G-451, transparent, kind A, form 1, mesh M1. The height from the walking surface to the centerline of the airports or fixed port lights shall be 1.638 m (5 ft, 4.5 in.).

600-19.2.3 Protective Covers. Metal protective covers shall be provided on the inside of the glass port for all fixed port lights and airports except those located in pilothouses. Standard covers shall be in accordance with NAVSEA Drawing 804-5184215. In addition to the above standard covers, fixed port lights and airports installed in ballistic plating shall be provided with ballistic covers, fitted on the outside, of the same weight and kind of plating as that in which the airport is installed. Ballistic covers located in pilothouses or conning stations are fitted with slots for vision. Ballistic covers shall be in accordance with drawing, NAVSHIPS 805-921843.

600-19.2.4 Airport and Fixed Port Light Set Up and Hinge Operation. When setting up dogs on airports lens frames, care must be taken to obtain an even bearing all around to prevent breaking of the glass lens when the ship is in heavy seas. In hinging up airport covers, care should be taken to bring the hinge pin of the cover all the way out to the end of the hinge to avoid breakage of the hinge.

600-19.2.5 Airport and Fixed Port Light Testing and Inspection. Airports and fixed port lights shall be visually inspected to identify material or operational deficiencies. Remove all paint and rust from rubber gaskets. Replace gaskets when they are damaged, hardened, or have taken a permanent set. Correct any material or operational deficiencies such that they comply with the requirements specified in the individual ship's building specification. After any repairs are made to airports and fixed port lights, they shall be subjected to a hose test with a stream of water directed at the airport or fixed port light. Nozzle size of 12.7 mm (0.5 in.) positioned 3.05 m (10 ft.) away with a pressure of 50 psi for duration of one minute.

600-19.3 WINDOWS, NON-ICING, ELECTRICALLY HEATED.

600-19.3.1 Overview. The window is composed of a lamination of two pieces of heat-treated glass. A transparent metallic oxide film is applied to the inside surface of the glass that is exposed to the weather. This metallic oxide film conducts electricity between two bars installed in the window. Current input provides sufficient thermal energy to maintain an ice-free, fog-free window, the heating of which is controlled by a specially designed control unit.

600-19.3.2 Non-Icing Windows. Window panes shall be clear, heat-treated glass, MIL-G-2857, or clear laminated heat-treated glass, MIL-G-8602, class II, or clear laminated non-icing glass, MIL-W-18445.

600-19.3.2.1 Fixed Windows. Windows consist of flat, laminated heat-treated glass contained in fixed metal frames that have sensors and heating elements. They are equipped with a temperature controller and are used to prevent ice build up and fogging. They are installed on the bridge and other areas of the ship as required.

600-19.3.2.2 Hinged Windows. Hinged windows are constructed the same as the fixed windows with the addition of a movable frame and a hinge arrangement. These windows are installed on the bridge and other areas of the ship as required.

600-19.3.2.3 Non-Icing, Electrically Heated Window Inspection. Windows shall be visually inspected for bubbles or cracks as directed in the applicable MIP/MRC. The power to the window should be disconnected if there are any signs of bubbling or cracking to prevent the window from spalling. The window heating element resistance shall be checked for a short or open. If either condition is found, the window shall be replaced. If the sensors are imbedded in the window, they should also be checked for proper resistance. Both the main and spare sensors should read approximately 325 ohms. If the main sensor reads short or open and the spare sensor reads correct, the main shall be disconnected from the circuit and the spare shall be connected into the circuit. If both sensors are open or shorted, the entire window shall be replaced.

600-19.3.3 Spinning Windows (Figure 600-19.1). Spinning windows have a circular frame mounted in the center of the window. The inside portion of the window spins at a high rate of speed to keep water off the window and help in providing a constant clear view area. These windows are installed in the bridge area.

600-19.3.3.1 Spinning Window Operation.

NOTE

The heater should be used under icing conditions, which would prevent free movement of the rotating glass. Under icing conditions, the heater switch should be in the **ON** position for approximately 15 minutes to allow any ice accumulation to be dissipated before activating the sensors. To start the rotating glass the motor switch should be put in the **ON** position. The speed of the rotating glass is constant and cannot be adjusted or changed. To shut down the equipment and stop the rotating glass, put the motor switch and the heater switch both in the **OFF** position.

CAUTION

Do not attempt to stop the rotating glass by hand or other means, even when the motor switch is OFF . It will take a short while for the rotating glass to slow down and stop; this is normal behavior.

600-19.3.3.2 Spinning Window Inspection/Testing. The spinning window has been designed so that maintenance is minimal. The motor is permanently lubricated and requires no special attention; brush replacement is easily accomplished by removing the back plate of the motor. If inspection of either of the glass or the air chamber is desired, proceed as follows from outside the pilothouse.

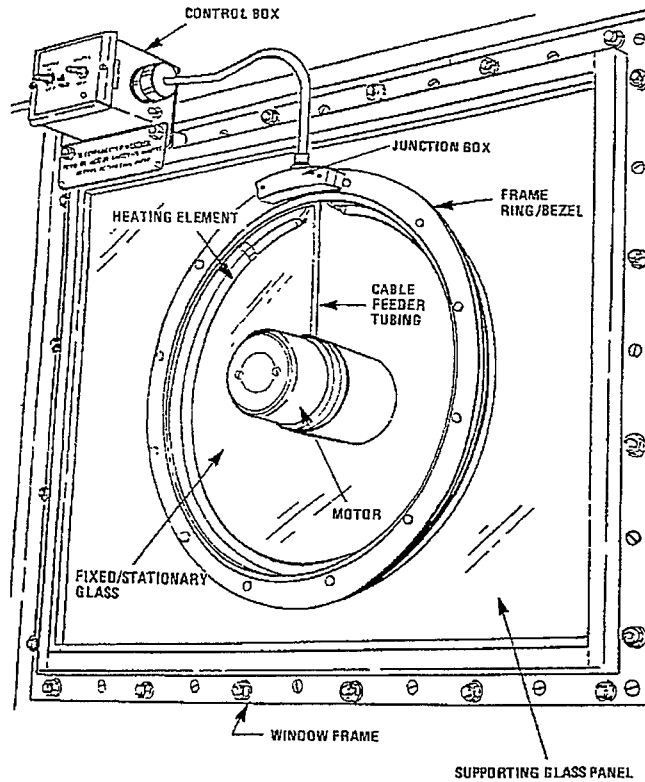


Figure 600-19.1. Spinning Window System - Inboard View

WARNING

Comply with ship's regulations for working above deck; wear safety harness and line.

- a) Hold the rotating glass firm and simultaneously remove the rotating cap by turning it in a counterclockwise direction. Reinstallation should be carried out in the reverse order.
- b) The drain hole at the bottom of the frame ring should be kept clean and unobstructed to prevent water buildup.
- c) The spinning window shall be subjected to an insulation resistance test. The measured resistance from the motor and heater circuits to ground shall be at least four megohms.

600-19.3.4 Heated Window Controllers. Controllers monitor the temperature of each window through sensors. When the temperature falls below a set temperature, the controller applies voltage to the window to de-ice or defrost the window. When the temperature of the window reaches approximately 29.4° C (+/- 3.5° C) (85° F (+/- 10° F)), the controller shuts off the power to the window. There are several models of controllers; some mount directly to the window, while others mount remotely with a junction box mounted directly to the window. Due to problems with stray RF signals from antennae located nearby, many of these types of controllers have experienced failures. Ensure that replacement controllers are equipped with an RF filter.

600-19.3.4.1 Window-Mounted Controllers. The following is a partial list of controllers and their characteristics. CC-1185 has sensors that are imbedded in the window. If the window sensors are bad, the window must be replaced. The controller shall be replaced if it is considered, after testing, to be non-operational. MK VII, Mod I, has sensors mounted to the backside of the controller. The controller shall be replaced if it is considered, after

testing, to be non-operational. KS-13440 has one sensor mounted to the backside of the controller. The controller shall be replaced if it is considered, after testing, to be non-operational.

600-19.3.4.2 Remotely Mounted Controllers. KS-12000 and KS-12000-218 controllers are remotely mounted in the overhead and a junction box is mounted to the window. If the sensors embedded in the window are bad, the window must be replaced. The controller shall be replaced if, after testing, the controller is considered non-operational.

600-19.3.4.3 Heated Window Controller Inspection/Testing. Controllers shall be tested and inspected in accordance with applicable MRCs.

600-19.3.5 Hose Testing of Windows After Repairs/Installation. All windows shall be hose tested as described below after major repairs or installation, except the spinning window, which shall have been in operation for at least ten minutes prior to the hose test and shall remain in continuous operation during the test and for ten minutes after the test. The hose test shall be made with a stream of water normal to the window from a 12.7 mm (0.5 in.) nozzle located 3.05 m (10 ft.) from the window. The water pressure shall be 50 psi and the test shall last one minute.

600-19.4 WINDOW WIPER SYSTEMS

600-19.4.1 Overview. Window wiper systems are used during inclement weather on bridge windows and various other windows throughout the ship where a clear view is necessary. There are generally two types of window wiper systems used aboard U.S. Navy ships.

600-19.4.2 Pendulum Window Wipers. The pendulum window wiper is a variable speed, electric motor-driven oscillating arm wiper with a totally enclosed drive unit. The wiper is equipped with a heated arm for operation under icing conditions. The wiper is suitable for use on fixed or hinged windows, and can be adjusted to ensure correct blade pressure and travel. This window wiper is made in accordance with MIL-W-3459. The window wiper runs on ship's service 115 VAC, single phase, 60 Hz power.

600-19.4.2.1 Pendulum Window Wiper Operation. Controls for the window wiper are located in the control box. The control box contains an ON/OFF/PARK switch for the wiper, an ON/OFF switch for the heater, a LOW/HIGH control knob for the variable powerstat, RESET push buttons for the motor and system protectors, and a red indicating light that comes on when the heater is energized. To operate the window wiper under normal conditions, proceed as follows:

- a) Ensure the system and motor protector RESET push buttons are pressed in. RESET push buttons should remain in this position throughout operation.
- b) Ensure that the variable powerstat knob is set in the LOW position.

CAUTION

Do not leave motor on if wiper blade does not move when ON/OFF/PARK switch is in the ON position. Motor could overheat.

- c) Place ON/OFF/PARK switch in the ON position.
- d) Adjust wiper speed by setting the variable powerstat knob from LOW to HIGH as required.

- e) To turn wiper off, place and hold ON/OFF/PARK switch in PARK position. When wiper is in stowed position, release switch. Switch spring returns to OFF position.

To operate the window wiper under icing conditions, the heater should be used. Use heater only if window is icing enough to prevent wiper motion. Proceed as follows:

- a) Place heater switch in ON position.
- b) Allow heater to warm up approximately 15 minutes before operating wiper.
- c) Ensure that the red indicating light in the control box is illuminated.
- d) Follow procedure in previous paragraph for normal operation procedures.

CAUTION

To avoid damage due to overheating, ensure that the heater switch is placed in the OFF position at the end of operation.

To operate the window wiper after system/motor overload, proceed as follows to resume normal operation.

CAUTION

To avoid damage to the motor, cause of system or motor overload should be corrected before operating wiper.

- a) Verify that the cause of the system/motor overload has been corrected.
- b) Press system or motor protector RESET push buttons as required.
- c) Follow procedures in paragraph for normal operation.

600-19.4.3 Horizontal Window Wipers. The horizontal window wiper is a variable speed, electric motor-driven horizontal arm wiper with a totally enclosed drive unit. The wiper is equipped with a heated arm for operation under icing conditions. The wiper is suitable for use on fixed or hinged windows, and can be adjusted to ensure correct blade pressure and travel.

APPENDIX 600-A.**STANDARD ACRONYMS/ABBREVIATIONS**

CPS	Collective Protection System
DC/FF	Damage Control/Fire Fighting
FD	Fire Damper (Round or Rectangular)
FZ Bkhd	Fire Zone Bulkhead
HVAC	Heating Ventilation and Air Conditioning
K-Closure	Flat Oval (butterfly valve) Closure
PCV	Pressure Control Valve
OD	Orifice Damper
R-Closure	Round (butterfly valve) Closure
TGD	Toxic Gas Damper
SES	Smoke Ejection System
SCD	Smoke Control Damper
SPD	Smoke Purge Damper
SID	Smoke Isolation Damper
WT Bkhd	Water Tight Bulkhead

APPENDIX 600-B.**TECHNICAL MANUAL DEFICIENCY/EVALUATION REPORT(TMDER)****NOTE**

Ships, training activities, supply points, depots, Naval Shipyards, and Supervisors of Shipbuilding are requested to arrange for the maximum practical use and evaluation of NAVSEA technical manuals. All errors, omissions, discrepancies, and suggestions for improvement to NAVSEA technical manuals shall be reported to the Commander, NAVSURFWARCENDIV, 4363 Missile Way, Port Hueneme, CA 93043-4307 in NAVSEA/SPAWAR Technical Manual Deficiency/Evaluation Report (TMDER), NAVSEA Form 4160/1. To facilitate such reporting, print, complete, and mail NAVSEA Form 4160/1 below or submit TMDERS at web site <http://nsdsa.phdnswc.navy.mil/tmder/tmder.htm>. All feedback comments shall be thoroughly investigated and originators will be advised of action resulting therefrom.

TMDER / MAILER

