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UNDERWATER SHIP HUSBANDRY MANUAL

CHAPTER 17
INSPECTION PROCEDURES

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1	3-1-00	Change paragraph 17-1.2.2 Change NSN in paragraph 17-5.3.1a Provide new Figure 17-5.1	FSL
B	5-15-03	Add paragraph17-5.3.1g Provide new Figure 17-5.7 Change paragraph 17-7.2.13.1a Change paragraph 17-8.2.13.1a & b Change paragraph 17-8.2.13.2 Change paragraph 17-8.3.13 Change paragraph 17-9.2.13.1a Change paragraph 17-10.2.14.1a Correct electrode size in table 17-7.2	FSL

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Subj: UNDERWATER SHIP HUSBANDRY MANUAL, NAVSEA S0600-AA-PRO-170

1. This letter promulgates Chapter 17 of the Underwater Ship Husbandry Manual. This chapter is the first document to detail specific inspection procedures for each ship class. The first five ship classes included are USS TICONDEROGA (CG-47), USS NIMITZ (CVN-68), USS SPRUANCE (DD-963), USS ARLEIGH BURKE (DDG-51), and USS OLIVER HAZARD PERRY (FFG-7). Additional ship classes will be added in future revisions of this chapter.

2. This chapter provides Fleet activities with NAVSEA approved inspection procedures which have been validated under typical conditions by various diving activities and will standardize the inspection methods being accomplished throughout the U.S. Navy. Comments, recommended changes and suggestions for additional chapters are welcomed. The Life Cycle Manager and technical point of contact for this manual is NAVSEA Code 00C5.

R. S. McCORD
Director of Ocean Engineering
Supervisor of Salvage and Diving

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	32A	(Destroyer Tender)
	32DD	(Submarine Tender)

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SAFETY SUMMARY

General Safety Precautions.

The following general safety precautions supplement the specific Warnings and Cautions throughout this chapter. These general precautions are related to the task of underwater ship husbandry inspections. They are precautions that must be understood and applied before and during inspections. In addition to the following precautions, personnel must be familiar with and observe safety precautions set forth in the following publications:

1. *Navy Safety Precautions for Forces Afloat*—OPNAV 5100 series
2. *Naval Ships' Technical Manual* (NSTM)
3. Technical/operating manuals for equipment
4. *U.S. Navy Diving Manual, Volume I*, NAVSEA 0944-LP-001-9010
5. *Radiological Control Manuals,* NAVSEA 389-0153, 389-0288, S9213-33-MMA-000/(V). (CLASSIFIED)

Do Not Repair or Adjust Alone.

Do not repair or adjust energized equipment alone. The presence of a qualified individual capable of rendering aid is required. Always protect against grounding hazards and make adjustments with one hand free and clear of equipment. Be aware that even after equipment has been deenergized, dangerous electrical hazards can exist due to capacitors retaining electrical charges. Circuits must be grounded and capacitors discharged.

Test Equipment.

Make certain that electrical test equipment is in good condition and personnel are familiar with its safe operation. Handheld equipment must be grounded, if possible, to prevent shock injury. Because some types of equipment cannot be grounded, avoid holding them.

Limit Switches and Interlocks.

Limit switches and interlocks are provided to protect personnel and equipment. They should not be overridden or modified except by an authorized person. Do not depend solely upon limit switches for protection. Disconnect power at the power distribution source before adjusting limit switches if possible.

Steam.

Pier steam is normally used to provide a source of heat to the heat exchanger that produces hot water for the cofferdam. Use appropriate safety equipment (i.e., gloves and face shield) when connecting, disconnecting, adjusting or operating equipment using steam.

Water.

Pier potable water is heated by the heat exchanger and circulated through the cofferdam. Prior to energizing the water system, verify that all water system connections are properly fastened. Improperly fastened water system connections could fail, causing equipment damage, serious injury, or death.

First Aid.

Attend to all injuries, however slight, by obtaining first aid or medical attention immediately.

Resuscitation.

Personnel working with or near high voltage shall be familiar with approved resuscitation methods. Begin resuscitation immediately if someone is injured and stops breathing. A delay could cost the victim's life. Resuscitation procedures shall be posted where electrical hazards exist.

Equipment in Motion.

Remain clear of equipment in motion. A safety watch will be posted if equipment requires adjustment while in motion. The safety watch shall have a full view of operations and immediate access to controls which are capable of stopping equipment. If at any time the equipment appears to be moving out of control, stop it immediately.

Minimizing Relative Motion.

Relative motion is the movement of two or more objects in relation to each other. This poses unique hazards to divers. A common example is a group of ships swaying and bouncing against each other because of wind and wave action. This motion would easily crush a diver caught between the two ships. To reduce the hazards of relative motion and to simplify the task, suspend the work platform and rigging from fittings on the ship.

WARNINGS AND CAUTIONS.

Specific Warnings and Cautions will appear in the appropriate sections of these procedures.

CHAPTER 17
UNDERWATER SHIP HUSBANDRY INSPECTION PROCEDURES

SECTION 1 INTRODUCTION

17-1.1 PURPOSE.

17-1.1.1 Historically, because of non-standardized procedures, underwater inspections of ships and submarines by divers have produced inconsistent results. Often, reinspection has been required. This inconsistency has hampered the ability of Type Commanders, planners and engineers to use the inspection results to plan, schedule, and budget repairs.

17-1.1.2 This chapter provides Underwater Ship Husbandry (UWSH) divers with the technical information they need to conduct accurate, standardized underwater inspections of surface ship and submarine hulls and appendages. These procedures will enable UWSH divers to increase inspection quality and produce accurate, reliable inspection reports. These reports are used to determine system failure; plan, budget and prepare maintenance requirements; determine repair procedures; and assist in evaluating a ship's level of operational readiness. Additionally, by using these procedures, baseline and ongoing trend analysis can be established. Inspection reports will clearly identify the material condition of hulls and appendages, thus allowing engineers and planners to assess the need for repair before system or component failure.

17-1.2 SCOPE.

17-1.2.1 This chapter addresses the personnel, equipment, and documentation requirements for UWSH inspections, using non-invasive procedures and techniques. The term non-invasive means that the diver does not remove any cover plates or disassemble any portion of the system during the inspection. Non-invasive inspections are divided into two categories: Level 1 inspections and Level 2 inspections.

17-1.2.2 Level 1 inspections are stern-to-stem, non-invasive inspections of the entire hull and its appendages. Level 1 inspections are typically routine, scheduled inspections. These inspections may be performed for regularly scheduled maintenance assessment, post-deployment condition assessment, or damage assessment following a collision, grounding, or other suspected mishap.

17-1.2.3 Level 2 inspections are system-specific, non-invasive inspections. Level 2 inspections usually result from either a deficiency discovered during a Level 1 inspection or from a problem reported by the ship.

17-1.2.4 A third level of inspection, Level 3, are system-specific, invasive procedures requiring some amount of disassembly of the system or component to complete the inspection. Level 3 inspections are outside the scope of this chapter. Level 3 inspections are covered in system-specific chapters of this manual. See Chapter 1, "Index and User Guide," for a list of all other chapters of the UWSH manual.

17-1.3 APPLICABILITY.

17-1.3.1 The Level 1 and 2 inspection procedures covered in this manual are applicable to all classes of active surface ships and submarines for which the procedures have been completed. A list of current inspection procedures can be found in the table of contents. As additional procedures are developed for other ship classes, this table will be revised.

17-1.3.2 The information and procedures contained in this chapter are not intended to duplicate or supersede information contained in various system technical manuals, the *U.S.*

Navy Diving Manual or the *Naval Ship's Technical Manual* (NSTM).

17-1.3.3 Certification as a Level 1 or 2 Inspector under this chapter does not imply certification under other commercial or military standards (e.g., ASNT, MIL-STD-271).

17-1.4 MANUAL LAYOUT.

17-1.4.1 This chapter is intended to serve two distinct purposes: as a general information and training guide and as a collection of inspection procedures for specific ship classes. The general information section includes references and discusses inspection equipment, personnel requirements, inspection techniques, (e.g., tag outs, positioning and locating), the inspection process, post-inspection requirements, and safety. Each separate ship class section includes a general hull description, a description of major hull components pertinent to that class, and Level 1 and Level 2 inspection procedures.

17-1.4.2 Level 1 procedures are organized as follows.

17-1.4.2.1 Procedures are given in the order inspection items are found from stern to stem.

17-1.4.2.2 Each ship section contains a “Plan and Profile” drawing of the ship. This figure shows key inspection items and their approximate frame locations. Inspection items are numbered to correspond with an inspection checklist (discussed below).

17-1.4.2.3 Each ship section also includes a “Checklist of Major Hull Components,” which can be used as an on-site reference. For each inspection item, the table lists the Plan and Profile drawing reference number, name of the item, system served, docking plan reference number, exact hull location (closest frame and distance from the centerline), and size of the opening. A space is also provided to record the condition found.

17-1.4.2.4 The Level 1 inspections and the checklists detailed in this manual were accurate at the time of publication for the lead ship in each class. However, SHIPALTs and other variations within any given ship class will require alterations and deletions to these procedures. Regular input from divers using these procedures will ensure that they are up to date.

17-1.4.2.5 The checklist presents hull components in the order in which they are found, beginning at the stern area and then moving to the port side, bow, and starboard. This order limits diver excursions under the keel, yet covers the entire hull surface. All hull openings listed on the docking drawing are also found on the checklist, even though some of them are located above the waterline. Items that appear above the water line can be used to assist in the setup of the dive station and also can help the diver’s orientation with the hull prior to descending below. The checklist and plan and profile figures can be photocopied for reference on the dive station during an inspection.

17-1.4.3 Level 2 procedures are given in order in which equipment is found, beginning at the stern.

SECTION 2 PERSONNEL AND EQUIPMENT REQUIREMENTS

17-2.1 PERSONNEL REQUIREMENTS.

17-2.1.1 This section discusses the personnel qualifications and equipment requirements necessary to conduct quality UWSH inspections.

17-2.1.2 The qualifications of the divers conducting the UWSH inspection are the single most important factor impacting the quality of data collected. This section sets forth specific minimum diver qualification standards for UWSH Inspectors.

17-2.1.3 The types of UWSH inspectors are Trainee, Level 1 Inspector, Level 2 Inspector, and Level 3 Inspector.

17-2.1.4 Trainees are those personnel who are newly assigned to a diving locker and who have no UWSH experience. They may assist a Level 1 Inspector during a Level 1 inspection. Trainees must have, as a minimum, the following skills and knowledge:

a. A thorough understanding of the terms and procedures of this chapter;

b. The ability to track and locate their position on any area of the hull; and

c. Training in the use of Diver's Underwater Color Television System (DUCTS)

17-2.1.5 Level 1 Inspectors are those personnel trained and qualified to perform non-invasive inspections. They may assist a Level 2 Inspector during a Level 2 inspection. Level 1 Inspectors must have, as a minimum, the following skills and knowledge:

a. A thorough understanding of the terms and procedures of this chapter;

b. The ability to track and locate their position on any area of the hull;

c. The ability to accurately report the size (area or percent) of damage, paint failure mode, and types of corrosion;

d. The ability to accurately determine Fouling Rating (FR) and Paint Deterioration Rating (PDR) in accordance with NSTM Chapter 081;

e. The ability to accurately measure clearances, including where and how to take measurements and how to use feeler gauges and inside and outside calipers;

f. Successful completion of U.S. Navy Training Course "Tools and Their Uses," NAVEDTRA No. 82085;

g. Demonstrated ability to accurately report propeller surface roughness using the Rupert Comparator;

h. Training in the use of the DUCTS; and

i. Training in the use of underwater 35mm photography equipment.

17-2.1.6 Level 2 Inspectors are those personnel trained and qualified to perform Level 2 inspections. They may assist a Level 3 Inspector during an invasive inspection. Level 2 Inspectors must have, as a minimum, the following skills and knowledge:

a. One year demonstrated experience as a Level 1 Inspector;

b. Successful completion of U.S. Navy Training Course "Blue Print Reading and Sketching," NAVEDTRA No. 82014;

c. The ability to read engineering drawings and plans; and

d. A functional understanding of the operation and purpose of the specific system being inspected.

17-2.1.7 Level 3 Inspectors are those personnel trained and qualified to perform both invasive and non-invasive inspections. Level 3 Inspectors must have, as a minimum, the following skills and knowledge:

a. One year demonstrated experience as a Level 2 Inspector; and

b. Knowledge and demonstrated experience following the procedures covered in system-specific chapters of this manual.

17-2.2 SUITABILITY OF DIVING EQUIPMENT.

17-2.2.1 Surface-supplied diving equipment with communications and helmet mounted lighting is recommended for UWSH inspections. Communications enable the diver to constantly report conditions encountered and to receive directions from the topside supervisor.

17-2.2.2 SCUBA is not recommended for routine UWSH inspections. The ease of deployment is far outweighed by safety for the diver and the quality of work produced. The lack of communications to the dive supervisor and recorder significantly degrades the quality of the inspection process. Also, the limited air supply, and thus the need to continually replace air cylinders, makes a thorough inspection impractical.

17-2.3 SUPPORT EQUIPMENT.

17-2.3.1 Because of the detailed nature of Level 1 and Level 2 inspections, a running log of the diver's findings must be maintained. For this log to be accurate, good communications are essential. For Level 2 inspections, the use of the Divers Underwater Color Television System (DUCTS) will greatly assist the repair activity in preparing a detailed report of the specific system deficiency inspected. Audio from both topside and the diver can be recorded on the tape.

17-2.3.2 Though a limited number and type of tools are required for Level 1 and 2 Inspections, their availability must not delay the inspection dive. Spare tools with tag lines need to be readily available. Table 17-2.1 gives a basic sample listing of the tools required to conduct inspections and its typical use. Local practice and requirements may dictate additional tools. Repair activities involved in routine UWSH inspections should develop a standard tool list to meet their needs. These tools should be part of the daily checklist.

17-2.3.3 It is essential to ensure that all tools and materials brought to the underwater jobsite are accounted for and removed at the completion of the job. Tools and material inadvertently left at the jobsite can generate unacceptable noise and possibly severe damage to shipboard components. Locally generated work packages shall ensure that a general tool and material log sheet is prepared and maintained during all UWSH operations.

Table 17-2.1. Tools Required and its Typical Use.

Tool	Use
Helmet-mounted lights	Illumination, hull coating inspection
Tool bag	Carry tools
Weighted lines for marking frames	Navigation aid
Hogging lines	Navigation and positioning
Bear paw magnets	Navigation and positioning
Greenie pads	Cleaning of fouling
Nylon brushes	Cleaning of fouling
Wire brush	Cleaning of corroded welds
Paint scraper	Cleaning of severe fouling
Diver Underwater Color Television System (DUCTS)	Depict damage
35mm camera with clear water box	Depict damage
Wooden or rubber mallet	Sounding of rudder voids or shaft coatings
Rupert gauge	Propeller surface roughness comparator
12 inch machinist ruler	Measurement of damage
36 inch ruler	Measurement of damage
50 foot tape measure	Measurement of damage
6 inch inside calipers	Measurement of fairwater/shaft clearance
8 inch Vernier calipers	Measurement of damage
Feeler gauges	Measurements of gap/clearances
Pit Gauge	Measurement of corrosion pitting or shaft coating damage
Yellow grease pencil	Mark damage
Center punch and hammer	Marking ends of cracks
Screwdrivers (various sizes)	Verifying fastener security
Allen wrench set (1/8” - 1”)	Verifying fastener security
1/4”, 3/8”, 1/2” and 3/4” socket sets	Verifying fastener security
Wrench set (7/16″ - 2″)	Verifying fastener security

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SECTION 3 TECHNIQUES

17-3.1 TAG OUTS.

17-3.1.1 Traditionally, the tag-out process has had a significant impact on the quality of diver hull inspections. Both ship availability and diver workload create the need for a well-planned, efficient tag-out process. A well-planned and coordinated effort between the inspecting activity and ship one to two days ahead of time gives all parties time to prepare and prevents hours of delay in inspection time. Ideally, the ship has no systems down, allowing for a lineup giving complete diver access to a significant portion of the hull. As the diver inspection proceeds, the system lineup can be shifted while the divers are shifting the dive station, with relatively little loss in inspection time. Obvious allowance must be made for the ability of the ship to shift systems over and to reconfigure the tag out. It is up to the dive supervisor and the ship to coordinate the tag-out process to yield the most efficient inspection. Experience has shown that an inefficient tag-out process causes inspection quality to suffer, resulting in hull or system deficiencies remaining unreported and significant schedule impact.

17-3.2 POSITIONING AND LOCATING.

17-3.2.1 Positioning. During a Level 1 inspection the diver must be able to reference his exact location to accurately report the location of discrepancies. To accomplish this, the diver uses obvious reference points such as struts, bilge keel, turn of the bilge, hull openings etc. When reporting, the diver gives measurements fore/aft, inboard/outboard, etc., from a known reference point to describe the location. Topside can then transcribe this information to the inspection report. When hull appendages or openings are not present for the diver to obtain a reference point, a hogging line may be used. Also, the use of the topside camera supplied with DUCTS allows the diver at the inspection site to review the plan and profile drawings, running gear drawings, and ships system specific figures found in this manual via the in-water monitor. This is especially beneficial on large ships during a complete hull inspection. During the inspection of an entire hull it is important for the diver to keep track of his location at all times. When in doubt the diver should verify his position to ensure accurate reporting.

17-3.2.2 Locating. A Level 2 inspection requires a diver to locate and inspect a specific component or hull area. This is a fairly simple task when the diver has to locate a rudder, shaft, or large hull opening. Some inspection tasks, however, may require locating a small opening (less than an inch) on a large, relatively flat bottomed ship or a small crack in the hull (as when the ship reports taking on water in a fuel tank and suspects a crack). Locating a small opening may require the effort of the entire dive team. The location process starts with the dive planning. It is important to have the correct references available at the dive station. Review the ships' plan and profile drawings, running gear drawings provided in the ship class inspection procedure and the shell plate drawings prior to the dive. The plan and profile drawings and running gear drawings provided in the ship class inspection procedure provide an overview of the hull and the frame reference of all hull openings and appendages. The shell plate drawing gives the location of strakes and weld seams relative to the frames and depicts hull penetrations. Following the horizontal and vertical weld seams give the diver a means to accurately locate the area for inspection.

17-3.2.3 In instances where conditions prohibit following weld seams (excessive fouling or badly corroded plate), alternate locating methods may be necessary. The use of a hogging line to mark a frame location, air discharged from the opening, and hammering from the inside of the hull have all been used successfully. Each of these methods has drawbacks, however. Openings on double hull ships often exit the inside hull and then exit the outer hull at a different frame. Air discharged from an opening on a large flat bottom hull may lay on the hull, creating a mirror effect and preventing the diver from locating the opening. Hogging lines take time to set and, depending on the area of the ship where it is installed, may tend fore or aft on the lower portion. A method to ensure that the hogging line will hang plum when installed is to add about 6 feet of chain to the middle of the hogging line to act as weight. This keeps the hogging line in position on the desired frame. When used carefully, each method will put the diver in close proximity to the inspection site.

17-3.3 INSPECTION TECHNIQUES.

17-3.3.1 Visual.

17-3.3.1.1 For a diver to accurately report the material condition, he must be thoroughly familiar with the conditions he is likely to encounter. The diver must be able to recognize paint failure modes and corrosion types as described in Section 17-3.4.

17-3.3.1.2 Proper inspection of any hull surface or component requires a clean, well-lighted surface. Surface corrosion, paint condition, and hull distortion or cracking may not be visible through a heavy layer of fouling. If possible, hull inspections should be conducted soon after hull cleaning. When inspecting a fouled hull, the diver must clean individual components to inspect them. Use a scraper, wire brush, or greenie pad as specified in NSTM 081. Cleaning is also required to determine the extent of damage.

17-3.3.1.3 Even in harbors with good visibility, a diver's light is required during the inspection. Proper inspection of the area inside the rope guard, fairwater, stern tube, and rudder fairing requires a light to locate fouling or debris. Also, the diver must have adequate light to assess the condition of the hull coating.

17-3.3.1.4 Some deteriorating hull conditions exhibit tell tale signs that alert the diver to investigate for the cause. Bleeding rust on the paint indicates a defect in the anticorrosion coating and possibly a crack in the hull plate. On the shaft, bleeding rust indicates the shaft coating has failed and a detailed Level 2 Inspection of the shaft must follow. A clean area when the surrounding area is fouled may indicate recent damage from collision or grounding. Conduct a thorough inspection for damaged or cracked hull plate and weld seams. Conversely, a fouled area with the surrounding area clean indicates an area of earlier damage. In this case the fouling should be cleaned to inspect the hull condition under the fouling for PDR, cracked or distorted plating, and corrosion.

17-3.3.2 Touch. Visual inspection is not the only means of assessment; for some systems, such as the sonar dome window or propeller blades, the diver may be better able to feel inconsistencies. Blisters, subsurface broken wires, or soft spots on rubber coated surfaces and waviness, curls and nicks on propeller blades can be detected by lightly rubbing the surface with the hand even with a wet suit glove on.

17-3.3.3 Use of Tools.

17-3.3.3.1 Both Level 1 and Level 2 inspections require the use of measuring devices to properly assess conditions. Accurate measurements are required to determine the urgency of repair or to track the change in condition over time. The diver must report area, length, and width based on actual measurements. Measurements must be taken using a standard unit of measurement, i.e., inches, square feet, centimeters, etc. The use of hands, fingers, or miscellaneous tools (knife, hammer handle, etc.) as measuring devices give inaccurate and unrepeatable data. The diver must provide a clear, concise report of the condition of the component being inspected.

17-3.3.3.2 Accuracy of Measurements. The diver must make precise measurements of damage to accurately record the extent of damage. Planners and engineers rely on accurate reporting to assess the need for repair. Table 17-3.1 specifies the required accuracies on measurements taken on various systems. For example, a crack's length and width (maximum) should be reported to the nearest 1/16th of an inch and be referenced to a definable point or mark to ensure consistency with follow up inspections. Another example is clearance measurements taken on fairwaters. These measurements are taken at the 3, 6, 9 and 12 o'clock positions, and since fairwaters often have a rounded edge, these measurements may not be at the outer edge. The results should be reported to the nearest 1/8 of an inch. In order to take the measurement at the minimum clearance points, a machinist rule should be used, however, in some instances the use of calipers may be necessary.

Table 17-3.1 Measurement Tolerances.

Measurement Tolerances		
Rudder Clearances		± 1/8 inch
Propeller Damage		± 1/32 inch
Fairwaters and Rope Guard Clearances		± 1/8 inch
Shaft Coating Damage	- $< 1\ ft^2$ - $> 1\ ft^2$	± 1/8 inch ± 1/4 inch
Cracks		± 1/16 inch
ICCP Dielectric Shield	- Cracks - Bare Metal Area	± 1/2 inch ± 1/2 inch
Coating Damage	- Length and width - Area of missing coating - Depth of pitting	± 1 inch ± 2 inch ± 1/16 inch
Sonar Dome	- Blisters - Cracks - Gouges - Separation - Tears - Scratches	± 1/2 inch ± 1/16 inch ± 1/16 inch ± 1/8 inch ± 1/8 inch ± 1/16 inch

17-3.4 TERMINOLOGY.

17-3.4.1 When documenting inspection results, use standard terminology to describe the system component, related parts, damage, and location (length, width, orientation, and/or area as appropriate). This allows engineers and planners reviewing the report to have a clear understanding of the condition. This section describes common general terms. For system-specific terms, refer to applicable chapters of this manual.

17-3.4.2 General.

17-3.4.2.1 Common terms used to describe damage to the hull, sonar dome, shaft or other components are:

a. *Crack*. A linear rupture of material under stress. Cracks may form anywhere on a surface, but are usually found near an edge or joint. Cracks have depth, length, and width and are not simply a surface defect.

b. *Dent*. A hollow area made by a blow or collision. There is no loss of material with a dent.

c. *Gouge*. A scooped out, shallow area or groove in the material caused by contact or collision with a hard object. This is common on softer material such as sonar dome rubber windows and shaft coatings, but may also be found on hull plating.

d. *Scratch*. A narrow surface defect which can be felt, but which has no depth into the material. Typically, scratches could be buffed out.

e. *Surface indication*. Any inconsistency of the surface that looks like a scratch or “hair line crack” but can not be felt or buffed out. Depending on the location and orientation, surface indications may require additional inspections.

f. *Tear*. Pulled apart or separated by force, common on the leading edge of a bilge keel or a sonar dome rubber window.

g. *Delamination*. Separation between layers, common on shaft coatings and sonar domes. Delaminations may be obvious with entire sections of material lost or may be hidden as a subsurface failure. Subsurface delaminations may appear as bulges.

17-3.4.3 Hull Coating System.

17-3.4.3.1 There are two major components of the hull coating system: the anticorrosion coating and the antifouling coating. During a waterborne hull inspection the condition of the entire hull coating system must be accurately reported to allow assessment of the existing condition, projected life remaining, and possible causes for coating failure. The anticorrosion coating system is the primary corrosion protection system for the underwater hull plating and appendages. The antifouling coating system is the primary protection against biological fouling. Both the anticorrosion and antifouling coatings are applied as multiple layers. Each layer is of a different, or alternating color to allow identification of the exposed layer. In addition to reporting the color of the exposed coating layer, two other values are reported: Paint Deterioration Rating (PDR) and Fouling Rating (FR). Guidance for determining and examples of PDR and FR values are detailed in NSTM Chapter 081. Whenever discrepancies are reported for hull plate or a specific appendage, always report PDR and FR ratings.

17-3.4.3.2 Common terms to describe hull coating components are:

17-3.4.3.2.1 Anticorrosion Coating. The primary protection against corrosion for the hull plating and appendages.

17-3.4.3.2.2 Antifouling Coating. The coating applied over the anticorrosion coating to reduce biological fouling.

17-3.4.3.2.3 Ablative and self-polishing antifouling coating. Antifouling coatings are designed to wear away in small quantities while the ship is underway. This wear process is intended to maintain the antifouling properties of the coating.

17-3.4.3.3 Hull coating failure modes. The following is a listing of some hull coating failure modes. Section 6 of NSTM Chapter 631, Volume 2 describes additional common failure modes and coating application faults.

a. *Alligatoring* or *Checking*. Alligatoring, or checking, exists when the outer layer of paint is broken and underlying paint coats are visible, often presenting an appearance similar to alligator hide.

b. *Cracking*. Cracking exists when a break extends through to the metal surface. Paints that lack elasticity because of aging or other causes can no longer contract or expand with moisture and temperature changes and therefore crack.

c. *Flaking, Scaling*, and *Peeling*. Flaking, scaling, and peeling are characterized by the detachment of pieces of paint, generally irregular in shape. When pieces are small, it is termed flaking; when pieces average over 1/4 inch, it is termed scaling; when pieces are larger than an inch, it is termed peeling. Flaking and scaling usually follow cracking and have the same causes. Peeling is often caused by the presence of moisture behind the film or by incompatibility of paint films.

d. *Blistering*. Blistering occurs when the top coat detaches from the underlying surface in unbroken areas as a result of gases or liquid (usually water) forming beneath the coating.

e. *Chalking*. Chalking is characterized by the presence of a loose powder emanating from the paint film, at or just beneath the surface. Chalking is present when rubbing the paint film with fingertips produces a milky substance. Slight chalking is desirable for some applications because the surface becomes self cleaning. The degree of chalking is determined by the composition of the paint. This indication may not be present if the inspection is a post-cleaning inspection or the ship has been underway.

17-3.4.4 Corrosion. Complete failure of the coating system results in bare metal on hull plate or a component. No matter what the size, report areas of bare metal. The report shall include the dimensions of exposed metal, condition of bare metal (bright or corroded), the type of corrosion, and the condition of paint in the surrounding area. In general the following are the most common forms of corrosion found on Navy hulls:

a. *Flash rusting*. Flash rusting develops almost immediately after the anticorrosive coating is removed down to bare metal and no form of cathodic protection is available to that area. This type of corrosion will eventually turn into general corrosion if left unattended. Flash rusting may be removed with a wire brush to determine the extent of damage.

b. *General corrosion*. General corrosion develops after a short period of time when flash rusting is left unattended. Moisture is absorbed into the pores of the metal and forms a corroded layer. Once this layer has formed, the corrosion process slows down dramatically and forms a protective barrier to the underlying metal. The corrosion process is only slowed down, however, not stopped. When a ship is moving through the water, this protective layer may be removed and the general corrosion process starts again.

c. *Erosion corrosion*. Erosion corrosion is the repeated process of general corrosion setting up, taking place, and being removed. When this condition is left unattended the metal plating is being gradually reduced in size (thickness). The metal under this condition may not appear to be severely corroded. The diver, however, may be able to determine by sight or by touch that the affected area shows signs of thickness deterioration and may require ultrasonic testing (UT) to determine loss of thickness. Leading edges of struts and rudders are typical locations for erosion corrosion.

d. *Pitting corrosion*. Pitting corrosion is normally caused from porosity in welds, slag entrapment in the weld near the surface, defects in the metal, or anticorrosion coating where moisture is allowed to come into contact with the metal. Localized accelerated corrosion forms pits or craters. Pitting may occur as a few isolated pits or large areas of pits. Large areas of pits are often found with general corrosion. Areas of pitting should be examined for the maximum and average size and depth of the pits. Pitting should not be confused with cavitation corrosion.

e. *Cavitation corrosion*. Cavitation corrosion is found in cavitation-prone areas such as trailing edges of struts, rudders, and propeller blades. Cavitation corrosion is caused by tiny bubbles of gas collapsing under pressure at the metal surface. The repeated effect is a gradual fatiguing and subsequent wearing away of the metal surface. Cavitation corrosion can be distinguished from pitting in two ways. First, cavitation corrosion occurs in high-flow, turbulent areas. Second, typically the edges of cavitation craters are sharp. The appearance of cavitation corrosion is somewhat like the covering of a golf ball.

f. *Galvanic corrosion*. Galvanic corrosion is caused by electrolysis between two dissimilar metals. The metal that is most anodic will corrode first. Components installed or assembled with dissimilar metals (anode and cathode) that are in the water are usually protected by a sacrificial zinc anode, zinc being one of the two most anodic materials. This material is intended to corrode to protect the others. In galvanic corrosion, the relative size of the anode to the cathode is a determining factor in the severity of the condition. A typical example would be a bolt, nut or washer of a dissimilar metal which is anodic next to bare hull plate. In this case the bolt, nut or washer (all or only one or two) will be severely corroded and the bare hull plate will not. If the hull plate was the anode and the bolt or nut the cathode, the corrosion would be less severe due to the large area of hull relative to the bolt or nut.

g. *Stray current corrosion*. Stray current corrosion is a common form of corrosion occurring on the hull and shaft while pierside or in a nest. This corrosion is a result of improper weld-lead hookup. Stray current corrosion can be identified by accelerated corrosion (thinning without obvious rust) of any exposed hull metal, as in a scratch in the hull coating. Stray current corrosion is serious and if found must be reported at once; if welding is ongoing, the corrosion can be stopped by proper grounding.

SECTION 4 INSPECTION PROCESS

17-4.1 DIVE TEAM BRIEFING AND OPERATIONS PLANNING.

17-4.1.1 Ship and submarine inspections are an ongoing, frequently occurring process. The magnitude of the area being inspected, the local water quality, the wide variation of installed systems, and the length of time out of dry dock all combine to increase the level of difficulty of inspections. A thorough review of past inspection reports by all dive team members is required to increase the inspection quality. Past reports are used as a starting point for the inspecting activity to compare the extent of past damage to current damage. The use of past reports is not a means to shorten the inspection process, however. Past reports serve only to allow the current inspection report to highlight any increase or worsening of the condition. The inspector diver must still conduct a thorough, independent inspection.

17-4.1.2 The inspector diver and the records keeper must be able to accurately describe the conditions encountered. If the topside personnel do not understand the diver's description of the conditions found, the inspection report will be meaningless. Therefore, a thorough review of the hull descriptions in this chapter prior to each dive will ensure that each inspection diver and record keeper is familiar with the area they are assigned to inspect. The diving supervisor must review and include in the dive brief information obtained from the following items: the last hull inspection or last docking report for the first inspection out of dry dock, the type of paint system installed, and a review of known ship or class problem areas.

17-4.1.3 One of the most important inspections conducted on a ship or submarine is the first diver inspection out of dry dock after repair or overhaul. It is during this first inspection that the baseline condition of the ship is established. Initial rudder, rope guard, and fairwater clearances must be accurate, since these readings will be compared to later values as a measure of change, such as rudder drop or bearing stave wear.

17-4.1.4 In order to conduct a complete Level 1 inspection, free access to the entire hull and appendages is required. Pre-dive operations planning must include any necessary berthing configurations, water depth, mooring line positioning, camels location, port control, and ship tag-out procedures.

17-4.2 DURING THE INSPECTION.

17-4.2.1 The primary focus of any UWSH inspection is the inspection report. No matter what the quality of the inspection, the inspection is meaningless without the proper documentation of the results. Diver communications, topside record keeping, and the selective use of video and 35mm photography all combine to achieve a quality report. As the diver conducts the inspection, maintain a running log of the results. Use the "Checklist of Major Hull Components" to maintain the log. This log must include the condition of the system being inspected, its Fouling Rating (FR) and Paint Deterioration Rating (PDR), and the FR and PDR of the surrounding area. As the diver moves along the hull, the record keeper must maintain a record of the general hull plate FR and PDR. Neither the record keeper nor the diver should attempt to remember the condition of a system or area of the hull. Instead, always maintain a running log. A summary of the overall FR and PDR can then be produced, with problem areas detailed, and the results transferred to the Diver Hull Inspection Data Forms (see Section 5).

17-4.3 POST-INSPECTION.

17-4.3.1 The detail and quality of the inspection report generated as a result of a Level 1 or Level 2 inspection must be of the highest standard. These reports are a direct reflection of the professionalism of your dive team, your Command, and the Underwater Ship Husbandry Program. Depending on the ship class and inspection results, these reports may see wide distribution, well beyond the normal chain. A neatly typed, thorough report of the inspection using the appropriate forms must be produced and maintained to document all conditions.

17-4.3.2 Each Underwater Ship Husbandry Diving Activity should maintain a file for each ship they have inspected. This file should include both the written report, 35mm photographs, and the video.

SECTION 5 REPORTING

17-5.1 GENERAL INFORMATION.

The reporting process is done in two steps. The Checklist of Major Hull Components (Table 2), which is provided for each ship class inspection, should be used in the field to record the raw inspection data. NAVSEA 00C5 has developed a series of forms to document diver hull inspection results in a standard format (NAVSEA Form 4730). The information required to accurately complete these forms should be transferred from the Checklist of Major Hull Components (Table 2) to the appropriate forms following a Level 1 or 2 inspection. The inspection task may require a full or partial hull inspection or inspection of a specific system. When performing a partial inspection and it is evident that other problems exist, the problems must be documented to make planners aware and provide for further evaluation and repair.

17-5.2 INSPECTION RESULTS.

17-5.2.1 Level 1 inspections are visual inspections documented in writing and recorded on the diver hull inspection data forms (NAVSEA 4730). Supplemental documentation such as 35mm color photographs and/or color video should be used to depict the condition of the hull and appendages.

17-5.2.2 Level 2 inspections are system specific inspections which require detailed measurements and assessment of the system be recorded on the appropriate diver hull inspection forms. Additional sketches should be provided which clearly document the extent of damage and color photographs (35mm) and/or color video should be used to record the condition of the system.

17-5.3 DIVER HULL INSPECTION DATA FORMS. These forms are available from the Navy Supply System. Forms obtained from the supply system are in a carbonless copy format, providing an original and two copies. Although additional copies are required for distribution, the carbonless copies allow immediate distribution to the ship and TYCOM. Upon completion, the original goes to the Ship, one copy goes to the TYCOM, one copy goes to NAVSEA 00C5, and one copy remains on file at the dive locker.

17-5.3.1 Ordering Information.

The form numbers, NSNs, and titles are:

a. NAVSEA 4730/3 (NSN 0116-LF-115-1600) Diver Hull Inspection Data (Figure 17-5.1)

b. NAVSEA 4730/4 (NSN 0116-LF-047-3025) Sonar Dome Rubber Window Inspection Data (Figure 17-5.2)

c. NAVSEA 4730/5 (NSN 0116-LF-047-3030) Sonar Keel Dome Inspection Data (Figure 17-5.3)

d. NAVSEA 4730/6 (NSN 0116-LF-047-3035) Propeller Inspection Data (Figure 17-5.4)

e. NAVSEA 4730/7 (NSN 0116-LF-047-3040) Impressed Current Cathodic Protection Inspection Data (Figure 17-5.5)

f. NAVSEA 4730/8 (NSN 0116-LF-047-3045) Auxiliary Propulsion Units Inspection Data (Figure 17-5.6)

g. NAVSEA 4730/11 (NSN 0116-LF-962-2500) DDG 51 Rudder Inspection Data (Figure 17-5.7)

17-5.4 ADDITIONAL REPORTING REQUIREMENTS.

Depending on the particular system, formal deficiency or damage reports may be required. An example of this is the Naval message used to report shaft coat damage to NAVSEA (see Chapter 13). Another example is the Naval message used to report sonar dome damage to NAVSEA (see Chapter 9).

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DIVER HULL INSPECTION DATA

U.S.S.	HULL TYPE NO.	LOCATION (CITY)	DATE (mm/dd/yy)
TYCOM	INSPECTING ACTIVITY		VISIBILITY (FT)
LOCATION OF LAST DRYDOCKING			UNDOCKING DATE
LOCATION OF LAST PAINTING			DATE

PAINT TYPE: ANTIFOULING ____________ ANTICORROSION ____________

DATE OF THE LAST WATERBORNE FULL HULL CLEANING	DATE OF THE LAST WATERBORNE INTERIM CLEANING

UNDERWATER PHOTOGRAPHS TAKEN ☐ YES ☐ NO UNDERWATER COLOR VIDEO TAKEN ☐ YES ☐ NO

UNDERWATER CLEANING ACCOMPLISHED THIS DATE

☐ FULL CLEAN ☐ POLISH ☐ MULTI-BRUSH ☐ INSPECT ☐ PAINT

☐ INTERIM ☐ HYDRO ☐ HAND-HELD ☐ REPAIR ☐ OTHER ____________

1. HULL COATING SYSTEM (PDR ________)

a. ANTIFOULING PAINT

PERCENTAGE REMAINING ________ PERCENT REJUVENATION ________

IS THE A/F ☐ HARD ☐ SOFT

PERCENTAGE ________ PEELING ________ LOCALIZED or ________ GENERAL

________ BLISTERING ________ LOCALIZED or ________ GENERAL

________ ABRASION ________ LOCALIZED or ________ GENERAL

CONDITION SUMMARY [IF PAINT DAMAGE IS LOCALIZED, GIVE LOCATION(s)]:

b) ANTICORROSION PAINT

PERCENT REMAINING ________

PERCENTAGE ________ PEELING ________ LOCALIZED or ________ GENERAL

________ BLISTERING ________ LOCALIZED or ________ GENERAL

________ ABRASION ________ LOCALIZED or ________ GENERAL

CONDITIONING SUMMARY [IF PAINT DAMAGE IS LOCALIZED, GIVE LOCATION(s)]:

c) DOCKING BLOCK AREAS (PDR ________)

AVERAGE PERCENTAGE OF BLOCK AREAS PAINTED ________ %

BARE METAL PITTING ________ % ________ IN. DIAMETER ________ IN. DEEP

CONDITION SUMMARY:

NAVSEA 4730/3 (5-98) 0116-LF-115-1600 SHEET 1 OF 3

Figure 17-5.1. Diver Hull Inspection Data (sheet 1 of 3).

2. CATHODIC PROTECTION SYSTEM

a. SACRIFICIAL ANODES (ZINCS)

AVERAGE PERCENTAGES OF ANODES REMAINING ______ %

ANODES ARE: ☐ UNIFORMLY WASTED ☐ WASTAGE GREATEST IN FOLLOWING AREAS:

______

______

ANODES ARE: ☐ WELDED ☐ BOLTED ☐ BOTH

NUMBER AND LOCATION OF ANY ANODES MISSING OR INACTIVE

MISSING ______

______

INACTIVE ______

______

b. IMPRESSED CURRENT

☐ DAMAGE NOTED ON ATTACHED DRAWING	(Port/Stbd)	(FRAME ______)
☐ WIRES LOOSE, BROKEN, OR MISSING	(Port/Stbd)	(FRAME ______)
☐ CAPASTIC SHIELD DAMAGE	(Port/Stbd)	(FRAME ______)
☐ INSULATORS LOOSE OR DAMAGED	(Port/Stbd)	(FRAME ______)
☐ OTHER	(Port/Stbd)	(FRAME ______)

3. GENERAL HULL DAMAGE (HULL PLATING, BILGE KEELS, etc.):

______

______

______

______

______

______

4. MASKER AIR SYSTEM

MASKER BELTS:

______ PERCENT BLOCKED HOLES (POST CLEAN) BELTS WELDED TO HULL ☐ YES ☐ NO

CUMULATIVE LENGTH OF EPOXY MISSING (BELTS NUMBERED BOW TO STERN)

PORT:	#1 ______ ft.	#2 ______ ft.	#3 ______ ft.	#4 ______ ft.
Stbd:	#1 ______ ft.	#2 ______ ft.	#3 ______ ft.	#4 ______ ft.

CONDITION SUMMARY: ______

______

______

5. HULL PENETRATIONS (PDR ______)

______ % CLOGGED WITH MARINE GROWTH (POST CLEAN)

______ % BARE METAL (AREA SURROUNDING PENETRATION)

______ % BARE METAL PITTING

AVERAGE PIT SIZE: ______ in. DIAMETER, ______ in. DEPTH

CONDITION SUMMARY: ______

______

______

NAVSEA 4730/3 (5-98) 0116-LF-115-1600 SHEET 2 OF 3

Figure 17-5.1. Diver Hull Inspection Data (sheet 2 of 3).

2. CATHODIC PROTECTION SYSTEM

a. SACRIFICIAL ANODES (ZINCS)

AVERAGE PERCENTAGES OF ANODES REMAINING ________ %

ANODES ARE: ☐ UNIFORMLY WASTED ☐ WASTAGE GREATEST IN FOLLOWING AREAS:

____

____

ANODES ARE: ☐ WELDED ☐ BOLTED ☐ BOTH

NUMBER AND LOCATION OF ANY ANODES MISSING OR INACTIVE

MISSING ____

____

INACTIVE ____

____

b. IMPRESSED CURRENT

☐ DAMAGE NOTED ON ATTACHED DRAWING	(Port/Stbd)	(FRAME ________)
☐ WIRES LOOSE, BROKEN, OR MISSING	(Port/Stbd)	(FRAME ________)
☐ CAPASTIC SHIELD DAMAGE	(Port/Stbd)	(FRAME ________)
☐ INSULATORS LOOSE OR DAMAGED	(Port/Stbd)	(FRAME ________)
☐ OTHER	(Port/Stbd)	(FRAME ________)

3. GENERAL HULL DAMAGE (HULL PLATING, BILGE KEELS, etc.):

____

____

____

____

____

____

4. MASKER AIR SYSTEM

MASKER BELTS:

________ PERCENT BLOCKED HOLES (POST CLEAN) BELTS WELDED TO HULL ☐ YES ☐ NO

CUMULATIVE LENGTH OF EPOXY MISSING (BELTS NUMBERED BOW TO STERN)

PORT:	#1 ________ ft.	#2 ________ ft.	#3 ________ ft.	#4 ________ ft.
Stbd:	#1 ________ ft.	#2 ________ ft.	#3 ________ ft.	#4 ________ ft.

CONDITION SUMMARY: ____

____

____

5. HULL PENETRATIONS (PDR ________)

________ % CLOGGED WITH MARINE GROWTH (POST CLEAN)

________ % BARE METAL (AREA SURROUNDING PENETRATION)

________ % BARE METAL PITTING

AVERAGE PIT SIZE: ________ in. DIAMETER, ________ in. DEPTH

CONDITION SUMMARY: ____

____

____

NAVSEA 4730/3 (5-98) 0116-LF-115-1600 SHEET 2 OF 3

Figure 17-5.1. Diver Hull Inspection Data (sheet 2 of 3).

6. SONAR DOME

☐ NO VISIBLE DAMAGE ☐ DAMAGE NOTED ON ATTACHED DRAWING ☐ CUTS ☐ LAYER SEPARATION ☐ WIRE PILES EXPOSED

7. PROPULSION SHAFTING

VISIBLE BARE METAL ☐ YES ☐ NO RUST BLEEDING ☐ YES ☐ NO PITTING ☐ YES ☐ NO

CONDITION SUMMARY (TYPE OF DAMAGE, LOCATION AND SIZE):

____

____

8. STRUTS AND BEARING HOUSING

PERCENT BARE METAL:	STARBOARD	PORT
MAIN	________ %	________ %
INTERMEDIATE	________ %	________ %
PDR	________	________

CONDITION OF STRUT LEADING AND TRAILING EDGES: ______________________________

____

____

CONDITION OF ROPE GUARDS: ______________________________

____

____

CONDITION OF FAIRWATERS: ______________________________

____

____

9. RUDDER

☐ NO DAMAGE ☐ DAMAGE SHOWN ON ATTACHED DRAWINGS

	STARBOARD		PORT	
PERCENT BARE METAL	%		%	
PDR				
ACCESS PLATES INTACT?	☐ YES	☐ NO	☐ YES	☐ NO
WAS RUDDER SOUNDED?	☐ YES	☐ NO	☐ YES	☐ NO
ANY SIGNS OF FLOODING?	☐ YES	☐ NO	☐ YES	☐ NO
ANY SIGNS OF DROPPING?	☐ YES	☐ NO	☐ YES	☐ NO

CONDITION SUMMARY:

____

____

10. PROPELLERS

☐ NO DAMAGE ☐ DAMAGE SHOWN ON ATTACHED DRAWINGS

PROP #1:	NICKS ____	CURLS ____	CRACKS - LARGEST CRACK LENGTH____"
PROP #2:	NICKS ____	CURLS ____	CRACKS - LARGEST CRACK LENGTH____"
PROP #3:	NICKS ____	CURLS ____	CRACKS - LARGEST CRACK LENGTH____"
PROP #4:	NICKS ____	CURLS ____	CRACKS - LARGEST CRACK LENGTH____"

PROPELLERS NUMBERED STARBOARD TO PORT.

SIGNATURE (DIVING SUPERVISOR)	SIGNATURE (SHIP'S ENGINEER)

NAVSEA 4730/3 (5-98) 0116-LF-115-1600 SHEET 3 OF 3

Figure 17-5.1. Diver Hull Inspection Data (sheet 3 of 3).

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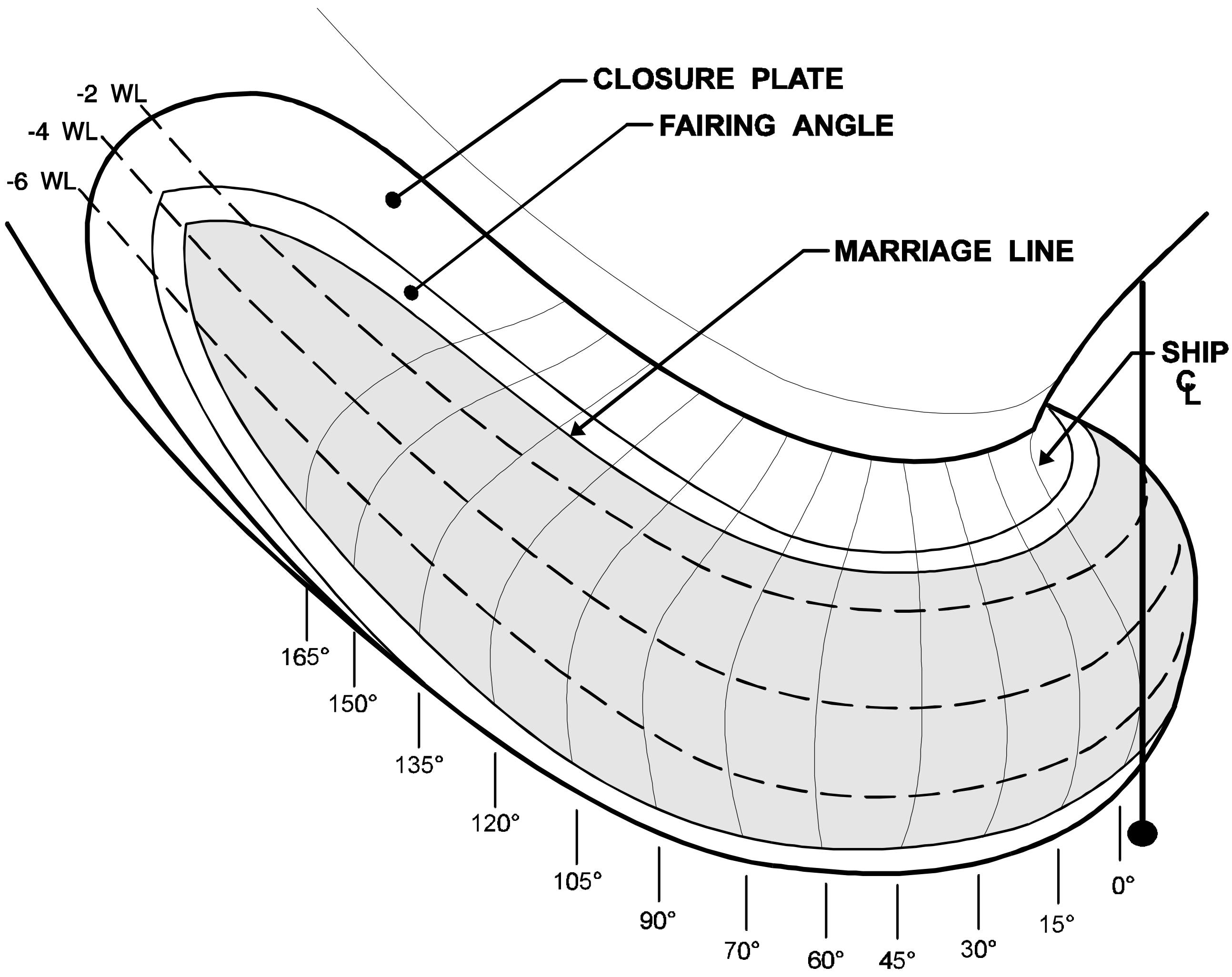
SONAR DOME RUBBER WINDOW INSPECTION DATA

USS	HULL NO.	LOCATION	DATE

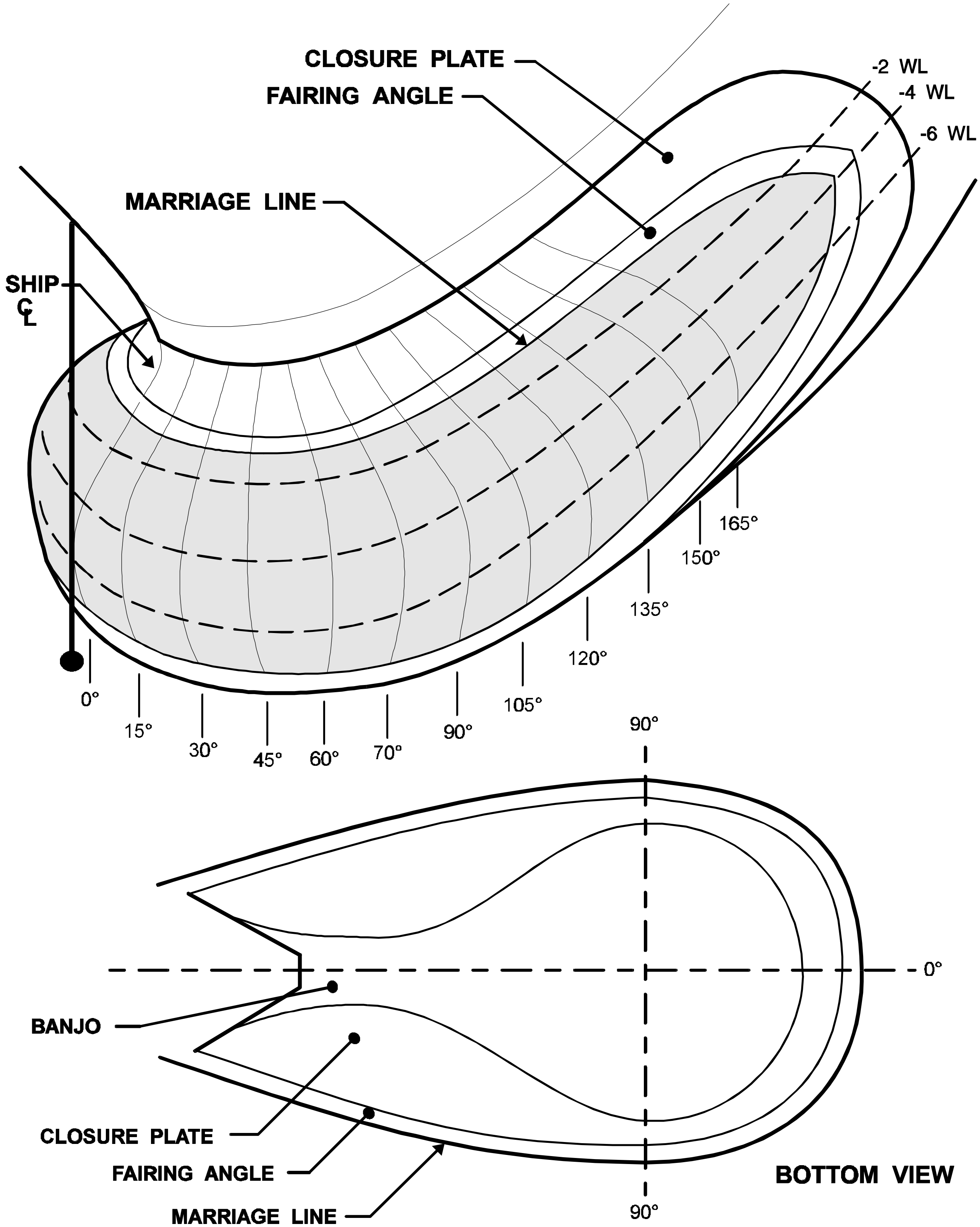


Condition Summary: ____

NAVSEA 4730/4 (3-88) 0116-LF-047-3025 SHEET 1 OF 2

Figure 17-5.2. Sonar Dome Rubber Window Inspection Data (sheet 1 of 2).

SONAR DOME RUBBER WINDOW INSPECTION DATA

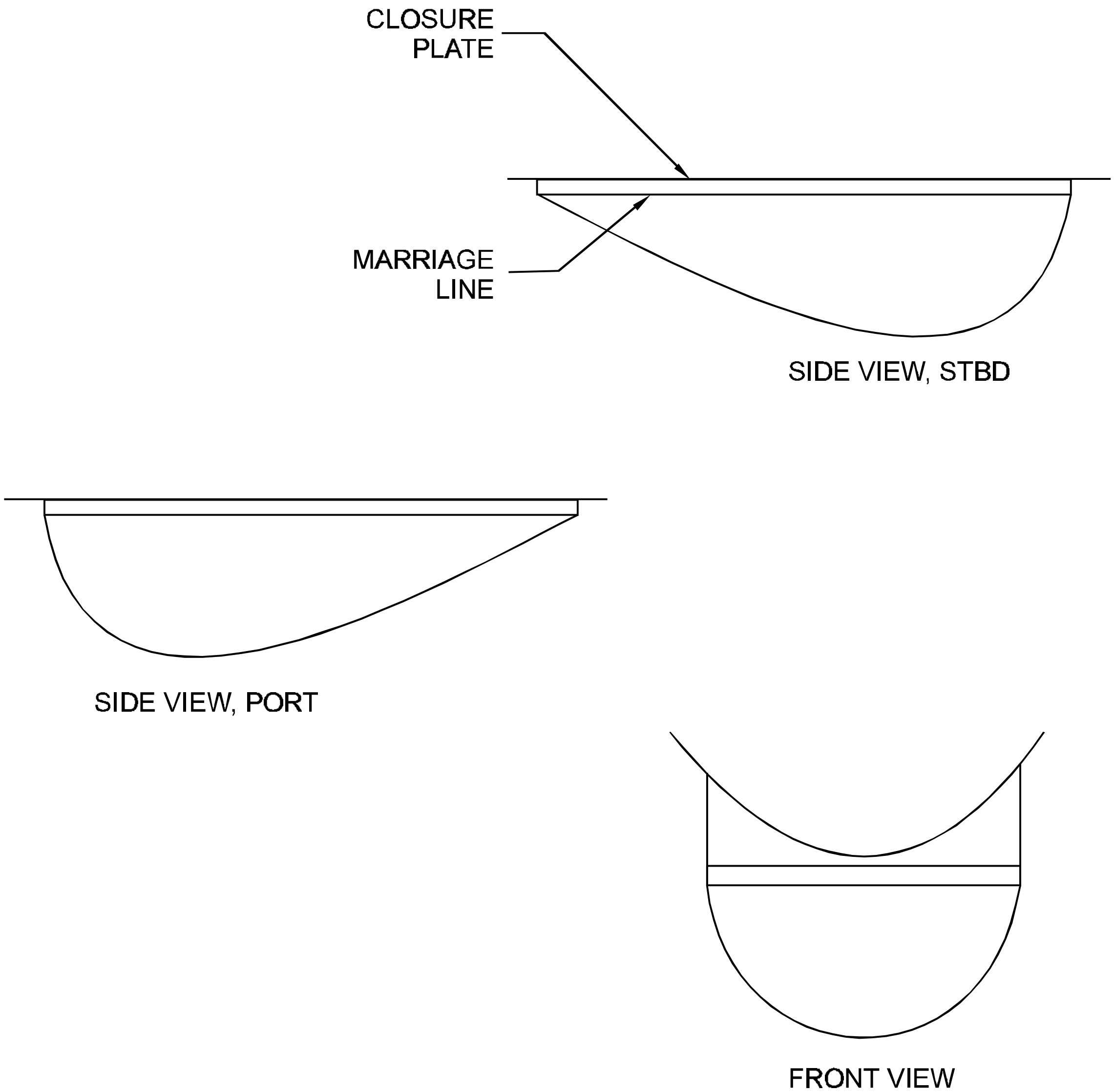


NAVSEA 4730/4 (3-88) 0116-LF-047-3025 SHEET 2 OF 2

Figure 17-5.2. Sonar Dome Rubber Window Inspection Data (sheet 2 of 2).

SONAR KEEL DOME INSPECTION DATA

USS	HULL NO.	LOCATION	DATE



CONDITION SUMMARY: ____________________

____

____

____

NAVSEA 4730/5 0116-LF-047-3030 SHEET 1 OF 1

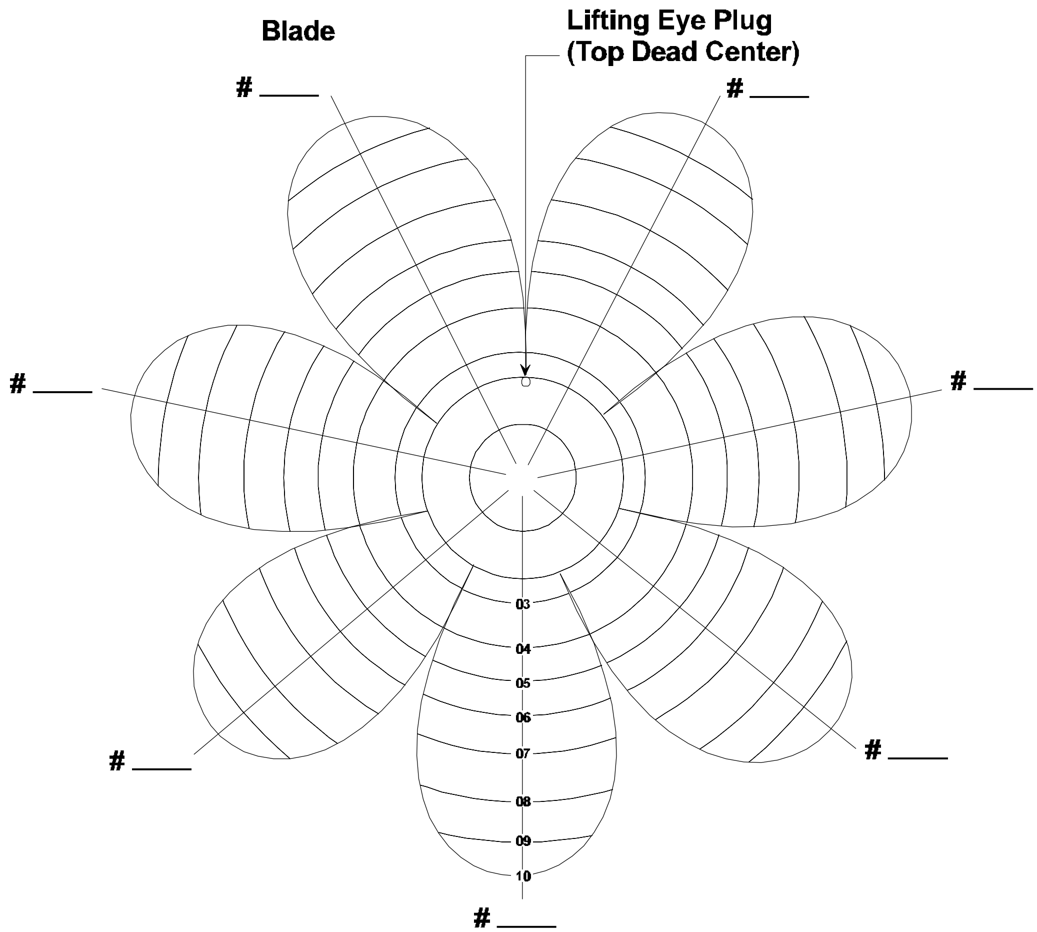
Figure 17-5.3. Sonar Keel Dome Inspection Data.

PROPELLER INSPECTION DATA

USS	HULL NO.	LOCATION	DATE

☐ PORT ☐ STBD ☐ CENTERLINE ☐ INBD ☐ OUTBD

INDICATE ALL DAMAGE ON BLADES (i.e., BENDS, CRACKS, HEAVY EROSION, etc.)



PROPELLER INSPECTION RESULTS (AVERAGE ROUGHNESS *)

BLADE NUMBER	1	2	3	4	5	6	7
PRE POLISH							
POST POLISH							

CONDITION SUMMARY: ____

____

____

____

* ALL FOULING TO BE REMOVED BEFORE ROUGHNESS READINGS OBSERVED. USE SAME LETTERS AS ON RUBERT COMPARATOR TO SHOW ROUGHNESS. AN AVERAGE OF TEN READINGS FOR EACH SIDE OF BLADE RECOMMENDED.

NOTE: BLADES ARE NUMBERED COUNTER TO THE DIRECTION OF FORWARD ROTATION WITH BLADE NUMBER ONE BEING THE BLADE ADJACENT TO THE LIFTING EYE PLUG.

NAVSEA 4730/6 0116-LF-047-3035 SHEET 1 OF 1

Figure 17-5.4. Propeller Inspection Data.

Impressed Current Cathodic Protection Inspection Data

USS	Hull No.	Location	Date

Frame Number________________ Port/STBD

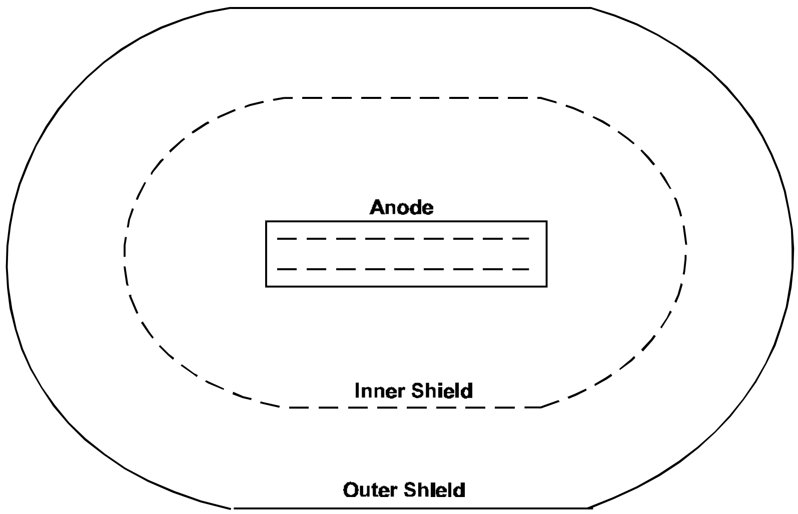
Indicate All Damage to Dielectric Shield Using Symbols:

Bare Metal

Calcareous Deposits

Cracks

Other



Condition of Wires and Insulators - Loose (L), Broken (B), Missing (M), Damaged (D):

____

____

____

Condition of Dielectric Shield:

____

____

____

Location and Condition of Reference Cells - Frame No., Damage, Fouling:

____

____

____

____

Additional Comments (Use Reverse Side if Needed):____________________

____

____

____

____

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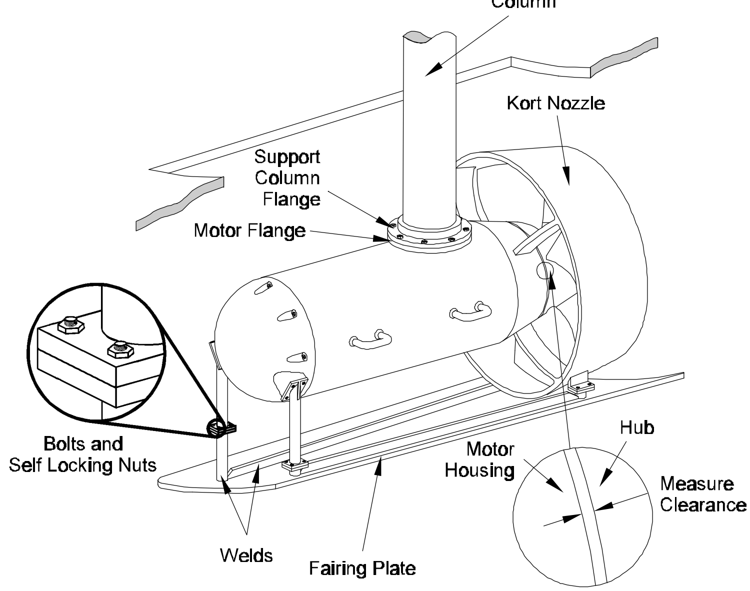
Figure 17-5.5. Impressed Current Cathodic Protection Inspection Data.

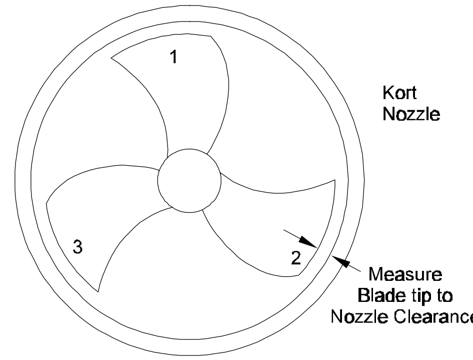
AUXILIARY PROPULSION UNIT INSPECTION DATA

USS	Hull No.	Location	Date

Indicate Appropriate Unit: ☐ Stbd ☐ Port

APU - EXTENDED





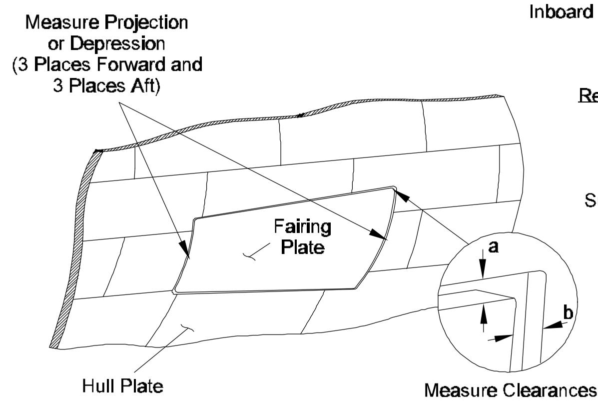
Looking Forward

Record Clearance Measurements:

	Prop Pulled Aft	- Prop Pushed Fwd	= Difference
Hub/Motor Housing			
Blade Tip / Kort Nozzle	1	2	3

	Forward			AFT		
Fairing Plate	Proj / Dep	a.	b.	Proj / Dep	a.	b.
Outboard						
Mid Point						
Inboard						

APU - RETRACTED



Record:	FR	PDR
Propeller		
Motor Housing		
Support Column		
Fairing Plate		

Condition Summary: ______________________________

____

____

____

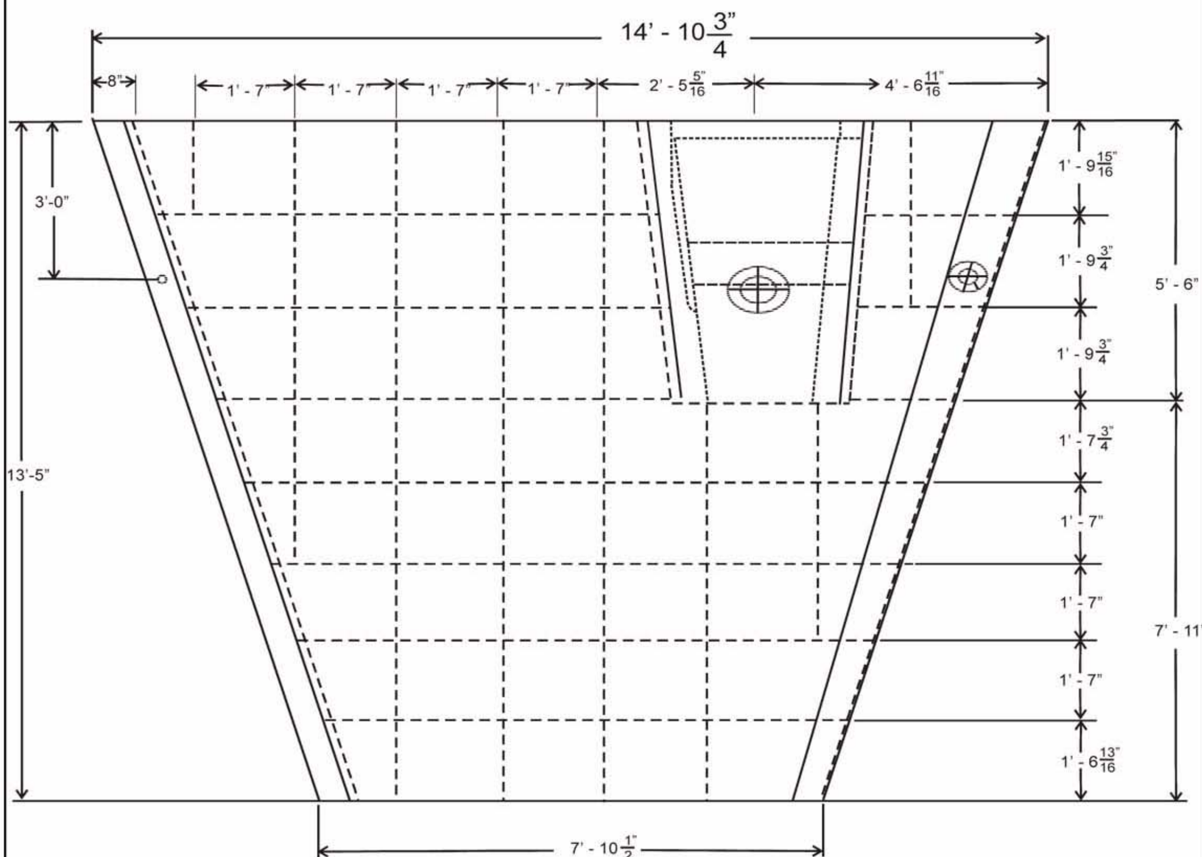
Figure 17-5.6. Auxiliary Propulsion Units Inspection Data.

DDG 51 RUDDER INSPECTION DATA

USS	Hull No.:	Location:	Date:

Indicate Appropriate View: ☐ STBD ☐ PORT ☐ INBOARD ☐ OUTBOARD

Inspect the entire surface area of the rudder for any cracks, marks, gouges, or scrapes. Pay special attention to the center region of the rudder and all weld seams. Measure and record the extent (length, width, depth), orientation, and location of all irregularities.



Condition Summary: ______________________________

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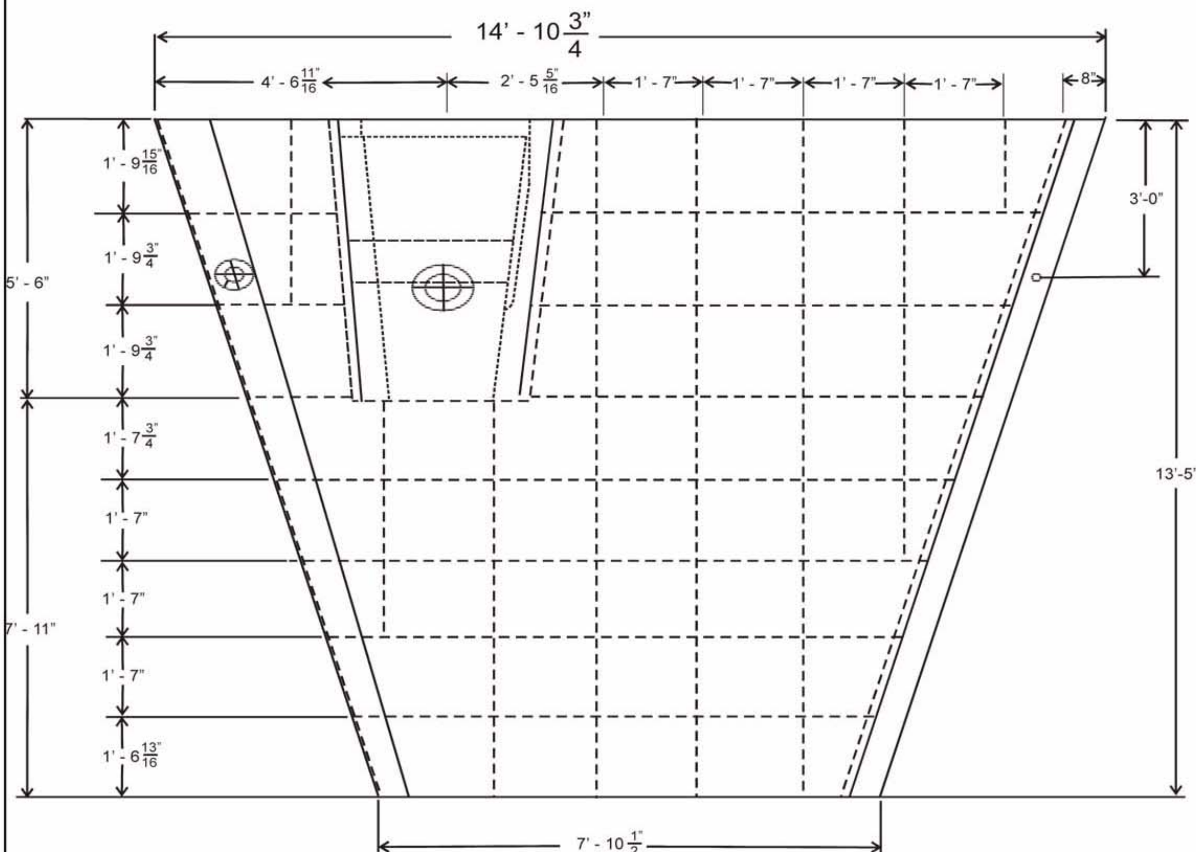
Figure 17-5.7 DDG 51 Rudder Inspection Data

DDG 51 RUDDER INSPECTION DATA

USS	Hull No.:	Location:	Date:

Indicate Appropriate View: ☐ STBD ☐ PORT ☐ INBOARD ☐ OUTBOARD

Inspect the entire surface area of the rudder for any cracks, marks, gouges, or scrapes. Pay special attention to the center region of the rudder and all weld seams. Measure and record the extent (length, width, depth), orientation, and location of all irregularities.



Condition Summary: ______________________________

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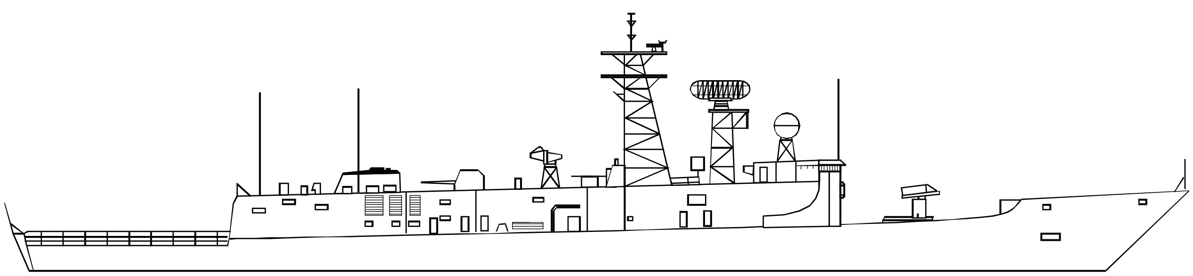
Figure 17-5.7 DDG 51 Rudder Inspection Data

UNDERWATER SHIP HUSBANDRY MANUAL

CHAPTER 17
SECTION 6

FFG 7 CLASS
UNDERWATER SHIP HUSBANDRY
INSPECTION PROCEDURES



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CHAPTER 17
UNDERWATER SHIP HUSBANDRY INSPECTION PROCEDURES

SECTION 6 FFG 7 OLIVER HAZARD PERRY CLASS GUIDED MISSILE FRIGATE

17-6.1 INTRODUCTION.

17-6.1.1 This section of the *Underwater Ship Husbandry Manual* contains inspection procedures for the FFG 7 Oliver Hazard Perry Class Guided Missile Frigates. It consists of a general introduction to the FFG 7 Class, a description of the major hull components found on this ship, a set of Level 1 inspection procedures, and a set of Level 2 inspection procedures.

17-6.1.2 Table 17-6.1 contains a general hull description of the FFG 7 Class. Table 17-6.2 (found at the end of the Level 1 inspection procedures) contains a checklist of all ship systems covered by these inspection procedures. Item numbers in this table correspond to the hull system numbers in Figure 17-6.1 and are arranged in order to facilitate a typical diver inspection of all components: stern area, port side, bow, and starboard side. Figure 17-6.1, “FFG 7 Class Plan and Profile,” and Figure 17-6.2, “FFG 7 Class Running Gear,” are located after Table 17-6.2 and provide points of reference for the procedures described in this section. These figures augment the typical ship drawings and can be used as a quick reference by diving personnel. Figure 17-6.1 is derived from NAVSEA Drawing No. PF 109-801-4670259, Rev. F, Docking Plan for the FFG 7 Oliver Hazard Perry Class Guided Missile Frigate. Figure 17-6.2 is derived from class arrangement drawings. These figures are also useful in locating the coordinates of components requiring Level 2 inspections. Figures of the individual components appear throughout the Level 2 inspection procedures.

17-6.1.3 Diving activities may photocopy Table 17-6.2 and use it to record data during inspections. Upon completion of the inspection, the results should be transferred to the standard Diver’s Underwater Hull Inspection Data Form, NAVSEA 4730/3 (NSN 0116-LF-047-3020). Figures found in the Level 2 inspection procedures section of this chapter may be photocopied and used to assist in sketching the extent of damage reported during inspections. These sheets should be attached to the Diver’s Underwater Hull Inspection Data Form upon completion of the inspection.

17-6.1.4 FFG 7 Class ships were constructed at three different shipyards, thus there may be ships within a class whose individual hull systems may not be identically located. For this reason, it is recommended that the Dive Supervisor also refer to a Docking Plan for the individual ship being inspected.

Table 17-6.1. General Hull Description.

Length between Perpendiculars:	407 feet, 10 inches
Beam:	46 feet, 11 1/2 inches
Frame Spacing:	12 inches
Rudder:	Single, spade without stool
Propeller:	Single, 5-bladed, controllable pitch
Masker Air Emitter Belts:	Frames 255, 177
Prairie Air:	Propeller and fin stabilizer
Sonar Dome:	Keel-mounted
Class Problems:	The main struts on this class ship have a history of severe corrosion. Most main struts have been repaired with clad welding, epoxy, or both. The rudder design on this class ship has the potential to drop which may lead to eventual loss of the rudder.

17-6.2 DESCRIPTION OF MAJOR HULL COMPONENTS.

17-6.2.1 Hull Coating.

17-6.2.1.1 The underwater hull coating system is applied to the hull, shaft, and appendages (i.e., rudder, struts, bearing housing, rope guard, fairwaters, rotating coupling, stern tube and skeg). The coating system is comprised of two types of coatings: an anticorrosion coating and an antifouling coating. The anticorrosion coating is applied on the majority of metal components to provide the primary protection from corrosion and deterioration of the surfaces. The antifouling coating is applied over the anticorrosion coating and is directly applied to nonmetallic components (e.g., the glass-reinforced shaft coating). The antifouling coating is designed to protect the underwater systems from biological fouling.

17-6.2.1.2 Multiple coats of anticorrosive and antifouling coatings are applied to the hull. Each coat is a different color except for the boot top area where all coats are black. Use a diver's light to help accurately identify the color of the exposed coating for both large hull areas and areas of damage. This will allow accurate assessment of the remaining life of the coating system. The hull coating system can easily become damaged from impact with underwater objects or collisions and groundings. Typical damage is minor abrasion to the antifouling coating, exposing the anticorrosion coating and permitting biological fouling. More severe abrasion of the anticorrosion coating exposing bare metal will result in corrosion and deterioration of the metal. As the age of the coating increases, the antifouling coating may become less effective in preventing biological fouling and could easily become damaged if the biological fouling is allowed to reach a destructive level. Even the smallest amount of biological fouling can drastically impact the ship's operational capabilities and could eventually destroy the anticorrosion coating system.

17-6.2.1.3 References.

a. NAVSEA S9086-CQ-STM-010/CH081, "Waterborne Underwater Hull Cleaning of Navy Ships"

b. NAVSEA S9086-VD-STM-010/CH631, "Preservation of Ships in Service"

17-6.2.2 Rudder.

17-6.2.2.1 The rudder is a rectangular, hydrodynamically shaped metal blade that is located aft of the propeller and used to steer the ship. Rudders on large ships are hollow structures that have been flushed with a preservative and then dried. The rudder on this class ship has one 1 1/2-inch copper-nickel (Cu-Ni) pipe drain plug located 30 3/4 inches from the forward edge on the bottom centerline. There are also two 1 1/2-inch fill plugs in the top: one located approximately 65 inches from the after edge, and the other approximately 24 inches from the forward edge. The rudder is supported and positioned by a rotating rudder stock. A roughly rectangular cover plate (24 1/2 inches high by 36 15/16 inches wide [top] and 35 3/16 inches wide [bottom]) covers the rudder casting at the rudder stock nut. This cover plate may be either welded or bolted in place. A fairing, called the rudder stock fairing, protects the rudder stock and seal between the top of the rudder and the hull. This fairing is welded to the hull. With the rudder amidships, approximately 3/8 inch of clearance exists between the top of the rudder and the fairing. The rudder must be shifted to port or starboard in order to inspect the rudder stock and seal assembly. Ships in this class have a spade rudder with no stool. The spade rudder is of one-piece construction. The entire rudder moves to steer the ship.

17-6.2.2.2 While underway, rudders are subject to severe loading, high flow, and turbulence, as well as to possible damage from contact with underwater objects. Previous repairs (such as clad welding or installation of doubler plates) that have been painted may cause a rough-textured surface on the rudder, making inspection for damage difficult. While inspecting the rudder surface, the primary indications of new deterioration or damage is poor or missing paint. Bare metal or corrosion damage may be present. Report any such findings.

17-6.2.2.3 As a result of impact damage, bearing wear, or improper installation, the rudder may drop down from the hull. One of the main aspects of a rudder inspection is the measurement to determine if the rudder has dropped. The ship's Engineering Officer compares the current measurements with previous measurements. A change in the measurements indicates that the rudder has dropped.

17-6.2.2.4 Location. The rudder is located 24 inches to starboard off the centerline, beginning at frame 403 and ending at frame 390.

17-6.2.2.5 References.

a. NAVSEA DWG PF 109-562-5352654, Rev. E, PF 109 Class Rudder

17-6.2.3 Lifting Fittings.

17-6.2.3.1 Lifting fittings are sections of pipe bent into a "U" shape and recessed into the hull. Lifting fittings or "lifting tunnels" provide convenient rigging attachment points for handling the rudder and propeller. There are six lifting fittings installed on this class ship, three to port and three to starboard of the rudder and propeller.

17-6.2.3.2 Location. Two lifting tunnels are located at frame 406, two at frame 392 and two at frame 382 approximately 7 feet port and starboard off the centerline of the ship.

17-6.2.3.3 References.

a. NAVSEA DWG PF 109 111-4669930 Rev. L, Shell Plating Frames and Longitudinals, Frame 369 1/2 - Stern

b. NAVSEA DWG PF 109 245-4661189, Rev. B, Propeller and Rudder Lifting Arrangements

17-6.2.4 Propeller (5-Bladed).

17-6.2.4.1 This class of ship is propelled by a controllable pitch propeller (CPP) system. A CPP system allows the ship to go from ahead to astern without changing the direction of shaft rotation. Rigid propeller blades are bolted on to hydraulically operated mounts on the propeller hub. This system positions the blades for the desired thrust, either ahead or astern. The controllable pitch propeller is bolted to the tailshaft flange.

17-6.2.4.2 The prairie air propeller blades have 302 holes of 3/64-inch diameter; 151 on the suction (forward) and 151 on the pressure (aft) sides. The holes begin 4 1/4 inches above the hub on the leading edge and continue to a point past the vertical blade center line on both the suction and pressure sides. They are evenly spaced, starting 3/4 inch from the leading edge and curving inward toward the blade tip to 1 inch from the leading edge. To function properly, these emitter holes must be free of fouling.

17-6.2.4.3 The propeller is right-hand and turns clockwise (when viewed from astern).

17-6.2.4.4 The five controllable pitch blades are lettered "A" through "E." The CPP hub does not have a lifting eye to assist in identifying blade "A." The letters are stamped on the flat surface blade hub flange near the flange edge (blade palm), outboard of the blade bolts. Blade identification may be in the form of serial numbers such as "RH8A, RH8B," etc.

17-6.2.4.5 A blade bolt identification number may be stamped adjacent to each blade bolt hole on the top surface of the flange (blade palm) of each blade. Numbering is sequential with 1 denoting the blade bolt on the suction face nearest the trailing edge and 8 denoting the blade bolt on the pressure face nearest the trailing edge.

17-6.2.4.6 Location. The propeller is located along the centerline of the ship at frame 384.

17-6.2.4.7 References.

a. NAVSEA S9086-HP-STM-010/CH245, "Propellers"

b. NAVSEA S9245-AR-TSM-010/PROP, *Technical Manual for Marine Propeller Inspection, Repair and Certification*

c. NAVSEA S0600-AA-PRO-120, *Underwater Ship Husbandry Manual*, Chapter 12, "Controllable Pitch Propellers"

d. Bird-Johnson Co. DWG 115651011, Rev. H, Propeller Blade FFG 7 Class

17-6.2.5 Bearing Housing and Struts.

17-6.2.5.1 Immediately forward of the propeller is the main strut. The main strut consists of two columns extending down from the hull forming a "V" shape that attaches to the bearing housing and supports the shaft. The struts are subjected to severe dynamic loading while the ship is underway. They are also subject to corrosion, vibration damage, and damage from rope and wire or other foreign material. At the top and bottom of the bearing housing are five evenly spaced 1/2-inch holes with pipe plugs installed. These holes are used for maintenance during dry-docking. Inspection includes a complete examination of the rope guard, strut surface, bearing housing, and fairwaters.

17-6.2.5.2 Location. The main strut and bearing housing are located immediately forward of the propeller at frame 378.

17-6.2.5.3 References.

a. NAVSHIPS DWG PF 109-161-4669944, Shaft Strut

17-6.2.6 Rope Guard.

17-6.2.6.1 Rope guards are circular plates fitted between the propeller hub and the ends of the main strut bearings. They are streamlined in shape in order to eliminate abrupt changes in water flow and they serve to protect the rotating shaft from becoming fouled by wire, rope, or other material. The design clearance between the propeller hub and the rope guard is 3/4 inch. The rope guards on ships of this class are made up of two halves constructed of steel, and are bolted to the bearing housing using twenty four 5/8-11 UNC screws secured by staking in two places. The rope guards on this class ship are equipped with 12 equally spaced 1 1/2-inch water circulation holes.

17-6.2.6.2 Location. The rope guards are located between the propeller hub and the aft ends of the main strut bearing housings at frame 382.

17-6.2.6.3 References.

a. NAVSHIPS DWG PF 109-243-5414129, Rev. G, Fairwater and Rope Guard Stepped Shaft

17-6.2.7 Fairwaters.

17-6.2.7.1 Fairwaters are circular plates fitted at the ends of the stern tube and strut bearing housing. They are shaped to streamline these parts in order to eliminate abrupt changes in water flow. The design clearance from the shaft is 1 inch. The fairwaters on ships of this class are made up of two halves constructed of steel which are bolted to the face of the bearing housing using 1 1/8-inch securing studs. The securing studs are covered by a tack-welded fairing plate and are not visible to the diver.

17-6.2.7.2 Location. The aft fairwater is located at the forward end of the main strut bearing housing at frame 373. The forward fairwater is located at the stern tube, mounted on the rotating coupling at frame 350.

17-6.2.7.3 References.

a. NAVSHIPS DWG PF 109-243-5414129, Rev. G, Fairwater and Rope Guard Stepped Shaft

17-6.2.8 Shafting.

17-6.2.8.1 The shafting transmits torque from the main engine to the propeller and axial thrust from the propeller to the hull. A glass-reinforced plastic (fiberglass) coating covers the shafting.

17-6.2.8.2 Location. The shaft extends along the centerline of the ship from the engine to the propeller. It is exposed between frames 371 and 352.

17-6.2.8.3 References.

a. NAVSEA S0600-AA-PRO-130, *Underwater Ship Husbandry Manual*, Chapter 13, "Propulsion Shaft Coating Repair"

b. NAVSHIPS DWG PF 109-243-5534450, Rev. A, Shafting Arrangement Stepped Shaft

17-6.2.9 Stern Tube.

17-6.2.9.1 The free-flood area where the shaft penetrates the hull is the stern tube. The stern tube supports the shaft as it enters the hull. It houses one or more shaft bearings. A stern tube fairing covers the shaft as it exits the skeg. The fairing is made of two halves which are bolted together and bolted to the skeg.

17-6.2.9.2 Location. The stern tube is located between frames 350 and 342.

17-6.2.9.3 References.

a. NAVSEA DWG PF 109-243-5534447, Rev A., Stern Tube Stepped Shaft

17-6.2.10 Rotating Coupling Cover.

17-6.2.10.1 Rotating couplings are covers that fit over the shaft coupling flange exiting the stern tube. The rotating coupling cover on ships of this class is made up of two steel halves which are bolted together. The bolts are covered with a tack-welded fairwater and are not visible to the diver. The design clearance from the hull fairing is 1 inch. When assembled, the rotating coupling is filled with tallow through one of two 1-inch 8 UNC plugs. The plugs are flush with the rotating coupling and are secured by staking in two places. The corners formed by the rotating coupling covers and shaft are covered with epoxy to form a seal.

17-6.2.10.2 Location. The rotating coupling cover is located at frame 350.

17-6.2.10.3 References.

a. Bird-Johnson Co. DWG 115655039, Rotating Coupling

17-6.2.11 Skeg.

17-6.2.11.1 The skeg is a long narrow vertical fin attached to the keel serving to assist keeping the ship on course. It also protects the keel, propeller, and rudder. The skeg is flushed with preservative and then drained and dried. It has one 1 7/8-inch fill hole plug located six inches forward of the upper trailing edge at frame 348, and one approximately four feet forward of the trailing edge, one foot above the bottom. The fill plugs are located on both sides, four total. There are two drain plugs on the bottom; one has a 1 7/8-inch diameter and is located 9 1/2 inches forward of frame 341 on the centerline, and the other has a 1 1/2-inch diamter and is located 7 1/4 inches aft of frame 342 on the centerline. There are two access cover plates, one on each side, bolted in place on the skeg, located just forward of the stern tube fairing.

17-6.2.11.2 Location. The skeg extends from frame 350 to 270.

17-6.2.11.3 References.

a. NAVSHIPS DWG PF 109-802-4386544, Shell Expansion and Typical Sections

17-6.2.12 Overboard Discharge.

17-6.2.12.1 Overboard discharges are round or oval openings used for discharging seawater or other fluids from the ship. Overboard discharges are not usually covered with screens or gratings.

17-6.2.12.2 Location. The overboard discharges are located in various places on the hull.

17-6.2.12.3 References.

a. NAVSEA DWG PF 109-801-4670259, Rev. F, FFG 7 Docking Plan

17-6.2.13 Sea Chests and Seawater Suction.

17-6.2.13.1 Seawater suctions are openings for bringing seawater into the ship. Multiple suctions located together at one hull opening are called sea chests. Suctions and sea chests are covered with either mesh screens, grates, or strainer bars to prevent objects or foreign material from entering.

17-6.2.13.2 Location. The seawater suctions and sea chests are located in various places on the hull.

17-6.2.13.3 References.

a. NAVSEA DWG PF 109-801-4670259, Rev. F, FFG 7 Docking Plan

b. NAVSEA DWG PF 109-163-4661229, Rev. J, Suction Sea Chests

17-6.2.14 Sacrificial Anodes (Zincs).

17-6.2.14.1 Sacrificial anodes are blocks of zinc, aluminum, or magnesium alloys, usually rectangular or annular shaped, that are placed along the bilge keel and near the stern to protect the hull and appendages from galvanic corrosion. These anodes, instead of the hull, waste away (or sacrifice) as a result of oxidation. Anodes that do not sacrifice are not functioning; if the anode is properly attached to the hull, the problem is in the anode material. Inspect these anodes for proper installation before replacing them. Spot replacement of certain anodes in some applications may be required from time to time, saving the expense of a complete replacement.

17-6.2.14.2 Areas under cathodic protection sometimes develop white deposits known as calcareous deposits. Calcareous deposits may be mistaken for deteriorated portions of the coating system. This may lead divers to report poor coating conditions. They are not indicative of hull deterioration. Because calcareous deposits form an additional protective barrier to the hull, they should not be removed. Biological fouling is not the same as calcareous deposits.

17-6.2.14.3 Location. Zincs are located at various locations along the hull from frames 410-398 centerline, 390-350 centerline, 348-338 port/starboard, 180-138 port/starboard, and 175-145 port/starboard.

17-6.2.14.4 References.

a. NSTM S9086-VF-STM-010/CH-633, Chapter 633, "Cathodic Protection"

b. NAVSEA DWG 803-921865, Rev. N, Cathodic Protection Hull Zinc Anodes

c. NAVSEA DWG PF 109-633-4661103, Rev. B, Zinc Protectors

d. NAVSEA DWG PF 109-633-5849047, Rev. —, Relocation of Zinc Protectors

17-6.2.15 Bilge Keel.

17-6.2.15.1 The bilge keel is a long narrow fin near or at the turn of the bilge in the middle portion of the ship. It decreases the magnitude of rolling of the ship. Bilge keels on ships in this class are V-shaped and are 36 inches wide. The bilge keels are hollow structures that have been flushed with a preservative and then dried. There are three 1 1/2-inch NPT fill/drain plugs on each bilge keel; two are located on the top at frames 141 and 157, and one is located on the bottom at frame 171.

17-6.2.15.2 Location. The bilge keel extends forward from frame 181 to frame 138 on the port and starboard sides.

17-6.2.15.3 References.

a. NAVSHIPS DWG PF 109-802-4386544, Shell Expansion and Typical Sections

b. NAVSEA DWG 111-5844640, Rev. —, Bilge Keel Modifications

17-6.2.16 Masker Belt.

17-6.2.16.1 Masker emitter belts are installed at the forward end and the after end of the ship's machinery spaces. They run vertically down both sides of the external hull from a point above the waterline to a termination point in the vicinity of the keel.

17-6.2.16.2 Emitter belts on this class ship are of the flat tube configuration. The flat tube configuration is a continuous length of flattened 90/10 copper-nickel (Cu-Ni) pipe epoxied into a fairing channel. The fairing channel serves to fair the flow of water over the flat tube and consists of two flat plates welded at an angle to a backing plate. The backing plate is welded to the hull. A procedure was developed for divers to replace failed belts with new belts underwater. For those belts replaced underwater, additional insulated support straps are welded to the fairing channel to hold the replacement belt in place. Where bilge keels obstruct the masker belt installation, an access is cut in the bilge keel to allow the masker belt to pass through. On each access there are six 3/8-inch 16 UNC preservative fill and drain plugs: three on the top and three on the bottom.

17-6.2.16.3 Air is supplied via a through-hull penetration to the upper end of the belt. The air is emitted through a series of 3/64-inch diameter holes drilled in a specific pattern along the underwater length of the belt.

17-6.2.16.4 A 1 1/4-inch clean-out plug is installed in the masker belt 2 1/2 inches above the keel termination support strap (a metal strap cradling the masker belt at the keel). The clean-out plug allows for removal to permit periodic flushing of the masker emitter belt system.

17-6.2.16.5 Ship's force personnel measure the flow rate to the masker belts while underway in accordance with applicable PMS procedures. This maintenance requirement determines whether or not cleaning of the system is required. Failure of the system to deliver a flow of 400-600 scfm at a pressure of 12-17 psig is indicative of failure or a requirement for cleaning. This would necessitate the inspection services of a diver.

17-6.2.16.6 Location. The FFG 7 Class ship has a total of four masker belt emitter systems, two per side. They are located port and starboard at frames 255 and 177.

17-6.2.16.7 References.

a. NAVSEA S0600-AA-PRO-050, *Underwater Ship Husbandry Manual*, Chapter 5, "Masker Emitter Belts"

b. NAVSEA DWG PF 109-551-4661044, Masker Emitter System

17-6.2.17 Fin Stabilizer.

17-6.2.17.1 Fin stabilizers are the external underwater part of an active system that counters the ship's roll by using water flow over the fins. A gyro senses rolling of the ship and generates a signal that, when transmitted to a hydraulic unit, adjusts the fins for the maximum righting effect.

17-6.2.17.2 The leading edge and fin tip are made from corrosion-resistant steel (Monel 400). The remainder of the structure is carbon steel, either in the form of a casting (fin socket) or of shaped plate. There are two 1-inch 8 UNC thread savers in the lifting eye holes on the face of each stabilizer, as well as one 3/8-inch thread saver in the oil injection point hole. The oil injection point hole is used only when hydraulically removing the fin from the shaft.

17-6.2.17.3 The air emission system consists of a series of 120 nozzles on each surface of the fin. The nozzles are hollow hexagon-head grub screws screwed into the fin nose and leading edge cavity approximately 20 degrees above and below the fin mid-plane at approximately 1-inch intervals. Air is directed down the fin shaft in a floating tube, and via a tube assembly, from the fin shaft stud to the leading edge manifold, and then to the air nozzles.

17-6.2.17.4 The fin is 1 1/4 inches from the hull. The fin shaft penetrates the hull through two rubber lip seals, a bushing, and a packing gland, none of which are visible to the diver.

17-6.2.17.5 Location. The fin stabilizers are located port and starboard at frame 193.

17-6.2.17.6 References.

a. S9565-AA-MMO-020, *Fin Stabilizer Hydro-Mechanical Equipment,* Volume II, Part One

b. S9565-AA-MMO-030, *Fin Stabilizer Hydro-Mechanical Equipment,* Volume II, Part Two

c. NAVSEA DWG PF 109-5833513, Fin Unit

d. NAVSEA DWG PF 109-5833624, Fin Assembly

17-6.2.18 Transducer.

17-6.2.18.1 Transducers are transmitting and receiving heads for various kinds of underwater acoustic signals. Transducer heads are protected by Buna-N rubber covers that are bolted to the hull. The mounting flange for the transducer has a series of 3/4-inch thread saver plugs for installation of a protective steel cover used while dry-docking the ship. This class ship has two hull-mounted transducers: the UQN-1 fathometer and the tracking pinger.

17-6.2.18.2 Location. The UQN-1 transducer is located on the starboard side at frame 138, 42 inches off centerline, eight inches above the keel. The Tracking Pinger transducer is located on the starboard side, frame 140, 49 inches off centerline, seven inches above the keel.

17-6.2.18.3 References.

a. NAVSEA SE178-AC-MMO-010, *Technical Manual for Installation, Operation, Maintenance, Repair and Parts Support, Hull-Mounted Transducers*

b. NAVSHIPS DWG PF 109-301-4671114, Rev. W, Electrical Equipment Below the Second Deck

17-6.2.19 Rodmeter (Underwater Log).

17-6.2.19.1 The rodmeter (also known as the pit sword) is the part of the underwater log that projects from the ship's hull. The underwater log is a device for measuring the ship's speed through the water. Ships of this class may have either a IC/E 28-6 or IC/E 46-6 type rodmeter. The IC/E 28-6 rodmeter is a fixed fiberglass rodmeter extending 20 inches from the hull. The IC/E 46-6 rodmeter is a fixed fiberglass rodmeter extending 39 inches from the hull. Fixed rodmeters require the services of a diver to remove them from the ship's hull or to perform preventive maintenance. When rodmeters are properly installed, the outer surface of the rodmeter hull fitting flange is flush with the hull. With fixed rodmeters, the most likely problem to be reported is the failure to receive input.

17-6.2.19.2 Location. The rodmeter is located on the starboard side, 3 feet 6 inches from the centerline, 30 inches below the keel, 10 1/4 inches forward of frame 140.

17-6.2.19.3 References.

a. NAVSEA DWG PF 109-801-4670259, Rev. F, FFG 7 Docking Plan

b. NAVSEA SE 178-AC-MMO-010, *Technical Manual for Installation, Operation, Maintenance, Repair and Parts Support, Hull Mounted Rodmeter Type IC/E 46-6*

c. NAVSEA DWG PF 109-301-4671114, Rev. W, Electrical Equipment 2nd Deck and Below General Arrangement Frame 100-140

17-6.2.20 Auxiliary Propulsion Unit (APU).

17-6.2.20.1 The auxiliary propulsion unit (APU) provides a source of power for maneuvering in confined waters and returning to port if there is a main propulsion failure. Ships in this class have two APUs. A water-lubricated, submersible electric motor drives the shrouded propeller (Kort nozzle). The motor is lowered, trained, and raised by motors driving a column that extends through the hull. A 7-foot by 4-foot fairing plate is attached to the bottom of the APU assembly. It serves to fair the flow of water over the hull when the unit is retracted.

17-6.2.20.2 Location. The auxiliary propulsion units are located port and starboard, between frames 108 and 100, 48 inches from the centerline, 10 inches above the keel.

17-6.2.20.3 References.

a. NAVSEA S0600-AA-PRO-040, *Underwater Ship Husbandry Manual,* Chapter 4, Auxiliary Propulsion Units

17-6.2.21 Keel-mounted Sonar Dome.

17-6.2.21.1 The sonar rubber dome (SRD) is a pressure-tight membrane that protects the sonar transducer array, reduces acoustic noise attenuation, and provides the proper hydrodynamic contour to minimize underway noise.

17-6.2.21.2 SRDs are constructed much like a steel-belted automobile tire: layers of rubber applied over a series of steel plies. They are normally internally pressurized with water to maintain the desired shape. A skirt plate and fairing band welded to the hull provide a smooth interface between the rubber sonar dome surface and the hull plate.

17-6.2.21.3 Some, but not all sonar domes on this class are marked with a series of grid markings to facilitate diver orientation. The grid markings consist of 2-inch circles along the periphery of the upper rubber window and fairing angle interface. Directly above each circle is a 2-inch number indicating the bearing. Divers should use these grid markings as reference points when reporting any damage or attempting to locate sources of reported noise spokes.

17-6.2.21.4 On sonar domes lacking grid markings, divers must carefully orient themselves using standard techniques when inspecting and reporting damage.

17-6.2.21.5 Location. The SRD is mounted at the keel between frames 40 and 65. It is faired to the hull with a steel skirt plate.

17-6.2.21.6 References.

a. NAVSEA S9165-AF-MMA-010, *Technical Manual for AN/SQS - 56 Sonar Rubber Dome for FFG 7 Class Vessels*

17-6.3 LEVEL 1 INSPECTION PROCEDURES.

17-6.3.1 Introduction.

17-6.3.1.1 This section contains Level 1 inspection procedures for the FFG 7 Class Frigate. The Table 17-6.2 checklist presents components in the order in which the diver would find them when making a stern area, port side, bow, and starboard side inspection dive. Note that all hull openings included on the docking plan are listed in Figure 17-6.1 and Table 17-6.2. Depending on the ship's draft at the time of the inspection, some items may be above the waterline. The Dive Supervisor can refer to Figures 17-6.1 and 17-6.2 and Table 17-6.2 (found at the end of these Level 1 procedures) to pinpoint the exact location of a particular component. These tables and figures can be photocopied and used to document the reported condition of each component. In addition, the NAVSEA diver inspection data forms for the hull, APU, keel-mounted sonar dome, and propeller should be used to record the inspection results. These forms are included in Section 5 of this chapter. Underwater color photography should also be used to further depict the damage described in the report and in the forms.

17-6.3.2 Paint and Fouling Inspection.

NOTE

To accurately report the PDR and FR, the diver must be thoroughly familiar with NSTM Chapter 081, "Waterborne Underwater Hull Cleaning of Navy Ships."

17-6.3.2.1 One of the most important aspects of a Level 1 inspection is the assessment of the Fouling Rating (FR) and the Paint Deterioration Rating (PDR). Values for the FR and the PDR may vary widely along the length of a hull.

17-6.3.2.2 The diver should continuously report the condition of the paint using standard terms such as peeling, blistered (broken or intact), and missing antifouling or anticorrosive paint. Report the color of exposed paint. A diver's light is necessary to report color accurately. Use sections of hull plate to estimate the condition of small areas: flat and curved areas of plate, edges, welds, seams, rivets, and bolt heads. The Dive Supervisor maintains a running log of the conditions and records the FR and PDR for localized areas. This enables the Dive Supervisor to keep track of the total estimate for each section of the hull. These values are then summarized, yielding the overall condition for each area: bow, stern, flat bottom, and sides. Report the docking block areas separatly from the flat bottom and sides. For docking block areas, report the average percent of block areas painted and the percent of base metal with pitting. Estimate the average diameter and depth of pitting. For a heavily fouled section of hull, only the FR can be reported since little or no hull paint will be visible.

17-6.3.2.3 This inspection procedure alerts the diver when the inspection process has been completed for each section of the hull to assist in summarizing the overall conditions.

a. Inspect and report the FR.

b. Inspect and report the PDR. Report localized areas of pitting, blisters, peeling, or missing paint.

c. Inspect and report the docking block FR and PDR.

17-6.3.3 General Hull Plate Inspection.

a. Carefully examine the hull plating. Look for areas of bare metal, bleeding rust, and large areas of pitting.

b. Inspect for holes, cracked weld seams, distorted hull plates, localized areas of pitting, corrosion, and any other apparent damage.

c. Estimate and report the extent and location of any damage; report length of cracks and average pit diameter and depth.

17-6.3.4 Lifting Fittings.

a. Inspect and report the FR.

b. Inspect and report the PDR. Report localized areas of pitting, blisters, peeling, or missing paint.

c. Inspect for cracked or corroded weld seams.

17-6.3.5 Sacrificial Anodes (Zincs).

a. Verify that anodes are secure by physically shaking them.

b. Inspect the condition of the anodes. Report the method of attachment: bolted or welded.

NOTE

Occasionally an anode may develop an oxide film that renders it inactive. Although anodes are rarely passive, this state can readily be detected by comparing the anode with others in the system. The inactive anode will usually have a hard, tenacious, dark gray or black film on the surface. Also, the anode manufacturer's identification will still be prominent on the surface.

c. Count and report all inactive anodes.

d. Estimate and report the percentage of anodes remaining.

(1) Since sacrificial anode deterioration is usually most severe at the ends of each anode line, use the center anode as a reference.

(2) Inspect an anode near the center of the anode line. If the lettering on the anode is still visible, use it as a reference to gauge wastage of the line. First, count and report the number of anodes remaining. Then, using the center reference anode, estimate the percentage of deterioration of the remaining anodes.

(3) If no lettering is visible on any of the anodes and the anode line appears severely deteriorated, inspect for straps that are either welded or bolted to the hull in the line. These straps indicate where anodes should be.

e. Report the percentage of deterioration of the remaining anodes.

17-6.3.6 Drain Plug, Inaccessible Void 5-386-0-V.

a. Verify that the plug is present and ensure that it has not backed out.

b. Inspect and report the FR and the PDR of the immediate area around the plug.

17-6.3.7 Rudder.

a. Inspect the entire rudder surface area for any cracked welds or any marks, gouges, or scrapes that indicate the rudder surfaces may have made contact with an underwater object.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

b. Inspect the area between the rudder, the rudder stock, and the hull for fouled wire, rope, or foreign material.

NOTE

The rudder design on this class ship has the potential to drop which may lead to eventual loss of the rudder.

c. Measure the rudder clearance. With the rudder amidships, at the forward edge of the rudder, take the measurements at the upper forward edge between the rudder and the hull. Design clearance measurement is 4 1/4 inches.

d. Verify that the two 1 1/2-inch fill hole plugs (upper) and the one 1 1/2-inch drain hole (lower) plug are present and have not backed out.

e. Sound the rudder by using a rubber or rawhide mallet.

(1) Rap on the surface to determine if the rudder has flooded. Begin sounding near the uppermost part of the rudder and continue downward to the lowest point.

NOTE

Internal framing and stiffeners will change the sound. It is necessary to sound the rudder in different locations. A hollow sound indicates the rudder is not flooded, while a dull sound indicates flooding.

(2) If the rudder is found to contain water, make the appropriate report and arrangements for follow-on dewatering and repair.

f. Inspect and report the FR and the PDR.

17-6.3.8 Propeller (5-Bladed).

a. Inspect the propeller hub end cover and hub cone cover plate for damage, cracks, and loose or missing fasteners.

b. Inspect the propeller hub for fouled wire, rope, or other foreign material. Fiber such as fish netting or manila line may be removed without difficulty. If removal of the material will be excessively time consuming, make the appropriate report and arrangements for follow-on removal.

c. Inspect the propeller blade root and flange areas for cracks and cavitation damage. Cavitation damage can be identified by an area of small pocked holes or a rough-textured surface.

(1) Verify that the blade bolt caps (four on each side of each blade) are in place and secure.

(2) Verify that the 1 1/4-inch thread savers (one on each side of each blade) are in place on the blade flange.

d. Inspect the overall physical appearance and FR of each blade, starting with blade “A.”

(1) Inspect the leading and trailing edges for nicks, curls, chips, dents, flat spots, cracks, or other apparent damage.

(2) Inspect the suction (forward) and pressure (aft) face of each blade for defects caused by cavitation.

(3) Inspect the prairie air channel cover plate on the blade pressure (aft) face for damage or cracked welds. Inspect both the pressure (aft) and suction (forward) face air emitter holes for fouling.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively fouled, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(4) Measure and record the extent of all damage.

(5) Inspect and report the FR of the propeller.

17-6.3.9 Rope Guard.

a. Verify that the rope guard is securely in place.

NOTE

A missing rope guard is a serious casualty.

b. Inspect all welds for corrosion, damage, or cracks.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Inspect for the presence of fouled rope, wire, or foreign material.

d. Verify that the 3/4-inch running clearance between the rope guard and propeller hub is uniform all around. Take clearance measurements at the 3, 6, 9, and 12 o'clock positions.

e. Verify the presence of the twenty-four 5/8-11 UNC fasteners. Ensure that they are staked at a minimum of two places.

f. Ensure that the 12 evenly spaced water circulation holes are clear of any foreign material.

g. Inspect and report the FR and the PDR of the rope guard.

17-6.3.10 Bearing Housing and Struts.

NOTE

The main struts on this class ship have a history of severe corrosion. Most main struts have been repaired with clad welding, epoxy, or both.

a. Inspect the bearing housing for the presence of the five top and bottom 1/2-inch plugs; ensure that they are flush and staked at a minimum of two places.

b. Inspect the strut columns for corrosion damage and the presence of wire or other foreign material.

c. Inspect the surface paint condition.

(1) At best, the surface of the struts will be very rough due to previous damage or repairs.

(2) Inspect for loose or missing epoxy.

d. Inspect the strut columns at the strut/hull interface for cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Report the FR and PDR of the strut and bearing housing.

17-6.3.11 Fairwaters.

a. Verify the presence of fairwaters.

NOTE

A missing fairwater is considered a serious casualty.

b. Verify that the 1-inch gap between the fairwater and the shaft is uniform all around. Take measurements at the 3, 6, 9, and 12 o'clock positions.

c. Inspect all welds for corrosion damage and cracks.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

d. Inspect and report the FR and the PDR of the fairwaters.

17-6.3.12 Shafting.

a. Inspect the full length of all accessible glass-reinforced plastic (fiberglass) covering.

(1) Inspect for evidence of deterioration, loss of adhesion, or any apparent physical damage. Loss of adhesion of shaft covering is characterized by one or more of the following: loss of covering (total or partial), delaminations, or bare metal.

(2) Inspect for damage such as nicks or cuts in the coating, missing covering, or loose covering. The covering may also have rust stains indicating where rust has leaked through near a cut, pinhole, area of porosity, patch, joint, or other flaw.

NOTE

Rust stains on the shaft coating indicate corrosion of the shaft. This is a serious problem.

b. If any of the above conditions exist, make the appropriate report and arrangements for follow-on Level 2 inspection.

17-6.3.13 Rotating Coupling Cover.

a. Inspect the rotating coupling cover fairing plate bolt cover welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

b. Verify the presence of the two 1-inch 8 UNC fill plugs; ensure that they are flush and staked at a minimum of two places.

c. Verify that the gap between the rotating coupling and the fairing is uniform all around. Design clearance is 1 inch. Take measurements at the 3, 6, 9, and 12 o'clock positions.

d. Inspect to verify that there is no missing epoxy between the rotating coupling and the shaft.

e. Inspect and report the FR and the PDR of the rotating coupling cover.

17-6.3.14 Stern Tube and Skeg.

a. Inspect the stern tube fairwater for missing or loose fasteners, corrosion damage, and cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

b. Inspect the skeg for damage, corrosion or cracked welds. Inspect the access cover plate fasteners, located port and starboard just forward of the stern tube fairing. Verify that the fasteners are in place and secure.

c. Inspect for loose or missing plugs. There are six fill and drain plugs on the skeg: one approximately 1 foot forward of the trailing edge near the hull (port and starboard); one approximately four feet forward of the trailing edge, one foot above the bottom edge (port and starboard); and two on the bottom centerline, one and four feet from the trailing edge.

17-6.3.15 Overboard Discharge.

a. Inspect for foreign material or corrosion damage.

b. Inspect and report the FR and the PDR.

17-6.3.16 Sea Chest and Seawater Suction.

a. Inspect screens and grates for clogged holes and loose or missing fasteners.

b. Inspect splitter bars for corrosion damage, broken or missing bars, cracked welds, and missing or loose fasteners.

c. Inspect and report the FR and the PDR.

17-6.3.17 Masker Belt.

a. Inspect for crushed, cracked, or missing masker belt.

b. Inspect for displaced masker belt, sprung from the channel.

c. Inspect for loose, missing, or excess epoxy.

d. Inspect the full length of weld between the fairing plate and the backing plate (the backing plate is the plate welded to the hull plating) and the weld between the backing plate and the hull plates for cracks. Inspect both sides.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Inspect the 3/64-inch emitter holes for fouling. Emitter holes are spaced in sections and the spacing varies in density for each section.

g. Inspect for holes in the fairing plate/welds.

h. If installed, inspect the support straps for missing insulation.

i. Inspect for a loose or missing 1 1/2-inch NPT clean-out plug located 2 1/2 inches from the keel termination support strap.

j. Inspect any previously repaired areas.

k. Inspect and report the FR and, if painted, the PDR.

17-6.3.18 Fin Stabilizer.

a. Inspect the area between the fin and hull for foreign material or damage.

b. Verify that the four 1-inch and one 3/8-inch nylon thread savers (both sides, ten total) are present and have not backed out.

c. Inspect the nozzles on the fin nose and leading edge cavity for damage, fouling, or blockage. Inspect for a loose or missing air channel clean-out plug.

d. Inspect and report the FR and the PDR.

17-6.3.19 Bilge Keel with Sacrificial Anodes.

a. Inspect the bilge keel for dents, cracks, curled edges, missing plate, or other apparent damage.

b. Inspect for foreign material and loose or missing plugs. There are three plugs on each bilge keel. Two 1 1/2-inch diameter plugs are located on top at frames 141 and 157. One 1 1/2-inch diameter plug is located on the bottom at frame 171.

c. Measure and record the location of any damage.

d. Inspect the sacrificial anodes located above, below, or directly on the bilge keel.

(1) Verify that the anodes are secure by physically shaking them.

(2) Inspect the condition of the anodes and report the method of attachment: bolted or welded.

NOTE

Occasionally an anode may develop an oxide film that renders it inactive. Although anodes are rarely passive, this state can readily be detected by comparing the anode with others in the system. The inactive anode will usually have a hard, tenacious, dark gray or black film on the surface. Also, the anode manufacturer's identification will still be prominent on the surface.

(3) Count and report all inactive anodes.

(4) Estimate and report the percentage of anodes remaining.

(a) Since sacrificial anode deterioration is usually most severe at the ends of each anode line, use the center anode as a reference.

(b) Inspect an anode near the center of the anode line. If the lettering on the anode is still visible, use it as a reference to gauge wastage of the line. First count and report the number of anodes remaining. Then, using the center reference anode, estimate the percentage of deterioration of the remaining anodes.

(c) If no lettering is visible on any of the anodes and the anode line appears severely deteriorated, inspect for straps that are either welded or bolted to the hull in the line. These straps indicate where anodes should be.

(5) Report the number of missing anodes and estimate the percentage of deterioration of the remaining anodes.

e. Inspect and report the FR and the PDR.

17-6.3.20 Transducer (Tracking Pinger).

a. Inspect sensor covers for tears, gouges, or delaminations.

b. Inspect the evenly spaced 3/4-inch thread savers around the perimeter of the sensor flange; ensure that they are flush and have not backed out.

c. Inspect for loose or missing fasteners and loose or missing fairing compound.

d. Inspect for signs of structural failure or damage caused by contact with underwater objects.

e. Inspect and report the FR.

17-6.3.21 Transducer (UQN-1).

a. Inspect sensor covers for tears, gouges, or delaminations.

b. Inspect the equally spaced 10 UNC plugs around the perimeter of the sensor flange; ensure that they are flush and have not backed out.

c. Inspect for loose or missing fasteners and loose or missing fairing compound.

d. Inspect for signs of structural failure or damage caused by contact with underwater objects.

e. Inspect and report the FR.

17-6.3.22 Rodmeter.

a. Inspect for the presence of foreign material and for damage or structural failure.

b. Verify that the angle of protrusion is perpendicular to the mounting flange.

c. Gently shake the rodmeter to verify that it is secure.

d. Inspect and report the FR.

17-6.3.23 Auxiliary Propulsion Unit (Closure Plate).

a. Verify that the gap between the hull opening and the fairing plate is uniform all around. The allowable gap around the perimeter is 1 inch ± 1/4 inch.

b. Inspect the fairness of the APU fairing plate with the outer shell plating. Measure and record the projection and depression of the forward and after edges of the fairing. Take a minimum of three readings (port, center, and starboard) on each edge.

(1) The forward edge of the plate should be flush (or recessed no more than 1/4 inch) from the surface of the outer shell plating.

(2) The after edge should be flush (or protruding no more 1/4 inch) from the surface of the outer shell plating.

c. Inspect and report the FR and the PDR of the fairing plate and the surrounding hull plate.

17-6.3.24 Keel-mounted Sonar Dome (Sonar Rubber Dome).

WARNING

Divers must exercise care when touching a dome with steel wires exposed.

WARNING

Avoid direct bare skin contact with NOFOUL rubber surfaces. Avoid contact between hands and eyes if hands have been exposed to the NOFOUL rubber material. Wash hands thoroughly before eating, drinking, or smoking.

a. Inspect the entire surface of the sonar dome using a latitudinal inspection pattern. Survey a swath approximately 3 feet wide on each pass until complete.

b. Inspect the rubber dome surface condition and the steel interface with the hull.

(1) Inspect and report the FR of the dome. The rubber surface of the dome is made of NOFOUL rubber. However, the antifouling properties of the dome may become ineffective as the dome ages or from over-spray of paint while in dry dock. Fouling degrades the performance of the sonar.

(2) Inspect for exposed wires, cuts, pits, gouges, bulges, soft spots, and any previous repairs that may have become faulty or deteriorated.

c. Inspect the fairing band along the upper perimeter of the dome for cracked welds or separation from the dome.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

d. Inspect the hull/sonar dome skirt plate interface for cracked welds or structural damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Report all discrepancies. NAVSEA Form 4730/5 can be used to illustrate the location and extent of damage.

NOTE

Rubber damage with exposed wires, cracked welds or structural damage are severe conditions.

17-6.3.25 Drain Plug, Hull Void.

a. Verify that the plug is present and ensure that it has not backed out.

b. Inspect and report the FR and PDR of the immediate area around the plug.

Name of Ship ____________________
Inspection Activity ____________________
Inspection Location ____________________
Inspection Date ____________________
Type of Inspection (Level 1 or Level 2) ____________________

Table 17-6.2. Checklist of Major Hull Components. (sheet 1 of 5)
(Item Numbers Correspond to Numbers on Figure 17-6.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size ** = Sea Chests with 6″ x 4″ angle baffles	Conditions Found
1		Stern Area Paint and Fouling		Frame 329-410		
2		Stern Area Hull Plate		Frame 329-410		
3	16	Overboard Discharge	Main and Secondary Drain and Ballast	Frame 375 Stbd, 16′ 11″ off CL *	2 5/8″ dia.	
4	54	Overboard Discharge	Flushing Pressure Release	Frame 363 Port, 18′ 6″ off CL *	1″ dia	
5		Lifting Fittings (3 Port, 3 Stbd)	Rudder and Propeller	Frame 406, 392, 382		
6		Sacrificial Anodes, Hull Mounted	Stern and Rudder	Frame 410-398 CL		
7	44	Plug (Drain)	Inaccessible Void 5-386-0-V	Frame 401 Stbd, 1′ off CL	2″ dia	
8		Sacrificial Anodes, Hull Mounted	Running Gear	Frame 390-350		
9	43	Plug (Drain)		Frame 386 Stbd, 1′ off CL	1 7/8″ dia	
10		Rudder		Frame 403-390 Stbd, 2′ off CL		
10.a		Rudder Drop Measurement				
10.b		Paint and Fouling				
10.c		Plating, Welds, Cover Plate				
10.d		Plugs - 2 Upper, 1 Lower				
10.e		Sound Rudder				
11		Propeller, CP, 5-Bladed		Frame 384 CL	16′ 6″ dia	
11.a		Hub				
11.b		Blades				
11.b.1		Blade Bolt Caps and Thread Savers				
11.b.2		Blade FR and Damage				
11.b.3		Prairie Air Channels				
12		Shaft Bearing Housing and Struts				
12.a		Rope Guard				

Name of Ship
Inspection Activity
Inspection Location
Inspection Date
Type of Inspection (Level 1 or Level 2)

Table 17-6.2. Checklist of Major Hull Components. (sheet 2 of 5)
(Item Numbers Correspond to Numbers on Figure 17-6.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size ** = Sea Chests with 6″ x 4″ angle baffles	Conditions Found
12.b		Bearing Housing				
12.c		Struts				
12.d		Fairwater				
13		Shaft				
14		Rotating Coupling Cover				
15		Stern Tube and Skeg				
15.a		Skeg Sacrificial Anodes		Frame 348-338 Port/Stbd		
15.b	42	Plug, Skeg Fill Fitting		Frame 348 Stbd, 7″ off CL		
15.c	45	Plug, Skeg Drain		Frame 343 CL		
15.d	41	Plug, Skeg Drain		Frame 340 CL		
Note: This completes the stern area for reporting FR and PDR values. Transom to frame 329.						
16		Port Side Paint and Fouling		Frame 328-93		
17		Port Side Hull Plate		Frame 328-93		
17.a		Port Side Docking Block Areas (Include Keel Block Areas), FR and PDR				
18	50	Overboard Discharge	Air Compressors	Frame 323 Port, 20′ 4″ off CL *	2″ dia	
19	31	Overboard Discharge	Diesel Seawater Circulating and Air Compressors	Frame 319 Port, 19′ 2″ off CL *	5″ dia	
20	30	Overboard Discharge	Distilling Plant Cooling Water	Frame 313 Port, 20′ 11″ off CL *	6 1/8″ dia	
21	14	Sea Chest	Auxiliary Machinery Room #3 (Frame 305-308)	Frame 306 Port, 3′ 2″ off CL	33 1/2″ x 19″ **	
22	13	Sea Chest	Auxiliary Machinery Room #3 (Frame 297-300)	Frame 298 Port, 3′ 3″ off CL	27 1/2″ x 22 5/8″ **	
23	17	Overboard Discharge	Prairie/Fin Stabilizer Air Cooler	Frame 268 Port, 18′ 3″ off CL	4 1/8″ dia	
24	8	Overboard Discharge	Eductor Main Drainage System	Frame 255 Port, 21′ 8″ off CL	5 1/16″ dia	
25	26	Overboard Discharge	Seawater Circulating Sea Chest Vent	Frame 252 Port, 22′ 9″ off CL *	2 5/8″ dia	
26		Masker Belt		Frame 254		
27	7	Sea Chest	Engine Room (Frame 253-250)	Frame 250 Port, 8′ 4″ off CL	33 1/2″ x 29″ **	
28	5	Sea Chest	Auxiliary Machine Room #2 (Frame 233-236)	Frame 236 Port, 8′ 6″ off CL	33 1/2″ x 27″ **	

Name of Ship
Inspection Activity
Inspection Location
Inspection Date
Type of Inspection (Level 1 or Level 2)

Table 17-6.2. Checklist of Major Hull Components. **(sheet 3 of 5)**
(Item Numbers Correspond to Numbers on Figure 17-6.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size ** = Sea Chests with 6″ x 4″ angle baffles	Conditions Found
29	25	Overboard Discharge	Diesel Seawater Circulating and Air Compressor	Frame 218 Port, 22′ 3″ off CL	6 1/8″ dia	
30	3	Overboard Discharge	Eductor Main Drainage System	Frame 214 Port, 20′ off CL	5 1/8″ dia	
31	23	Overboard Discharge	Seawater Cooling	Frame 204 Port, 19′ 11″ off CL	3 1/8″ dia	
32	24	Overboard Discharge	Eductor	Frame 203 Port, 18′ 6″ off CL	5 1/8″ dia	
33		Fin Stabilizer		Frame 193 Port, 20′ 11″ off CL		
34	15	Sea Chest	Auxiliary Machinery Room #1 (Frame 188-186)	Frame 187 Port, 6′ 2″ off CL	23 7/8″ x 27″ **	
35	22	Overboard Discharge	Diesel Seawater Circulating	Frame 182 Port, 18′ 2″ off CL	5 1/8″ dia	
36	21	Overboard Discharge	Seawater Circulating Sea Chest Valve	Frame 185 Port, 22′ 2″ off CL *	2 5/8″ dia	
37		Masker Belt		Frame 176 Port		
38	32	Overboard Discharge	Oily Water Separators	Frame 173 Port, 19′ 1″ off CL	2″ dia	
39		Bilge Keel		Frame 138-181 Port		
39.a		Sacrificial Anodes				
39.b	18	Plug	Drain Bilge Keel	Frame 171 Port	1 1/2″ dia	
39.c	40	Plug	Vent Bilge Keel	Frame 157 Port	1 1/2″ dia	
39.d	39	Plug	Fill Bilge Keel	Frame 141 Port	1 1/2″ dia	
40	28	Closure Plate	Auxiliary Propulsion Unit (APU)	Frame 107-100 Port, 4′ off CL	7′ 1″ x 4′ 1″	
41	49	Overboard Discharge	Seawater Cooling from Air Conditioning Condenser	Frame 98 Port, 16′ off CL *	4″ dia	
42	48	Overboard Discharge	Eductor Main and Secondary Drainage	Frame 97 Port, 16′ 4″ off CL *	4″ dia	
Note: This completes the port side for reporting FR and PDR values. Frames 329 to 93.						
43		Bow Paint and Fouling		Frame 93 and Forward		
44		Bow Hull Plate		Frame 93 and Forward		
44.a		Bow Docking Block Areas (Keel Block), FR and PDR		Frame 93-65		
45	53	Overboard Discharge	Seawater Cooling from Air Conditioning Condenser	Frame 89 Port, 14′ 2″ off CL *	4″ dia	
46	47	Overboard Discharge	Eductor Main and Secondary Drainage	Frame 51 Stbd, 9′ 9″ off CL *	6″ dia	

Name of Ship
Inspection Activity
Inspection Location
Inspection Date
Type of Inspection (Level 1 or Level 2)

Table 17-6.2. Checklist of Major Hull Components. (sheet 4 of 5)
(Item Numbers Correspond to Numbers on Figure 17-6.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size ** = Sea Chests with 6″ x 4″ angle baffles	Conditions Found
47	51	Overboard Discharge	Seawater Cooling	Frame 49 Stbd, 8′ 8″ off CL	2″ dia	
48		Sonar Dome		Frame 65-40 CL		
48.a		Fairing Plate		Frame 65-40 CL		
48.b		Sonar Rubber Dome (SRD)		Frame 65-40 CL		
49	38	Plug, Drain	Hull Void	Frame 32 Port, 9″ off CL	1 3/4″ dia	
Note: This completes the bow area for reporting FR and PDR values. Frame 93 and forward.						
50		Starboard Side Paint and Fouling		Frame 328-93		
51		Starboard Side Hull Plate		Frame 328-93		
51.a		Starboard Side Docking Block Areas (Report Side Blocks Only), FR and PDR				
52	28	Closure Plate	Auxiliary Propulsion Unit (APU)	Frame 107-100 Stbd, 4′ off CL	7′ 1″ x 4′ 1″	
53	35	Rodmeter		Frame 139 Stbd, 3′ 6″ off CL	6″ dia	
54	29	Transducer	UQN-1	Frame 138 Stbd, 3′ 6″ off CL	19″ dia	
55	37	Transducer	Tracking Pinger	Frame 140 Stbd, 4′ 1″ off CL	4″ dia	
56		Bilge Keel		Frame 138-181 Stbd		
56.a		Sacrificial Anodes				
56.b	18	Plug	Fill Bilge Keel	Frame 141 Stbd	1 1/2″ dia	
56.c	40	Plug	Vent Bilge Keel	Frame 157 Stbd	1 1/2″ dia	
56.d	39	Plug	Drain Bilge Keel	Frame 171 Stbd	4 1/2″ dia	
57	34	Overboard Discharge	Electronic Cooling Water	Frame 157 Stbd, 21′ 4″ off CL *	3 1/8″ dia	
58	20	Overboard Discharge	Laundry Steam Drain	Frame 167 Stbd, 18′ 9″ off CL	3″ dia	
59	19	Overboard Discharge	Boiler Blow	Frame 160 Stbd, 14′ 6″ off CL	1 3/8″ dia	
60	1	Sea Chest	Fire Pump #1 (Frame 172-175)	Frame 172 Stbd, 8′ 6″ off CL	33 1/4″ x 27″	
61		Masker Belt		Frame 176 Stbd		
62		Fin Stabilizer		Frame 193 Stbd, 20′ 11″ off CL		
63	2	Overboard Discharge	Drainage	Frame 218 Stbd, 18′ 4″ off CL	3 1/8″ dia	

Name of Ship ____________________
Inspection Activity ____________________
Inspection Location ____________________
Inspection Date ____________________
Type of Inspection (Level 1 or Level 2) ____________________

Table 17-6.2. Checklist of Major Hull Components. (sheet 5 of 5)
(Item Numbers Correspond to Numbers on Figure 17-6.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size ** = Sea Chests with 6″ x 4″ angle baffles	Conditions Found
64	4	Overboard Discharge	Diesel Seawater Circulating	Frame 234 Stbd, 22′ 1″ off CL	5″ dia	
65	6	Sea Chest	Auxiliary Machine Room #2 (Frame 233-236)	Frame 236 Stbd, 8′ 6″ off CL	33 1/2″ x 27″ **	
66	11	Sea Chest	Engine Room (Frame 253-250)	Frame 250 Stbd, 8′ 5″ off CL	33 1/2″ x 28 7/8″ **	
67	26	Overboard Discharge	Seawater Circulating Sea Chest Vent	Frame 252 Stbd, 22′ 8″ off CL	2 5/8″ dia	
68		Masker Belt		Frame 254 Stbd		
69	27	Overboard Discharge	Start Air Cooler	Frame 265 Stbd, 21′ 4″ off CL *	3 1/8″ dia	
70	46	Overboard Discharge	Electronic Cooling Water	Frame 265 Stbd, 21′ 4″ off CL	2″ dia	
71	9	Overboard Discharge	Main Lube Oil Cooler Seawater Circulating	Frame 269 Stbd, 21′ 4″ off CL	6″ dia	
72	10	Overboard Discharge	Eductor Main Drainage System	Frame 293 Stbd, 17′ 1″ off CL	5″ dia	
73	33	Overboard Discharge	Waste and Oily Waste	Frame 301 Stbd, 19′ 9″ off CL	2 3/8″ dia	
74	12	Sea Chest	Auxiliary Machinery Room #3 (Frame 304-308)	Frame 306 Stbd, 3′ 1″ off CL	45 3/4″ x 18 7/8″ **	
75	36	Overboard Discharge	Brine from Distilling Plant	Frame 303 Stbd, 21′ 3″ off CL *	4″ dia	
76	52	Overboard Discharge	Brine from Distilling Plant #2	Frame 308 Stbd, 21′ 6″ off CL	3″ dia	
Note: This completes the starboard side for reporting FR and PDR values. Frame 93 to frame 329.						

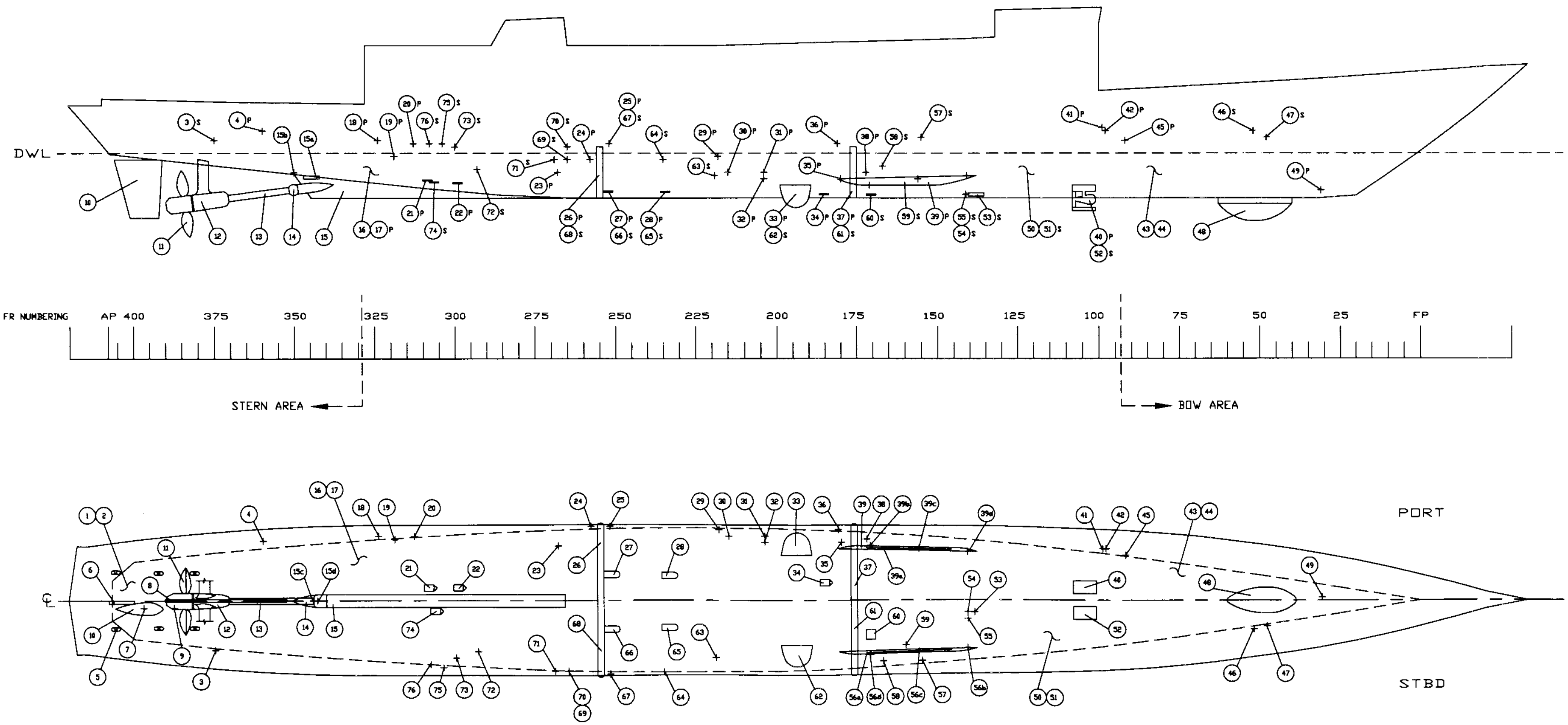


Figure 17-6.1 FFG 7 Class Plan and Profile.

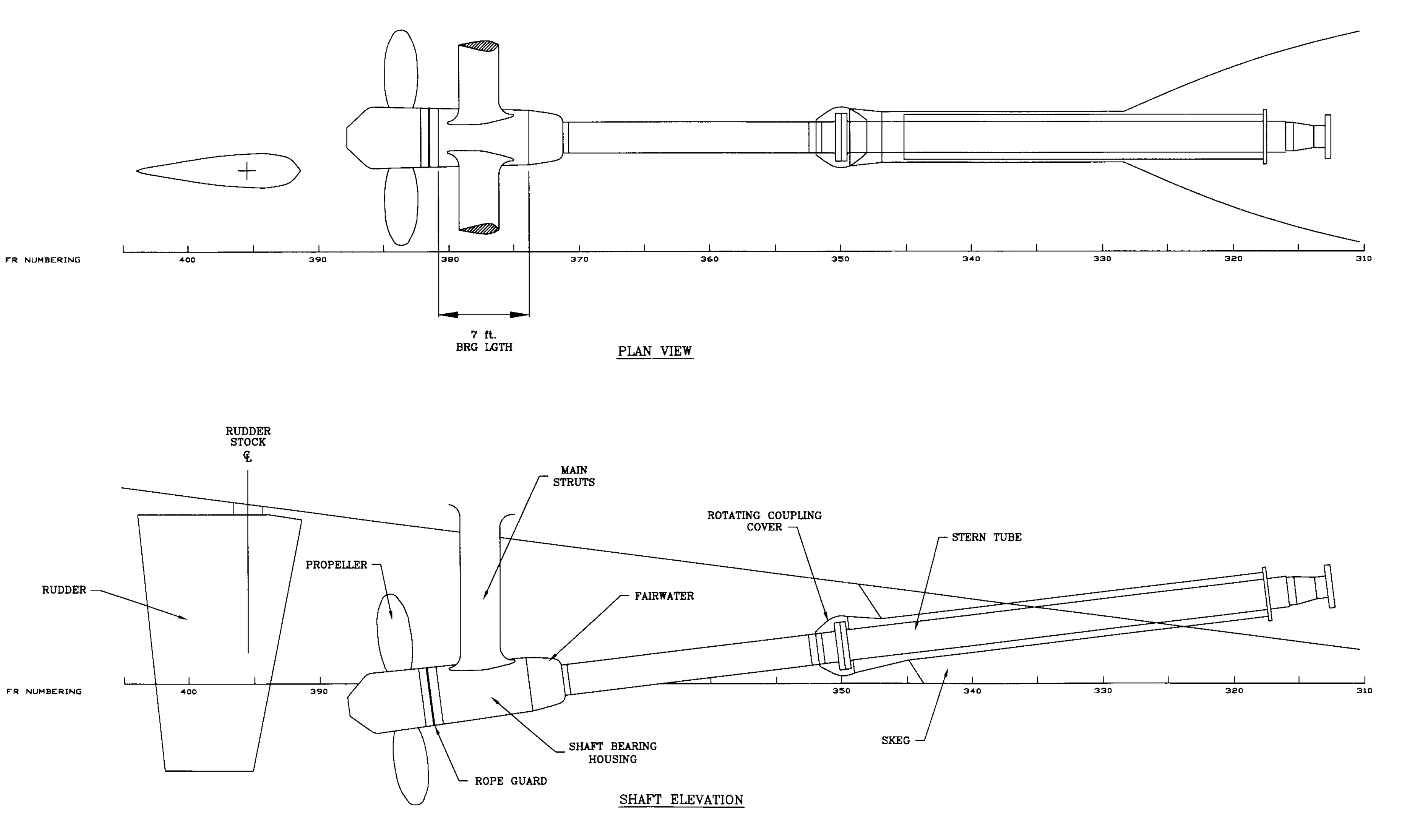


Figure 17-6.2 FFG 7 Class Running Gear.

17-6.4 LEVEL 2 INSPECTION PROCEDURES.

17-6.4.1 Introduction.

17-6.4.1.1 This section contains Level 2 inspection procedures for the FFG 7 Class Guided Missile Frigate. The procedures are presented in the order in which the diver would find the components when making a stern-to-stem swim. The Dive Supervisor can refer back to Table 17-6.2 to pinpoint the exact location of a particular component.

17-6.4.1.2 The purpose of a Level 2 inspection is to conduct a detailed inspection of the malfunctioning or damaged component. The diver must gather sufficient information for further evaluation. For this reason, the diver must make precise measurements and record the exact coordinates of any discrepancies which require further repair. The drawings in this chapter can be photocopied and marked to show the location and extent of damage. The diver can also refer to the appropriate forms for recording damage on certain types of systems. Underwater color video and/or photography should also be used to further depict the damage described on the report and on the forms.

17-6.4.2 Hull Coating And Hull Plate.

17-6.4.2.1 The purpose of a Level 2 hull coating and hull plate inspection is to accurately assess the extent of known or suspected damage resulting from collision, grounding, or other mishap. The inspection requires a detailed description (with measurements) of the exact location and extent of all damage.

17-6.4.2.2 Damage Description Requirements.

17-6.4.2.2.1 Report all areas, size, and location of paint damage, areas of exposed metal, and condition of surrounding paint. Use definable reference points such as suctions, discharges, bilge keel, flat bottom, turn of the bilge, etc.

17-6.4.2.2.2 Hull plate damage must be detailed in terms of the amount of distortion, orientation, and size, length and maximum width of cracks or gouges; proximity and orientation of closest weld seams; torn or missing plate; and condition of exposed stiffeners and framing.

17-6.4.2.2.3 Damage at or near the keel must include a detailed inspection of the keel. Locate and measure any cracks or distortion.

17-6.4.2.2.4 Example of Report. "10-foot by 35-foot damaged area running fore and aft, 15 feet outboard port of the keel beginning 38 feet aft of the rodmeter. Damage begins with an area of scraped paint, approximately 10 feet long, and continues to a maximum plate distortion of four inches by six feet wide by 20 feet long, 50 percent bare metal, no visible hull plate cracks, no suctions or discharges are located in the damaged area."

17-6.4.2.3 Inspection Procedure.

17-6.4.2.3.1 Gross Damage Assessment.

a. Conduct a quick inspection of the damaged area and immediate surrounding area.

   (1) Inspect the condition of the hull paint and locate the closest hull appendages and openings.

   (2) If only paint damage has occurred, report the size and location; if distorted, gouged, or cracked metal is found, continue with the detailed inspection.

   (3) Measure extent of pitting: percent, diameter, and depth.

17-6.4.2.3.2 Detailed Damage Inspection.

a. Thoroughly inspect all damaged areas: length, width, and orientation of all cracks, area of distorted or missing hull plate, maximum depression of plate, presence of torn or bulging plate.

b. If hull plate is torn or missing, report condition of all exposed framing.

NOTE

Damage at or near the keel is a serious casualty. Exact details of the condition are required to determine the seaworthiness of the hull.

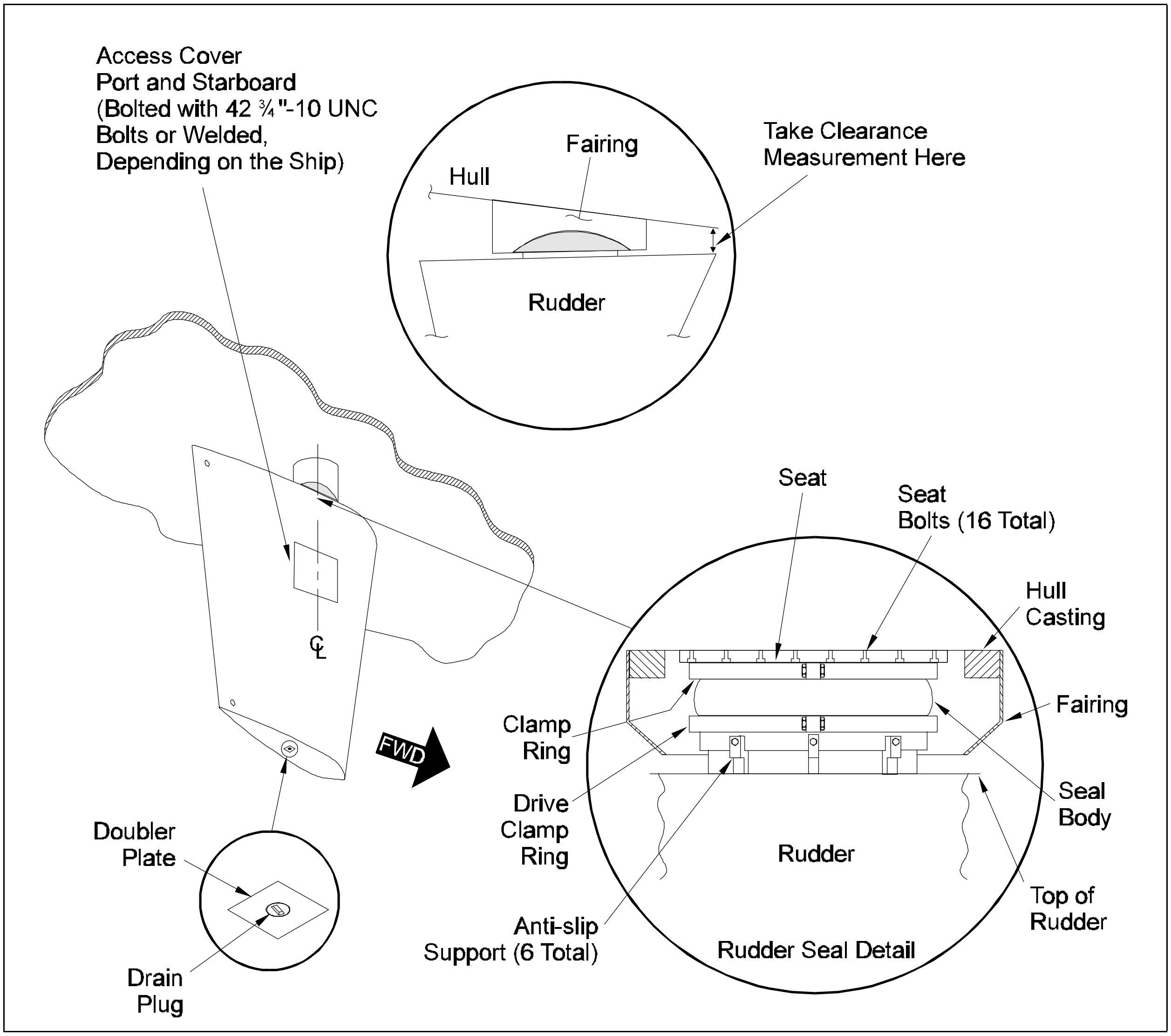


Figure 17-6.3. Spade Rudder with Rudder Post Fairing.

17-6.4.3 Rudder.

17-6.4.3.1 Damage Description Requirements.

17-6.4.3.1.1 Inspection of rudders requires a detailed description (with measurements) of the exact location and size of all corrosion, damage, and flaws. As a minimum, the description must include:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference point (top/bottom/side/leading edge).

b. Length, maximum width, and orientation of all cracks; give closest weld seam information, include the direction of the crack with respect to the weld (perpendicular or parallel) and the proximity of the crack to the weld (center of weld, base metal). If cracks are found in or near any clad welding, describe the location with respect to the cladding (center, edge, parallel to weld bead, etc.).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage.

e. PDR and FR.

17-6.4.3.1.2 Example of Report. “Pitting on leading edge of rudder, inboard side, starting 30 inches from forward bottom, 6-inch by 8-inch area. Maximum pit depth: 1/8-inch depth by 1/4-inch diameter. Average pit depth: 1/8-inch depth by 1/4-inch diameter.”

17-6.4.3.2 Inspection Procedure. See Figure 17-6.3.

a. Inspect the rudder stock area.

(1) Inspect the area between the rudder, rudder post fairing, and around the rudder stock for fouled wire, rope, or other foreign material.

b. Measure the rudder clearance.

(1) With the rudder amidships take the clearance measurement between the top of the rudder (at the forward most point of the rudder) and the hull. Design clearance measurement is 4 1/4 inches.

(2) Verify that the two fill plugs on top of the rudder are present and secure.

c. Inspect the rudder stock seal assembly.

NOTE

The rudder must be cycled to either port or starboard to provide access to rudder stock seal assembly.

(1) Inspect for biological fouling. If fouled, clean with a wire brush.

(2) Inspect the upper and lower clamp rings. Inspect for loose or missing fasteners. Ensure that both clamp rings are secure.

(3) Inspect the sixteen 7/8-inch seat mounting bolts. Ensure that all are in place and secure.

(4) Inspect the seal body for damage, cracks, tears, or splits.

(5) Inspect the six anti-slip supports and fasteners. Ensure that all are in place and secure.

d. Inspect the rudder surface.

(1) Determine the overall FR of the rudder. If the rudder FR is 40 or greater, inspect for clean areas which indicate areas of recent damage from grounding or contact with submerged objects. If any such areas are found, thoroughly inspect for cracks, dents, or gouges.

(2) Conduct a detailed inspection of the rudder surface for any cracked welds, marks, gouges, or scrapes. Inspect for areas of bleeding rust and bare metal.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(3) Some rudders on this class have cover plates bolted in place. Inspect the cover plate to ensure it is secure and that the forty-two 3/4-10 UNC bolts are secure.

(4) Verify that the drain plug on the bottom of the rudder is present and secure.

(5) Report the FR and the PDR.

e. Sound the rudder.

(1) Using a rubber or rawhide mallet, rap on the surface to determine if the rudder has flooded. Begin sounding near the uppermost part of the rudder and continue downward to the lowest point.

NOTE

Internal framing and stiffeners will change the sound. It is necessary to sound the rudder in different locations. A hollow sound indicates the rudder is not flooded, while a dull sound indicates flooding.

(2) If the rudder is found to contain water, conduct a detailed inspection to locate the source of flooding. Inspect all plugs for tightness and inspect weld seams for cracks. Make the appropriate report and arrangements for follow-on dewatering and repair.

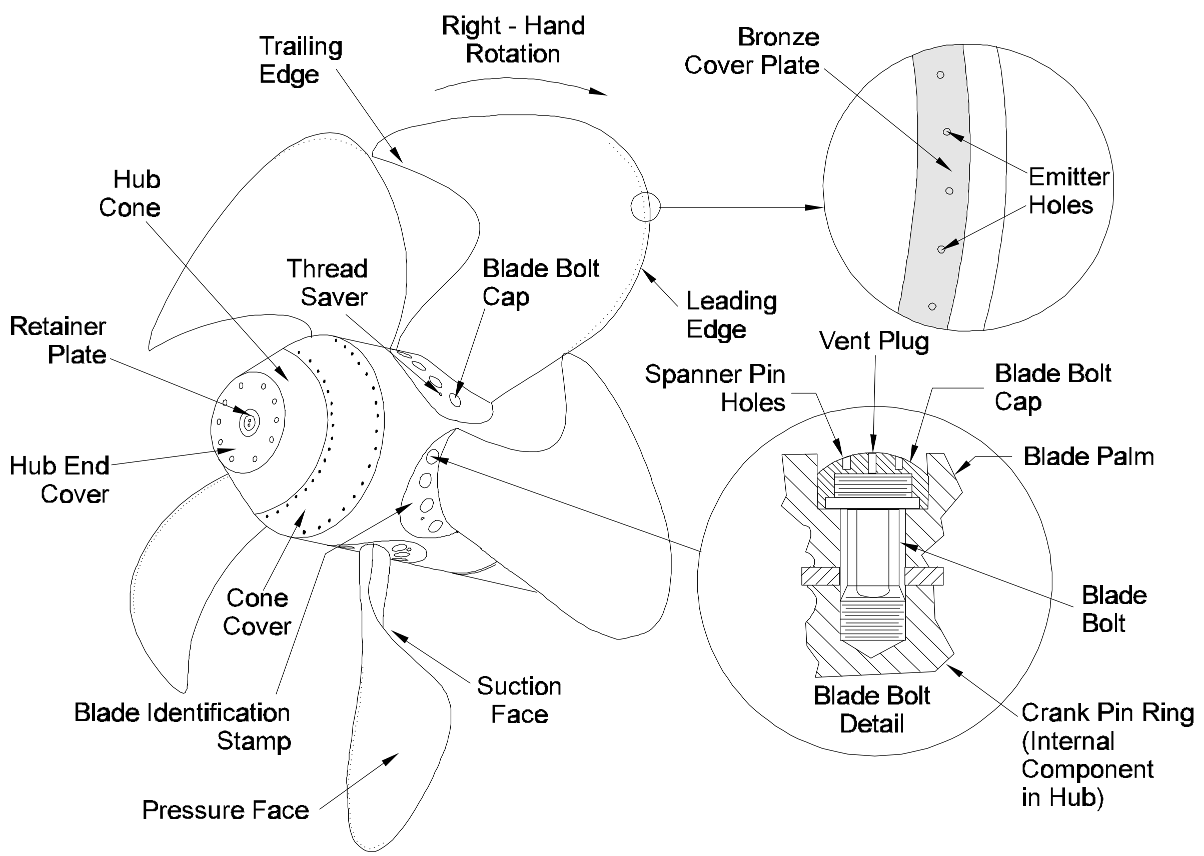


Figure 17-6.4. Controllable Pitch Propeller with Prairie Air System.

17-6.4.4 Propeller (5-Bladed).

17-6.4.4.1 Damage Description Requirements.

17-6.4.4.1.1 The inspection of a propeller requires a detailed description (with measurements) of the exact location and size of any damage, flaws, cracks, porosity, curls, bends, or cavitation erosion. Cavitation erosion results from the rapid formation and collapse of water vapor bubbles on the propeller surfaces while underway. This damage results in a porous, sponge-like, pitted metal surface. Heavy localized concentrations of eroded areas should be interpreted as cavitation erosion.

17-6.4.4.1.2 Propellers are subject to two kinds of cavitation erosion: one caused by propeller damage and the other by design or operating conditions. Therefore, if cavitation damage is found, inspect for the cause. The irregularity ahead of the eroded area can be a nick, gouge, or other damage in the leading edge or a leading edge radius that has been improperly cleaned or finished, leaving flat spots or other unfairness.

17-6.4.4.1.3 Do not confuse cavitation erosion with porosity. Porosity is common and is a manufacturing defect. Porosity will likely be coupled with fouling. Cavitation is uncommon and is often characterized by a trace of worn away metal (area is clean) in the direction of water flow. Porosity is often sharp-edged, whereas cavitation erosion (unless severe) is not.

17-6.4.4.1.4 Damage location descriptions must include reference to obvious points and must use standard nomenclature. Following is a list of common propeller terms:

a. *Blade number*. Propeller blades are lettered counterclockwise (when viewed from astern) using letters “A” through “E.” These letters are stamped on the flat surface blade hub flange. Numbering may be in the form of serial numbers such as “RH8A, RH8B,” etc.

b. *Blade palm*. The round portion of the propeller blade that bolts to the hub (also referred to as the blade flange).

c. *Blade bolt cap*. A protective cover installed over the blade bolt.

d. *Pressure face*. The portion of the blade that faces aft.

e. *Suction face*. The portion of the blade that faces forward.

f. *Leading edge*. The heavy, thick, more rounded portion of blade closest to the forward end of the hub.

g. *Trailing edge*. The thinner, sharper portion of blade closest to the aft end of the hub.

h. *Fillets*. The area at the base of each blade where the pressure and suction faces are blended into the flange contour (the intersection between the flange and the blade).

i. *Blade tip*. The outermost edge of the blade.

j. *Emitter holes*. Holes drilled into a channel near the leading edge that distribute the prairie masker air.

k. *Hub cone*. A fairing bolted to the aft end of the hub which provides a smooth hydrodynamic flow.

l. *Hub cone cover plate*. Fairing plates that are installed over the bolts used in the attachment of the hub cone to the hub.

m. *Hub end cover*. Aft end of the hub cone cover assembly used to distribute the prairie air past the check valve through the hub cone cover and hub and then out to the blades.

n. *Retainer plate*. This plate is threaded into the hub end cover and retains the prairie air adapter plug.

o. *Prairie air adapter plug*. This plug is threaded into the retainer plate and provides access to the check valve.

17-6.4.4.1.5 It is important that the diver accurately report the size and extent of any damage. The report must reflect an accurate measurement of the area for cavitation erosion, porosity, curls, bends, scrapes, cracks, nicks, gouges, and the maximum width and length of any cracks.

17-6.4.4.1.6 Example of Report. "Blade D, trailing edge, 2 feet from blade palm, 1/8-inch deep by 1-inch long nick. Evidence of cavitation erosion on the suction face, starting 4 inches in from the nick. Erosion damage covers a 2-inch by 4-inch area."

17-6.4.4.1.7 NAVSEA Form 4730/6 (NSN 0116-LF-047-3035) Propeller Inspection Data should be used to record results.

17-6.4.4.2 Inspection Procedure.

17-6.4.4.2.1 Gross Damage Assessment.

a. Conduct a quick inspection of all surfaces.

(1) Make note of the overall FR and look for areas of obvious damage (bends, cracks, curls, gouges, and nicks) that indicate the propeller may require changing.

(2) For moderately or heavily fouled propellers (FR 40 or greater) look for clean areas that indicate recent damage (contact with an object or grounding, or areas of cavitation erosion). If evidence of cavitation erosion is discovered, carefully inspect the area ahead of the erosion for any irregularities (nicks, flat spots, etc., in the leading edge).

b. Inspect the propeller hub for fouled wire, rope, or other foreign material. Fiber such as fish netting or manila line may be removed without difficulty. If removal of the material will be excessively time consuming, make the appropriate report and arrangements for follow-on removal.

c. Conduct a detailed inspection of any obvious major damage and thoroughly document the type, size, and location of the damaged area.

17-6.4.4.2.2 Detailed Damage Inspection.

NOTE

If the FR of the propeller is 40 or greater, the propeller must be cleaned prior to conducting the detailed inspection unless the decision is made that, due to obvious damage, the propeller blades require replacement.

a. Inspect the entire surface of the propeller hub. Inspect for cable marks, scratches, cracks, curls, gouges, porosity, and cavitation erosion. Particular attention must be given to any cracks to determine whether it is one crack, or cracks that run completely around the hub. Record the exact location, size, and orientation of any such cracks.

b. Inspect the blades.

NOTE

Report the exact location and extent of damage as it is found. A running log of the inspection must be maintained by the log keeper to ensure accuracy.

(1) Inspect the overall physical appearance and FR of each

blade, pressure and suction faces, starting with blade “A.”

(2) Inspect the tip and leading and trailing edges of each blade for nicks, curls, chips, dents, flat spots, cracks, or other apparent damage. Cracks may be found in the edges and tips without any evidence of impact in the area. They can be caused by local vibration, stress corrosion cracking, or residual stresses in the blades.

NOTE

Pay particular attention to areas of the blade where repairs have been made (areas of discoloration caused by welding). Thoroughly inspect these areas for the presence of cracks.

(3) Verify that two 1 1/4-inch thread savers installed in the lifting bolt holes (180° on each side of each blade) are in place on the blade palm.

(4) Verify that the blade bolt caps (four on each side of each blade) are secure and in place.

(5) Inspect the hub for debris, cavitation damage, and leaking hydraulic oil.

(6) Inspect the cone cover plates for damage, loose or missing plates, and loose or missing fasteners. Each cone cover plate is secured with twenty 1/2-inch cap screws.

(7) Inspect the hub cone for damage and leaking hydraulic oil.

(8) Inspect the hub cone end cover plate for loose or missing fasteners and leaking hydraulic oil. There are 10 1-inch cap screws.

(9) Inspect the retainer plate for loose or missing fasteners and leaking hydraulic oil. There is one 5/16-inch socket set screw.

(10) Inspect the prairie air adapter plug for loose or missing fasteners and leaking hydraulic oil. There are two 1/2-inch socket screws and one 3/8-inch socket set screw.

(11) Inspect the suction (forward) and pressure (aft) face of each blade for defects caused by cavitation. Cavitation damage can be identified by an area of small pocked holes or a rough-textured surface.

(12) Inspect the prairie air channel cover plate on the blade pressure (aft) face for damage or cracked welds. The cover plate is 1 1/2 inches wide and is located 3/8 inch from the leading edge, starting at the hub. Inspect both the pressure (aft) and suction (forward) face emitter holes for fouling. The air emitter holes are 3/64 inch in diameter. The blades suction (fwd) and pressure (aft) faces each have 151 holes. They are spaced 1 inch apart, starting 4 1/4 inches above the hub on the leading edge. To function properly, these emitter holes must be free of fouling.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Record the overall FR of the propeller.

d. If any discrepancies are found, make the appropriate report and arrangements for follow-on cleaning and/or repair.

17-6.4.4.2.3 Detailed Inspection of the Propeller Prairie Air System.

NOTE

Before proceeding with the next step, verify that there is sufficient depth between the tip of the lower most blade and the bottom. A minimum of 5 feet is required to prevent mud or silt from being sucked into the air emitter holes.

NOTE

Performance of the following procedure requires that the dive station have, as a minimum, sound powered communications with Ship's Force personnel.

NOTE

When the diver reports "ready," the Dive Supervisor will have Ship's Force apply low pressure air so that a thorough inspection of the prairie air system can be conducted.

WARNING

Rotating the propeller while divers are in the vicinity may cause serious injury or death. Ensure that the propeller is rotated only at the direction of the Dive Supervisor.

NOTE

Insufficient flow of air to the lower blades may require jacking the shaft over to reposition each blade for the inspection. If air flow is too great to observe individual holes, Ship's Force can decrease the flow.

a. Gross damage assessment.

(1) Begin the inspection procedure by conducting a quick inspection of the system for air leakage other than from the air emitter holes. Check the propeller hub end cover, blade palms, and the air channel weld seams.

(2) Note the general dispersion of air so that areas that appear below normal can be concentrated on during the detailed inspection of each blade. Use a wood block, bronze or lexan scraper, or a "greenie" to remove light fouling in areas where the holes appear to be fouled.

b. Detailed inspection of the air emitter holes.

(1) Beginning with blade "A," start at the hub of the propeller and conduct the inspection toward the tip.

(a) Inspect to determine that the first five emitter holes are clear of fouling.

(b) Working toward the blade tip, inspect in 10-hole segments. Report the number of holes fouled per 10-hole segment. NAVSEA S9245-AR-TSM-010/PROP, *Technical Manual for Marine Propeller Inspection, Repair and Certification,* stipulates that no more than two holes in any series of 10 may be fouled, and that no two adjacent holes may be fouled.

(c) At the blade tip, inspect to determine that the last five holes are clear of fouling.

NOTE

The maximum allowable number of fouled holes for each blade is 16.

(2) Repeat the inspection process for the remaining propeller blades.

(3) Secure the air flow to the emitter system.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on cleaning and/or repair.

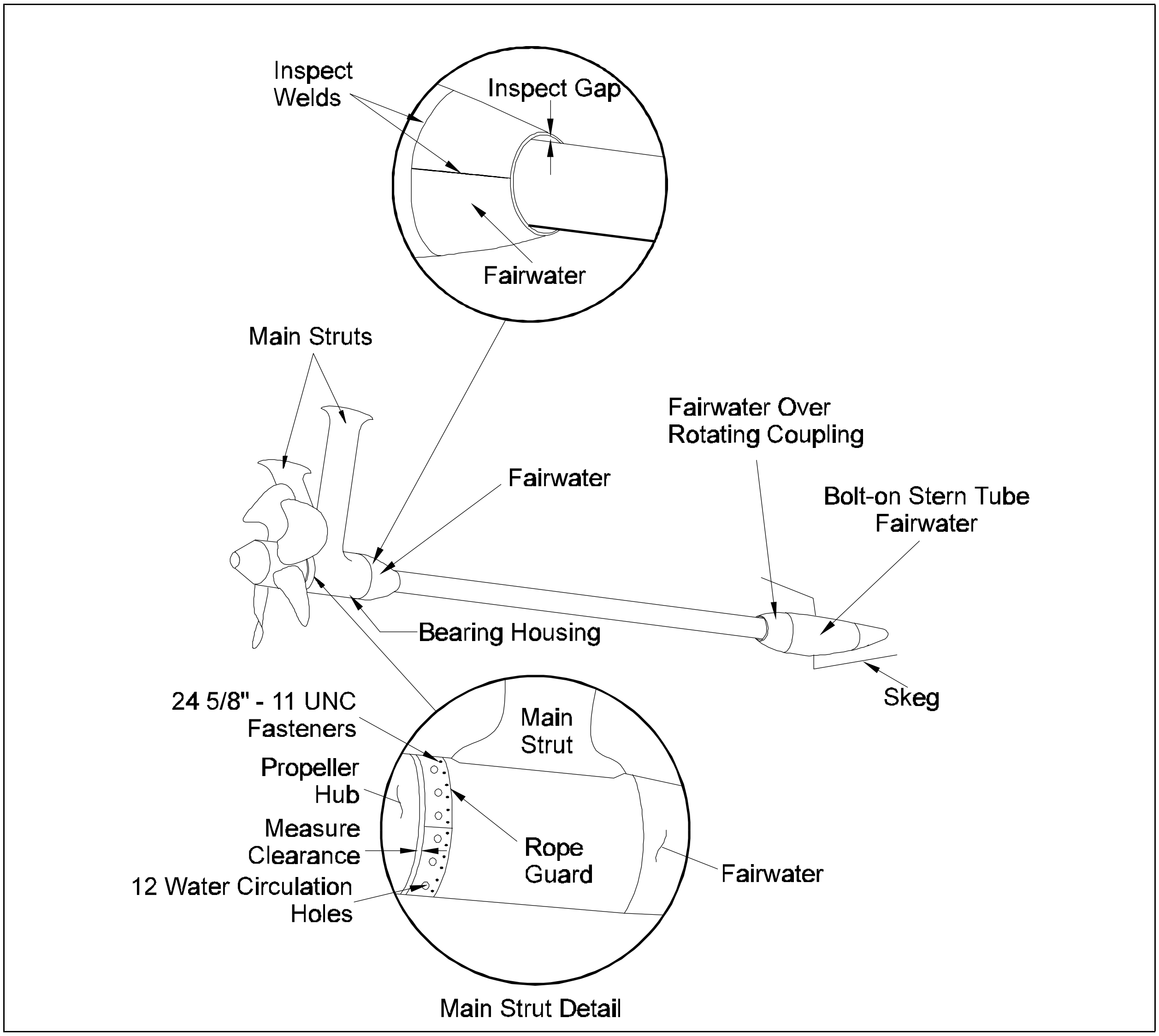


Figure 17-6.5. Main Strut, Shaft, Stern Tube, Rotating Coupling, Rope Guard, and Fairwaters.

17-6.4.5 Main Propulsion Assembly (Main Strut, Shaft, Stern Tube, Rotating Coupling, Rope Guard, and Fairwaters).

17-6.4.5.1 Damage Description Requirements.

17-6.4.5.1.1 General condition or damage assessment of the main strut, shaft, stern tube, rotating coupling, rope guard, and stern tube requires a detailed description (with measurements) of the exact location and size of any damage or flaws. The description must include:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information: the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage.

e. Exact location and size of all coating damage, tears, or delaminations on the shaft.

17-6.4.5.1.2 Example of Report. "Shaft, 6 feet 9 inches forward of the strut fairwater, longitudinal gouge in fiberglass coating 2 inches wide by 1 foot long, bare metal showing; subsurface delamination 6 inches by 6 inches, centered on a rust stain, located by sounding."

17-6.4.5.2 Inspection Procedure.

a. Main strut assembly (struts, bearing housing, rope guard, and fairwater)

NOTE

The main struts on this class have a history of severe corrosion. Most main struts have been repaired with clad welding, epoxy, or both.

(1) Inspect the main strut columns (port/starboard) and bearing housing for corrosion, damage, and the presence of wire or other foreign material.

(a) At best the surface of the struts will be very rough due to previous damage or repairs.

(b) Inspect for loose or missing epoxy.

(2) At the strut/hull interface, inspect the strut columns, doubler plates and immediate area hull plate for cracked welds, corrosion, and damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(3) Verify the presence of the five evenly spaced 1/2-inch plugs on the top, and the five evenly spaced 1/2-inch plugs on the bottom of the bearing housing. Ensure that they are flush and staked in at least two places.

(4) Verify that the rope guard is present.

NOTE

A missing rope guard is a serious casualty.

(a) The FFG 7 Class has steel rope guards which are bolted on with twenty-four 5/8-inch x 1 1/4-11 UNC flat head screws. Inspect for any apparent damage or corrosion and for the presence of fouled wire, rope, or other foreign material. Inspect the twelve 1 1/2-inch diameter water circulation holes to ensure that all are free of fouling and debris.

(b) Use a diver's light or diver-held video equipment light to inspect the area between the propeller hub and the strut bearing housing.

(c) Verify the presence and tightness of all fasteners and ensure that they are staked in at least two places.

(d) Record the number of missing fasteners.

(e) Verify that there is a uniform gap all around between the propeller hub and the rope guard by taking measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is 3/4 inch.

(5) Verify that the fairwater is present. The FFG 7 Class has steel fairwaters that are bolted to the face of the bearing housing. The 1 1/8-inch securing studs are covered by a tack-welded fairing plate and are not visible to the diver.

NOTE

A missing fairwater is considered a serious casualty.

(a) Inspect the fairwater for cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(b) Verify that there is a uniform gap between the fairwater and the shaft by taking clearance measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is 1 inch.

(6) Inspect and report the FR and the PDR of the main strut columns, immediate hull plate area, bearing housing, rope guard, and fairwater.

b. Shaft.

NOTE

Pay particular attention to the detection of damage or breaks in the covering in the area of shaft nearest the fairwaters and rotating coupling. Propeller shafts are covered with a hard metal sleeve at all bearing areas. The shaft coating at the sleeve ends are the most vulnerable areas of the waterborne shafting. Therefore, give special attention to the detection of breaks in the covering or leakage in the joint (rust stains) in these critical areas.

(1) Inspect the full length of all accessible glass-reinforced plastic (fiber glass) covering for evidence of deterioration, loss of adhesion, or any apparent physical damage.

(2) Inspect for loss of covering, cuts, tears, surface delaminations, and other damage.

(3) Inspect for rust stains indicating where corrosion has leaked through the covering near a cut, pinhole, area of porosity, patch, joint, or other flaw.

(4) Inspect for internal separation of the fiberglass covering from the metal shaft. Use a rubber or rawhide mallet to sound the covering at approximately 18-inch intervals along the length of the shaft.

(a) Rap the shaft in the 3, 6, 9, and 12 o'clock positions while holding the palm of one hand against the covering on the opposite side of the shaft. Continue sounding the shaft around and along its entire length.

NOTE

Discernible vibration, movement of the covering, or an audible, hollow sound is evidence of probable loose bond and must be explored or further examined. To determine the full extent of the damaged area, reduce the distance for sounding the shaft from 18 inches to 4 inches. The important criterion is to isolate and fully determine the extent of the damaged or delaminated area.

(5) If discrepancies are found, measure the exact location and size, then make the appropriate report and arrangements for follow-on repair.

c. Rotating coupling, fairwaters, and stern tube.

(1) The FFG 7 Class has a rotating coupling over the shaft coupling flange exiting the stern tube. Inspect for any apparent damage or corrosion and for the presence of fouled wire, rope, or other foreign material. Use a diver's light or diver-held video equipment light to inspect the area between the coupling and the stern tube fairing.

(a) Inspect the tack welds on the bolt fairing covers.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(b) Verify the presence of the two 1-inch 8 UNC plugs. Ensure that they are flush and staked in at least two places.

(c) Inspect for missing epoxy at the corners formed by the coupling covers and shaft.

(d) Verify that there is a uniform gap all around between the rotating coupling and the stern tube fairing. Take clearance measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is 1 inch.

(e) Inspect and report the FR and the PDR of the rotating coupling and the stern tube fairing.

(f) If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

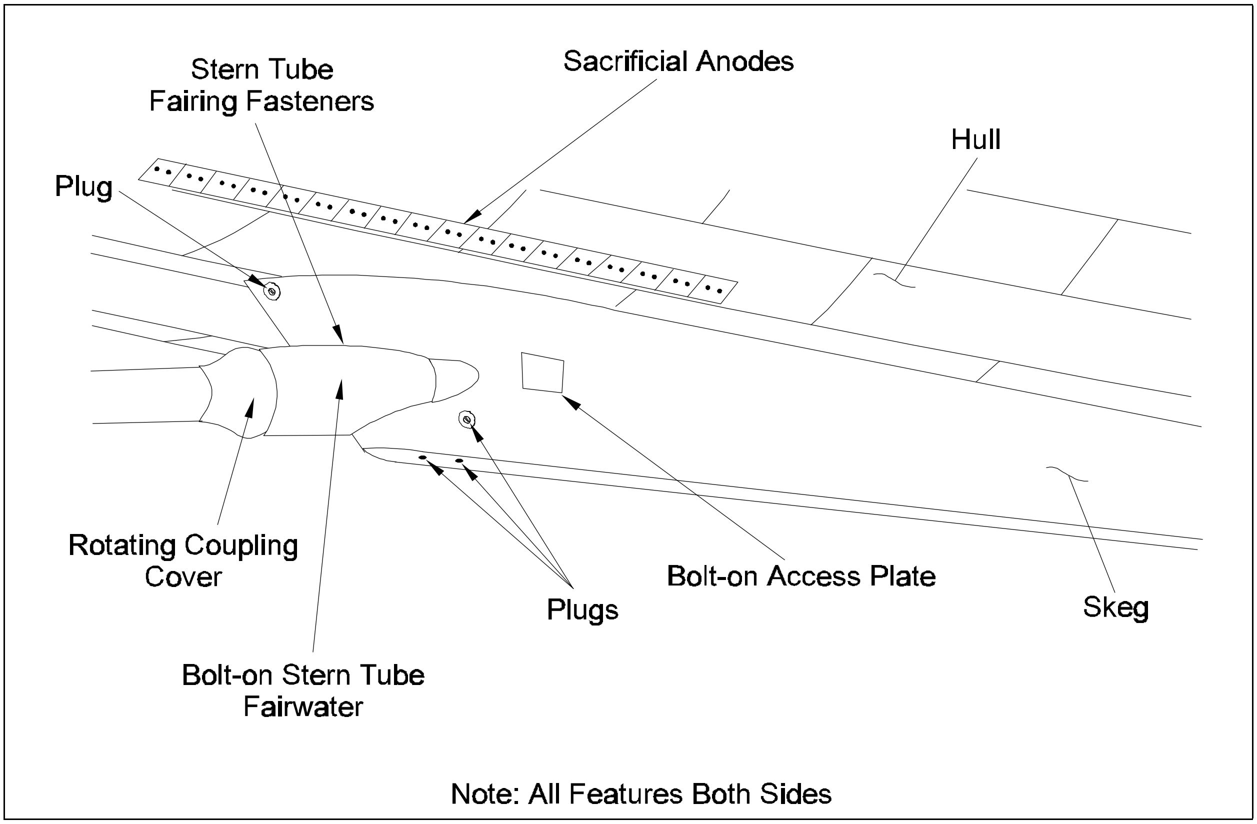


Figure 17-6.6. Skeg and Stern Tube.

17-6.4.6 Skeg.

17-6.4.6.1 Damage Description Requirements.

17-6.4.6.1.1 Include the exact location and size of all damage or flaws. Description must include as a minimum:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information: the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage. For example: “Weld crack 1 foot long by 1/2 inch wide, port side, 18 feet forward of after end along the skeg/hull interface.”

17-6.4.6.2 Inspection Procedure.

a. Verify the presence of the fill plug (frame 348, starboard side, 6 inches forward of the upper trailing edge) and ensure that it has not backed out.

b. Verify the presence of the two drain plugs (2 1/2 inches aft of frame 340 on the centerline and 7 1/4 inches aft of frame 342 on the centerline) and that they have not backed out.

c. Inspect the entire length of the skeg for dents, cracks, curled edges, or other apparent damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

d. Inspect and report the FR and the PDR.

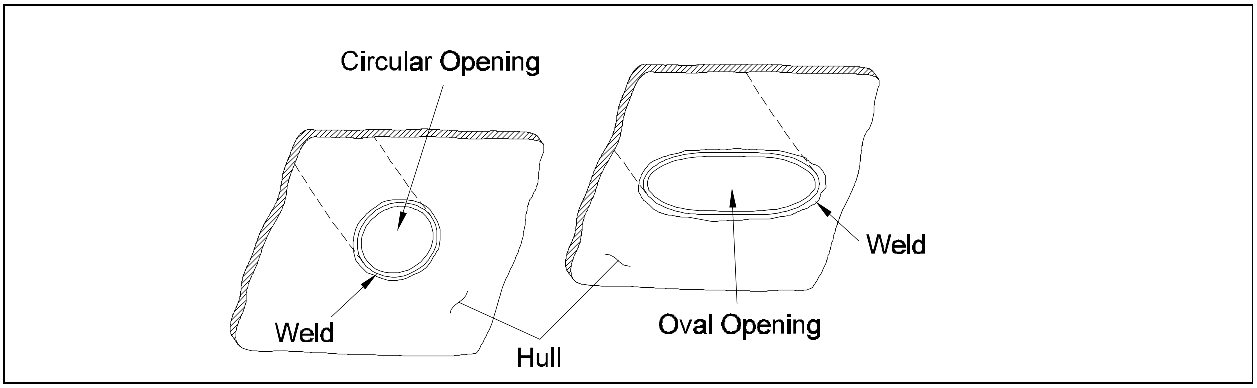


Figure 17-6.7. Seawater Discharge Openings.

17-6.4.7 Overboard Discharge.

17-6.4.7.1 Inspection Procedure.

a. Inspect for foreign material or corrosion damage.

b. Inspect and report the FR and the PDR.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair

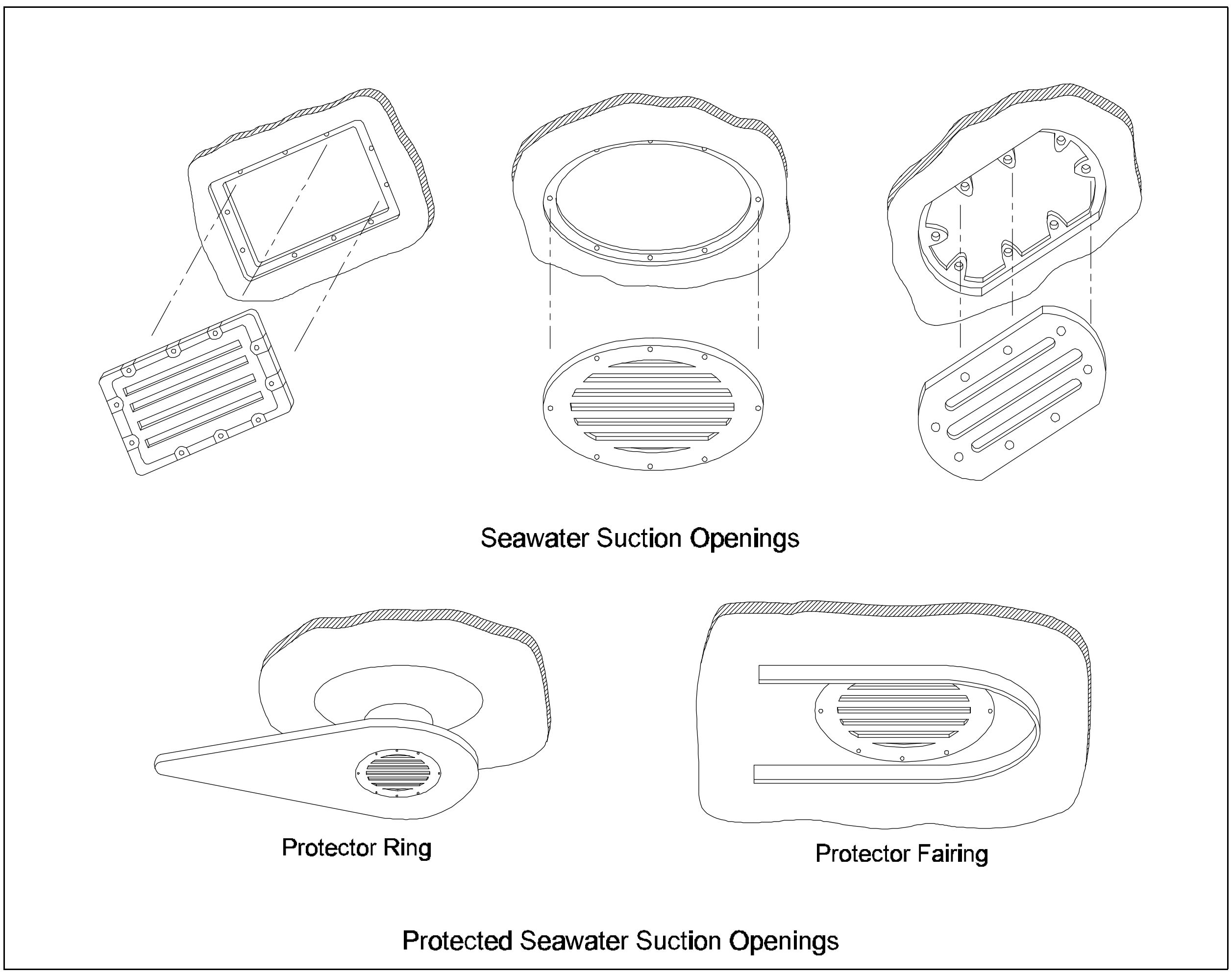


Figure 17-6.8. Seawater Suctions.

17-6.4.8 Sea Chest and Seawater Suction.

17-6.4.8.1 Inspection Procedure.

a. Clean and inspect screens or grates for clogged holes and loose or missing fasteners.

b. Inspect strainer bars for corrosion damage, broken or missing bars, cracked welds, and missing or loose fasteners.

c. Inspect and report the FR and the PDR.

d. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

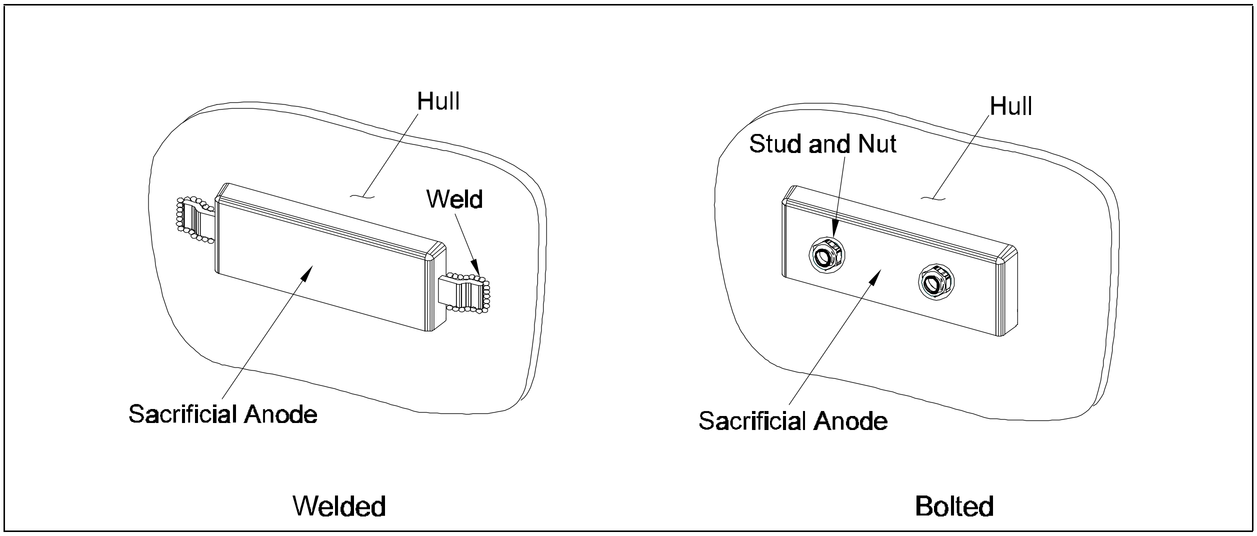


Figure 17-6.9. Typical Sacrificial Anodes.

17-6.4.9 Sacrificial Anodes (Zincs).

17-6.4.9.1 Inspection Procedure.

NOTE

To conduct a proper inspection of the anodes, refer to the ship's last docking report. This report lists the material of which the anodes are made. Table 6-33 of NSTM S9086-VF-STM-010/CH-633, Chapter 633, "Cathodic Protection," provides information for predicting remaining anode life, using the anode thickness gauge.

a. Inspect for loose anodes by physically shaking them.

b. Inspect the condition of the anodes.

c. Estimate and report the percentage of anodes remaining. Since sacrificial anode deterioration is usually most severe at the ends of each anode line, use the center anode as a reference.

(1) Inspect an anode near the center of the anode line. If the lettering on the anode is still visible, use it as a reference to gauge wastage of the line. First count and report the number of anodes remaining. Then, using the center reference anode, estimate the percentage of deterioration of the remaining anodes.

(2) If no lettering is visible on any of the anodes and the anode line appears severely deteriorated, inspect for pairs of straps that are either welded or bolted to the hull

in the line. These straps indicate where an anode should be.

d. Report the number of missing anodes and estimate the percentage of deterioration of the remaining anodes.

e. Using the anode thickness gauge, measure questionable anodes. Do not use the end anodes in an array for determining the remaining life because the end anodes will usually deteriorate more rapidly than those in the center of the row.

f. If any discrepancies are found, including the necessity for spot replacement of any anodes, make the appropriate report and arrangements for follow-on repair.

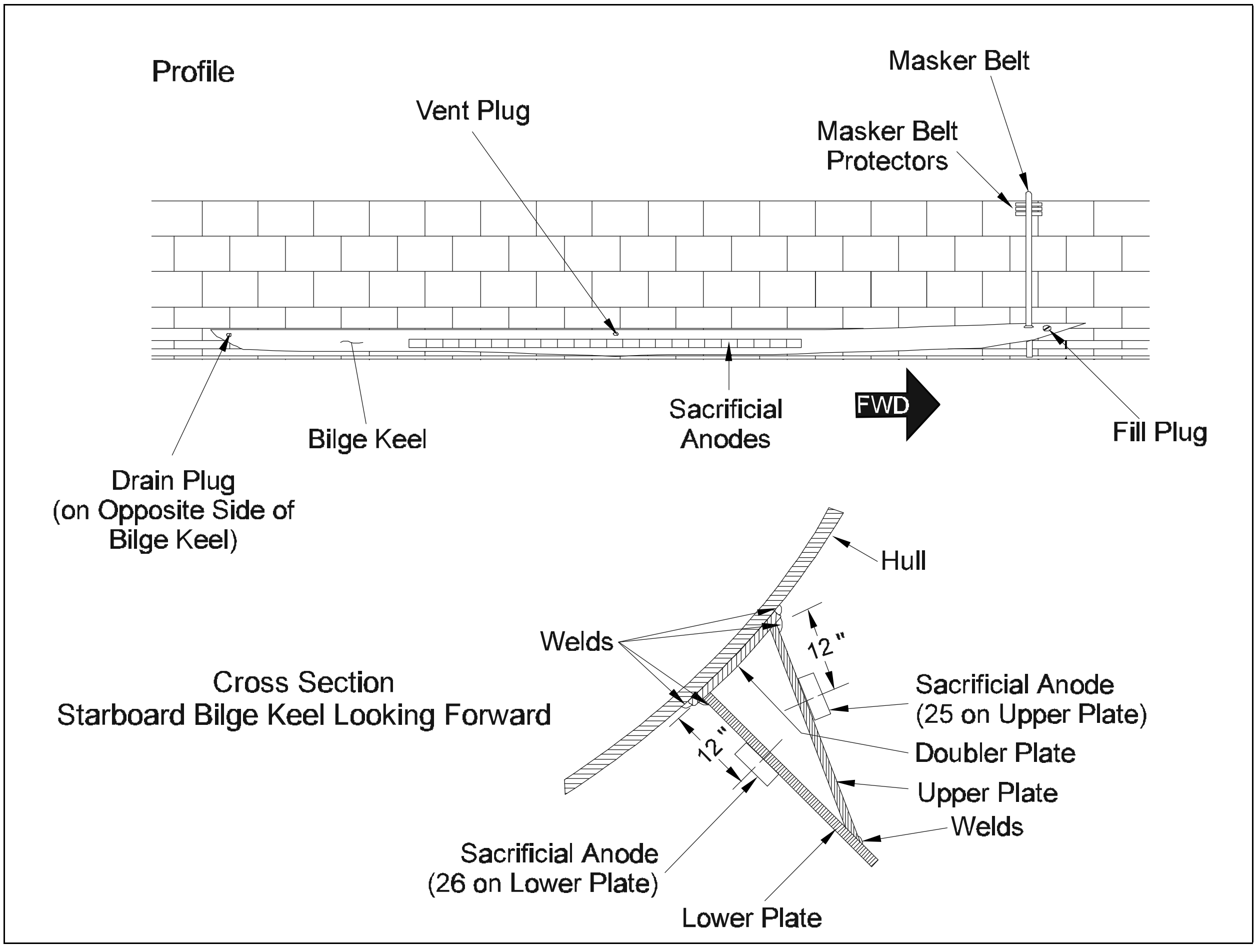


Figure 17-6.10. Bilge Keel.

17-6.4.10 Bilge Keel.

17-6.4.10.1 Damage Description Requirements.

17-6.4.10.1.1 Include exact location of all damage or flaws. Description must include as a minimum:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information; the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage. For example: “Port bilge keel, 1 foot long by 1/2 inch wide crack in weld between upper and lower plates located 18 feet forward of after end.”

17-6.4.10.2 Inspection Procedure.

a. Inspect the bilge keel for dents, cracks, curled edges, missing plate, or other apparent damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

b. Inspect for foreign material and loose or missing plugs. There are three NPT plugs located on each bilge keel. There are two plugs on the top located at frames 157 and 141, (1 1/2-inch diameter) and one on the bottom at frame 171 (4 1/2-inch diameter).

c. Measure and record the location of any damage.

d. Inspect and report the FR and the PDR.

e. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

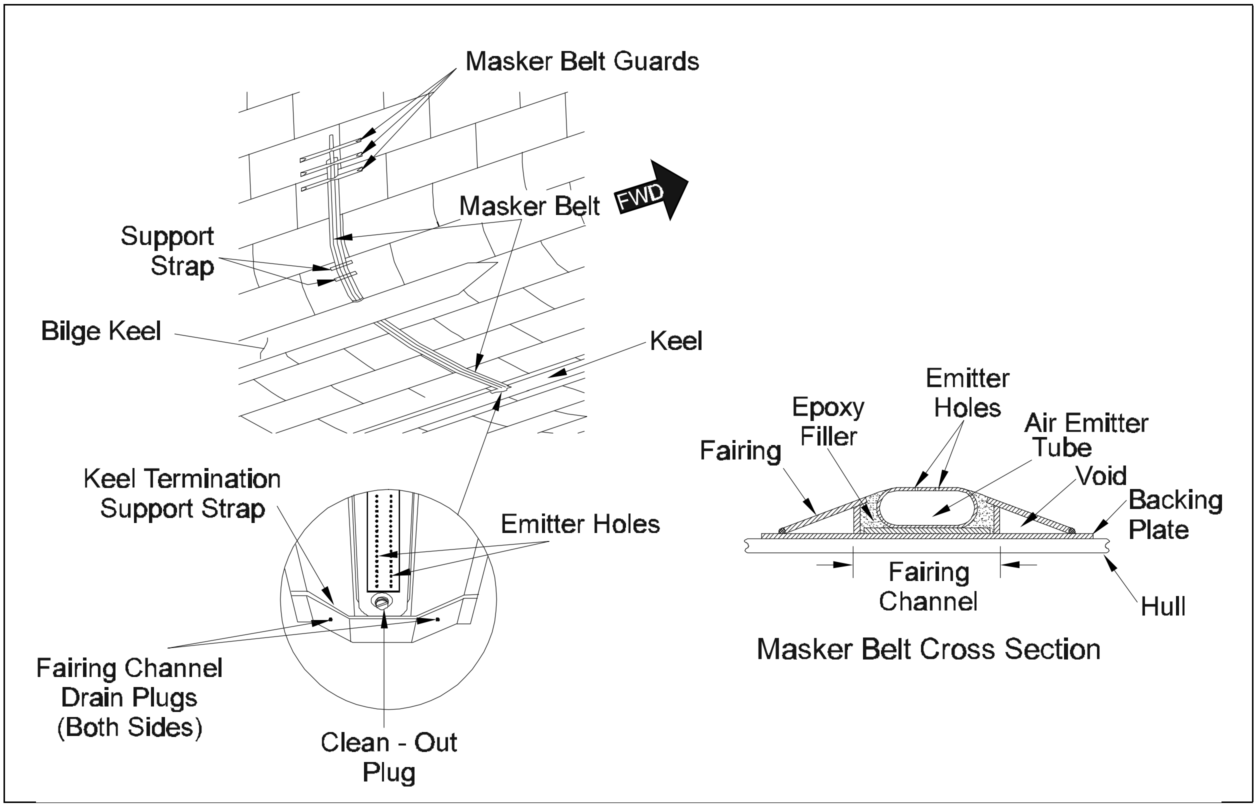


Figure 17-6.11. Masker Emitter Belt.

17-6.4.11 Masker Belt.

17-6.4.11.1 Damage Description Requirements.

NOTE

Emitter hole blockage is difficult to inspect. Checking for blockage when the ship is pier side is not recommended. Procedures for assessing blockage by measuring flow rate while the ship is underway are detailed in the shipboard PMS. Diver cleaning procedures are provided in NAVSEA S0600-AA-PRO-050.

17-6.4.11.1.1 Inspection of masker belt systems requires a detailed description (with measurements) of the exact location and size of any damage or flaws. As a minimum, the description must include:

a. Identity of masker belt emitter system (forward/aft, port/starboard, frame number).

b. On the fairing plate, the length, maximum width, and orientation of all cracks, including closest weld seam information. Also include the direction of the crack with respect to the weld (perpendicular or parallel) and the proximity of the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or any other damage. Take all measurements from the keel up.

17-6.4.11.1.2 Location must include reference to obvious points and use standard nomenclature. Following is a list of common terms used by the diver to describe the location of damage.

a. *Fairing channel*. A channel constructed of two flat plates welded at an angle on the backing plate. The fairing channel houses the flattened pipe which is epoxied into it.

b. *Backing plate*. A flat plate welded to the hull to which the fairing plate/channel is welded.

c. *Air emitter tube*. A flattened Cu-Ni pipe within a fairing channel that contains 3/64-inch air emitter holes.

d. *Support strap*. When an emitter belt is replaced or repaired when the ship is waterborne, a Lexan-insulated strap is welded to the fairing channel to provide extra support to the belt.

e. *Keel termination support strap*. A metal strap cradling the end of the masker belt at the keel.

f. *Epoxy filler*. Rigid fairing and support compound which fills the space between the fairing and flattened air emitter tube.

17-6.4.11.1.3 Example of Report "3-inch section of epoxy missing, starting at the keel termination support strap, aft starboard masker emitter system. The next three feet of epoxy is hard and cracking."

17-6.4.11.2 Inspection Procedure.

17-6.4.11.2.1 Gross Damage Assessment.

a. Begin the inspection procedure by conducting a quick inspection of the masker belt and surrounding hull plate area.

b. Make note of the overall FR and the PDR and look for areas of obvious damage (crushed, twisted, or missing sections of masker belt).

17-6.4.11.2.2 Detailed Damage Inspection.

a. Inspect for crushed, cracked, or missing masker belt.

b. Inspect for displaced masker belt, sprung from the channel.

c. Inspect for loose, missing, or excess epoxy.

d. Starting at the keel, inspect the full length of weld between the backing plate and the fairing plate (the backing plate is the plate welded to the hull) and the weld between the backing plate and the hull for cracks. Inspect both sides.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Inspect the 3/64-inch emitter holes for fouling. Emitter holes are spaced in sections and the spacing varies in density for each section.

f. Inspect for holes in the fairing plate and welds.

g. If installed, inspect the support straps for missing Lexan insulator.

h. Inspect for a loose or missing 1 1/2-inch NPT clean-out plug located 2 1/2 inches from the keel termination support strap

i. Inspect any previously repaired areas.

j. Inspect and report the FR and, if painted, the PDR.

k. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

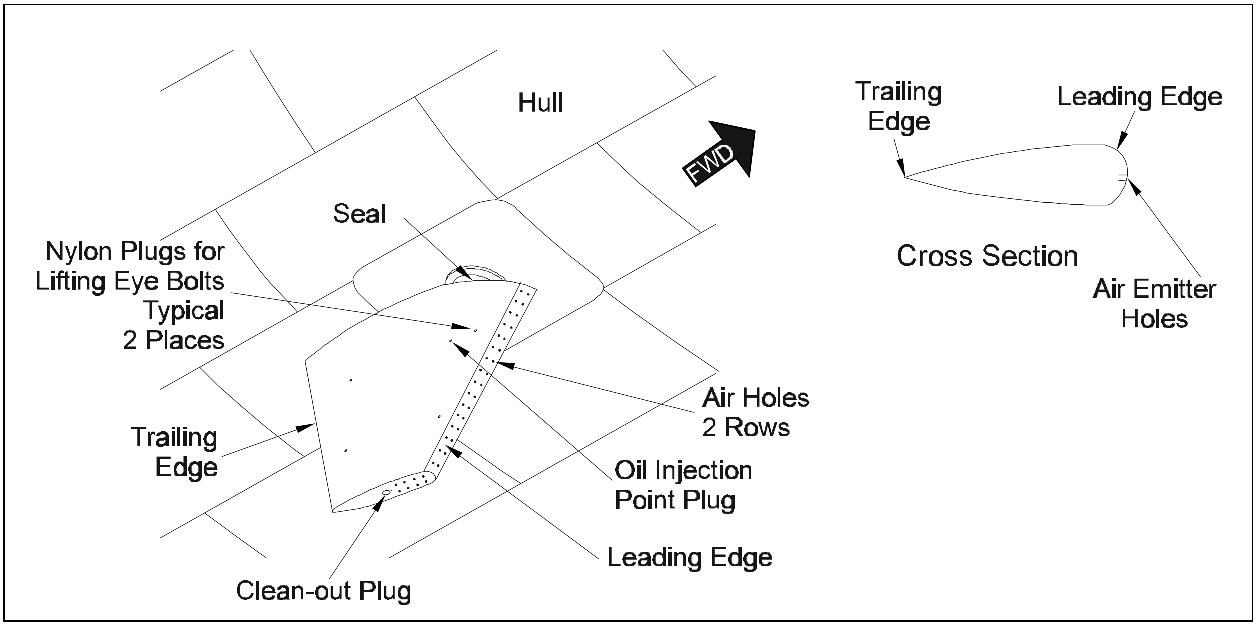


Figure 17-6.12. Fin Stabilizer.

17-6.4.12 Fin Stabilizer.

17-6.4.12.1 Damage Description Requirements.

17-6.4.12.1.1 Inspection of fin stabilizers requires a detailed description (with measurements) of the exact location and size of any damage or flaws. As a minimum, the description must include:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information: the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

17-6.4.12.1.2 Example of Report. “Port fin stabilizer: pitting on leading edge, 24 inches from hull, 4-inch by 7-inch area, maximum pitting depth: 3/8-inch by 1/2-inch diameter, average: 1/4-inch by 1/4-inch diameter.”

17-6.4.12.1.3 The following is a list of standard fin stabilizer terms:

a. *Leading edge*. The forward facing blunt vertical edge of the fin stabilizer.

b. *Trailing edge*. The aft facing vertical edge of the fin stabilizer.

c. *Nose*. The lower horizontal end of the fin stabilizer.

d. *Air emitter nozzles*. A series of 1/4-inch hollow hexagon-head grub screws along the fin nose and leading edge on both surfaces of the fin stabilizer.

17-6.4.12.2 Inspection Procedure.

a. Inspect the area between the fin and hull for foreign material or damage.

b. Inspect the entire surface of the fin for damage, cracks, pitting, or corrosion.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Verify the presence of the four 1-inch lifting eye plugs and the 3/8-inch oil injection point plug on the outboard surface of the fin; ensure that they have not backed out.

d. Inspect the nozzles on the fin nose and leading edge cavity for damage.

e. Conduct a detailed inspection of the prairie air system. Report the exact location and extent of damage as it is found. A running log of the inspection must be maintained by the log keeper to ensure accuracy.

NOTE

Performance of the following procedure requires that the dive station have, as a minimum, sound-powered communications with Ship's Force personnel.

NOTE

When the diver reports "ready," the Dive Supervisor will have Ship's Force apply low pressure air to the fin assembly so that a thorough inspection of the prairie air system can be conducted.

NOTE

Working from the nose toward the top of the leading edge, inspect the nozzles in 10-nozzle segments. Report the number of nozzles fouled per 10-nozzle segment

(1) Inspect for the leakage of air from points other than the screwed-in nozzles.

(2) Inspect each nozzle for air flow. Airflow should be the same for all nozzles. Report restricted or plugged nozzles.

f. Secure the air flow to the fin stabilizer.

g. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

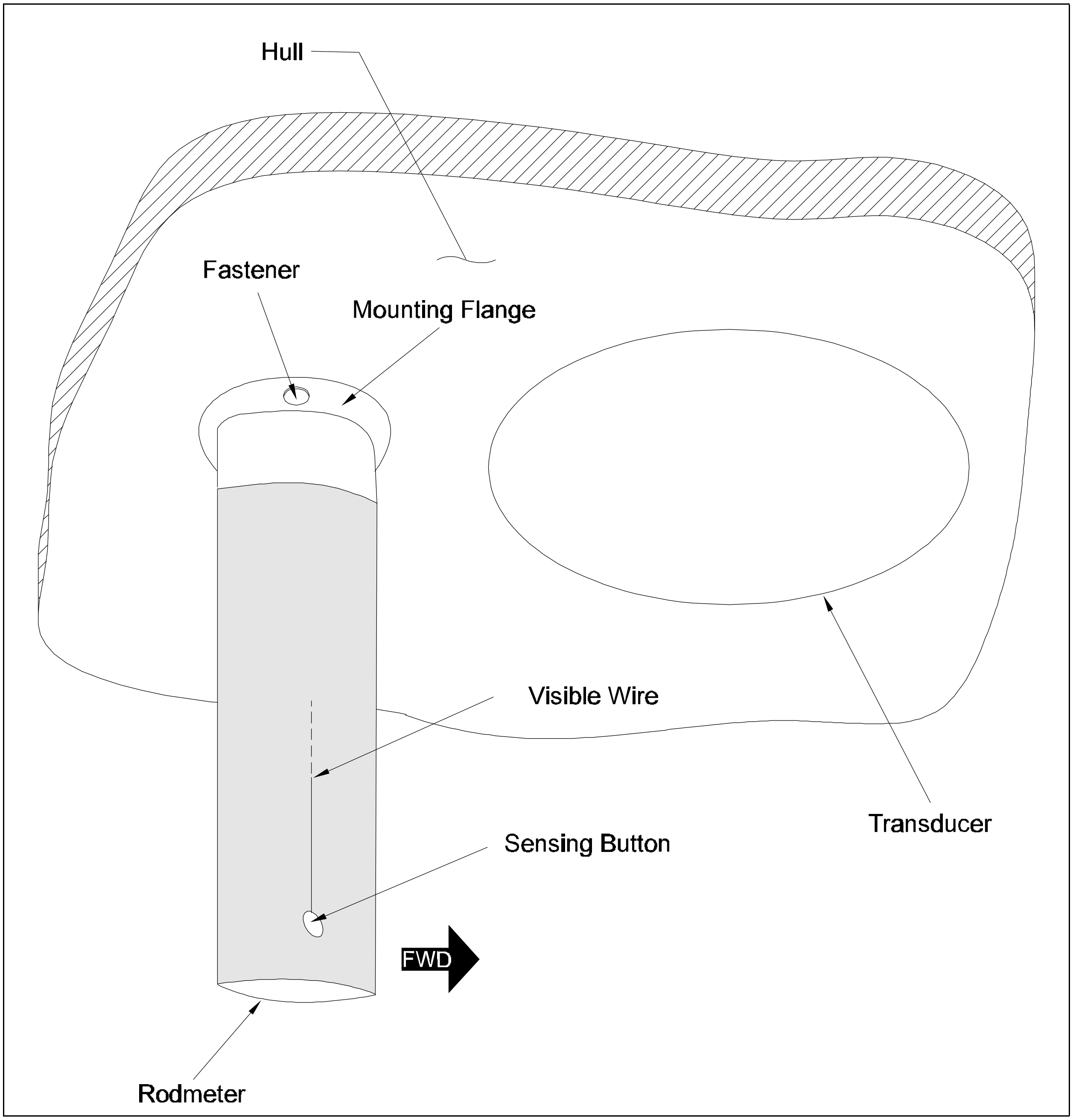


Figure 17-6.13. Rodmeter and Transducer.

17-6.4.13 Transducer.

17-6.4.13.1 Damage Description Requirements.

17-6.4.13.1.1 Inspection of transducers requires a detailed description (with measurements) of the exact location and extent of all damage and flaws. As a minimum, the description must include:

a. Length, maximum width, and orientation of all cracks or flaws in the sensor cover.

b. Total area affected, including the diameter and depth of any pitting or corrosion of the immediate hull plate area. Also include both the maximum and average pit size.

17-6.4.13.1.2 Example of Report. "1-inch by 2-inch diagonal gouge on sensor cover, maximum depth 1/16 inch located at the 8 o'clock position."

17-6.4.13.2 Inspection Procedure.

a. Begin the inspection procedure by conducting a quick inspection of the transducer and the surrounding hull plate area.

   (1) Make note of the FR and PDR of the immediate hull plate area and look for areas of obvious damage or flaws.

b. Conduct a detailed inspection of the entire transducer assembly.

   (1) Using a "greenie," gently scrub light fouling off the sensor head and inspect the sensor protective covers.

   (2) Inspect rubber covers for tears, cracks, scrapes, or gouges.

   (3) Inspect for signs of structural failure or damage caused by contact with underwater objects.

   (4) Inspect for loose or missing fasteners and thread savers and loose or missing fairing compound.

   (5) Inspect and report the FR and PDR.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

17-6.4.14 Rodmeter.

17-6.4.14.1 Inspection Procedure.

a. Inspect the rodmeter for the presence of foreign material and for damage or structural failure. If ship reports that it is not receiving information from the rodmeter, inspect for a broken or damaged unit.

b. Verify that the angle of protrusion is perpendicular to the mounting flange.

c. Gently shake the rodmeter to verify that it is secure.

d. Using a "greenie," gently scrub off any light fouling.

e. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

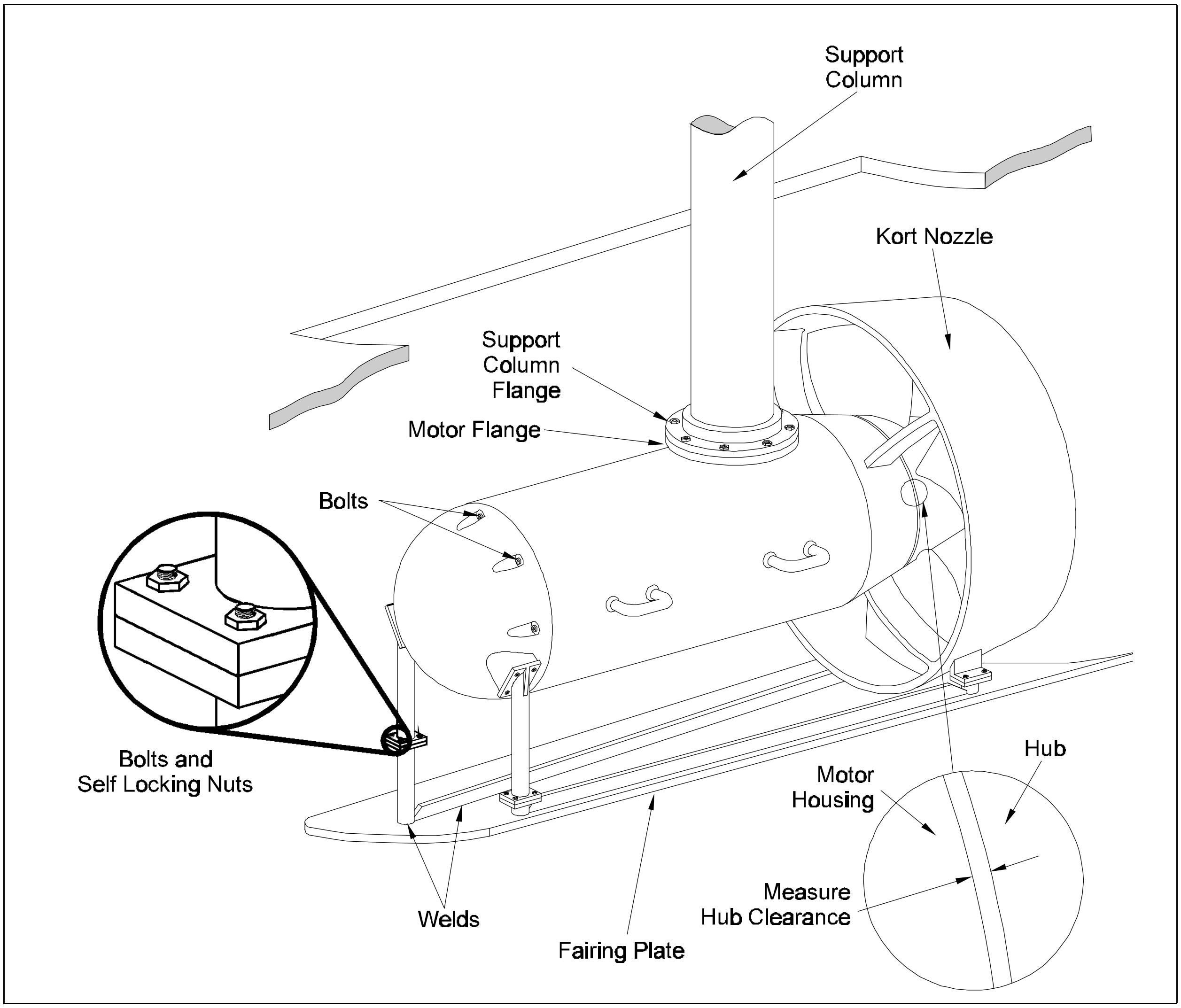


Figure 17-6.14. Auxiliary Propulsion Unit (Extended).

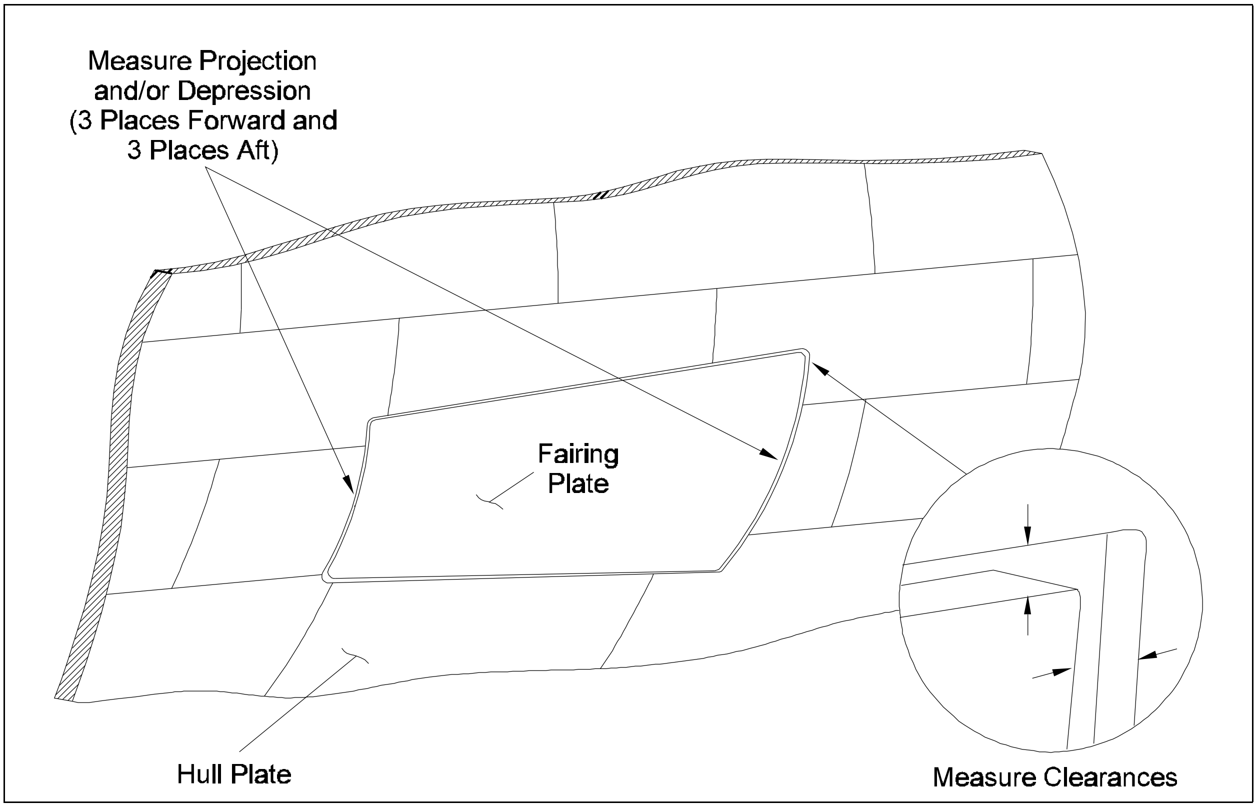


Figure 17-6.15. Auxiliary Propulsion Unit (Retracted).

17-6.4.15 Auxiliary Propulsion Unit (APU).

17-6.4.15.1 Mechanical Problems. High motor amperage (greater than 800 amperes) or an increase in noise and vibration during APU motor operation are signs of mechanical damage or bearing wear problems which should prompt Ship's Force to request diver inspection of an APU system. Loud metal-to-metal contact noise during retracting or extending operations indicates APU motor misalignment or improperly set alignment limit switches and should also prompt Ship's Force to request diver inspection.

17-6.4.15.2 Diver APU Inspection. Record all inspection observations and measurements on the APU Inspection Data Form, NAVSEA 4730/8, (NSN 0116-LF-047-3045).

17-6.4.15.2.1 Include exact location of all damage or flaws. Description must include as a minimum:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information; the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

17-6.4.15.2.2 Inspection Procedure.

NOTE

A Level 2 inspection of the APU must be conducted with the unit in both the retracted and the deployed positions. Begin the inspection with the unit in the deployed position.

a. Inspect the support column flange for the presence of all fasteners.

b. Verify that the small gap which exists between the support column flange and the motor flange is no more than 1/2 inch deep.

c. Inspect the motor-to-fairing plate legs for any apparent damage and for the presence of all flange nuts and bolts. Report any missing nuts and bolts (and lock wire if used).

d. Inspect the fairing plate for any structural damage.

e. Inspect and report the FR and the PDR of the fairing plate and the surrounding hull plate.

f. Inspect the Kort nozzle for structural damage.

(1) Verify that the six drain holes (three in top and three in the bottom) of the nozzle are clear.

(2) Inspect and report the FR of the Kort nozzle.

g. Inspect the propeller.

(1) Inspect the propeller hub for fouled wire, rope, or other foreign material. Propellers may become fouled by fiber or wire. Fiber such as fish netting or manila line is usually removed without difficulty. If removal of the material will be excessively time consuming, make the appropriate report and arrangements for follow-on removal.

(2) Push the propeller forward towards the motor housing. Measure and record the clearance between the APU motor housing and the propeller hub. Pull the propeller aft away from the motor housing. Measure and record the clearance between the APU motor housing and the propeller hub. The difference between the two measurements or the total end play of the propeller shaft must not exceed 1/8 (0.12) inch.

(3) Measure and record the clearance between each blade tip and the Kort nozzle with a feeler gauge. Blade tip clearance must range between 0.040 inch minimum to 0.185 inch maximum.

(4) Report the overall physical appearance and FR of each blade. Inspect the leading and trailing edges for nicks, curls, chips, dents, flat spots, cracks, or other apparent damage.

(5) Measure and record the extent of all damage.

h. Inspect and report the FR of the APU motor.

i. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

NOTE

Verify with the Ship’s Force that the bench mark is at the “zero” position.

j. Retract the APU motor until the fairing plate is six (6) inches below the hull opening. Inspect to determine if the motor is out of rotational alignment. If so, have Ship’s Force correct the alignment, change the benchmark inside the APU machinery room in accordance with NAVSEA S9237-AD-MMA-010/01425, Technical Manual for Description, Operation, and Maintenance Instructions, Retractable Auxiliary Propulsion Equipment System, 15 February 1989 (NSN 0910-LP-110-9600), paragraph 8-4.1, and adjust the travel limit switches in accordance with paragraph 8-4.2.

k. Retract the APU motor fully.

(1) Ensure that the APU is properly housed and flush with adjacent hull.

(2) Verify that the gap between the hull opening and the fairing plate is uniform all around. The allowable gap around the perimeter is 1 inch ± 1/4 inch.

(3) Inspect the fairness of the APU fairing plate with the outer shell plating. Measure and record the projection and depression of the forward and after edges of the fairing. Take a minimum of three readings (port, center, starboard) on each edge.

(a) The forward edge of the plate should be flush (or recessed no more than 1/4 inch).

(b) The after edge should be flush (or protruding no more than 1/4 inch from the surface of the outer shell plating).

(4) The ship's Engineering Officer will compare the measurements with previously taken measurements.

(5) If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

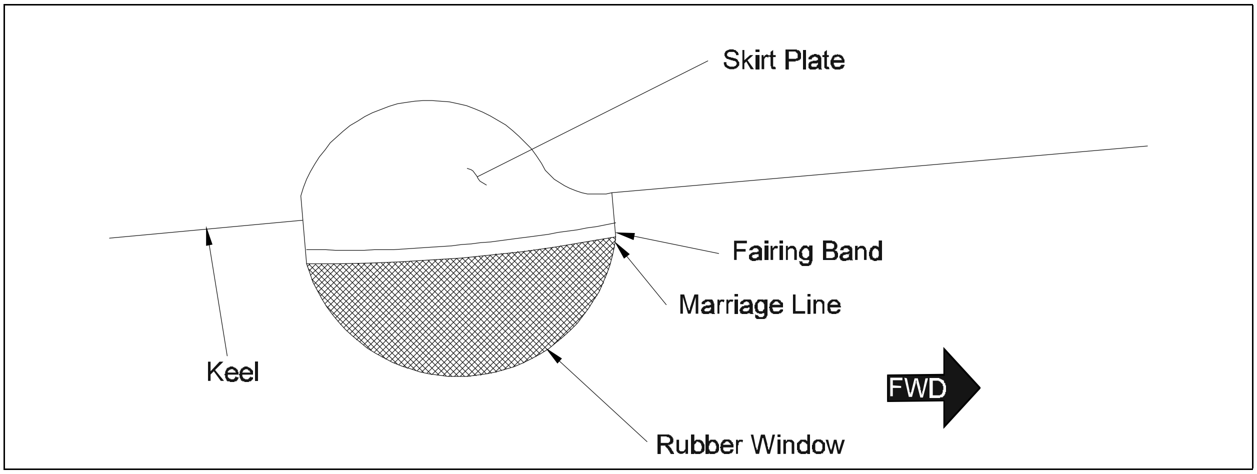


Figure 17-6.16. Keel-mounted Sonar Dome.

17-6.4.16 Keel-mounted Sonar Dome.

17-6.4.16.1 Damage Description Requirements.

17-6.4.16.1.1 Inspection of sonar domes requires a detailed description (with measurements) of the exact location and size of all damage and flaws. For location use exact measurements, horizontal and vertical, from definable points such as the centerline. Measurements will require the use of bear paw magnets and tape measures. The following is a list of standard sonar dome rubber (SDR) terms:

a. *Marriage line*. That area where the fairing band meets the dome.

b. *Vertical midpoint*. An imaginary continuation of the keel vertically down the dome at the 0° point.

c. *Horizontal midpoint*. A horizontal line midway between the marriage line and the bottom of the dome.

d. *Skirt plate*. Steel plate that attaches directly to the steel hull and dome.

e. *Fairing band*. A steel plate that covers the bolts which hold the dome in place. It is welded to the skirt plate.

17-6.4.16.1.2 The description of the damage must include:

a. Rubber dome material.

(1) Exact location and size (length, width and depth) of all gouges, tears, delaminations, blisters, flap, or other damage.

(2) Layers of wire plies exposed.

(3) FR.

b. Skirt plate and fairing band.

c. Exact location and size of all damage or flaws. As a minimum, the description must include:

(1) Distance and direction (port/starboard/forward/aft) from a known point.

(2) Length, maximum width, and orientation of all cracks, including closest weld seam information. Also include the direction of the crack with respect to weld seams on the marriage line (perpendicular or parallel) and distance of the crack from the rubber interface with the fairing band.

(3) Amount of separation between the fairing angle and the rubber dome material, including the overall length and maximum width of the separation.

(4) Total area affected, including the diameter and depth of any pitting. Also include both the maximum and average pit size.

(5) Area and location of corrosion or other damage, including FR and the PDR.

17-6.4.16.1.3 Example of Report. "Torn rubber port side, 2 feet 9 inches down from the marriage line, 10 feet 6 inches aft of the vertical midpoint. Torn area measures 8 inches in width, 14 inches in length. Three plies of rubber peeled back with wire exposed."

17-6.4.16.1.4 NAVSEA Form 4730/5 (NSN 0116-LF-047-3025) Sonar Keel Dome Inspection Data is available to record results.

17-6.4.16.2 Inspection Procedure.

17-6.4.16.2.1 Specific Noise Source Inspection.

WARNING

Divers must exercise care when touching a dome with steel wires exposed.

WARNING

Avoid direct bare skin contact with NOFOUL rubber surfaces. Avoid contact between hands and eyes if hands have been exposed to the NOFOUL rubber material. Wash hands thoroughly before eating, drinking, or smoking.

a. Prior to beginning the inspection, get the latest Sonar Self Noise Test report from the ship's Engineer. This report will show the location of all noise spokes. Use these spokes as the starting point for the inspection. Conduct a detailed inspection of these areas until the source of the noise is located. Possible noise sources to inspect for that may be located at or forward of the noise spoke location are:

(1) Cuts, pits, flaps, and gouges in the outer surface.

(2) Separation in rubber plies as indicated by bulges or soft spots.

(3) Previous repairs which have become deteriorated or faulty.

(4) Exposed or broken structural steel wires.

b. To assist the diver in orientating himself on the dome, starting at the waterline, follow the stem down, surveying the hull plate for damage on both sides (port and starboard) and continue down to the marriage line (0° point). From here, follow the marriage line to the relative heading (port or starboard) of the noise spoke. Drop down from that point to begin the detailed inspection.

(1) Attach a bear paw magnet to the skirt plate at the point above the noise source.

(2) Lower a tape measure down from the bear paw to establish a vertical reference for the diver.

(3) Conduct a detailed (visual and hand) inspection of the area of suspected damage.

NOTE

Because of limited visual contrast, the diver's hands (even with gloves) may often sense damage that the eye cannot detect.

(4) If the noise source is not located, move the bear paw forward 18 to 24 inches and repeat the process until the damage is located.

17-6.4.16.2.2 Detailed Damage Inspection.

a. Return to the marriage line. Start at the 0° point to begin the overall damage inspection.

b. Inspect the marriage line (rubber dome and steel interface with the hull). Inspect the entire perimeter of the dome for:

(1) Separation of the rubber dome from the steel in the area of the fairing band.

(2) Dents or cracks in the fairing band and skirt plate welds, or immediate hull area.

NOTE

Be particularly alert for the presence of cracks. If any cracks are discovered, particular attention must be given to determine if the crack is running parallel to or vertically into the shell plating.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(3) FR and the PDR of the fairing band and the skirt plate, and immediate hull plate area.

c. Inspect the rubber surface of the dome. To ensure complete coverage of the SRD surface, begin the inspection at the 0° point at the marriage line. Follow the marriage line to starboard and inspect the general area while swimming aft. After reaching the aft most point of the dome, drop down no more than 3 feet (depending on water clarity) and work forward to the dome 0° point. Follow this sweeping pattern until the entire starboard side has been inspected. Inspect the port side using the same procedure.

d. Inspect the following conditions and report the physical dimensions and relative bearing and vertical location of each.

(1) Cuts, pits, and gouges in the outer surface of the rubber dome.

(2) Separation in rubber plies, which are indicated as bulges or soft spots.

(3) Previous repairs to the rubber window which have become faulty or have deteriorated.

(4) Exposed structural steel wire of the window.

NOTE

If rubber window steel wires are exposed, contact Naval Sea Systems Command Code SEA 00C5 for an analysis of the required repair.

(5) The fairing band, skirt, and the structural area within approximately 4 feet of the rubber dome.

(6) Inspect and report the FR of the dome. The rubber surface is made of NOFOUL rubber. However, the antifouling properties of the dome may become ineffective as the dome ages or from overspray of paint while in dry dock. Fouling degrades the performance of the sonar.

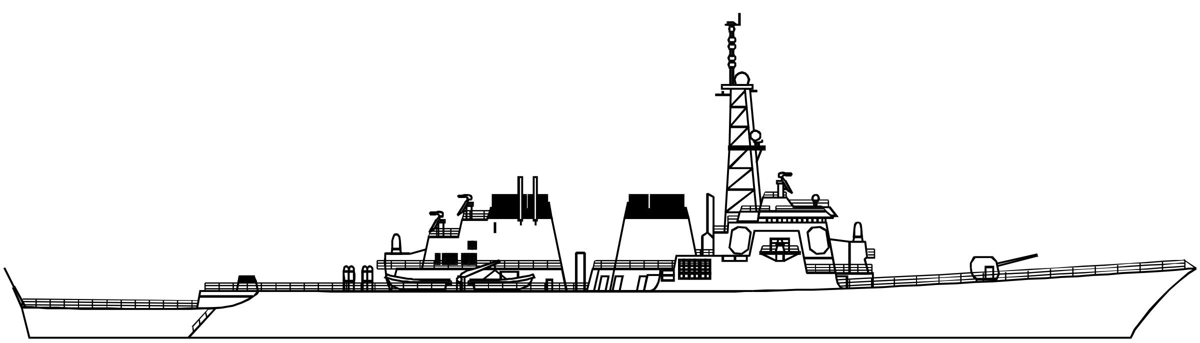
(7) Report the FR and the PDR.

e. If any discrepancies are noted, make the appropriate report and arrangements for follow-on repair.

UNDERWATER SHIP HUSBANDRY MANUAL

CHAPTER 17
SECTION 7

DDG 51 CLASS
UNDERWATER SHIP HUSBANDRY
INSPECTION PROCEDURES



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CHAPTER 17
UNDERWATER SHIP HUSBANDRY INSPECTION PROCEDURES

SECTION 7 DDG 51 ARLEIGH BURKE CLASS GUIDED MISSILE DESTROYER

17-7.1 INTRODUCTION.

17-7.1.1 This section of the *Underwater Ship Husbandry Manual* contains inspection procedures for the DDG 51 Arleigh Burke Class Guided Missile Destroyers. It consists of a general introduction to the DDG 51 Class, a description of the major hull components found on this ship, a set of Level 1 inspection procedures, and a set of Level 2 inspection procedures.

17-7.1.2 Table 17-7.1 contains a general hull description of the DDG 51 Class. Table 17-7.2 (found at the end of the Level 1 inspection procedures) contains a checklist of all ship systems covered by these inspection procedures. Item numbers in this table correspond to the hull system numbers in Figure 17-7.1 and are arranged in order to facilitate a typical diver inspection of all components: stern area, port side, bow, and starboard side. Figure 17-7.1, "DDG 51 Class Plan and Profile," and Figure 17-7.2, "DDG 51 Class Running Gear," are located after Table 17-7.2 and provide points of reference for the procedures described in this section. These figures augment the typical ship drawings and can be used as a quick reference by diving personnel. Figure 17-7.1 is derived from NAVSEA Drawing No. 085-6218641, Rev. C, DDG 51 Class Dry Dock Arrangement Guidance Drawing. Figure 17-7.2 is derived from class arrangement drawings. These figures are also useful in locating the coordinates of components requiring Level 2 inspections. Figures of the individual components appear throughout the Level 2 inspection procedures.

17-7.1.3 Diving activities may photocopy Table 17-7.2 and use it to record data during inspections. Upon completion of the inspection, the results should be transferred to the standard Diver's Underwater Hull Inspection Data Form, NAVSEA 4730/3 (NSN 0116-LF-047-3029). Figures found in the Level 2 inspection procedures section of this chapter may be photocopied and used to assist in sketching the extent of damage reported during inspections. These sheets should be attached to the Diver's Underwater Hull Inspection Data Form upon completion of the inspection.

17-7.1.4 DDG 51 Class ships were constructed at two different shipyards, thus there may be ships within a class whose individual hull systems may not be identically located. For this reason, it is recommended that the Dive Supervisor also refer to a Docking Plan for the individual ship being inspected.

Table 17-7.1. General Hull Description.

Length between Perpendiculars:	466 feet
Beam:	66 feet, 6 inches
Frame Spacing:	See docking plan profile
Rudders:	Port and starboard, spade with stool
Propellers:	Twin, 5-bladed, controllable pitch
Masker Air Emitter Belts:	Port and starboard, frames 232, 174, and 122
Prairie Air:	Propellers and main strut fairwater/rope guard
Sonar Dome:	Bow-mounted
Class Problems:	The propellers on this class ship are prone to cavitation damage.

17-7.2 DESCRIPTION OF MAJOR HULL COMPONENTS.

17-7.2.1 Hull Coating.

17-7.2.1.1 The underwater hull coating system is applied to the hull, shaft, and appendages (i.e., rudder, struts, bearing housing, rope guard, fairwaters, rotating coupling, stern tube and skeg). The coating system is comprised of two types of coatings: an anticorrosion coating and an antifouling coating. The anticorrosion coating is applied on the majority of metal components to provide the primary protection from corrosion and deterioration of the surfaces. The antifouling coating is applied over the anticorrosion coating and is directly applied to nonmetallic components (e.g., the glass-reinforced shaft coating). The antifouling coating is designed to protect the underwater systems from biological fouling.

17-7.2.1.2 Multiple coats of anticorrosive and antifouling coatings are applied to the hull. Each coat is a different color except for the boot top area where all coats are black. Use a diver's light to help accurately identify the color of the exposed coating for both large hull areas and areas of damage. This will allow accurate assessment of the remaining life of the coating system. The hull coating system can easily become damaged from impact with underwater objects or collisions and groundings. Typical damage is minor abrasion to the antifouling coating, exposing the anticorrosion coating and permitting biological fouling. More severe abrasion of the anticorrosion coating exposing bare metal will result in corrosion and deterioration of the metal. As the age of the coating increases, the antifouling coating may become less effective in preventing biological fouling and could easily become damaged if the biological fouling is allowed to reach a destructive level. Even the smallest amount of biological fouling can drastically impact the ship's operational capabilities and could eventually destroy the anticorrosion coating system.

17-7.2.1.3 References.

a. NAVSEA S9086-CQ-STM-010/CH081, "Waterborne Underwater Hull Cleaning of Navy Ships"

b. NAVSEA S9086-VD-STM-010/CH631, "Preservation of Ships in Service"

17-7.2.2 Rudders.

17-7.2.2.1 Ships in this class have two spade rudders with stool. The spade rudder is of one-piece construction. The entire rudder below the stool moves to steer the ship. The rudders are rectangular, hydrodynamically shaped metal blades located aft of the propellers and used to steer the ship. Rudders on large ships are hollow structures that have been flushed with a preservative and then dried. Rudders on this class ship have one 1 1/4-inch pipe drain plug located 4 feet 1 inch from the forward edge on the bottom centerline. There are also two 1 1/4-inch fill plugs on the top centerline: one located 1 foot 6 1/2 inches aft of the leading edge and one located 3 feet 11 inches forward of the trailing edge. There are two lifting fittings on each rudder, one each on the leading and trailing edges 3 feet down from the top.

17-7.2.2.2 The rudder stool is fixed to the hull. It protects and fairs the area around the rudder stock and bearing area. There are two fill plugs (one approximately 10 inches aft of the leading edge and one approximately 20 inches forward of the trailing edge, both on the outboard side near the hull) and two drain plugs (both on the bottom of the stool on the centerline directly below the fill plugs). The rudder will have to be shifted over to inspect the drain plugs and the bottom of the stool. The rudder stools each have one bolted-on zinc anode cover plate on the outboard side, located just aft of the rudder stock centerline. The cover plate is secured with 14 flat-head screws. There is approximately a 1-inch clearance between the top of the rudder and the stool.

17-7.2.2.3 While underway, rudders are subject to severe loading, high flow, and turbulence, as well as to possible damage from contact with underwater objects. Previous repairs (such as clad welding or installation of doubler plates) that have been painted may cause a rough-textured surface on the rudder, making inspection for damage difficult. While inspecting the rudder surface, the primary indications of new deterioration or damage is poor or missing paint. Bare metal or corrosion damage may be present. Report any such findings.

17-7.2.2.4 As a result of impact damage, bearing wear, or improper installation, the rudder may drop down from the hull. One of the main aspects of a rudder inspection is the measurement to determine if the rudder has dropped. The ship's Engineering Officer compares the current measurements with previous measurements. A change in the measurements indicates that the rudder has dropped.

17-7.2.2.5 Location. The rudders are located 10 feet 2 inches off the centerline, port and starboard, beginning at frame 464 and ending at frame 448.

17-7.2.2.6 References.

a. NAVSEA DWG DDG 51-562-6218937, Rev. F, Rudder and Rudder Control Details

b. NAVSEA DWG DDG 51-100-6218948, Rev. T, Unit Structural Arrangement Drawing, Assembly Unit 3520 (Rudder Stool Details)

17-7.2.3 Lifting Fittings.

17-7.2.3.1 Lifting fittings are sections of pipe bent into a "U" shape and recessed into the hull. Lifting fittings or "lifting tunnels" provide convenient rigging attachment points for handling the rudder and propeller. There are 14 lifting fittings installed on this class ship, seven to port and seven to starboard of the rudder and propeller.

17-7.2.3.2 Location. The lifting fitting arrangement is the same for both the port and starboard sides. There are two fittings at frame 463, one inboard and one outboard of the rudder; three at frame 448, one inboard and forward of the rudder, one aft of the propeller hub and one outboard of the propeller; and two at frame 442, one inboard and one outboard of the propeller.

17-7.2.3.3 References.

a. NAVSEA DWG DDG 51-245-6221272, Rev. C, Propeller and Rudder Lifting Arrangement

17-7.2.4 Propellers (5-Bladed).

17-7.2.4.1 This class of ship is propelled by two 17-foot diameter, 5-bladed, controllable pitch propeller (CPP) systems equipped with prairie air systems. A CPP system allows the ship to go from ahead to astern without changing the direction of shaft rotation. Rigid propeller blades are bolted on to hydraulically operated mounts on the propeller hub. This system positions the blades for the desired thrust, either ahead or astern. The controllable pitch propeller (CPP) system is bolted to the tailshaft flange.

17-7.2.4.2 The prairie air propeller blades have 306 3/64-inch diameter holes; 153 on the suction (forward) and 153 on the pressure (aft) sides. They are spaced 1 inch apart and 3/4 inches from the leading edge on both faces. To function properly, these emitter holes must be free of fouling.

17-7.2.4.3 The port propeller is left-hand and turns counterclockwise (when viewed from astern). The blades are numbered in the clockwise direction.

17-7.2.4.4 The starboard propeller is right-hand and turns clockwise (when viewed from astern). The blades are numbered in the counterclockwise direction.

17-7.2.4.5 The five controllable pitch blades are lettered "A" through "E." The CPP hub does not have a lifting eye to assist in identifying blade "A." The letters are stamped on the flat surface blade hub flange near the flange edge (blade palm), outboard of the blade bolts. Blade identification may be in the form of serial numbers such as "LH17A, LH17B" or "RH8A, RH8B," etc.

17-7.2.4.6 A blade bolt identification number may be stamped adjacent to each blade bolt hole on the top surface of the flange (blade palm) of each blade. Numbering is sequential, with 1 denoting the blade bolt on the suction face nearest the trailing edge and 8 denoting the blade bolt on the pressure face nearest the trailing edge.

17-7.2.4.7 Location. The propellers are located 13 feet 6 inches off centerline at frame 440, port and starboard.

17-7.2.4.8 References.

a. NAVSEA S9086-HP-STM-010/CH245, "Propellers"

b. NAVSEA S9245-AR-TSM-010/PROP, *Technical Manual for Marine Propeller Inspection, Repair and Certification*

c. NAVSEA S0600-AA-PRO-120, *Underwater Ship Husbandry Manual*, Chapter 12, "Controllable Pitch Propellers"

d. Bird-Johnson Co. Drawing 115651021, Rev. C, Propeller Blade DDG 51 Class

17-7.2.5 Bearing Housing and Struts.

17-7.2.5.1 Immediately forward of the propeller is the main strut. The main strut consists of two columns extending down from the hull forming a "V" shape that attaches to the bearing housing and supports the shaft. The struts are subjected to severe dynamic loading while the ship is underway. They are also subject to corrosion, vibration damage, and damage from rope and wire or other foreign material. At the top of the strut bearing housing are two 1/2-inch IPS pipe plugs, one forward and one aft. Additionally, there are six evenly spaced 1/2-inch IPS plugs on the bottom of the bearing housing. These holes are used for maintenance during dry-docking. Inspection includes a complete examination of the rope guard, strut surface, bearing housing, and fairwaters.

17-7.2.5.2 Location. The main struts and bearing housings are located immediately forward of the propeller at frame 433, port and starboard.

17-7.2.5.3 References.

a. NAVSEA DWG DDG 51-161-6218869, Rev. K, Shaft Strut Details and Tables

17-7.2.6 Rope Guards.

17-7.2.6.1 Rope guards are circular plates fitted between the propeller hub and the ends of the main strut bearings. They are streamlined in shape in order to eliminate abrupt changes in water flow and they serve to protect the rotating shaft from becoming fouled by wire, rope, or other material. The design clearance between the propeller hub and the rope guard is 3/4 inch. The rope guards on ships of this class are made up of two halves constructed of steel, and are welded to the bearing housing. The rope guards on this class ship are equipped with 102 equally spaced 3/64-inch diameter prairie air emitter holes. There are 43 on the upper half and 59 on the lower half.

17-7.2.6.2 Location. The rope guards are located immediately forward of the propellers at frame 438.

17-7.2.6.3 References.

a. NAVSEA DWG DDG 51-161-6221278, Rev. H, Fairwater and Rope Guards Fabrication and Details

17-7.2.7 Fairwaters.

17-7.2.7.1 Fairwaters are circular plates fitted at the ends of the stern tube and strut bearing housing. They are shaped to streamline these parts in order to eliminate abrupt changes in water flow. The design clearance from the shaft is 7/8 inch. The fairwaters on ships of this class are made up of two halves constructed of steel and are welded to the bearing housing. The main strut fairwaters are equipped with 134 3/64-inch diameter prairie air emitter holes evenly spaced around the circumference. There are 63 holes on the upper half and 71 on the lower half.

17-7.2.7.2 Location. The fairwaters are located forward of the main strut at frame 427 and aft the stern tube at frame 387. The prairie air emitter holes are located approximately 42 inches aft of the forward edge of the fairwater.

17-7.2.7.3 References.

a. NAVSEA DWG DDG 51-161-6221278, Rev. H, Fairwater and Rope Guards Fabrication and Details

17-7.2.8 Shafting.

17-7.2.8.1 The shafting transmits torque from the main engine to the propeller and axial thrust from the propeller to the hull. The section of shaft between the propeller and the stern tube is the “propeller shaft.” The propeller shaft is bolted to the “stern tube shaft.” This connection is provided by a rotating fairwater or “coupling cover.” This rotating fairwater is housed within the stern tube and is not visible to the diver. A glass-reinforced plastic (fiberglass) coating covers the propeller shaft.

17-7.2.8.2 Location. The shafts extend from the reduction gears to the propellers. The propeller shafts are exposed from frames 425 to 388.

17-7.2.8.3 References.

a. NAVSEA S0600-AA-PRO-130, *Underwater Ship Husbandry Manual*, Chapter 13, “Propulsion Shaft Coating Repair”

b. NAVSEA DWG DDG 51-243-6218423, Rev. K, Propulsion Shafting Arrangement

17-7.2.9 Stern Tube.

17-7.2.9.1 The free-flood area where the shaft penetrates the hull is the stern tube. The stern tube supports the shaft as it enters the hull. It houses one shaft bearing. A fairing is installed where the shaft enters the hull. The stern tube fairings on this class ship are made up of two halves constructed of steel and are welded to the hull. Design clearance between the fairing and the shaft is not less than 1/4 inch.

17-7.2.9.2 Location. The stern tubes extend from frame 386 to frame 368.

17-7.2.9.3 References.

a. NAVSEA DWG DDG 51-100-6218941, Rev. T, Unit Structural Arrangement, Drawing Assembly Unit 3320

17-7.2.10 Skeg.

17-7.2.10.1 The skeg is a long narrow vertical fin attached to the keel serving to assist keeping the ship on course. The skeg is flushed with preservative and then drained and dried. It has one fill plug located at frame 392 on the starboard side, 3 inches forward of the uppermost trailing edge and one drain plug located at frame 378 on the centerline.

17-7.2.10.2 Location. The skeg extends from frame 418 to 340.

17-7.2.10.3 References.

a. NAVSEA DWG DDG 51-100-6218941, Rev. M, Unit Structural Arrangement Drawing Assembly Unit 3320

17-7.2.11 Overboard Discharge.

17-7.2.11.1 Overboard discharges are round or oval openings used for discharging seawater or other fluids from the ship. Overboard discharges are not usually covered with screens or gratings.

17-7.2.11.2 Location. The overboard discharges are located in various spots on the hull.

17-7.2.11.3 References.

a. NAVSEA DWG DDG 51-085-6218641, Rev. C, DDG 51 Class Dry Dock Arrangement Guidance Drawing

17-7.2.12 Sea Chests and Seawater Suction.

17-7.2.12.1 Seawater suctions are openings for bringing seawater into the ship. Multiple suctions located together at one hull opening are called sea chests. Suctions and sea chests are covered with either mesh screens, grates, or strainer bars to prevent objects or foreign material from entering.

17-7.2.12.2 Location. The seawater suctions and sea chests are located in various spots on the hull.

17-7.2.12.3 References.

a. NAVSEA DWG DDG 51-085-6218641, Rev. C, DDG 51 Class Dry Dock Arrangement Guidance Drawing

17-7.2.13 Impressed Current Cathodic Protection (ICCP) System.

17-7.2.13.1 The Impressed Current Cathodic Protection (ICCP) system uses ship's power to provide galvanic corrosion protection for the hull and all underwater appendages. The system consists of two major hull-mounted components:

a. Reference Electrode (Reference Cell): The reference electrode is a cell constructed of a silver mesh screen that has been treated with silver chloride. It is mounted in a domed, 9-inch diameter circular polyvinyl chloride holder that electrically isolates the reference electrode from the hull. The reference electrode is secured to a base or sole plate by a pattern of screws. A series of holes in the reference electrode permit passage of seawater at the hull, allowing the controller to detect electromechanical activity at the hull and measure the potential of the hull versus the reference electrode. The holes in the reference electrodemust remain open for it to function, and should never be covered by paint or epoxy. A stuffing tube is used to pass a cable from the electrode to the controller. The controller measures the potential of the hull versus the reference electrode and signals a power supply to increase or decrease current output as required to reduce the potential difference between the hull potential and the preset desired potential. Two reference electrodes are installed for each controller. Reference electrodes are located on each side of the hull approximately halfway between anode sites.

b. Anodes: ICCP anodes are constructed of pairs of platinum-coated tantalum rods mounted in an insulating glass-reinforced polyester holder, which is bolted to the outside of the ship's hull. The direct current produced by the power supply is provided to the anode by a conductor through a stuffing tube. The current flows into the seawater through the platinum surface of the tantalum rods. The platinum surface of the anode corrodes very slowly, and the replacement period for anodes, unless physically damaged, is normally greater than 10 years. Two sizes of anodes are used on this class ship: 4 feet (75 amperes) and 8 feet (150 amperes).

17-7.2.13.2 A dielectric shield prevents shorting of the anode current to the hull near the anode and aids in wider current distribution. The dielectric shield is applied as a thick coating around each anode. It consists of a high-solids epoxy with high dielectric strength. It is applied with the hull coating system. The dielectric shield changes thickness as one moves away from the anode. For this class of ship, the 4-foot anode is surrounded by a dielectric shield approximately 100 mils thick out to a 7-foot by 10-foot area (inner shield). An additional dielectric shield (22 mils) extends out to 13 feet by 16 feet (outer shield). Eight-foot anodes are surrounded by a dielectric shield approximately 100 mils thick out to a 7-foot by 14-foot area (inner shield). Additional dielectric shield (22 mils) extends out to 13 feet by 20 feet (outer shield).

17-7.2.13.3 Anodes that have excessive output of protective current for prolonged periods will cause a failure of the hull coating in the immediate area causing blisters, peeling or missing paint, and large areas of bare metal. When the anode is active or energized, small bubbles are generated on the anode wires. The anode and the hull area above it will be free of marine fouling. In addition, if the dielectric shield becomes damaged and the system is working properly, a layer of calcium will be deposited over the exposed bare metal area. This calcium (calcareous deposits) may be mistaken for deteriorated portions of the coating system. Because calcareous deposits form an additional protective barrier to the hull they should not be removed. This condition, however, indicates a damaged coating and should be reported. Biological fouling is not the same as calcareous deposits.

17-7.2.13.4 An anode that has been turned off for prolonged periods will have a heavy layer of marine fouling on the anode strip and possibly the dielectric shield.

17-7.2.13.5 Location. This class ship has four 4-foot anodes, two per side, located at frames 246 and 69, and two 8-foot anodes, one per side, located at frame 410. Four reference electrodes are located port and starboard at frames 450 and 197.

17-7.2.13.6 References.

a. NAVSEA S9086-VF-STM-010/CH-633, Chapter 633, “Cathodic Protection”

b. NAVSEA DWG DE 1052-600-4466754, Anode and Reference Electrode for Impressed Current Cathodic Protection System

c. NAVSEA S0600-AA-PRO-190, *Underwater Ship Husbandry Manual*, Chapter 19, “Cathodic Protection Systems”

17-7.2.14 Bilge Keel.

17-7.2.14.1 The bilge keel is a long narrow fin near or at the turn of the bilge in the middle portion of the ship. It decreases the magnitude of rolling of the ship. Bilge keels on ships in this class are V-shaped and are 39 inches wide. The bilge keels are hollow structures that have been flushed with a preservative and then dried. There are three 1-inch fill/drain plugs on each bilge keel; two are located on the top at frames 322 and 178 and one is located on the bottom at frame 248.

17-7.2.14.2 Location. The bilge keels extend forward from frame 329 to frame 174 on the port and starboard sides.

17-7.2.14.3 References.

a. NAVSEA DWG DDG 51-100-6218922 Rev. Y, Unit Structural Arrangement Drawing, Assembly Unit 2320

17-7.2.15 Masker Belt.

17-7.2.15.1 Masker emitter belts are installed at the forward end and the after end of the ship’s machinery spaces. They run vertically down both sides of the external hull from a point above the waterline to a termination point in the vicinity of the keel.

17-7.2.15.2 The masker emitter belt configuration found on this class is the flat plate. The flat plate configuration consists of a flat plate rolled into a half-pipe-shaped air channel, welded to a backing plate. The backing plate is welded to the hull and runs vertically down both sides from a point above the waterline to a termination point at the keel.

17-7.2.15.3 Where bilge keels obstruct masker belt installation, an access is cut in the bilge to allow the masker belt to pass through. The accesses are located at frame 232. On each access there are two 3/8-inch UNC preservative fill and drain plugs: one on top and one on the bottom.

17-7.2.15.4 Air is supplied via a through-hull penetration to the upper end of the belt. The air is emitted through a series of 3/64-inch diameter holes drilled in a specific pattern along the underwater length of the belt.

17-7.2.15.5 Ships that have the flat plate configuration have a 1 1/4-inch clean-out plug installed on the masker belt 2 inches from the keel. The clean-out plug allows for removal to permit periodic flushing of the masker emitter belt system.

17-7.2.15.6 Ship's force personnel measure the flow rate to the masker belts while underway per MRC Code 551G U-3. This maintenance requirement determines whether or not cleaning of the system is required. Failure of the system to deliver a flow of 400-600 scfm at a pressure of 12-17 psig is indicative of failure or a requirement for cleaning. This would necessitate the inspection services of a diver.

17-7.2.15.7 Location. The DDG 51 Class ship has a total of six masker belt emitter systems, three per side. They are located port and starboard at frames 232, 174, and 122.

17-7.2.15.8 References.

a. NAVSEA S0600-AA-PRO-050, *Underwater Ship Husbandry Manual*, Chapter 5, “Masker Emitter Belts”

b. NAVSEA DWG DDG 51-551-6219430, Rev. J, Masker Emitter Belts

c. NAVSEA DWG DDG 51-551-6566484, Rev. H, Masker Emitter System Arrangement and Details

17-7.2.16 Transducer.

17-7.2.16.1 Transducers are transmitting and receiving heads for various kinds of underwater acoustic signals. The transducer is housed in an oil-filled corrosion resistant steel (CRES) trunk. The outer covering (166A CRES) of the trunk is welded to the hull. This class ship has one hull-mounted transducer: the TR-331/UQN. This transducer is part of the AN/UQN-4A Sonar Sounding Set (fathometer).

17-7.2.16.2 Location. The transducer is located on the starboard side at frame 127, 5 feet 7 inches off centerline.

17-7.2.16.3 References.

a. NAVSEA DWG DDG 51-180-6219420, Rev. H, Foundation Arrangement Drawing, Design Zone 2110 Booklet No. 1

17-7.2.17 Rodmeter (Underwater Log).

17-7.2.17.1 The rodmeter (also known as the pit sword) is the part of the underwater log that projects from the ship’s hull. The underwater log is a device for measuring the ship’s speed through the water. Ships in this class have a 72-inch retractable rodmeter. Retractable rodmeters can be retracted through an opening in the hull through a sea valve for maintenance. They are usually in the retracted (stowed) position and inaccessible to divers while the ship is in port.

17-7.2.17.2 With retractable rodmeters, possible problems include (but are not limited to):

a. Ship unable to receive input from rodmeter.

b. Ship unable to retract rodmeter.

17-7.2.17.3 Location. The rodmeter is located on the starboard side, 5 feet 7 inches from the centerline.

17-7.2.17.4 References.

a. NAVSHIPS DWG RE-E2699910, Rev. B, EM Log Seavalve MK 4 MOD 1

17-7.2.18 Bow-mounted Sonar Dome.

17-7.2.18.1 The Sonar Dome Rubber Window (SDRW) is a pressure-tight membrane that protects the sonar transducer array, reduces acoustic noise attenuation, and provides the proper hydrodynamic contour to minimize underway noise.

17-7.2.18.2 SDRWs are constructed much like steel-belted automobile tires, with layers of rubber applied over a series of steel plies. They are normally internally pressurized with water to maintain the desired shape. A fairing plate welded to the hull provides a smooth interface between the rubber sonar dome surface and the hull plate.

17-7.2.18.3 Most SDRWs are marked with a series of white grid markings to facilitate diver orientation. The grid markings consist of 2-inch by 2-inch squares along the upper periphery of the upper rubber window/fairing angle interface. These squares are painted every 15° to a point 165° aft on both sides. Directly above each square is a 2-inch number indicating the bearing that the square represents and an “S” or “P” to indicate starboard or port, as appropriate (15S, 135P, etc.). Additionally, in a horizontal line along the periphery of the lower rubber window/fairing angle interface are the same painted squares and numeral/letter combinations. The vertical midpoint of the SDRW is marked by a painted 2-inch square along the SDRW at the midpoint between the upper and lower bearing squares. Divers should use these location marks as reference points when reporting any damage. If the grid marks are not visible, the diver must estimate the location of any discrepancies.

17-7.2.18.4 The sonar dome banjo is a section of steel plate that extends forward from the keel. This plate supports the bottom of the dome. The banjo is narrowest just forward of the keel and increases in size as one moves to the forward end of the banjo.

17-7.2.18.5 Location. The sonar dome is located along the centerline of the ship from frame 54 to frame 0 (the forward perpendicular).

17-7.2.18.6 References.

a. NAVSEA S9165-AE-MMA-010/SDRW-1, *Technical Manual for Sonar Dome Rubber Window SDRW-1 for DDG 51 Class Vessels,* 1 May 1990

17-7.3 LEVEL 1 INSPECTION PROCEDURES.

17-7.3.1 Introduction.

17-7.3.1.1 This section contains Level 1 inspection procedures for the DDG 51 Class Guided Missile Destroyer. The Table 17-7.2 checklist presents components in the order in which the diver would find them when making a stern area, port side, bow, and starboard side inspection dive. Note that all hull openings included on the docking plan are listed in Figure 17-7.1 and Table 17-7.2. Depending on the ship's draft at the time of the inspection, some items may be above the waterline. The Dive Supervisor can refer to Figures 17-7.1 and 17-7.2 and Table 17-7.2 (found at the end of these Level 1 procedures) to pinpoint the exact location of a particular component. These tables and figures can be photocopied and used to document the reported condition of each component. In addition, the NAVSEA Diver Inspection Data Forms for the hull, Sonar Dome Rubber Window, ICCP, and propeller should be used to record the inspection results. These forms are included in Section 5 of this chapter. Underwater color photography should also be used to further depict the damage described in the report and in the forms.

17-7.3.2 Paint and Fouling Inspection.

NOTE

To accurately report the PDR and FR, the diver must be thoroughly familiar with NSTM Chapter 081, "Waterborne Underwater Hull Cleaning of Navy Ships."

17-7.3.2.1 One of the most important aspects of a Level 1 inspection is the assessment of the Fouling Rating (FR) and the Paint Deterioration Rating (PDR). Values for the FR and the PDR may vary widely along the length of a hull.

17-7.3.2.2 The diver should continuously report the condition of the paint using standard terms such as peeling, blistered (broken or intact), and missing antifouling or anticorrosive paint. Report the color of exposed paint. A diver's light is necessary to report color accurately. Use sections of hull plate to estimate the condition of small areas: flat and curved areas of plate, edges, welds, seams, rivets, and bolt heads. The Dive Supervisor maintains a running log of the conditions and records the FR and PDR for localized areas. This enables the Dive Supervisor to keep track of the total estimate for each section of the hull. These values are then summarized, yielding the overall condition for each area: bow, stern, flat bottom, and sides. Report the docking block areas separately from the flat bottom and sides. For docking block areas, report the average percent of block areas painted and the percent of base metal with pitting. Estimate the average diameter and depth of pitting. For a heavily fouled section of hull, only the FR can be reported since little or no hull paint will be visible.

17-7.3.2.3 This inspection procedure alerts the diver when the inspection process has been completed for each section of the hull to assist in summarizing the overall conditions.

a. Inspect and report the FR.

b. Inspect and report the PDR. Report localized areas of pitting, blisters, peeling, or missing paint.

c. Inspect and report the docking block FR and PDR.

17-7.3.3 General Hull Plate Inspection.

a. Carefully examine the hull plating. Look for areas of bare metal, bleeding rust, and large areas of pitting.

b. Inspect for holes, cracked weld seams, distorted hull plates, localized areas of pitting, corrosion, and any other apparent damage.

c. Estimate and report the extent and location of any damage; report length of cracks and average pit diameter and depth.

17-7.3.4 Lifting Fittings.

a. Inspect and report the FR.

b. Inspect and report the PDR. Report localized areas of pitting, blisters, peeling, or missing paint.

c. Inspect for cracked or corroded weld seams.

17-7.3.5 Rudder.

a. Inspect the entire surface area of the rudder and stool for any cracked welds or any marks, gouges, or scrapes that indicate the rudder surfaces may have made contact with an underwater object.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of any damage.

b. Inspect the area between the rudder, the rudder stock, and the stool for fouled wire, rope, or foreign material.

c. Measure the rudder clearance. At the center of the rudder stock, take the measurements at the inboard and outboard sides (both sides) between the top of the rudder and the stool. Design clearance is 1 inch.

d. Verify that the two fill plugs on the stool are present and have not backed out.

NOTE

The rudder will have to be shifted to port or starboard to inspect the stool drain plugs and the rudder fill plugs.

e. Verify that the two 1 1/4-inch fill holes (upper) and the 1 1/4-inch drain hole (lower) plugs are present and have not backed out.

f. Inspect the rudder lifting fittings.

g. Sound the rudder and stool by using a rubber or rawhide mallet.

(1) Rap on the surface to determine if the rudder or stool has flooded. Begin sounding near the uppermost part and continue downward to the lowest point.

NOTE

Internal framing and stiffeners will change the sound. It is necessary to sound the rudder and stool in different locations. A hollow sound indicates the rudder or stool is not flooded, while a dull sound indicates flooding.

(2) If the rudder is found to contain water, make the appropriate report and arrangements for follow-on dewatering and repair.

h. Inspect and report the FR and the PDR.

17-7.3.6 Propellers (5-Bladed).

a. Inspect the propeller hub end cover and hub cone cover plate for damage, cracks, and loose or missing fasteners.

b. Inspect the propeller hub for fouled wire, rope, or other foreign material. Fiber such as fish netting or manila line may be removed without difficulty. If removal of the material will be excessively time consuming, make the appropriate report and arrangements for follow-on removal.

c. Inspect the propeller blade root and flange areas for cracks and cavitation damage. Cavitation damage can be identified by an area of small pocked holes or a rough-textured surface.

(1) Verify that the blade bolt caps (4 each side of each blade) are in place and secure.

(2) Verify that the 1 1/8-inch thread savers (one in each side of the blade) are in place on the blade flange.

d. Inspect the overall physical appearance and FR of each blade, starting with blade "A."

(1) Inspect the leading and trailing edges for nicks, curls, chips, dents, flat spots, cracks, or other apparent damage.

(2) Inspect the suction (forward) and pressure (aft) face of each blade for defects caused by cavitation.

(3) Inspect the 1 3/4-inch prairie air channel cover plate on the blade pressure (aft) face for damage or cracked welds. Inspect both the pressure (aft) and suction (forward) face air emitter holes for fouling.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively fouled, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(4) Measure and record the extent of all damage.

(5) Inspect and report the FR of the propeller.

17-7.3.7 Rope Guard.

a. Verify that the rope guard is securely in place.

NOTE

A missing rope guard is a serious casualty.

b. Inspect all welds for corrosion, damage, or cracks.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Inspect for the presence of fouled rope, wire, or foreign material.

d. Verify that the 1 inch running clearance between the rope guard and propeller hub is uniform all around. Take clearance measurements at the 3, 6, 9, and 12 o'clock positions.

e. Inspect the 102 prairie air holes located around the guard for fouling or blockage.

f. Inspect and report the FR and the PDR of the rope guard.

17-7.3.8 Bearing Housing and Struts.

a. Inspect the bearing housing for the presence of the two 1/2-inch IPS pipe plugs (one on the forward and one on the after upper bearing housing edges) and six 1/2-inch IPS plugs evenly spaced on the bottom of the bearing housing; ensure that they are flush and staked at a minimum of two places.

b. Inspect the strut columns for corrosion damage and the presence of wire or other foreign material.

c. Inspect the surface paint condition.

(1) At best, the surface of the struts will be very rough due to previous damage or repairs.

(2) Inspect for loose or missing epoxy.

d. Inspect the strut columns at the strut/hull interface for cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Report the FR and PDR of the strut and bearing housing.

17-7.3.9 Fairwaters.

a. Verify the presence of fairwaters.

NOTE

A missing fairwater is considered a serious casualty.

b. Verify that the 7/8-inch gap between the fairwater and the shaft is uniform all around. Take measurements at the 3, 6, 9, and 12 o'clock positions.

c. Inspect the 134 evenly spaced 3/64-inch air emitter holes located around the fairwater for fouling or blockage.

d. Inspect all welds for corrosion damage and cracks.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Inspect and report the FR and the PDR of the fairwaters.

17-7.3.10 Shafting.

a. Inspect the full length of all accessible glass-reinforced plastic (fiberglass) covering.

(1) Inspect for evidence of deterioration, loss of adhesion, or any apparent physical damage. Loss of adhesion of shaft covering is characterized by one or more of the following: loss of covering (total or partial), delaminations, or bare metal.

(2) Inspect for damage such as nicks or cuts in the coating, missing covering, or loose covering. The covering may also have rust stains indicating where rust has leaked through near a cut, pinhole, area of porosity, patch, joint, or other flaw.

NOTE

Rust stains on the shaft coating indicate corrosion of the shaft. This is a serious problem.

b. If any of the above conditions exist, make the appropriate report and arrangements for follow-on Level 2 inspection.

17-7.3.11 Stern Tube.

a. Inspect the stern tube fairwater for corrosion damage and cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

b. Verify that the gap between the fairwater and the shaft is uniform all around. Take measurements at the 3, 6, 9, and 12 o’clock positions. Design clearance is 1 inch.

c. Inspect and report the FR and the PDR of the stern tube and immediate hull plate area.

17-7.3.12 Skeg.

a. Inspect the skeg for damage, corrosion, or cracked welds.

b. Inspect for loose or missing plugs. The skeg has one fill plug located at frame 392 on the starboard side, 3 inches forward of the uppermost trailing edge and one drain plug located at frame 378 on the centerline.

c. Inspect and report the FR and the PDR.

17-7.3.13 Impressed Current Cathodic Protection (ICCP) Anode (4-Foot and 8-Foot Anode).

NOTE

The presence of marine fouling indicates a non-functioning anode.

CAUTION

Avoid disturbing the white calcium buildup on the dialectric shield that protects areas of bare metal from corrosion.

a. Inspect the anode for damage, missing or broken wires, and missing or damaged platinum coating on the wires.

b. Inspect the dielectric shield for chips, cracks, blisters, or missing epoxy.

c. Inspect the hull coating in the area around the anode for missing or peeling paint or blisters. Inspect for calcareous buildup.

d. Inspect and report the FR and the PDR.

17-7.3.14 Reference Electrode (Reference Cell).

a. Inspect for damage, clogged water circulation holes, and loose or missing epoxy.

b. Inspect and report the FR.

17-7.3.15 Overboard Discharge.

a. Inspect for foreign material or corrosion damage.

b. Inspect and report the FR and the PDR.

17-7.3.16 Sea Chest and Seawater Suction.

a. Inspect screens and grates for clogged holes and loose or missing fasteners.

b. Inspect splitter bars for corrosion damage, broken or missing bars, cracked welds, and missing or loose fasteners.

c. Inspect and report the FR and the PDR.

17-7.3.17 Bilge Keel.

a. Inspect the bilge keel for dents, cracks, curled edges, missing plate, or other apparent damage.

b. Inspect for foreign material and loose or missing plugs. There are three plugs on each bilge keel. Two are located on the top at frames 322 and 178, and the other is located on the bottom at frame 248.

c. Measure and record the location of any damage.

d. Inspect and report the FR and the PDR.

17-7.3.18 Masker Belt.

a. Inspect for crushed, dented, or missing sections of masker belt.

b. Inspect the full length of weld between the backing plate and the hull (the backing plate is the plate welded to the hull) and the weld between the emitter plate and the backing plate for cracks. Inspect both sides.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Inspect the 3/64-inch air emitter holes for fouling. Emitter holes are spaced 1/2 inch forward and aft of the emitter pipe vertical centerline. Emitter holes are spaced in sections and the spacing varies in density for each section.

d. Inspect for a loose or missing 1 1/4-inch NPT clean-out plug located 2 inches from the end of the emitter pipe at the keel.

e. Inspect and report the FR and if painted, the PDR.

17-7.3.19 Transducer (Sonar TR 331/UQN).

a. Inspect sensor protective cover for tears, gouges, or delaminations.

b. Inspect the cover plate weld for damage, corrosion, or leaks.

c. Inspect for signs of structural failure or damage caused by contact with underwater objects.

d. Inspect and report the FR.

17-7.3.20 Rodmeter (Underwater Log).

a. Inspect the hull opening to verify that it is free of any obstruction.

b. Inspect and report the FR.

17-7.3.21 Bow-mounted Sonar Dome.

WARNING

Divers must exercise care when touching a dome with steel wires exposed.

WARNING

Avoid direct bare skin contact with NOFOUL rubber surfaces. Avoid contact between hands and eyes if hands have been exposed to the NOFOUL rubber material. Wash hands thoroughly before eating or smoking.

a. Inspect the entire surface of the sonar dome and banjo using a latitudinal inspection pattern. Survey a swath approximately 3 feet wide on each pass until complete. Inspect for cuts, pits, gouges, bulges, soft spots, and any previous repairs that may have become faulty or deteriorated.

b. Inspect and report the FR of the dome. The rubber surface of the dome is made of NOFOUL rubber. However, the anti-fouling properties of the dome may become ineffective as the dome ages or from over-spraying of paint while the ship is in dry-dock. Fouling degrades the performance of the sonar.

c. Inspect the entire perimeter of the rubber dome and steel closure plate for separation, cracks, damage or corrosion of the steel.

d. Inspect the banjo and fairing with the hull for damage, cracks or corrosion. Report the FR and PDR of the banjo.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Inspect the hull/sonar dome fairing interface for cracked welds or structural damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

f. Rubber damage with exposed wires, cracked welds, or structural damage are severe conditions. If any such discrepancies are noted, make the appropriate report and arrangements for a follow-on Level 2 inspection.

Name of Ship ____________________
Inspection Activity ____________________
Inspection Location ____________________
Inspection Date ____________________
Type of Inspection (Level 1 or Level 2) ____________________

Table 17-7.2. Checklist of Major Hull Components (sheet 1 of 6)
(Item Numbers Correspond to Numbers on Figure 17-7.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
1		Stern Area Paint and Fouling		Frame 338-466		
2		Stern Area Hull Plate		Frame 338-466		
3		Lifting Fittings, Stbd	Rudder and Propeller	Frame 463 (2 ea.), 488 (3 ea.), 442 (2 ea.)		
4	64	Overboard Discharge	Firemain	Frame 459 Stbd, 14′ 8″ off CL	3 5/8″ dia	
5	63	Overboard Discharge	Plumbing Drain	Frame 448 Stbd, 22′ 1″ off CL*	3″ dia	
6	19	Reference Electrode (Reference Cell)	ICCP System	Frame 448 Stbd, 8′ 0″ off CL	9″ dia	
7		Rudder and Rudder Stool, Stbd		Frame 464-448 Stbd, 10′ 2″ off CL		
7.a		Rudder Drop Measurement				
7.b		Paint and Fouling				
7.c		Plating, Welds				
7.d		Rudder Fill and Drain Plugs				
7.e		Stool Fill and Drain Plugs				
7.f		Stool Access Cover Plate				
7.g		Sound Rudder and Stool				
8		Propeller (5-Bladed) Stbd		Frame 444-438 Stbd, 13′ 6″ off CL		
8.a		Hub				
8.b		Blades				
8.b.1		Blade Bolt Caps and Thread Savers				
8.b.2		Blade FR and Damage				
8.b.3		Prairie Air Channels				
9		Bearing Housing and Struts, Stbd		Frame 436-428 Stbd, 13′ 6″ off CL		
9.a		Rope Guard with Prairie Air				
9.b		Bearing Housing				
9.c		Struts				
9.d		Fairwater with Prairie Air				

Name of Ship ____
Inspection Activity ____
Inspection Location ____
Inspection Date ____
Type of Inspection (Level 1 or Level 2) ____

Table 17-7.2. Checklist of Major Hull Components (sheet 2 of 6)
(Item Numbers Correspond to Numbers on Figure 17-7.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
10		Shaft, Stbd		Frame 428-388 Stbd, 13′ 6″ off CL		
11		Stern Tube and Fairing, Stbd		Frame 388-342 Stbd, 13′ 6″ off CL		
12	10	Sea Chest	Ships Service Gas Turbine Generator Cooling Pump #3	Frame 382-378 Stbd, 7′ 10″ off CL	46 1/2″ x 12 1/2″	
13		Skeg		Frame 418-340 on CL		
13.a		Plug (Skeg Fill Plug)	Skeg	Frame 392 Stbd, 3″ Forward off Uppermost Trailing Edge		
13.b	69	Plug (Skeg Drain Plug)	Skeg	Frame 378 CL	1″ dia	
13.c		Skeg Keel Docking Block Area, FR and PDR				
14	17	Impressed Current Cathodic Protection (ICCP) Anode (8-Foot Anode)	ICCP System 150 amp anode	Frame 412-404 Stbd, 14′ 11″ off CL	96″ x 5″ area	
15	56	Overboard Discharge	Firemain	Frame 396 Stbd, 25′ 8″ off CL	3 5/8″ dia	
16	54	Overboard Discharge	Seawater Cooling	Frame 381 Stbd, 26′ 2″ off CL	3 5/8″ dia	
17	53	Overboard Discharge	Seawater Cooling	Frame 380 Stbd, 24′ 4″ off CL	3 5/8″ dia	
18	67	Overboard Discharge	Submersible Dewatering Pump	Frame 352 Stbd, 28′ 8″ off CL*	4″ dia	
19		Lifting Fittings, Port	Rudder and Propeller	Frame 463 (2 ea.), 488 (3 ea.), 442 (2 ea.)		
20	20	Reference Electrode (Reference Cell)	ICCP System	Frame 448 Port, 8′ 0″ off CL	9″ dia	
21		Rudder and Rudder Stool, Port		Frame 464-448 Port, 10′ 2″ off CL		
21.a		Rudder Drop Measurement				
21.b		Paint and Fouling				
21.c		Plating, Welds				
21.d		Rudder Fill and Drain Plugs				
21.e		Stool Fill and Drain Plugs				
21.f		Stool Access Cover Plate				
21.g		Sound Rudder and Stool				
22	62	Overboard Discharge	Plumbing Drain	Frame 448 Port, 22′ 1″ off CL*	3″ dia	

Name of Ship ____________________
Inspection Activity ____________________
Inspection Location ____________________
Inspection Date ____________________
Type of Inspection (Level 1 or Level 2) ____________________

Table 17-7.2. Checklist of Major Hull Components (sheet 3 of 6)
(Item Numbers Correspond to Numbers on Figure 17-7.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
23	61	Overboard Discharge	Main and Secondary Drain	Frame 446 Port, 22′ 3″ off CL*	5 1/8″ dia	
24		Propeller (5-Bladed) Port		Frame 444-438 Port, 13′ 6″ off CL		
24.a		Hub				
24.b		Blades				
24.b.1		Blade Bolt Caps and Thread Savers				
24.b.2		Blade FR and Damage				
24.b.3		Prairie Air Channels				
25		Bearing Housing and Struts, Port		Frame 436-428 Port, 13′ 6″ off CL		
25.a		Rope Guard with Prairie Air				
25.b		Bearing Housing				
25.c		Struts				
25.d		Fairwater with Prairie Air				
26		Shaft, Port		Frame 428-388 Port, 13′ 6″ off CL		
27		Stern Tube and Fairing, Port		Frame 388-358 Port, 13′ 6″ off CL		
28	18	Impressed Current Cathodic Protection (ICCP) Anode (8-Foot Anode)	ICCP System 150 amp Anode	Frame 412-404 Port, 14′ 11″ off CL	96″ x 5″ area	
29	59	Overboard Discharge	Plumbing Waste Drain	Frame 407 Port, 25′ 2″ off CL*	3 1/8″ dia	
30	57	Overboard Discharge	Washdown Countermeasure Drain	Frame 395 Port, 26′ 5″ off CL*	1 3/4″ dia	
31	68	Overboard Discharge	Firemain Distribution	Frame 394 Port, 26′ 8″ off CL*	1 3/4″ dia	
Note: This completes the stern area for reporting FR and PDR values. Transom to frame 338.						
32		Port Paint and Fouling		Frame 338-78		
33		Port General Hull Plate		Frame 338-78		
33.a		Port Side Docking Block Areas (Include Keel Block Areas) FR and PDR				
34	52	Overboard Discharge	Seawater Cooling	Frame 337 Port, 12′ 2″ off CL	7″ dia	
35	9	Sea Chest	Fire Pump #5	Frame 322-318 Port, 10′ 1″ off CL	46 1/2″ x 25 1/2″	
36	71	Overboard Discharge	Firemain	Frame 324 Port, 16′ 1″ off CL	3 5/8″ dia	

Name of Ship
Inspection Activity
Inspection Location
Inspection Date
Type of Inspection (Level 1 or Level 2)

Table 17-7.2. Checklist of Major Hull Components (sheet 4 of 6)
(Item Numbers Correspond to Numbers on Figure 17-7.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
37	50	Overboard Discharge	Sea Chest Vent	Frame 323 Port, 29′ 4″ off CL*	2 1/2″ dia	
38	47	Overboard Discharge	Sewage and Plumbing Drain	Frame 313 Port, 29′ 9″ off CL*	5 5/8″ dia	
39		Bilge Keel, Port		Frame 328-175 Port		
39.a		Plug	Bilge Keel	Frame 322 Port	1″ dia	
39.b		Plug	Bilge Keel	Frame 248 Port	1″ dia	
39.c		Plug	Bilge Keel	Frame 178 Port	1″ dia	
40	41	Overboard Discharge	Seawater Cooling	Frame 265 Port, 25′ 6″ off CL	7 1/2″ dia	
41	16	Impressed Current Cathodic Protection (ICCP) Anode (4-Foot Anode)	ICCP System 75 amp Anode	Frame 245-241 Port, 27′ 0″ off CL	48″ x 5″ area	
42		Masker Belt, Port		Frame 232 Port		
43	35	Overboard Discharge	Seawater Cooling	Frame 208 Port, 28′ 4″ off CL*	4 1/8″ dia	
44	34	Overboard Discharge	Water Waste Transfer	Frame 200 Port, 29′ 3″ off CL*	3 1/8″ dia	
45	14	Reference Electrode (Reference Cell)	ICCP System	Frame 197 Port, 25′ 9″ off CL	9″ dia	
46	33	Overboard Discharge	Sea Chest Vent	Frame 190 Port, 29′ 10″ off CL*	2 1/2″ dia	
47	32	Overboard Discharge	Plumbing Waste Drain	Frame 189 Port, 29′ 10″ off CL*	4 1/8″ dia	
48	30	Overboard Discharge	Main and Secondary Drainage	Frame 184 Port, 30′ 0″ off CL*	9 7/8″ dia	
49	58	Overboard Discharge	Firemain	Frame 189 Port, 25′ 3″ off CL	4 1/4″ dia	
50	31	Overboard Discharge	Distilling Plant	Frame 187 Port, 28′ 4″ off CL	3 5/8″ dia	
51	4	Sea Chest	Fire Pump #3 and Cooling Pump #2	Frame 190-186 Port, 5′ 7″ off CL	46 1/2″ x 25 1/2″ 9′ 1″ x 3′ 0″ fairing	
52	28	Overboard Discharge	Main and Secondary Drainage	Frame 169 Port, 29′ 0″ off CL*	9 7/8″ dia	
53		Masker Belt, Port		Frame 174 Port		
54	3	Sea Chest	Ships Service Gas Turbine Generator Circulating Cooling Pump #1	Frame 168-166 Port, 9′ 6″ off CL	22 1/2″ x 22 1/2″ 7′ 1″ x 3′ 0″ fairing	
55	27	Overboard Discharge	Ships Service Gas Turbine Generator Seawater Circulating Pump #1	Frame 166 Port, 19′ 7″ off CL	3 5/8″ dia	
56	25	Overboard Discharge	Seawater Cooling Pump #1 Recirculating	Frame 145 Port, 15′ 8″ off CL	2 1/2″ dia	
57	2	Sea Chest	Central Seawater Cooling Pump #1 and Fire Pump #2	Frame 138-134 Port, 3′ 4″ off CL	46 1/2″ x 25 1/2″ 9′ 1″ x 3′ 0″ fairing	
58	24	Overboard Discharge	Chemical, Fluorocarbon Cooling	Frame 134 Port, 26′ 3″ off CL*	1 3/4″ dia	

Name of Ship ______
Inspection Activity ______
Inspection Location ______
Inspection Date ______
Type of Inspection (Level 1 or Level 2) ______

Table 17-7.2. Checklist of Major Hull Components (sheet 5 of 6)
(Item Numbers Correspond to Numbers on Figure 17-7.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
59		Masker Belt, Port		Frame 122 Port		
60	22	Overboard Discharge	Plumbing Drain	Frame 120 Port, 18′ 3″ off CL	4 1/8″ dia	
61	70	Overboard Discharge	Firemain	Frame 118 Port, 16′ 9″ off CL	4 1/4″ dia	
62	1	Sea Chest	Fire Pump #1	Frame 118-115 Port, 12′ 6″ off CL	34 1/2″ x 25 1/2″	
63	21	Overboard Discharge	Fire Pump #1 Sea Chest Vent	Frame 116 Port, 24′ 3″ off CL*	2 1/2″ dia	
Note: This completes the port side for reporting FR and PDR value. Frames 338 to 78.						
64		Bow Paint and Fouling		Frame 78 and Forward		
65		Bow General Hull Plate		Frame 78 and Forward		
65.a		Bow Keel Docking Block Areas, FR and PDR				
66	12	Impressed Current Cathodic Protection (ICCP) Anode (4-Foot Anode)	ICCP System 75 amp Anode	Frame 71-67 Port, 10′ 5″ off CL	48″ x 5″ area	
67		Bow-mounted Sonar Dome		Frame 55-0 CL		
68	11	Impressed Current Cathodic Protection (ICCP) Anode (4-Foot Anode)	ICCP System 75 amp Anode	Frame 71-67 Stbd, 10′ 5″ off CL	48″ x 5″ area	
Note: This completes the bow area for reporting FR and PDR values. Frame 78 and forward.						
69		Stbd Paint and Fouling		Frame 78-338		
70		Stbd General Hull Plate		Frame 78-338		
70.a		Stbd Side Docking Block Areas FR and PDR				
71	23	Overboard Discharge	Plumbing Waste Drain	Frame 123 Stbd, 23′ 9″ off CL	3 5/8″ dia	
72		Masker Belt, Stbd		Frame 122 Stbd		
73	66	Transducer (Sonar TR 331/UQN)		Frame 127 Stbd, 5′ 7″off CL	16 1/4″ dia	
74	65	Rodmeter (Retractable)	Underwater Log	Frame 131 Stbd, 5′ 7″ off CL	12 7/8″ dia	
75	29	Overboard Discharge	Central Seawater Cooling Pump #1	Frame 169 Stbd, 20′ 0″ off CL	9 1/2″ dia	
76	26	Overboard Discharge	Masker Emitter System	Frame 171 Stbd, 29′ 4″ off CL*	4 1/8″ dia	
77		Masker Belt, Stbd		Frame 174 Stbd		
78		Bilge Keel, Stbd		Frame 328-175 Stbd		
78.a		Plug	Bilge Keel	Frame 178 Stbd	1″ dia	

Name of Ship ____________________
Inspection Activity ____________________
Inspection Location ____________________
Inspection Date ____________________
Type of Inspection (Level 1 or Level 2) ____________________

Table 17-7.2. Checklist of Major Hull Components (sheet 6 of 6)
(Item Numbers Correspond to Numbers on Figure 17-7.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
78.b		Plug	Bilge Keel	Frame 248 Stbd	1″ dia	
78.c		Plug	Bilge Keel	Frame 322 Stbd	1″ dia	
79	13	Reference Electrode (Reference Cell)	ICCP System	Frame 197 Stbd, 25′ 9″ off CL	9″ dia	
80	37	Overboard Discharge	Oily Waste Transfer	Frame 217 Stbd, 30′ 0″ off CL*	3 5/8″ dia	
81	36	Overboard Discharge	Seawater Cooling	Frame 215 Stbd, 26′ 5″ off CL	7 1/2″ dia	
82	5	Sea Chest	Central Seawater Cooling Pump #3	Frame 228-224 Stbd, 12′ 4″ off CL	34 1/2″ x 25 1/2″ 8′ 1″ x 3′ 0″ fairing	
83		Masker Belt, Stbd		Frame 232 Stbd		
84	38	Seawater Suction	Central Seawater Cooling Pump #3	Frame 238 Stbd, 15′ 3″ off CL	9 7/8″ dia	
85	15	Impressed Current Cathodic Protection (ICCP) Anode (4-Foot Anode)	ICCP System 75 Amp Anode	Frame 245-241 Stbd, 27′ 0″ off CL	48″ x 5″ area	
86	39	Overboard Discharge	Seawater Cooling	Frame 248 Stbd, 29′ 4″ off CL	3 5/8″ dia	
87	40	Overboard Discharge	Seawater Cooling	Frame 261 Stbd, 26′ 11″ off CL	3 5/8″ dia	
88	55	Overboard Discharge	Firemain	Frame 267 Stbd, 27′ 9″ off CL	2 1/4″ dia	
89	42	Overboard Discharge	Waste Water Pump	Frame 267 Stbd, 30′ 0″ off CL*	3″ dia	
90	43	Overboard Discharge	Seawater Cooling	Frame 275 Stbd, 28′ 11″ off CL	4 1/8″ dia	
91	6	Sea Chest	Central Seawater Cooling Pump #4 and Fire Pump #4	Frame 272-268 Stbd, 5′ 7″ off CL	46 1/2″ x 25 1/2″ 9′ 1″ x 3′ 0″ fairing	
92	7	Sea Chest	Ships Service Gas Turbine Generator Circulating Cooling Pump #2	Frame 282-280 Stbd, 7′ 10″ off CL	22 1/2″ x 25 1/2″ 7′ 1″ x 3′ 0″ fairing	
93	44	Overboard Discharge	Plumbing Drain	Frame 297 Stbd 26′ 3″ off CL	4 3/4″ dia	
94	60	Overboard Discharge	Sewer and Plumbing Drain	Frame 306 Stbd, 29′ 9″ off CL*	5 3/8″ dia	
95	45	Overboard Discharge	Sewage and Plumbing Drain	Frame 308 Stbd, 29′ 11″ off CL*	4 1/8″ dia	
96	46	Overboard Discharge	Plumbing	Frame 311 Stbd, 29′ 8″ off CL*	3″ dia	
97	49	Overboard Discharge	Sea Chest Vent	Frame 319 Stbd, 29′ 4″ off CL*	2 1/2″ dia	
98	48	Overboard Discharge	Seawater Cooling	Frame 320 Stbd, 14′ 1″ off CL	2 3/4″ dia	
99	8	Sea Chest	Seawater Cooling Pump #5	Frame 322-318 Stbd, 10′ 1″ off CL	34 1/2″ x 25 1/2″ 8′ 1″ x 3′ 0″ fairing	
100	51	Overboard Discharge	Main and Secondary Drainage	Frame 337 Stbd, 29′ 3″ off CL*	11 5/8″ dia	
Note: This completes the starboard side for reporting FR and PDR values. Frames 78 to 338.						

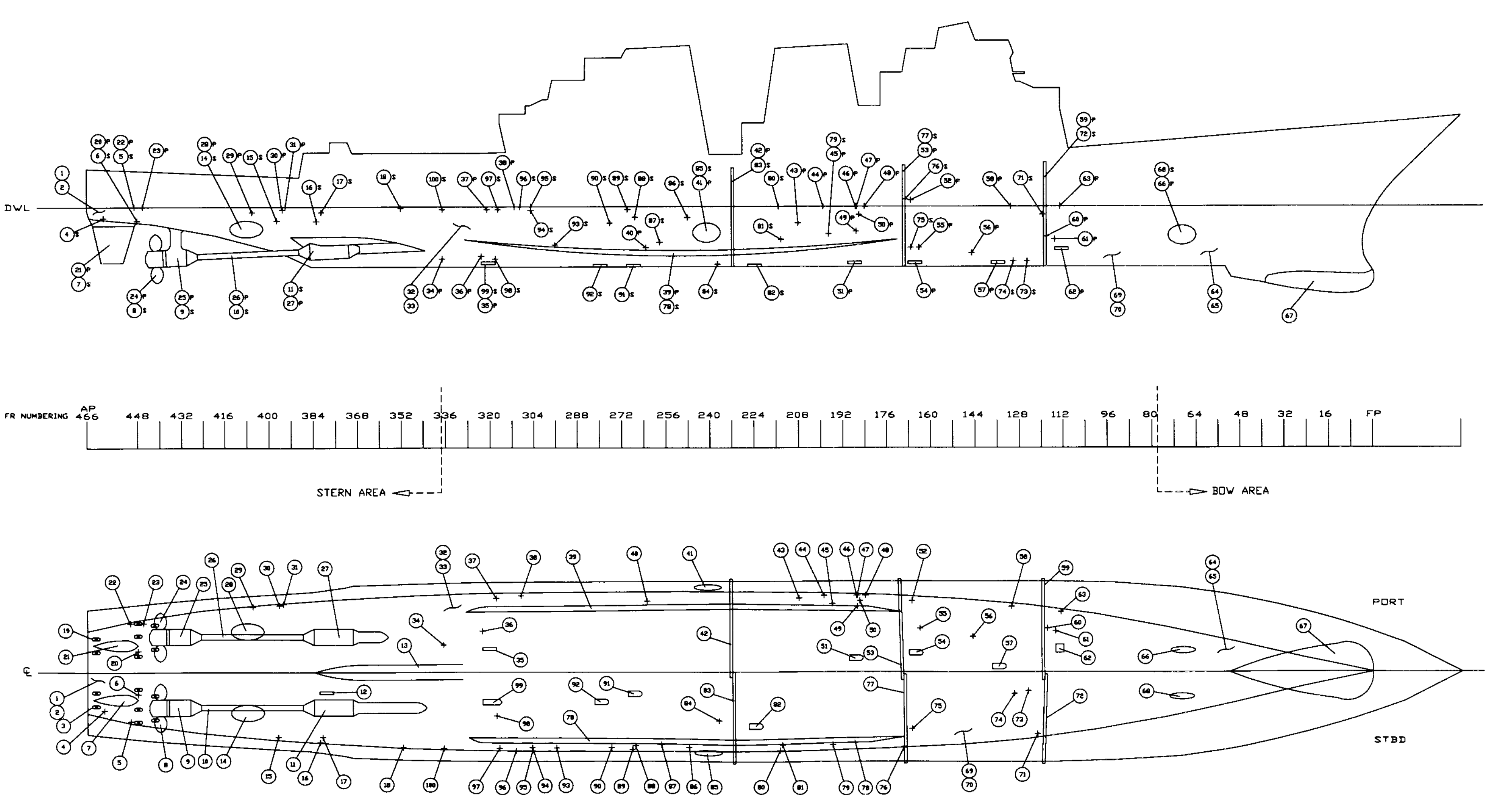


Figure 17-7.1 DDG 51 Class Plan and Profile.

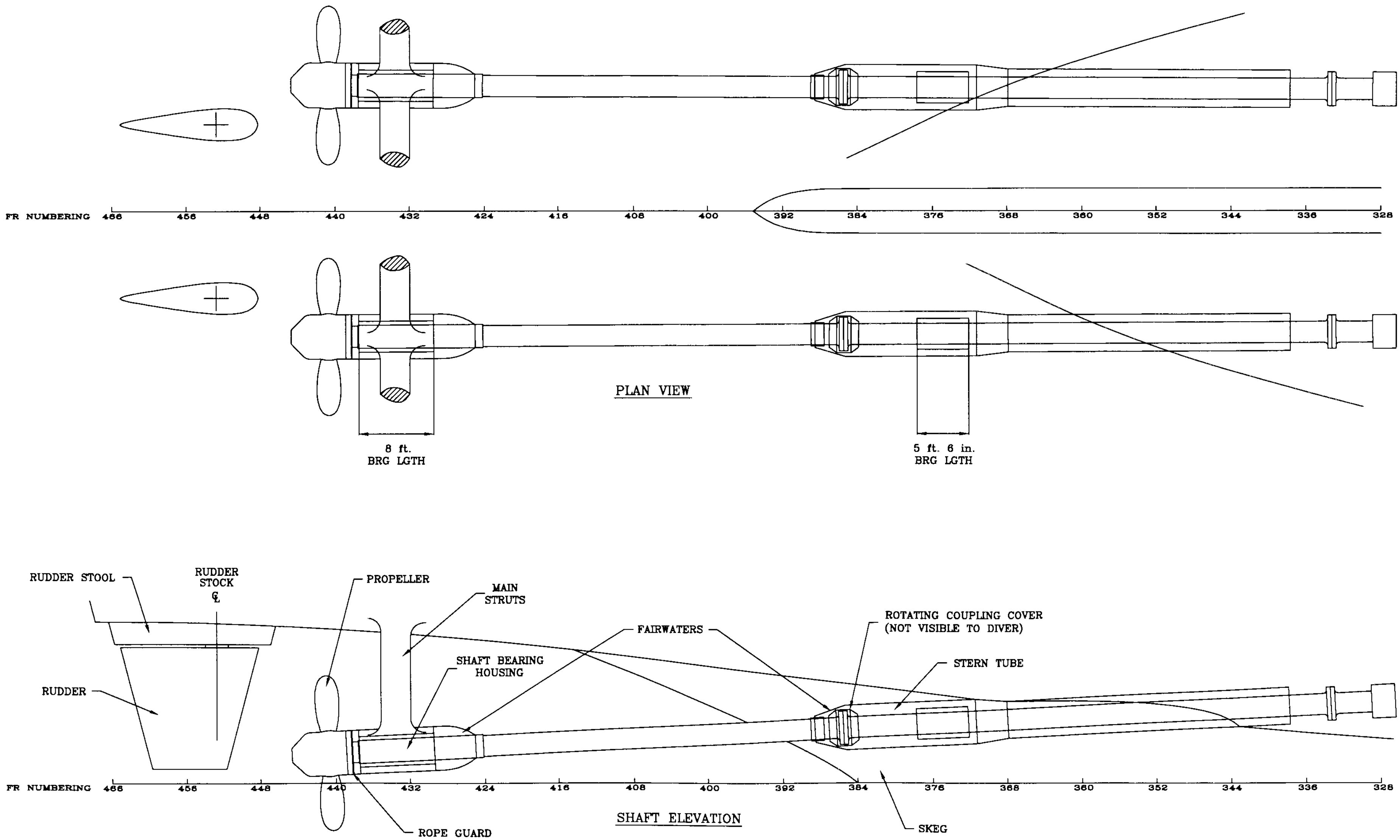


Figure 17-7.2 DDG 51 Class Running Gear.

17-7.4 LEVEL 2 INSPECTION PROCEDURES.

17-7.4.1 Introduction.

17-7.4.1.1 This section contains Level 2 inspection procedures for the DDG 51 Class Guided Missile Destroyer. The procedures are presented in the order in which the diver would find the components when making a stern-to-stem swim. The Dive Supervisor can refer back to Table 17-7.2 to pinpoint the exact location of a particular component.

17-7.4.1.2 The purpose of a Level 2 inspection is to conduct a detailed inspection of the malfunctioning or damaged component. The diver must gather sufficient information for further evaluation. For this reason, the diver must make precise measurements and record the exact coordinates of any discrepancies that require further repair. The drawings in this chapter can be photocopied and marked to show the location and extent of damage. The diver can also refer to the appropriate forms for recording damage on certain types of systems. Underwater color video and/or photography should also be used to further depict the damage described on the report and on the forms.

17-7.4.2 Hull Coating And Hull Plate.

17-7.4.2.1 The purpose of a Level 2 hull coating and hull plate inspection is to accurately assess the extent of known or suspected damage resulting from collision, grounding, or other mishap. The inspection requires a detailed description (with measurements) of the exact location and extent of all damage.

17-7.4.2.2 Damage Description Requirements.

17-7.4.2.2.1 Report all areas, size, and location of paint damage, areas of exposed metal, and condition of surrounding paint. Use definable reference points such as suctions, discharges, bilge keel, flat bottom, turn of the bilge, etc.

17-7.4.2.2.2 Hull plate damage must be detailed in terms of the amount of distortion, orientation, and size, length, and maximum width of cracks or gouges; proximity and orientation of closest weld seams; torn or missing plate; and condition of exposed stiffeners and framing.

17-7.4.2.2.3 Damage at or near the keel must include a detailed inspection of the keel. Locate and measure any cracks or distortion.

17-7.4.2.2.4 Example of Report. "10-foot by 35-foot damaged area running fore and aft, 15 feet outboard port of the keel beginning 38 feet aft of the rodmeter. Damage begins with an area of scraped paint, approximately 10 feet long, and continues to a maximum plate distortion of four inches by six feet wide by 20 feet long, 50 percent bare metal, no visible hull plate cracks, no suctions or discharges are located in the damaged area."

17-7.4.2.3 Inspection Procedure.

17-7.4.2.3.1 Gross Damage Assessment.

a. Conduct a quick inspection of the damaged area and immediate surrounding area.
   (1) Inspect the condition of the hull paint and locate the closest hull appendages and openings.
   (2) If only paint damage has occurred, report the size and location; if distorted, gouged, or cracked metal is found, continue with the detailed inspection.
   (3) Measure extent of pitting: percent, diameter, and depth.

17-7.4.2.3.2 Detailed Damage Inspection.

a. Thoroughly inspect all damaged areas: length, width, and orientation of all cracks, area of distorted or missing hull plate, maximum depression of plate, presence of torn or bulging plate.
b. If hull plate is torn or missing, report condition of all exposed framing.

NOTE

Damage at or near the keel is a serious casualty. Exact details of the condition are required to determine the seaworthiness of the hull.

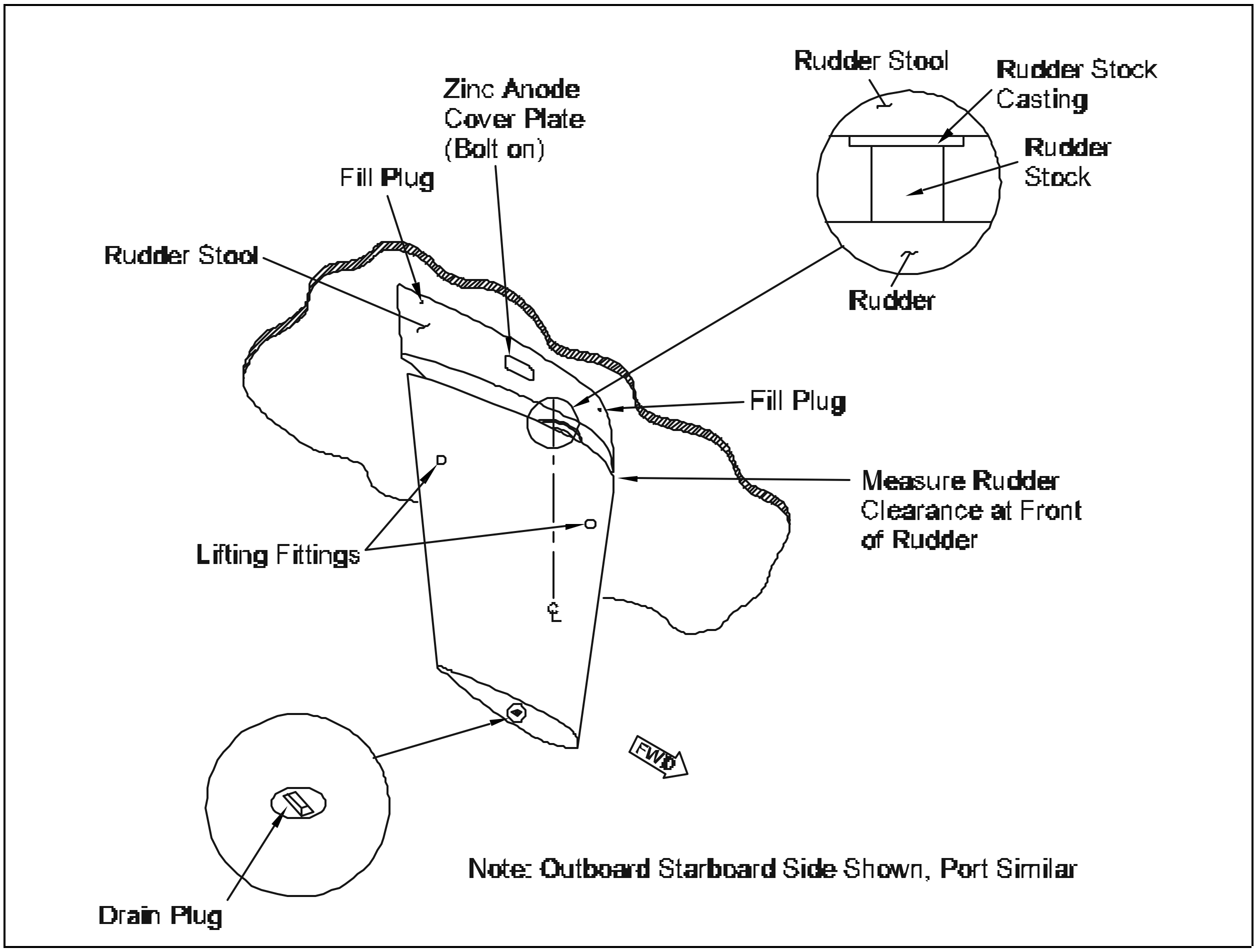


Figure 17-7.3. Spade Rudder with Stool.

17-7.4.3 Rudder and Stool.

17-7.4.3.1 Damage Description Requirements.

17-7.4.3.1.1 Inspection of rudders requires a detailed description (with measurements) of the exact location and size of all corrosion, damage, and flaws. As a minimum, the description must include:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference point (top/bottom/side/leading edge).

b. Length, maximum width, and orientation of all cracks; give closest weld seam information, include the direction of the crack with respect to the weld (perpendicular or parallel) and the proximity of the crack to the weld (center of weld, base metal). If cracks are found in or near any clad welding, describe the location with respect to the cladding (center, edge, parallel to weld bead, etc.).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage.

e. PDR and FR.

17-7.4.3.1.2 Example of Report. “Pitting on leading edge of port rudder, inboard side, starting 30 inches from forward bottom, 6-inch by 8-inch area. Maximum pit depth: 1/8-inch depth by 1/4-inch diameter. Average pit depth: 1/8-inch depth by 1/4-inch diameter."

17-7.4.3.2 Inspection Procedure. See Figure 17-7.3.

a. Inspect the rudder stock area.

(1) Inspect the area between the rudder and stool, and around the rudder stock for fouled wire, rope, or other foreign material.

b. Measure the rudder clearance.

(1) With the rudder amidships, take the clearance measurements between the top of the rudder and the stool (at the forward most part of the rudder and stool). Design clearance measurement is 1 inch.

c. Inspect the rudder and stool surface.

(1) Verify that the two fill plugs on top of the rudder are present and secure. Verify that the zinc anode access cover plate is in place and that all 14 flat-head screws are in place and secure.

(2) Determine the overall FR of the rudder and stool. If the FR is 40 or greater, inspect for clean areas which indicate areas of recent damage from grounding or contact with submerged objects. If any such areas are found, thoroughly inspect for cracks, dents, or gouges.

(3) Conduct a detailed inspection of the rudder and stool surface for any cracked welds, marks, gouges, or scrapes. Inspect for areas of bleeding rust and bare metal. Inspect the stool to hull weld for cracks and corrosion.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(4) Verify that the drain plug on bottom of the rudder is present and secure.

(5) Report the FR and the PDR.

d. Sound the rudder and stool.

(1) Using a rubber or rawhide mallet, rap on the rudder and stool surface to determine if the rudder has flooded. Begin sounding near the uppermost part of the rudder and continue downward to the lowest point.

NOTE

Internal framing and stiffeners will change the sound. It is necessary to sound the rudder and stool in different locations. A hollow sound indicates the rudder or stool is not flooded, while a dull sound indicates flooding.

(2) If the rudder or stool is found to contain water, conduct a detailed inspection to locate the source of flooding. Inspect all plugs for tightness and inspect weld seams for cracks. Make the appropriate report and arrangements for follow-on dewatering and repair.

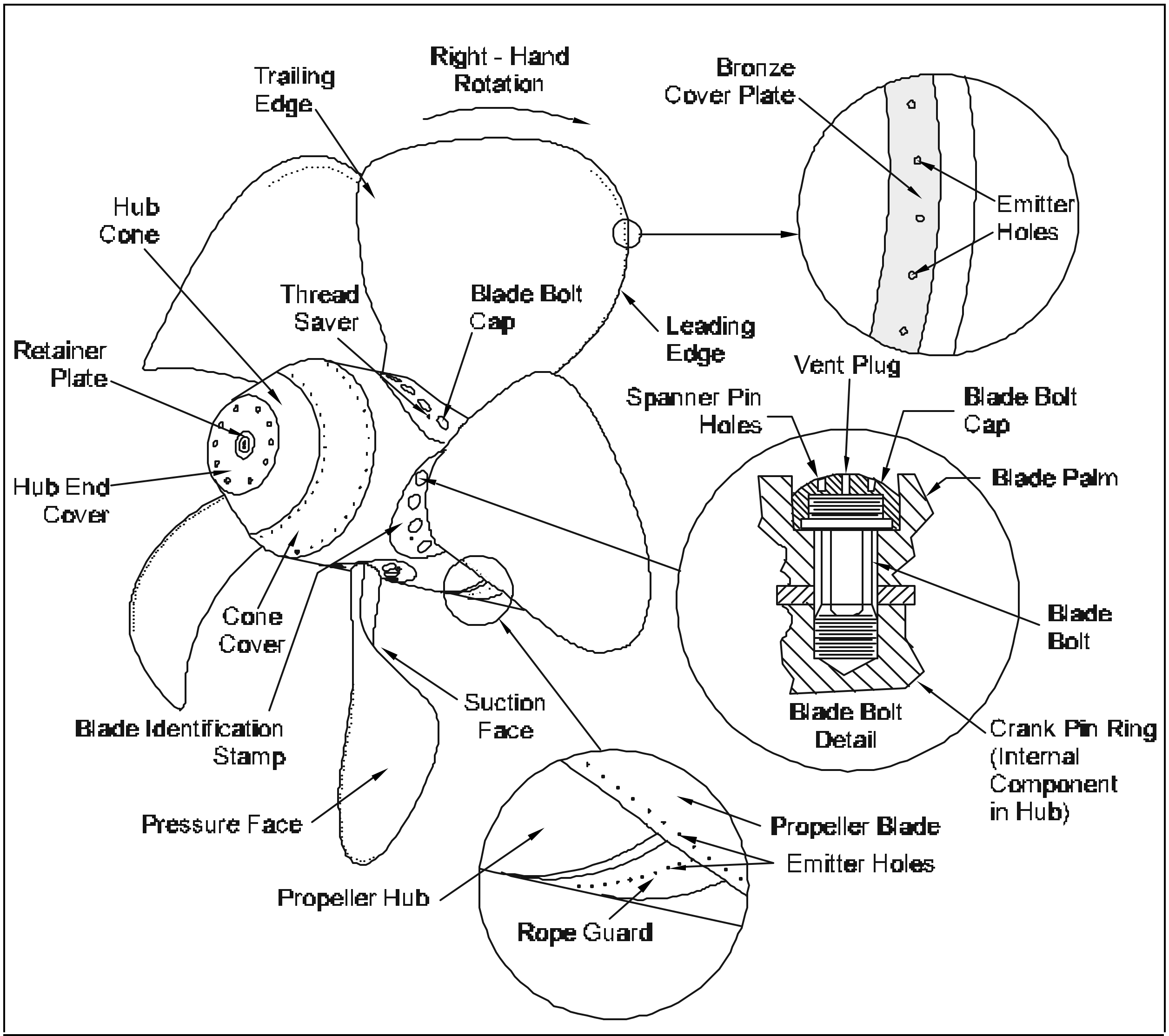


Figure 17-7.4. Controllable Pitch Propeller with Prairie Air System.

17-7.4.4 Propeller (5-Bladed).

17-7.4.4.1 Damage Description Requirements.

17-7.4.4.1.1 The inspection of a propeller requires a detailed description (with measurements) of the exact location and size of any damage, flaws, cracks, porosity, curls, bends, or cavitation erosion. Cavitation erosion results from the rapid formation and collapse of water vapor bubbles on the propeller surfaces while underway. This damage results in a porous, sponge-like, pitted metal surface. Heavy localized concentrations of eroded areas should be interpreted as cavitation erosion.

17-7.4.4.1.2 Propellers are subject to two kinds of cavitation erosion: one caused by propeller damage and the other by design or operating conditions. Therefore, if cavitation damage is found, inspect for the cause. The irregularity ahead of the eroded area can be a nick, gouge, or other damage in the leading edge or a leading edge radius that has been improperly cleaned or finished, leaving flat spots or other unfairness.

17-7.4.4.1.3 Do not confuse cavitation erosion with porosity. Porosity is common and is a manufacturing defect. Porosity will likely be coupled with fouling. Cavitation is uncommon and is often characterized by a trace of worn away metal (area is clean) in the direction of water flow. Porosity is often sharp-edged, whereas cavitation erosion (unless severe) is not.

17-7.4.4.1.4 Damage location descriptions must include reference to obvious points and must use standard nomenclature. Following is a list of common propeller terms:

a. *Blade number*. Both port and starboard propeller blades are numbered in the opposite direction of rotation (when viewed from astern) using letters “A” through “E”. These letters are stamped on the flat surface blade hub flange near the flange edge outboard (12 o’clock position) of the blade bolts.

b. *Blade palm*. The round portion of the propeller blade that bolts to the hub (also referred to as the blade flange).

c. *Blade bolt cap*. A protective cover installed over the blade bolt.

d. *Pressure face*. The portion of the blade that faces aft.

e. *Suction face*. The portion of the blade that faces forward.

f. *Leading edge*. The heavy, thick, more rounded portion of blade closest to the forward end of the hub.

g. *Trailing edge*. The thinner, sharper portion of blade closest to the aft end of the hub.

h. *Fillets*. The area at the base of each blade where the pressure and suction faces are blended into the flange contour (the intersection between the flange and the blade).

i. *Blade tip*. The outermost edge of the blade.

j. *Emitter holes*. Holes drilled into a channel near the leading edge that distribute the prairie masker air.

k. *Hub cone*. A fairing bolted to the aft end of the hub which provides a smooth hydrodynamic flow.

l. *Hub cone cover plate*. Fairing plates that are installed over the bolts used in the attachment of the hub cone to the hub.

m. *Hub end cover*. Aft end of the hub cone cover assembly used to distribute the prairie air past the check valve through the hub cone cover and hub and then out to the blades.

n. *Retainer plate*. This plate is threaded into the hub end cover and retains the prairie air adapter plug.

o. *Prairie air adapter plug*. This plug is threaded into the retainer plate and provides access to the check valve.

17-7.4.4.1.5 It is important that the diver accurately report the size and extent of any damage. The report must reflect an accurate measurement of the area for cavitation erosion, porosity, curls, bends, scrapes, cracks, nicks, gouges, and the maximum width and length of any cracks.

17-7.4.4.1.6 “Blade D, trailing edge, 2 feet from blade palm, 1/8-inch deep by 1-inch long nick. Evidence of cavitation erosion on the suction face, starting 4 inches in from the nick. Erosion damage covers a 2-inch by 4-inch area.”

17-7.4.4.1.7 NAVSEA Form 4730/6 (NSN 0116-LF-047-3035) Propeller Inspection Data should be used to record results.

17-7.4.4.2 Inspection Procedure.

17-7.4.4.2.1 Gross Damage Assessment.

a. Conduct a quick inspection of all surfaces.

   (1) Make note of the overall FR and look for areas of obvious damage (bends, cracks, curls, gouges, and nicks) that indicate the propeller may require changing.

   (2) For moderately or heavily fouled propellers (FR 40 or greater) look for clean areas that indicate recent damage (contact with an object or grounding, or areas of cavitation erosion). If evidence of cavitation erosion is discovered, carefully inspect the area ahead of the erosion for any irregularities (nicks, flat spots, etc., in the leading edge).

b. Inspect the propeller hub for fouled wire, rope, or other foreign material. Fiber such as fish netting or manila line may be removed without difficulty. If removal of the material will be excessively time consuming, make the appropriate report and arrangements for follow-on removal.

c. Conduct a detailed inspection of any obvious major damage and thoroughly document the type, size, and location of the damaged area.

17-7.4.4.2.2 Detailed Damage Inspection.

NOTE

If the FR of the propeller is 40 or greater, the propeller must be cleaned prior to conducting the detailed inspection unless the decision is made that, due to obvious damage, the propeller blades require replacement.

a. Inspect the entire surface of the propeller hub. Inspect for cable marks, scratches, cracks, curls, gouges, porosity, and cavitation erosion. Particular attention must be given to any cracks to determine whether it is one crack, or cracks that run completely around the hub. Record the exact location, size, and orientation of any such cracks.

b. Inspect the blades.

NOTE

Report the exact location and extent of damage as it is found. A running log of the inspection must be maintained by the log keeper to ensure accuracy.

   (1) Inspect the overall physical appearance and FR of each blade, pressure and suction faces, starting with blade “A.”

   (2) Inspect the tip and leading and trailing edges of each blade for nicks, curls, chips, dents, flat spots, cracks, or other apparent damage. Cracks may be found in the edges and tips without any evidence of impact in the area. They can be caused by local vibration, stress corrosion cracking, or residual stresses in the blades.

NOTE

Pay particular attention to areas of the blade where repairs have been made (areas of discoloration caused by welding). Thoroughly inspect these areas for the presence of cracks.

   (3) Verify that two 1 1/4-inch thread savers installed in the lifting bolt holes (180° on each side of each

blade) are in place on the blade palm.

(4) Verify that the blade bolt caps (four on each side of each blade) are secure and in place.

(5) Inspect the hub for debris, cavitation damage, and leaking hydraulic oil.

(6) Inspect the cone cover plates for damage, loose or missing plates, and loose or missing fasteners. Each cone cover plate is secured with twenty 1/2-inch cap screws.

(7) Inspect the hub cone for damage and leaking hydraulic oil.

(8) Inspect the hub cone end cover plate for loose or missing fasteners and leaking hydraulic oil. There are 10 1-inch cap screws.

(9) Inspect the retainer plate for loose or missing fasteners and leaking hydraulic oil. There is one 5/16-inch socket set screw.

(10) Inspect the prairie air adapter plug for loose or missing fasteners and leaking hydraulic oil. There are two 1/2-inch socket screws and one 3/8-inch socket set screw.

(11) Inspect the suction (forward) and pressure (aft) face of each blade for defects caused by cavitation. Cavitation damage can be identified by an area of small pocked holes or a rough-textured surface.

(12) Inspect the prairie air channel cover plate on the blade pressure (aft) face for damage or cracked welds. The cover plate is 1 3/4 inches wide and is located 3/8 inches from the leading edge, starting at the hub and running to a point past the center of the blade tip. Inspect both the pressure (aft) and suction (forward) face emitter holes for fouling. The air emitter holes are 3/64 inch in diameter. The blade suction (forward) and pressure (aft) faces each have 153 air emitter holes. They are spaced 1 inch apart starting approximately 5 1/2 inches from the base of the hub, and are 3/4 inch from the leading edge on both faces. To function properly, these emitter holes must be free of fouling.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively fouled, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Record the overall FR of the propeller.

d. If any discrepancies are found, make the appropriate report and arrangements for follow-on cleaning and/or repair.

17-7.4.4.2.3 Detailed Inspection of the Propeller Prairie Air System.

NOTE

Before proceeding with the next step, verify that there is sufficient depth between the tip of the lowermost blade and the bottom. A minimum of 5 feet is required to prevent mud or silt from being sucked into the air emitter holes.

NOTE

Performance of the following procedure requires that the dive station have, as a minimum, sound powered communications with Ship’s Force personnel.

NOTE

When the diver reports "ready," the Dive Supervisor will have Ship's Force apply low pressure air so that a thorough inspection of the prairie air system can be conducted.

WARNING

Rotating the propeller while divers are in the vicinity may cause serious injury or death. Ensure that the propeller is rotated only at the direction of the Dive Supervisor.

NOTE

Insufficient flow of air to the lower blades may require jacking the shaft over to reposition each blade for the inspection. If air flow is too great to observe individual holes, Ship's Force can decrease the flow.

a. Gross damage assessment.

(1) Begin the inspection procedure by conducting a quick inspection of the system for air leakage other than from the air emitter holes. Check the propeller hub end cover, blade palms, and the air channel weld seams.

(2) Note the general dispersion of air so that areas that appear below normal can be concentrated on during the detailed inspection of each blade. Use a wood block, bronze or Lexan scraper, or a "greenie" to remove light fouling in areas where the holes appear to be fouled.

b. Detailed inspection of the air emitter holes.

(1) Beginning with blade "A," start at the hub of the propeller and conduct the inspection toward the tip.

(a) Inspect to determine that the first five emitter holes are clear of fouling.

(b) Working toward the blade tip, inspect in 10-hole segments. Report the number of holes fouled per 10-hole segment. NAVSEA S9245-AR-TSM-010/PROP, *Technical Manual for Marine Propeller Inspection, Repair and Certification,* stipulates that no more than two holes in any series of 10 may be fouled, and that no two adjacent holes may be fouled.

(c) At the blade tip, inspect to determine that the last five holes are clear of fouling.

NOTE

The maximum allowable number of fouled holes for each blade is 16.

(2) Repeat the inspection process for the remaining propeller blades.

(3) Secure the air flow to the emitter system.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on cleaning and/or repair.

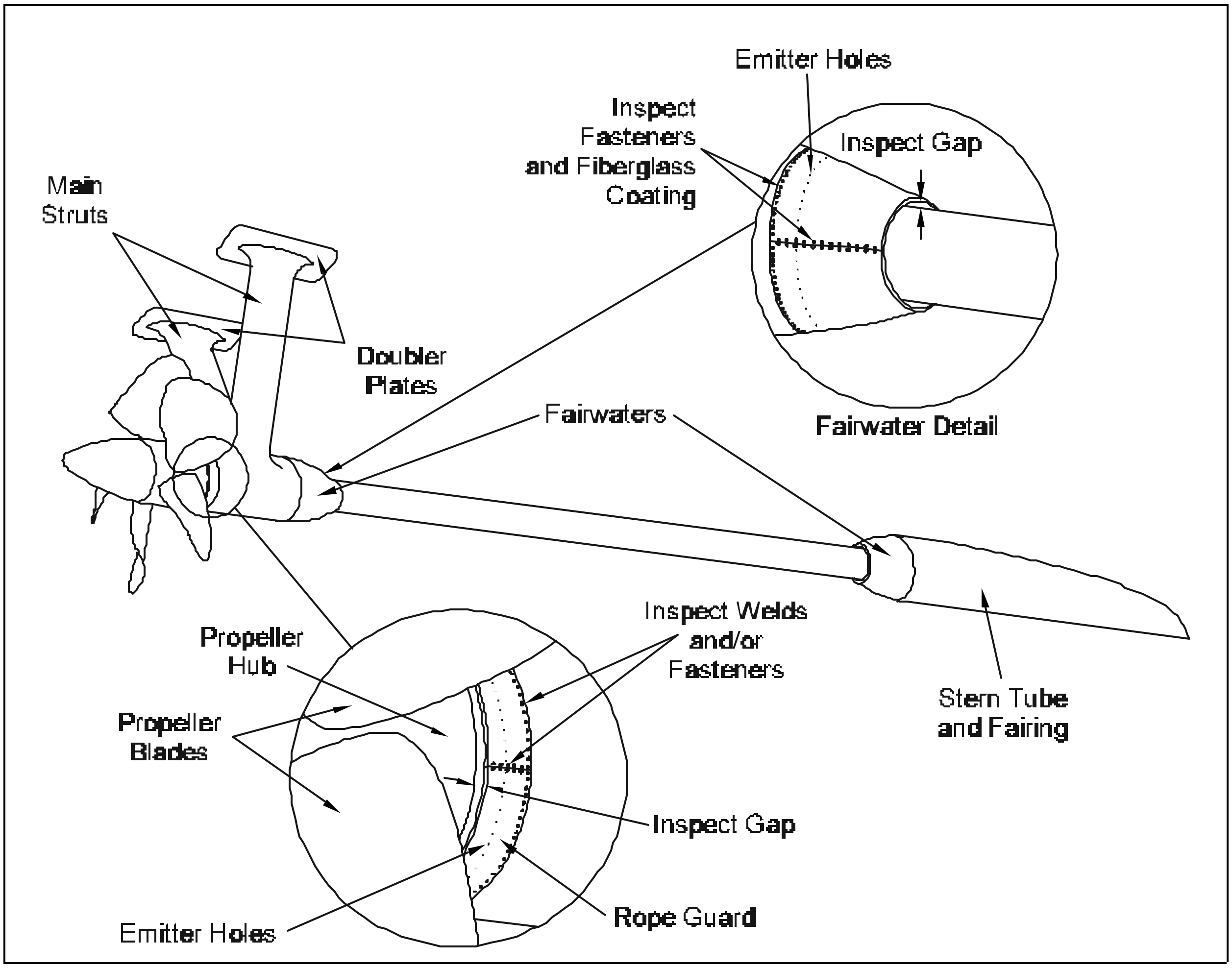


Figure 17-7.5. Main Strut, Shaft, Stern Tube, Rope Guard, and Fairwaters.

17-7.4.5 Main Propulsion Assembly (Main Strut, Shaft, Stern Tube, Rope Guard, and Fairwaters).

17-7.4.5.1 Damage Description Requirements.

17-7.4.5.1.1 General condition or damage assessment of the main strut, shaft, stern tube, rope guard, and stern tube requires a detailed description (with measurements) of the exact location and size of any damage or flaws. The description must include:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information: the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage.

e. Exact location and size of all coating damage, tears, or delaminations on the shaft.

17-7.4.5.1.2 Example of Report. "Port shaft, 6 feet 9 inches forward of the strut fairwater, longitudinal gouge in fiberglass coating 2 inches wide by 1 foot long, bare metal showing; subsurface delamination 6 inches by 6 inches, centered on a rust stain, located by sounding."

17-7.4.5.2 Inspection Procedure.

a. Main strut assembly (struts, bearing housing, rope guard, and fairwaters)

(1) Inspect the main strut columns (inboard/outboard) and bearing housing for corrosion, damage, and the presence of wire or other foreign material.

(a) At best, the surface of the struts will be very rough due to previous damage or repairs.

(b) Inspect for loose or mixing epoxy.

(2) At the strut/hull interface, inspect the strut columns, doubler plates and immediate area hull plate for cracked welds, corrosion, and damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of the damage.

(3) Verify the presence of the two 1/2-inch plugs on the top, and the six evenly spaced 1/2-inch plugs on the bottom of the bearing housing; ensure that they are flush and staked at a minimum of two places.

(4) Verify that the rope guard is present.

NOTE

A missing rope guard is a serious casualty.

(a) This ship class has steel rope guards with prairie air which are welded on. Inspect for any apparent damage and for the presence of fouled wire, rope, or other foreign material.

(b) Use a diver's light or diver-held video equipment light to inspect the area between the propeller hub and the strut bearing housing.

(c) Inspect the rope guards for cracked welds.

(d) Verify that there is a uniform gap all around between the propeller hub and the rope guard by taking measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is 3/4 inch.

(5) Verify that the fairwater is present.

NOTE

A missing fairwater is considered a serious casualty.

(a) This ship class has steel fairwaters with prairie air which are welded on. Inspect for any apparent damage and for the presence of fouled wire, rope, or other foreign material.

(b) Inspect the fairwater guards for cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(c) Verify that there is a uniform gap between the fairwater and the shaft by taking clearance measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is 7/8 inch.

(6) If discrepancies are found, measure the exact location and size, then make the appropriate report and arrangements for follow-on repair.

(7) Inspect and report the FR and the PDR of the main strut columns, immediate hull plate area, bearing housing, rope guard, and fairwater.

(8) Inspect the rope guard and and main strut fairwater prairie air system.

NOTE

Performance of the following procedure requires that the dive station have as a minimum, sound powered communications with Ship's Force personnel.

NOTE

When the diver reports "ready," Dive Supervisor will have Ship's Force apply low pressure air so that a thorough inspection of the prairie air system can be conducted.

(a) Begin the inspection procedure by conducting a quick inspection of the system for air leakage other than from the air emitter holes.

NOTE

If air flow is too great to observe individual holes, Ship's Force can decrease the flow.

(b) Note the general dispersion of air so that areas that appear below normal can be concentrated on during the detailed inspection. Use a wood block, bronze or lexan scrapper, or a "greenie" to remove light fouling in areas where the holes appear to be fouled.

(c) Beginning with the upper half of the rope guard, inspect to determine the emitter holes are clear of fouling.

(d) Repeat the inspection process for the air emitter holes on the lower half of the rope guard.

NOTE

The maximum allowable number of fouled holes for each rope guard half is 5 percent of the total number of holes.

(e) Secure the air flow to the emitter system.

(f) If any discrepancies are found, make the appropriate report and arrangements for follow-on cleaning and/or repair.

b. Shaft.

NOTE

Pay particular attention to the detection of damage or breaks in the covering in the area of shaft nearest the fairwaters and rotating coupling. Propeller shafts are covered with a hard metal sleeve at all bearing areas. The shaft coating at the sleeve ends are the most vulnerable areas of the waterborne shafting. Therefore, give special attention to the detection of breaks in the covering or leakage in the joint (rust stains) in these critical areas.

(1) Inspect the full length of all accessible glass-reinforced plastic (fiber glass) covering for evidence of deterioration, loss of adhesion, or any apparent physical damage.

(2) Inspect for loss of covering, cuts, tears, surface delaminations, and other damage.

(3) Inspect for rust stains indicating where corrosion has leaked through the covering near a cut, pinhole, area of porosity, patch, joint, or other flaw.

(4) Inspect for internal separation of the fiberglass covering from the metal shaft. Use a rubber or rawhide mallet to sound the covering at approximately 18-inch intervals along the length of the shaft.

(a) Rap the shaft in the 3, 6, 9, and 12 o'clock positions while holding the palm of one hand against the covering on the opposite side of the shaft. Continue sounding the shaft around and along its entire length.

NOTE

Discernible vibration, movement of the covering, or an audible, hollow sound is evidence of probable loose bond and must be explored or further examined. To determine the full extent of the damaged area, reduce the distance for sounding the shaft from 18 inches to 4 inches. The important criterion is to isolate and fully determine the extent of the damaged or delaminated area.

(5) If discrepancies are found, measure the exact location and size, then make the appropriate report and arrangements for follow-on repair.

c. Stern tube and fairwater.

(1) Verify that the stern tube fairwater is present.

NOTE

A missing fairwater is considered a serious casualty.

(a) Inspect for any apparent damage and for the presence of fouled wire, rope, or other foreign material.

(2) Inspect and report the FR and the PDR of the stern tube, immediate hull plate area, and fairwater.

(3) If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

17-7.4.6 Skeg.

17-7.4.6.1 Damage Description Requirements.

17-7.4.6.1.1 Include the exact location and size of all damage or flaws. Description must include as a minimum:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information: the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage. For example: "Weld crack 1 foot long by 1/2 inch wide, port side, 18 feet forward of after end along the hull/skeg interface."

17-7.4.6.2 Inspection Procedure.

a. Verify the presence of the fill plug (frame 392, starboard side, 3 inches forward of the upper trailing edge) and ensure that it has not backed out.

b. Verify the presence of the drain plug (frame 378 on the centerline) and ensure that it has not backed out.

c. Inspect the entire length of the skeg for dents, cracks, curled edges, or other apparent damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

d. Inspect and report the FR and the PDR.

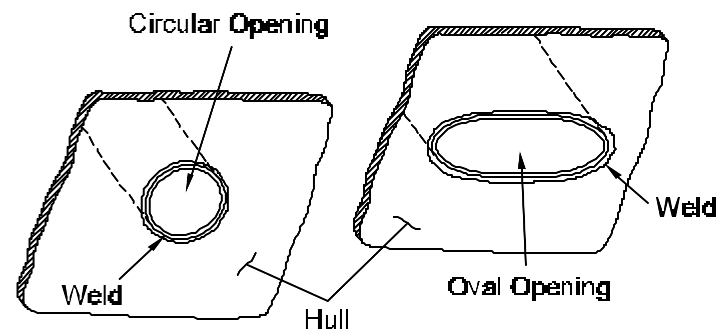


Figure 17-7.6. Seawater Discharge Openings.

17-7.4.7 Overboard Discharge.

17-7.4.7.1 Inspection Procedure.

a. Inspect for foreign material or corrosion damage.

b. Inspect and report the FR and the PDR.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair

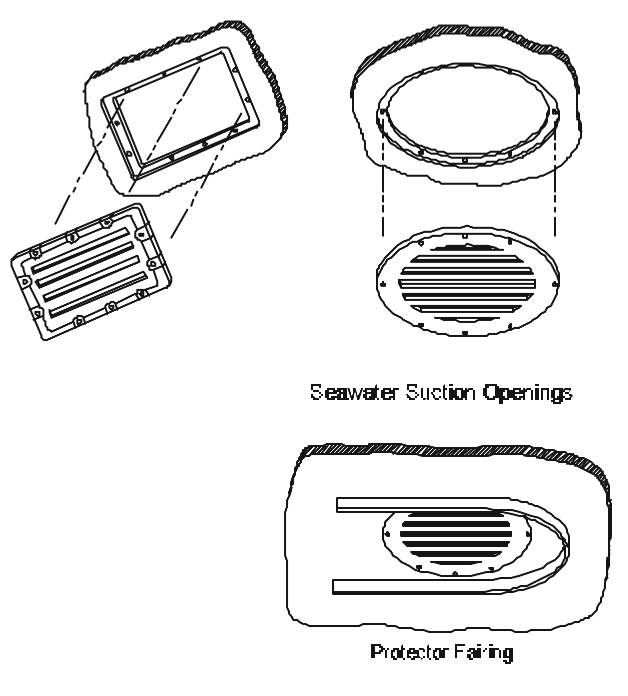


Figure 17-7.7. Seawater Suctions.

17-7.4.8 Sea Chest and Seawater Suction.

17-7.4.8.1 Inspection Procedure.

a. Clean and inspect screens or grates for clogged holes and loose or missing fasteners.

b. Inspect strainer bars for corrosion damage, broken or missing bars, cracked welds, and missing or loose fasteners.

c. Inspect and report the FR and the PDR.

d. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

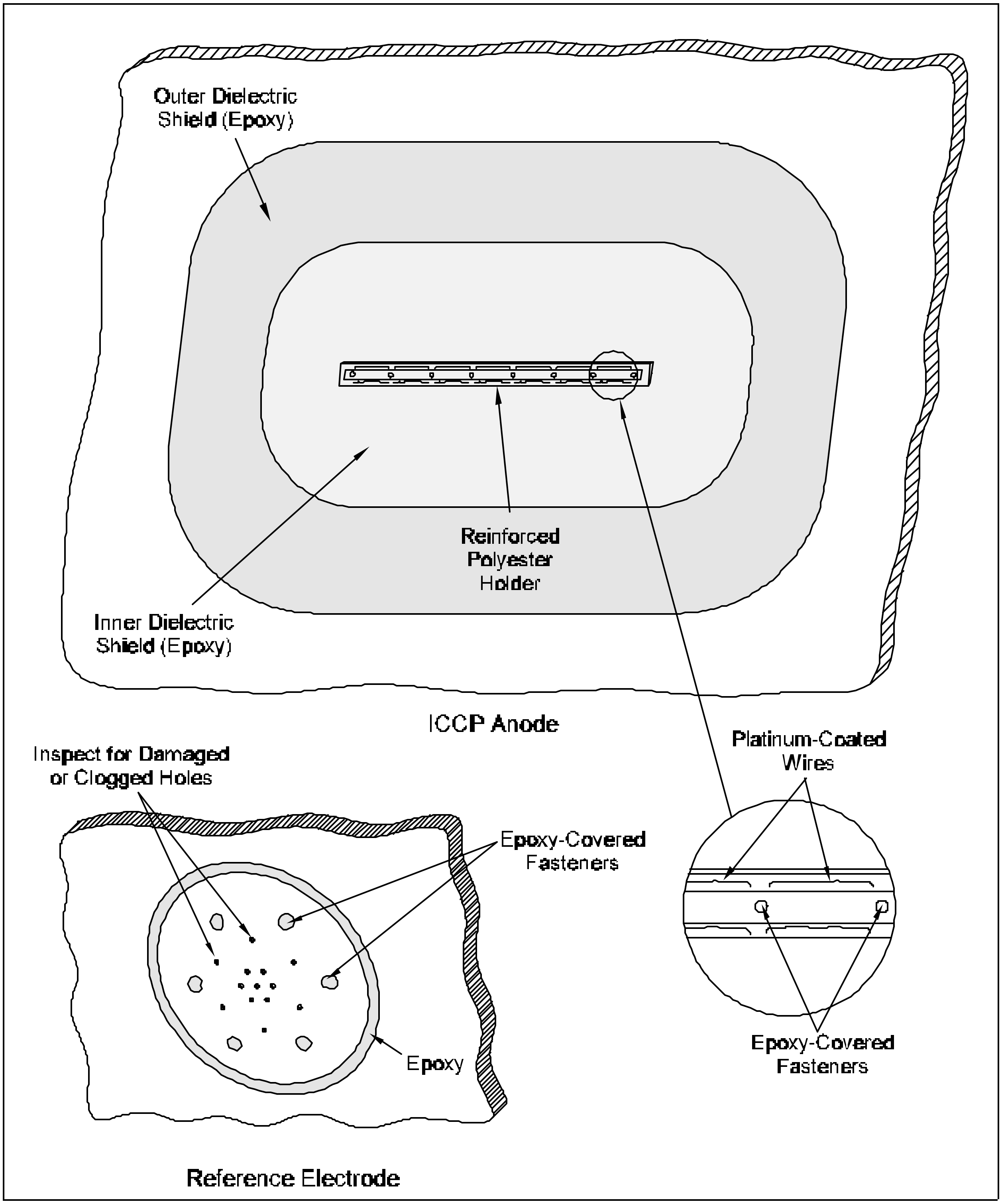


Figure 17-7.8. Impressed Current Cathodic Protection (ICCP) Anode.

17-7.4.9 Impressed Current Cathodic Protection (ICCP) Anode.

17-7.4.9.1 Inspection Procedure.

a. Begin the inspection procedure by conducting a quick inspection of the anode, dielectric shield, and the immediate hull plate area out to a distance of

20 feet. Inspect for obvious damage: large areas of bare metal, cracked, peeling, or blistered epoxy or paint, large areas of calcium buildup.

b. Conduct a detailed inspection of the anode.

(1) Inspect the anode for damage and missing or broken wires and missing or damaged platinum coating on the wires. Count the number of missing or broken wires. Report the position of each broken or missing wire relative to the center of the anode.

(2) Inspect the bond between the dielectric shield and the anode holder. Check that the dielectric shield is evenly faired up to the face of the anode and is not cracked or chipped.

NOTE

The presence of marine fouling indicates a non-functioning anode.

CAUTION

Avoid disturbing the white calcium buildup on the dialectric shield that protects areas of bare metal from corrosion.

c. Conduct a detailed inspection of the dielectric shield.

(1) Report the percentage of dielectric shield with calcareous deposits.

(2) Inspect the dielectric shield for chips, cracks, blisters, or missing epoxy.

(3) Report the percentage of deterioration of the dielectric shield.

(4) Inspect the hull coating in the area around the anode for missing or peeling paint or blisters. Inspect for calcareous buildup. Report the FR and the PDR.

17-7.4.10 Impressed Current Cathodic Protection (ICCP) Reference Electrode.

17-7.4.10.1 Inspection Procedure.

a. Inspect for damage, clogged holes, and loose or missing epoxy.

CAUTION

Do not attempt to unclog holes with any pointed objects. Potential damage to internal components may result.

b. Inspect and report the FR.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

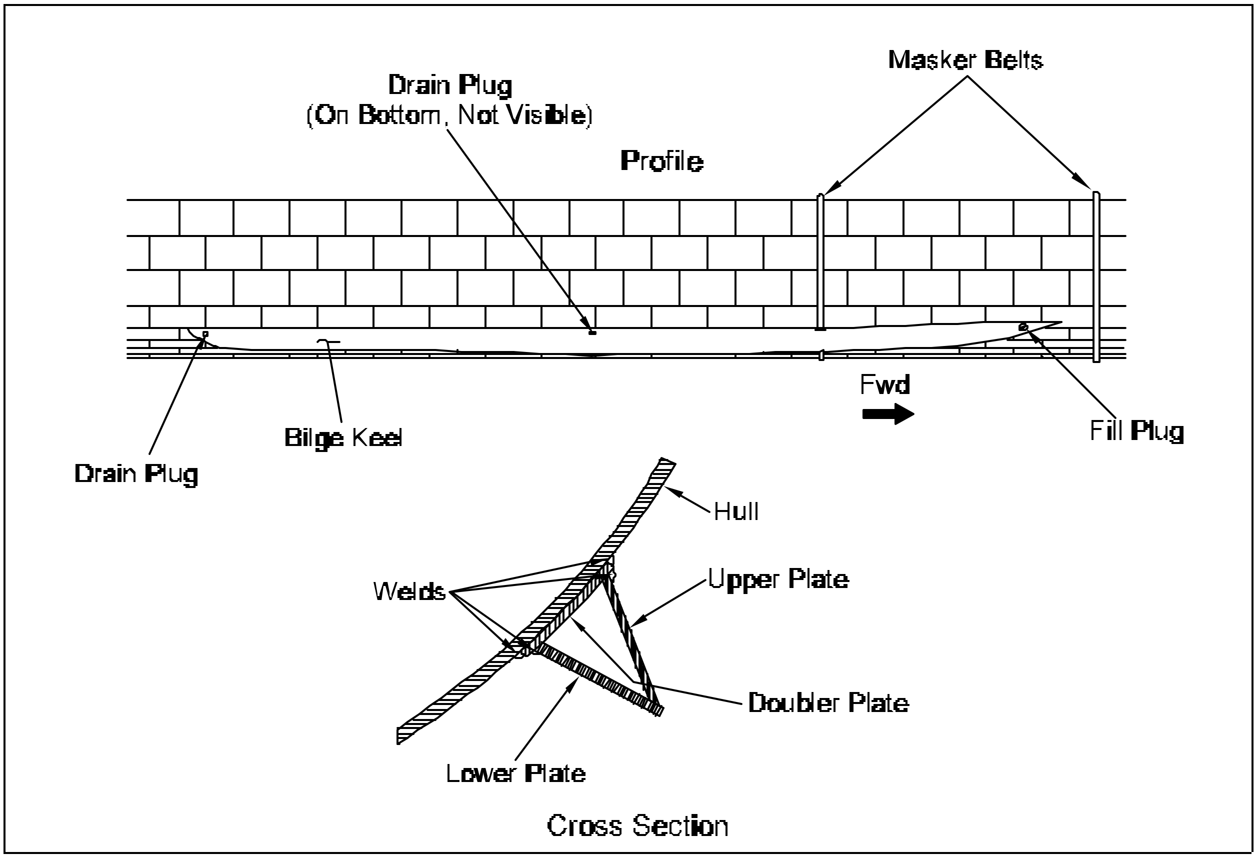


Figure 17-7.9. Bilge Keel.

17-7.4.11 Bilge Keel.

17-7.4.11.1 Damage Description Requirements.

17-7.4.11.1.1 Include exact location of all damage or flaws. Description must include as a minimum:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information; the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage. For example: “Port bilge keel, 1 foot long by 1/2 inch wide crack in weld between upper and lower plates located 18 feet forward of after end.”

17-7.4.11.2 Inspection Procedure.

a. Inspect the bilge keel for dents, cracks, curled edges, missing plate, or other apparent damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

b. Inspect for foreign material and loose or missing plugs. There are three 1-inch NPT fill/drain plugs located on each bilge keel. There are two plugs on the top located at frames 322 and 178, and one on the bottom at frame 248.

c. Measure and record the location of any damage.

d. Inspect and report the FR and the PDR.

e. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

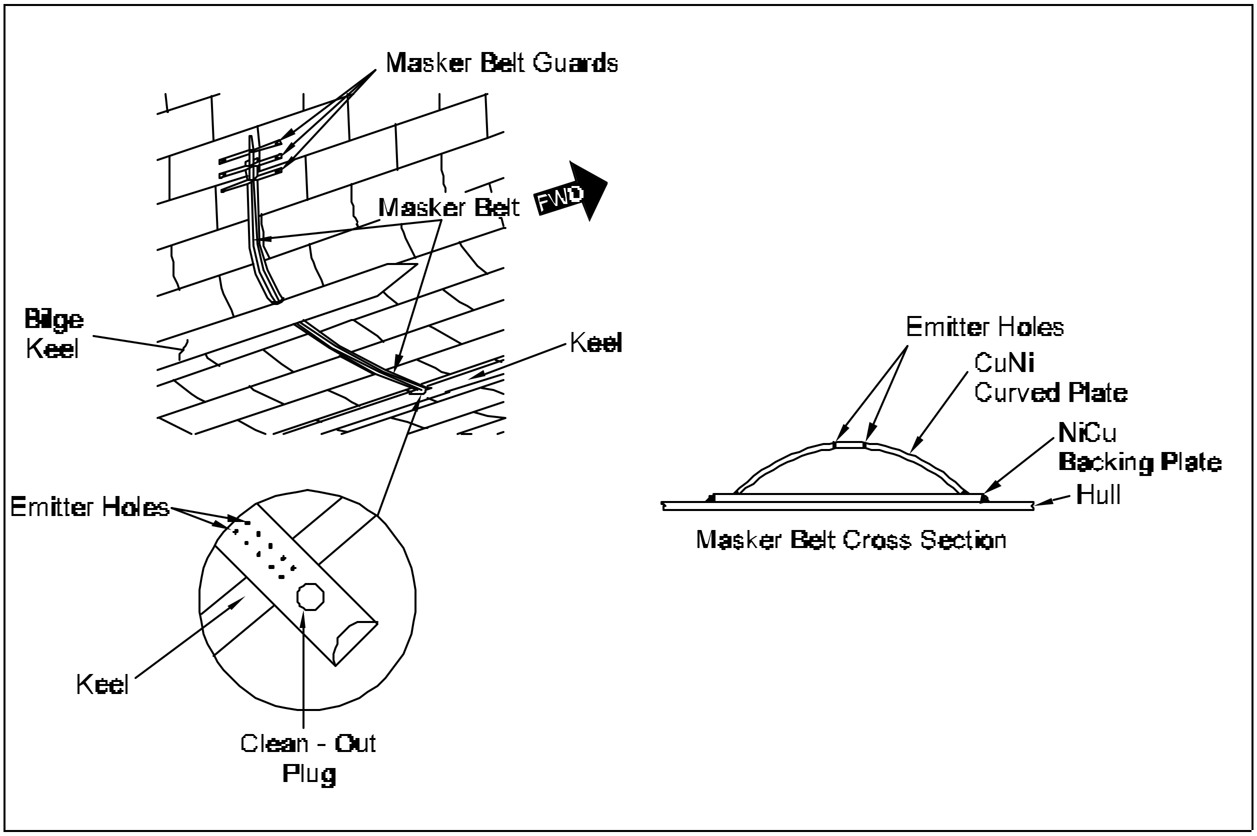


Figure 17-7.10. Masker Emitter Belt.

17-7.4.12 Masker Belt.

17-7.4.12.1 Damage Description Requirements.

NOTE

Emitter hole blockage is difficult to inspect. Checking for blockage when the ship is pier side is not recommended. Procedures for assessing blockage by measuring flow rate while the ship is underway are detailed in the shipboard PMS. Diver cleaning procedures are provided in NAVSEA S0600-AA-PRO-050.

17-7.4.12.1.1 Inspection of masker belt systems requires a detailed description (with measurements) of the exact location and size of any damage or flaws. As a minimum, the description must include:

a. Identity of masker belt emitter system (forward/aft, port/starboard, frame number).

b. On the backing plate, the length, maximum width, and orientation of all cracks, including closest weld seam information. Also include the direction of the crack with respect to the weld (perpendicular or parallel) and the proximity of the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or any other damage. Take all measurements from the keel up.

17-7.4.12.1.2 Location must include reference to obvious points and use standard nomenclature. Following is a list of common terms used by the diver to describe the location of damage.

a. *Backing plate*. A flat plate welded to the hull to which the rolled emitter plate is welded.

b. *Air emitter tube*. A rolled Cu-Ni pipe welded to the backing plate. The tube contains 3/64-inch air emitter holes.

17-7.4.12.1.3 Example of Report "3-inch horizontal crack in the weld seam of two sections of the rolled plate of the aft starboard masker emitter system."

17-7.4.12.2 Inspection Procedure.

17-7.4.12.2.1 Gross Damage Assessment.

a. Begin the inspection procedure by conducting a quick inspection of the masker belt and surrounding hull plate area.

b. Make note of the overall FR and the PDR and look for areas of obvious damage (crushed, twisted, or missing sections of masker belt).

17-7.4.12.2.2 Detailed Damage Inspection.

a. Inspect for crushed, cracked, or missing masker belt.

b. Starting at the keel, inspect the full length of weld between the backing plate and the hull and the weld between the Cu-Ni masker air channel and backing plate.

c. Inspect the 3/64-inch emitter holes for fouling. Emitter holes are spaced in sections and the spacing varies in density for each section.

d. Inspect for a loose or missing 1 1/4-inch NPT clean-out plug located 2 1/2 inches from the keel termination.

e. Inspect and report the FR and, if painted, the PDR.

f. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

17-7.4.13 Transducer.

17-7.4.13.1 Damage Description Requirements.

17-7.4.13.1.1 Inspection of transducers requires a detailed description (with measurements) of the exact location and extent of all damage and flaws. As a minimum, the description must include:

a. Length, maximum width, and orientation of all cracks or flaws in the sensor cover.

b. Total area affected, including the diameter and depth of any pitting or corrosion of the immediate hull plate area. Also include both the maximum and average pit size.

17-7.4.13.1.2 Example of Report. "1-inch by 2-inch diagonal gouge on sensor cover, maximum depth 1/16 inch located at the 8 o'clock position."

17-7.4.13.2 Inspection Procedure.

a. Begin the inspection procedure by conducting a quick inspection of the transducer and the surrounding hull plate area.

(1) Make note of the FR and PDR of the immediate hull plate area and look for areas of obvious damage or flaws.

b. Conduct a detailed inspection of the entire transducer assembly.

(1) Using a "greenie," gently scrub light fouling off the sensor head and inspect the sensor protective covers.

(2) Inspect for signs of structural failure or damage caused by contact with underwater objects.

(3) Inspect and report the FR.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

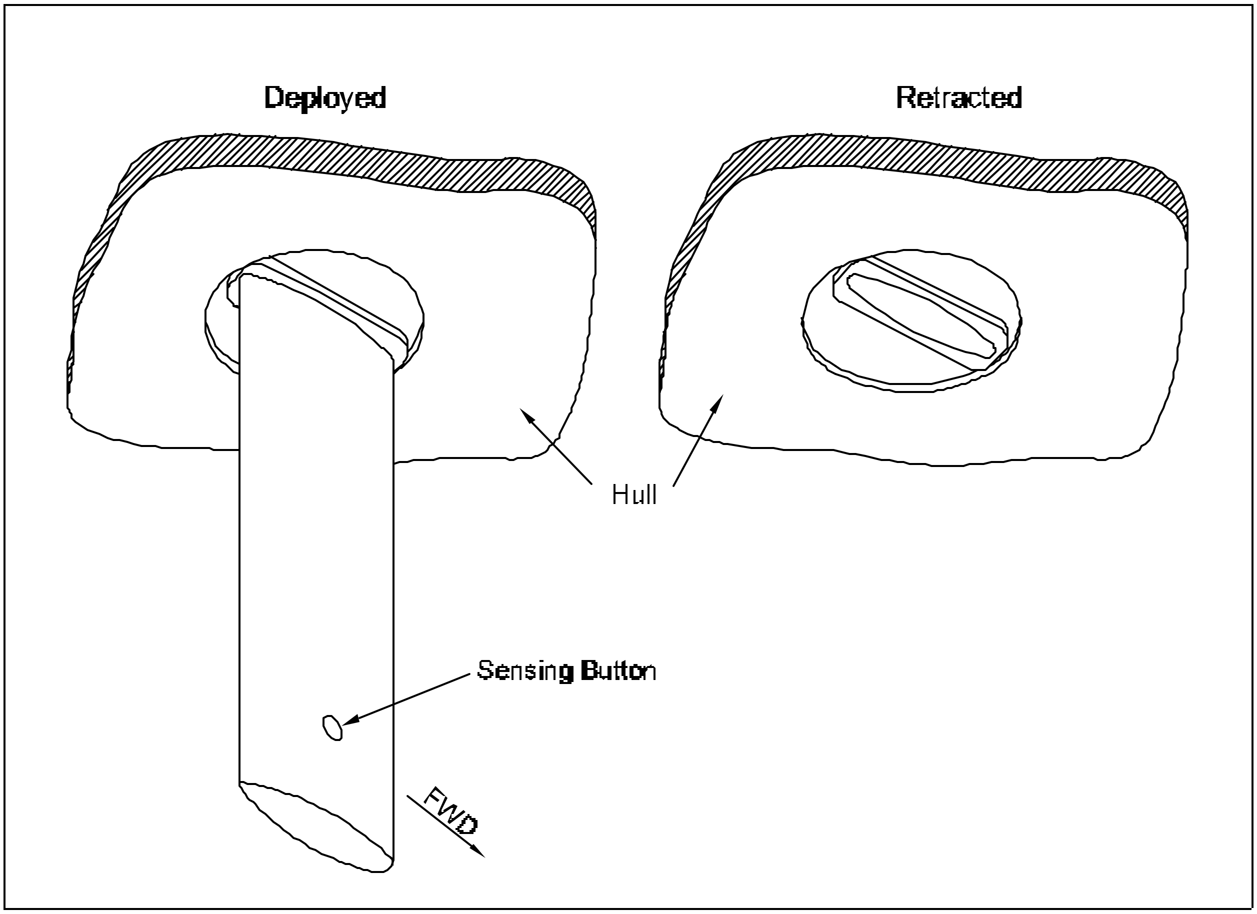


Figure 17-7.11. Rodmeter.

17-7.4.14 Rodmeter.

17-7.4.14.1 Normally, divers will only be called upon to inspect the rodmeter opening. Ship's force personnel perform maintenance and repairs on the rodmeter after retracting it into the hull. However, divers may be called upon to inspect the hull opening if the ship reports damage to the rodmeter (scratches, gouges, etc.) or is unable to either retract or deploy the rodmeter.

17-7.4.14.2 Inspection Procedure.

a. If Ship's Force reports damage to the rodmeter, (scratches, gouges, etc.) or is unable to retract or deploy the rodmeter, inspect the hull opening and verify that it is clear of barnacles, sea growth, or other foreign material.

b. If ship's force is unable to retract the rodmeter, inspect for a bent or broken unit.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

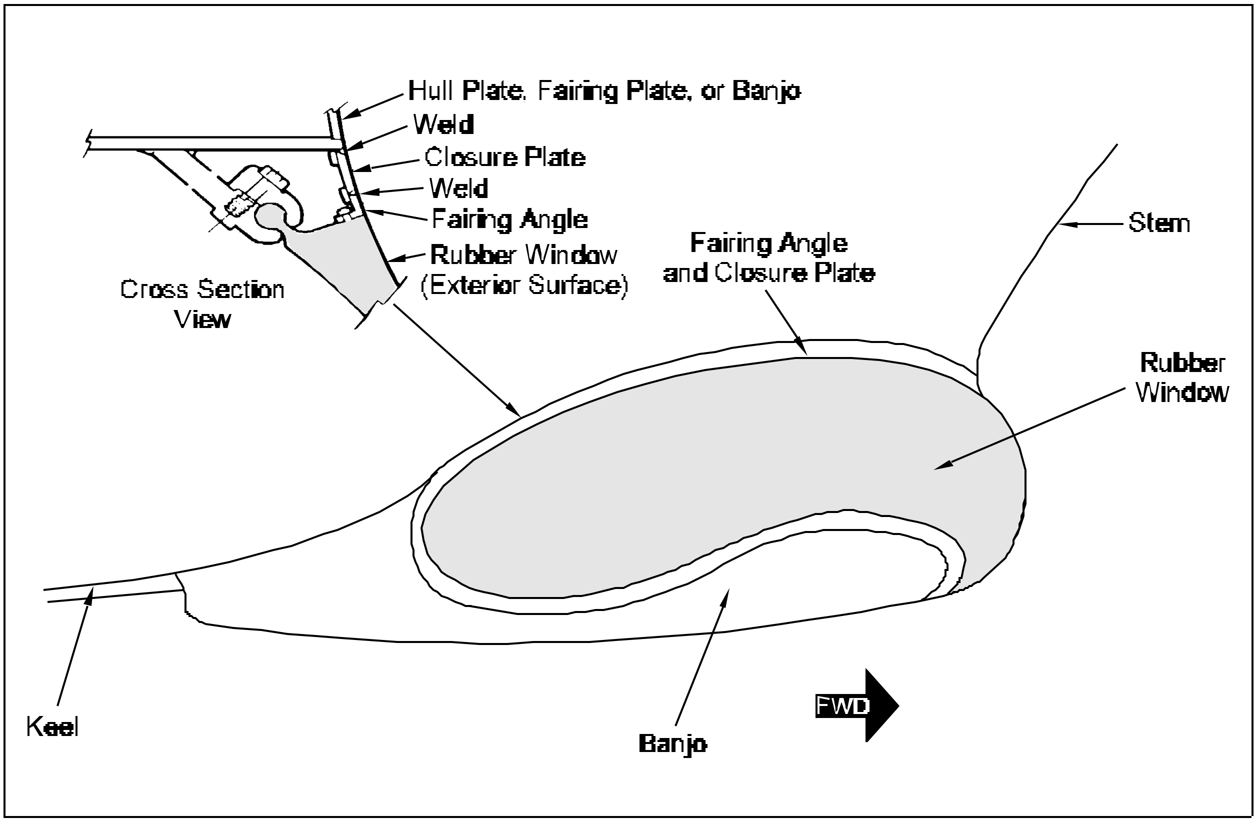


Figure 17-7.12. Bow-mounted Sonar Dome.

17-7.4.15 Bow-mounted Sonar Dome.

17-7.4.15.1 Damage Description Requirements.

17-7.4.15.1.1 Inspection of sonar domes requires a detailed description (with measurements) of the exact location and size of all damage and flaws. For location, use distance measurements from the closest relative bearing grid marks, or if grid marks are not present, use exact measurements, horizontal and vertical, from definable points such as the centerline (i.e., 1 foot 3 inches above the lower marriage line). Measurements will require the use of bear paw magnets and tape measures. The following is a list of standard Sonar Dome Rubber Window terms:

a. *Marriage line*. That area where the hull meets the dome, often referred to as the upper and lower marriage line.

b. *Banjo*. A section of steel plate that extends forward from the keel. It supports the bottom of the dome.

c. *Stem*. Vertical forward-most part of the ship.

d. *Vertical midpoint*. An imaginary continuation of the stem vertically down the dome.

e. *Horizontal midpoint*. A horizontal line midway between the upper and lower marriage line.

f. *Fairing angle*. Metal band which attaches directly to the dome material and is welded to the closure plate.

g. *Closure plate*. A metal band which covers the bolts which hold the dome in place. It is welded to the shell plating on one edge and the fairing angle on the other.

17-7.4.15.1.2 The description of damage must include:

a. Rubber dome material.

(1) Exact location and size (length, width and depth) of all gouges, tears, delaminations, blisters, flap, or other damage.

(2) Layers of wire plies exposed.

(3) FR.

b. Fairing and closure plates.

(1) Exact location and size of all damage or flaws. As a minimum, the description must include:

(a) Distance and direction (port/starboard/forward/aft) from a known degree marker and/or other reference point.

(b) Length, maximum width, and orientation of all cracks, including closest weld seam information. Also include the direction of the crack with respect to weld seams on the marriage line (perpendicular or parallel) and distance of the crack from the rubber interface with the fairing angle.

(c) Amount of separation between the fairing angle and the rubber dome material, including the overall length and maximum width of the separation.

(d) Total area affected, including the diameter and depth of any pitting. Also include both the maximum and average pit size.

(e) Any damage, bare metal, scratches, or abrasions on the banjo.

(f) Area and location of corrosion or other damage, including the FR and the PDR.

17-7.4.15.1.3 Example of Report. "Torn rubber 2 feet 9 inches above the 15° mark at the lower marriage line. Torn area measures 2 inches in width, 6 inches long. Three plies of rubber peeled back."

17-7.4.15.1.4 NAVSEA Form 4730/4 (NSN 0116-LF-047-3025) Sonar Dome Rubber Window Inspection Data is available to record results.

17-7.4.15.2 Inspection Procedure.

17-7.4.15.2.1 Specific Noise Source Inspection.

WARNING

Divers must exercise care when touching a dome with steel wires exposed.

WARNING

Avoid direct bare skin contact with NOFOUL rubber surfaces. Avoid contact between hands and eyes if hands have been exposed to the NOFOUL rubber material. Wash hands thoroughly before eating or smoking.

NOTE

Dome must be pressurized with air to 15 psig to conduct this inspection.

a. Prior to beginning the inspection, get the latest Sonar Self Noise Test report from the ship's Engineer. This report will show the location of all noise spokes. Use these spokes as the starting point for the inspection. Conduct a detailed inspection of these areas until the source of the noise is located. Possible noise sources to inspect for that will be located at or forward of the noise spoke location are:

(1) Cuts, pits, flaps, and gouges in the outer surface.

(2) Separation in rubber plies as indicated by bulges or soft spots.

(3) Previous repairs which have become faulty.

(4) Exposed or broken structural steel wires.

b. To assist the diver in orienting himself on the dome, starting at the waterline, follow the stem down, surveying the hull plate for damage on both sides (port and starboard) and continue down to the upper marriage line (0° marker). From here, follow the upper marriage line to the relative heading (port or starboard) of the noise spoke. Drop down from that point to begin the detailed inspection.

(1) Attach a bear paw magnet to the hull at the point above the noise source.

(2) Lower a tape measure down from the bear paw to establish a vertical reference for the diver. Drop down from that point to begin the detailed inspection.

(3) Conduct a detailed (visual and hand) inspection of the area of suspected damage.

NOTE

Because of limited visual contrast, the diver's hands (even with gloves) may often sense damage that the eye cannot detect.

(4) If the noise source is not located, move the bear paw forward 18 to 24 inches and repeat the process until the damage is located.

17-7.4.15.2.2 Detailed Damage Inspection.

a. Return to the upper marriage line. Start at 0° to begin the overall damage inspection.

b. Inspect the marriage line (rubber dome and steel interface with the hull). Inspect the entire perimeter of the dome for:

(1) Separation of the rubber dome from the steel in the area of the fairing angles.

(2) Dents or cracks in the fairing angle and closure plate welds, or immediate hull area.

NOTE

Be particularly alert for the presence of cracks. If any cracks are discovered, particular attention must be given to determine if the crack is running parallel to or vertically into the shell plating.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(3) PDR and FR of the fairing angle, closure plate, and immediate hull plate area.

c. Inspect the rubber surface of the dome. To ensure complete coverage of the SDRW surface, begin the inspection at the 0° marker at the upper marriage line. Follow the marriage line to starboard and inspect the general area while swimming aft. After reaching the most aft point of the window, drop down no more than 3 feet (depending on water clarity) and work forward to the dome 0° marker. Follow this sweeping pattern until the complete starboard side has been inspected. Inspect the port side using the same procedure. Inspect the following conditions and report the physical dimensions and relative bearing and vertical location of each:

(1) Cuts, pits, and gouges in the outer surface of the rubber window and the structural area within approximately 4 feet of the rubber window.

(2) Separation in rubber plies, which are indicated as bulges or soft spots.

(3) Previous repairs to the rubber window which have become faulty or have deteriorated.

(4) Exposed structural steel wire of the rubber window.

NOTE

If rubber window steel wires are exposed, contact Naval Sea Systems Command Code SEA 00C5 for an analysis of the repair.

(5) Inspect and report the FR of the dome. The rubber surface of the dome is made of NOFOUL rubber. However, the antifouling properties of the dome may become ineffective as the dome ages or from over-spray of paint while in dry-dock. Fouling degrades the performance of the sonar.

d. Inspect the banjo area and the structural area surrounding the dome to the water surface.

(1) Inspect for dents, cracks, pitting or corrosion in the steel areas of the dome, including the closure plate.

(2) Inspect for scrapes, abrasions, bare metal, corrosion, peeling, or absence of protective paint on the steel structural portion of the dome, including the banjo.

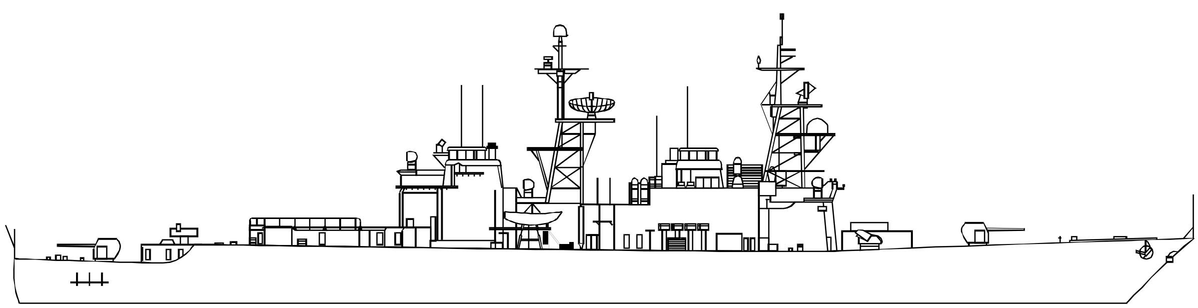
(3) Report the PDR and FR.

(4) If any discrepancies are noted, make the appropriate report and arrangements for follow-on repair.

UNDERWATER SHIP HUSBANDRY MANUAL

CHAPTER 17
SECTION 8

DD 963 CLASS
UNDERWATER SHIP HUSBANDRY
INSPECTION PROCEDURES



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CHAPTER 17
UNDERWATER SHIP HUSBANDRY INSPECTION PROCEDURES

SECTION 8 DD 963 SPRUANCE CLASS DESTROYER

17-8.1 INTRODUCTION.

17-8.1.1 This section of the *Underwater Ship Husbandry Manual* contains inspection procedures for the DD 963 Spruance Class Destroyers. It consists of a general introduction to the DD 963 Class, a description of the major hull components found on this ship, a set of Level 1 inspection procedures, and a set of Level 2 inspection procedures.

17-8.1.2 Table 17-8.1 contains a general hull description of the DD 963 Class. Table 17-8.2 (found at the end of the Level 1 inspection procedures) contains a checklist of all ship systems covered by these inspection procedures. Item numbers in this table correspond to the hull system numbers in Figure 17-8.1 and are arranged in order to facilitate a typical diver inspection of all components: stern area, port side, bow, and starboard side. Figure 17-8.1, "DD 963 Class Plan and Profile," and Figure 17-8.2, "DD 963 Class Running Gear," are located after Table 17-8.2 and provide points of reference for the procedures described in this section. These figures augment the typical ship drawings and can be used as a quick reference by diving personnel. Figure 17-8.1 is derived from NAVSEA Drawing No. 845-4700558, Rev. G, Docking Plan for the DD 963 Spruance Class Destroyer. Figure 17-8.2 is derived from class arrangement drawings. These figures are also useful in locating the coordinates of components requiring Level 2 inspections. Figures of the individual components appear throughout the Level 2 inspection procedures.

17-8.1.3 Diving activities may photocopy Table 17-8.2 and use it to record data during inspections. Upon completion of the inspection, the results should be transferred to the standard Diver's Underwater Hull Inspection Data Form, NAVSEA 4730/3 (NSN 0116-LF-047-3020). Figures found in the Level 2 inspection procedures section of this chapter may be photocopied and used to assist in sketching the extent of damage reported during inspections. These sheets should be attached to the Diver's Underwater Hull Inspection Data Form upon completion of the inspection.

17-8.1.4 All ships of this class were constructed at one shipyard during a ten year period. Changes in systems and design changes and upgrades during construction produce hull systems that are not identically located. For this reason, it is recommended that the Dive Supervisor also refer to a Docking Plan for the individual ship being inspected.

Table 17-8.1. General Hull Description.

Length between Perpendiculars:	529 feet
Beam:	55 feet, 1 inch
Max Draft	21 feet 2 5/16 inches
Frame Spacing:	See docking plan profile
Rudders:	Port and starboard, spade without stool
Propellers:	Twin, 5-bladed, controllable pitch
Masker Air Emitter Belts:	Frames 300, 258, 218, and 172
Prairie Air:	Propellers and main strut fairwater rope guards
Sonar Dome:	Bow-mounted
Class Problems:	The main struts on this class ship have a history of severe corrosion. The rudders on this class ship have a history of severe corrosion caused by cavitation. Most main struts have been repaired with clad welding, epoxy, or both. Many ships in this class have a history of cracking near or on the keel at the aft end of the skeg.

17-8.2 DESCRIPTION OF MAJOR HULL COMPONENTS.

17-8.2.1 Hull Coating.

17-8.2.1.1 The underwater hull coating system is applied to the hull, shaft, and appendages (i.e., rudder, struts, bearing housing, rope guard, fairwaters, rotating coupling, stern tube and skeg). The coating system is comprised of two types of coatings: an anticorrosion coating and an antifouling coating. The anticorrosion coating is applied on the majority of metal components to provide the primary protection from corrosion and deterioration of the surfaces. The antifouling coating is applied over the anticorrosion coating and is directly applied to nonmetallic components (e.g., the glass-reinforced shaft coating). The antifouling coating is designed to protect the underwater systems from biological fouling.

17-8.2.1.2 Multiple coats of anticorrosive and antifouling coatings are applied to the hull. Each coat is a different color except for the boot top area where all coats are black. Use a diver's light to help accurately identify the color of the exposed coating for both large hull areas and areas of damage. This will allow accurate assessment of the remaining life of the coating system. The hull coating system can easily become damaged from impact with underwater objects or collisions and groundings. Typical damage is minor abrasion to the antifouling coating, exposing the anticorrosion coating and permitting biological fouling. More severe abrasion of the anticorrosion coating exposing bare metal will result in corrosion and deterioration of the metal. As the age of the coating increases, the antifouling coating may become less effective in preventing biological fouling and could easily become damaged if the biological fouling is allowed to reach a destructive level. Even the smallest amount of biological fouling can drastically impact the ship's operational capabilities and could eventually destroy the anticorrosion coating system.

17-8.2.1.3 References.

a. NAVSEA S9086-CQ-STM-010/CH081, "Waterborne Underwater Hull Cleaning of Navy Ships"

b. NAVSEA S9086-VD-STM-010/CH631, "Preservation of Ships in Service"

17-8.2.2 Rudders.

17-8.2.2.1 Ships in this class have two spade rudders with no stool. The spade rudder is of one-piece construction. The entire rudder moves to steer the ship.

17-8.2.2.2 The rudders are rectangular, hydrodynamically shaped metal blades located aft of the propellers and used to steer the ship. Rudders on large ships are hollow structures that have been flushed with a preservative and then dried. Rudders on this class ship have two 1 1/4-inch drain plugs; one located 37 inches forward of the after trailing edge and the other approximately 23 inches aft of the forward edge on the bottom center. There are also two 1 1/4-inch fill plugs in the top: one located approximately 49 inches from the after edge, the other approximately 20 inches from the forward edge. The rudder is supported and positioned by a rotating rudder stock. The area where the rudder stock enters the hull contains the rudder bearings, seals, and gland ring.

17-8.2.2.3 While underway, rudders are subject to severe loading, high flow, and turbulence as well as to possible damage from contact with underwater objects. Previous repairs (such as clad welding or installation of doubler plates) that have been painted may cause a rough-textured surface on the rudder, making inspection for damage difficult. While inspecting the rudder surface, the primary indications of new deterioration or damage is poor or missing paint. Bare metal or corrosion damage may be present. Report any such findings.

17-8.2.2.4 As a result of impact damage, bearing wear, or improper installation, the rudder may drop down from the hull. One of the main aspects of a rudder inspection is the measurement to determine if the rudder has dropped. The ship's Engineering Officer compares the current measurements with previous measurements. A change in the measurements indicates the rudder has dropped.

17-8.2.2.5 Location. The rudders are located 11 feet off the centerline, port and starboard, beginning at frame 524 and ending at frame 510.

17-8.2.2.6 References.

a. NAVSEA DWG DD 963 519-4539262, Rev. F, Rudder Assembly and Details

17-8.2.3 Propellers (5-Bladed).

17-8.2.3.1 This class of ship is propelled by two 17-foot diameter, 5-bladed, controllable pitch propeller (CPP) systems equipped with prairie air systems. A CPP system allows the ship to go from ahead to astern without changing the direction of shaft rotation. Rigid propeller blades are bolted on to hydraulically operated mounts on the propeller hub. This system positions the blades for the desired thrust, either ahead or astern. The controllable pitch propeller (CPP) system is bolted to the tailshaft flange.

17-8.2.3.2 The prairie air propeller blades have 270 3/64-inch diameter holes; 120 on the suction (forward) and 150 on the pressure (aft) sides. On the suction side, they are evenly spaced 1 inch apart starting 4 inches from the vertical blade center line, and 3/4-inch from the leading edge. On the pressure side, they are variably spaced starting 4 inches from the hub on the leading edge to 5 inches past the vertical blade center line, and 3/4-inch from the leading edge. The first 31 holes are spaced 1/2-inch apart. The next 88 holes are spaced 1 inch apart and the remaining 31 holes are 1/2-inch apart. To function properly, these emitter holes must be free of fouling.

17-8.2.3.3 The port propeller is right-hand and turns clockwise (when viewed from astern). Most ships number the blades in the direction opposite of the direction in which the blades turn. However, the port propeller blades in this class ship are numbered in the same direction. The blades of the port propeller are numbered in the clockwise direction.

17-8.2.3.4 The starboard propeller is left-hand and turns counter-clockwise (when viewed from astern). The blades are numbered in the clockwise direction.

17-8.2.3.5 The five controllable pitch blades are lettered “A” through “E.” The CPP hub does not have a lifting eye to assist in identifying blade “A.” The letters are stamped on the flat surface blade hub flange near the flange edge (blade palm), outboard of the blade bolts. Blade identification may be in the form of serial numbers such as “LH17A, LH17B” or “RH8A, RH8B,” etc.

17-8.2.3.6 A blade bolt identification number is stamped adjacent to each blade bolt hole on the top surface of the flange (blade palm) of each blade. Numbering is sequential, with 1 denoting the blade bolt on the suction face nearest the trailing edge and 8 denoting the blade bolt on the pressure face nearest the trailing edge.

17-8.2.3.7 Location. The propellers are located 12 feet 9 inches off centerline at frame 496, port and starboard.

17-8.2.3.8 References.

a. NAVSEA S9086-HP-STM-010/CH-245, “Propellers”

b. NAVSEA S9245-AR-TSM-010/PROP, *Technical Manual for Marine Propeller Inspection, Repair and Certification*

c. NAVSEA S0600-AA-PRO-120, *Underwater Ship Husbandry Manual*, Chapter 12, “Controllable Pitch Propellers”

d. BIRD-JOHNSON COMPANY Drawing No. 115651002, Rev. A, Propeller Blade

17-8.2.4 Main Bearing Housing and Struts.

17-8.2.4.1 Immediately forward of the propeller is the propeller or main strut. The main strut consists of two columns extending down from the hull forming a "V" shape that attaches to the bearing housing and supports the shaft. The struts are subjected to severe dynamic loading while the ship is underway. They are also subject to corrosion, vibration damage, and damage from rope and wire or other foreign material. At the top of the bearing housing are four 1/2-inch pipe plugs located 7 1/2 inches and 26 1/2 inches from the forward edge and 17 1/2 inches and 36 1/2 inches from the after edge. On the bottom of the bearing housing are four 1/2-inch pipe plugs located 17 1/2 inches and 36 1/2 inches from the forward edge and 7 1/2 inches and 26 1/2 inches from the forward edge. These holes are used for maintenance during dry-docking. Inspection includes a complete examination of the strut surface, bearing housing, and fairwaters.

17-8.2.4.2 Location. The main struts are located immediately forward of the propellers at frame 490, port and starboard.

17-8.2.4.3 References.

a. NAVSEA DWG DD 963 119-4537820, Rev. G, Strut - Main Casting Port

b. NAVSEA DWG DD 963 119-4537821, Rev. G, Strut - Main Casting Starboard

17-8.2.5 Rope Guards.

17-8.2.5.1 Rope guards are circular plates fitted between the propeller hub and the ends of the main strut bearing housings. They are streamlined in shape in order to eliminate abrupt changes in water flow and they serve to protect the rotating shaft from becoming fouled by wire, rope, or other material. The design clearance between the propeller hub and the rope guard is 1 inch. The rope guards on ships of this class are made up of two halves constructed of steel, and are welded to the bearing housing. The rope guards are equipped with 1/16-inch prairie air emitter holes spaced 1 inch apart. There is also one 1 inch 14-UNF prairie air cleanout plug on the bottom of each rope guard half. This plug is flush with the rope guard and secured by means of nylon inserts.

17-8.2.5.2 Location. The rope guards are located immediately forward of the propellers at frame 494.

17-8.2.5.3 References.

a. NAVSEA DWG DD 963 100-4537744, Rev. W, Shaft Fairwaters and Rope Guards MDL 3

17-8.2.6 Fairwaters.

17-8.2.6.1 Fairwaters are circular plates fitted at the forward and aft ends of the intermediate bearing housings, and forward of the main bearing housings. On this class ship the stern tube fairwater is faired and welded to the hull plating. They are shaped to streamline these parts to eliminate abrupt changes in water flow. The main bearing housing fairwaters on ships of this class are made up of two halves constructed of steel, and are welded to the bearing housing and the design clearance from the shaft is 1 1/2 inch. The main strut fairwaters are equipped with 3/64-inch prairie air emitter holes spaced 3/4 inch around the fairing. For hulls numbered 963 through 977 the prairie air holes are drilled directly into the fairwater plate over the air channel. For hulls numbered 978 through 992 and 997 a 3-inch wide copper nickel plate is welded over the air channel and the emitter holes are drilled in the center of this plate. There is also one 1 inch 14-UNF prairie air cleanout plug per fairwater half. These plugs are flush with the fairwater and secured by means of nylon inserts. An approximately 1 inch diameter air escape hole is located on the fairwater top center near the intersection with the bearing housing.

17-8.2.6.2 Location. The fairwaters are located forward of the main struts and forward and aft of the intermediate struts.

17-8.2.6.3 References.

a. NAVSEA DWG DD 963 100-4537744, Rev. W, Shaft Fairwaters and Rope Guards MDL 3

17-8.2.7 Shafting.

17-8.2.7.1 The shafting transmits torque from the main engine to the propeller and axial thrust from the propeller to the hull. The section of shaft between the stern tube and intermediate strut is called the intermediate shaft. The section of shaft between the intermediate strut and propeller is called the propeller shaft. The shaft couplings are protected by rotating coupling covers. On this ship class, these rotating coupling covers are not visible to the diver. The propeller shaft is bolted to the intermediate shaft forward of the intermediate strut and is protected by the forward fairwater. A glass reinforced plastic (fiberglass) coating covers the exposed shafting.

17-8.2.7.2 Location. The shafts extend from the reduction gears to the propellers. They are exposed from frame 482 to 402 on the port shaft and 482 to 414 on the starboard shaft.

17-8.2.7.3 References.

a. NAVSEA DWG DD 963-203-4538736, Shaft, Propeller Turbine Engine

b. NAVSEA S0600-AA-PRO-130, *Underwater Ship Husbandry Manual*, Chapter 13, "Propulsion Shafting Coating Repair"

17-8.2.8 Intermediate Bearing Housing and Struts.

17-8.2.8.1 The intermediate strut supports the shaft midway between the main strut and the stern tube. They are also subject to corrosion, vibration damage, and damage from rope and wire or other foreign material. At the top of the bearing housing are three 1/2-inch pipe plugs installed 5 1/2 inches, 17 1/2 inches, and 29 1/2 inches from the forward edge. On the bottom are three 1/2-inch plugs installed 5 1/4 inches, 17 1/4 inches, and 29 1/4 inches from the after edge. Two configurations of forward fairwaters are installed on this class. Hulls numbered 963 through 982 have prairie air holes (3/64-inch diameter spaced 3/4 inch apart approxamately 2 3/4 inches aft of the leading edge). Hulls numbered 983 through 992 and 997 do not have prairie air. Hulls with prairie air have two 1 inch clean out plugs near the bottom center of the air channel. The fairwaters are shaped to streamline these parts in order to eliminate abrupt changes in water flow. The design clearance from the shaft is 1 1/2 inches. The fairwaters are made up of two halves constructed of steel, and are welded to the bearing housing.

17-8.2.8.2 Location. The intermediate struts are located at frame 446.

17-8.2.8.3 References.

a. NAVSEA DWG DD 963 119-4537818, Rev. G, Strut-Intermediate Casting Port

b. NAVSEA DWG DD 963 119-4537819, Rev. G, Strut-Intermediate Casting Starboard

c. NAVSEA DWG DD 963 100-4537744, Shaft Fairwaters and Rope Guards - MDL 3

17-8.2.9 Stern Tube.

17-8.2.9.1 The free-flood area where the shaft penetrates the hull is the stern tube. The stern tube supports the shaft as it enters the hull. It houses one or more shaft bearings. A fairing is installed where the shaft enters the hull. The stern tube fairwaters on this class ship are made up of several parts and constructed of steel. On hulls numbered 963 through 974 the stern tube and fairwater are fitted together with screws tack welded in place. On hulls 975 through 992 and 997 the components are welded together. The entire assembly is then fastened to the hull with screws that are tack-welded and then ground flush. On the after end of both port and starboard fairwaters are 2 inch air escape holes, two on the port side and three on the starboard side.

17-8.2.9.2 Location. The port stern tube extends from frame 408 to 390. The starboard stern tube extends from frame 414 to 390.

17-8.2.9.3 References.

a. NAVSEA DWG DD 963 119-4537817, Rev D, Stern Tube Casting

b. NAVSEA DWG DD 963 100-4537744, Rev. W, Shaft Fairwaters and Rope Guards

17-8.2.10 Skeg.

17-8.2.10.1 The skeg is a long narrow vertical fin attached to the keel serving to assist keeping the ship on course. The skeg is flushed with preservative and then drained and dried. It has two 1 inch plugs. The fill plug is located on the starboard side, 6 inches forward of the upper trailing edge at frame 411. The drain plug is located on the bottom of the skeg on the centerline at frame 354.

17-8.2.10.2 Location. The skeg extends forward from frame 411 to 332.

17-8.2.10.3 References.

a. NAVSEA DWG DD 963 845-4700558, Rev. G, Docking Drawing

b. NAVSEA DWG DD 963 100-4537746, Rev. H, Skeg Plating and Framing

17-8.2.11 Overboard Discharge.

17-8.2.11.1 Overboard discharges are round or oval openings used for discharging sea water or other fluids from the ship. Overboard discharges are not usually covered with screens or gratings.

17-8.2.11.2 Location. Overboard discharges are located in various positions along the hull.

17-8.2.11.3 References.

a. NAVSEA DWG DD 963 845-4700558, Rev. G, Docking Drawing

a. NAVSEA DWG DD 963 845-4700558, Rev. G, Docking Drawing

17-8.2.12 Seachests and Seawater Suction.

17-8.2.12.1 Seawater suctions are openings for bringing seawater into the ship. Multiple suctions located together at one hull opening are called sea chests. Suctions and sea chests are covered with either mesh screens, grates, or strainer bars to prevent objects or foreign material from entering.

17-8.2.12.2 Location. The seawater suctions and seachests are located in various positions along the hull.

17-8.2.12.3 References.

a. NAVSEA DWG DD 963 845-4700558, Rev. G, Docking Drawing

b. NAVSEA DWG DD 963 120-4537822, Rev. P, Suction Seachests Misc.

17-8.2.13 Impressed Current Cathodic Protection (ICCP) System.

17-8.2.13.1 The Impressed Current Cathodic Protection (ICCP) system uses ship's power to provide galvanic corrosion protection for the hull and all underwater appendages. The system consists of two major hull-mounted components:

a. Reference Electrode (Reference Cell): The reference electrode is a cell constructed of a silver mesh screen that has been treated with silver chloride. It is mounted in a domed, 9-inch diameter circular polyvinyl chloride holder that electrically isolates the reference electrode from the hull. The reference electrode is secured to a base or sole plate by a pattern of screws. A series of holes in the reference electrode permit passage of seawater at the hull, allowing the controller to detect electromechanical activity at the hull and measure the potential of the hull versus the reference electrode. The holes in the reference electrode must remain open for it to function, and should never be covered by paint or epoxy. A stuffing tube is used to pass a cable from the electrode to the controller. The controller measures the potential of the hull versus the reference electrode and signals a power supply to increase or decrease current output as required to reduce the potential difference between the hull potential and the preset desired potential. Two reference electrodes are installed for each controller. Reference electrodes are located on each side of the hull approximately halfway between anode sites.

b. Anodes: ICCP anodes are constructed of pairs of platinum-coated tantalum rods mounted in an insulating glass-reinforced polyester holder, which is bolted to the outside of the ship's hull. The direct current produced by the power supply is provided to the anode by a conductor through a stuffing tube. The current flows into the seawater through the platinum surface of the tantalum rods. The platinum surface of the anode corrodes very slowly, and the replacement period for anodes, unless physically damaged, is normally greater than 10 years. One size anode is used on this class ship: 4 feet (75 amperes).

17-8.2.13.2 A dielectric shield prevents shorting of the anode current to the hull near the anode and aids in wider current distribution. The dielectric shield is applied as a thick coating around each anode. It consists of a high-solids epoxy with high dielectric strength. It is applied with the hull coating system. The dielectric shield changes thickness as one moves away from the anode. For this class of ship, the 4-foot anode is surrounded by a dielectric shield approximately 100 mils thick out to a 7-foot by 10-foot area (inner shield). An additional dielectric shield (22 mils) extends out to 13 feet by 16 feet (outer shield).

dielectric shield (22 mils) extends out to 13 feet by 20 feet (outer shield).

17-8.2.13.3 Anodes that have excessive output of protective current for prolonged periods will cause a failure of the hull coating in the immediate area causing blisters, peeling or missing paint, and large areas of bare metal. When the anode is active or energized, small bubbles are generated on the anode wires. The anode and the hull area above it will be free of marine fouling. In addition, if the dielectric shield becomes damaged and the system is working properly, a layer of calcium will be deposited over the exposed bare metal area. This calcium (calcareous deposits) may be mistaken for deteriorated portions of the coating system. Because calcareous deposits form an additional protective barrier to the hull they should not be removed. This condition, however, indicates a damaged coating and should be reported. Biological fouling is not the same as calcareous deposits.

17-8.2.13.4 An anode that has been turned off for prolonged periods will have a heavy layer of marine fouling on the anode strip and possibly the dielectric shield.

17-8.2.13.5 Locations. This class ship has six anodes, three per side, located at frames 426, 277, and 83 on the port side and at frames 426, 277, and 113 on the starboard side. Two reference electrodes are located port and starboard at frame 382.

17-8.2.13.6 References.

a. NAVSEA S9086-VF-STM-010/CH-633, Chapter 633, “Cathodic Protection”

b. NAVSEA DWG DD 963 100-4537745, Rev. J, Cathodic Protection Arrangement and Details

c. NAVSEA S0600-AA-PRO-190, *Underwater Ship Husbandry Manual*, Chapter 19, “Cathodic Protection Systems”

d. NAVSEA DWG DE 1052-600-4466754, Anode and Reference Electrode for Impressed Current Cathodic Protection System

17-8.2.14 Bilge Keel.

17-8.2.14.1 The bilge keel is a long narrow fin near or at the turn of the bilge in the middle portion of the ship. It resists and decreases the magnitude of rolling of the ship. It extends forward from frame 346 to 212. Bilge keels on ships in this class are of the V-shaped section type and are 39 inches wide. The bilge keel, a hollow structure, has been flushed with a preservative and then dried. There are three 1 inch NPT fill/drain plugs on each bilge keel; two are located on the top at frames 346 and 212 and one is located on the bottom, 48 inches forward of frame 292.

17-8.2.14.2 Locations. The bilge keel extends forward from frame 346 to 212, port and starboard sides.

17-8.2.14.3 References.

a. NAVSEA DWG DD 963 100-4537743, Rev. G, Bilge Keel-MDL 2

17-8.2.15 Masker Belt.

17-8.2.15.1 Masker emitter belts are installed at the forward end and the after end of the ship’s machinery spaces. They run vertically down both sides of the external hull from a point above the waterline to a termination point in the vicinity of the keel.

17-8.2.15.2 Two different masker emitter belt configurations are found on ships of this class: the flat plate and the flat tube. The flat plate configuration consists of a flat plate rolled into a half-pipe-shaped air channel, welded to a backing plate. The backing plate is welded to the hull and runs vertically down both sides from a point above the waterline to a termination point at the keel.

17-8.2.15.3 The flat tube/epoxy configuration is a continuous length of flattened 90/10 copper-nickel (Cu-Ni) pipe epoxied into a fairing channel. The fairing channel serves to fair the flow of water over the flat tube and consists of two flat plates welded at an angle to a backing plate. The backing plate is welded to the hull. This configuration also runs vertically down both sides of the external hull from a point above the waterline to a termination point at the keel. This configuration was an attempt to electrically insulate the Cu-Ni belt material from the steel hull to promote antifouling action. A procedure was developed for divers to replace failed belts with new belts underwater. For those belts replaced underwater, additional insulated support straps are welded to the fairing channel to hold the replacement belt in place.

17-8.2.15.4 On the flat tube/epoxy configurations where bilge keels obstruct masker belt installation, an access is cut in the bilge to allow the masker belt to pass through. They are located at frames 297, 257, and 215. On each access there are six 3/8-inch-UNC preservative fill and drain plugs; three on top and three on the bottom.

17-8.2.15.5 Air is supplied via a through-hull penetration to the upper end of the belt. The air is emitted through a series of 3/64-inch diameter holes drilled in a specific pattern along the underwater length of the belt.

17-8.2.15.6 Ships that have the flat plate configuration have a 1 1/4-inch clean-out plug installed on the masker belt 2 inches from the keel. Ships that have the flat tube/epoxy configuration have a 1 1/2-inch clean-out plug installed in the masker belt 2 1/2 inches above the keel termination support strap (a metal strap cradling the masker belt at the keel). The clean-out plug is removable to permit periodic flushing of the masker emitter belt system.

17-8.2.15.7 Ship's force personnel measure the flow rate to the masker belts while underway per MRC Code 551G U-3. This maintenance requirement determines whether or not cleaning of the system is required. Failure of the system to deliver a flow of 400-600 scfm at a pressure of 12-17 psig is indicative of failure or a requirement for cleaning. This would necessitate the inspection services of a diver.

17-8.2.15.8 Location. This class ship has a total of eight masker belt emitter systems, four per side. They are located port and starboard at frames 297, 257, 215 and 172.

17-8.2.15.9 References.

a. NAVSEA S0600-AA-PRO-050, *Underwater Ship Husbandry Manual*, Chapter 5, “Masker Emitter Belts”

b. NAVSEA DWG DD 963 513-4539250, Rev H, Masker Air System Girth Emitters

17-8.2.16 Transducer.

17-8.2.16.1 Transducers are transmitting and receiving heads for various kinds of underwater acoustic signals. Transducer heads are protected by Buna-N rubber covers that are bolted to the hull. The mounting flange for the transducer has a series of 3/4-inch 10-UNC thread saver plugs for installation of a protective steel cover used while dry-docking the ship. This class ship has two hull-mounted transducers, the UQN-4 and the AUTEC range pinger.

17-8.2.16.2 Location. The transducers are located on the starboard side from frames 154 to 150, 3 feet 4 inches off centerline, above the keel.

17-8.2.16.3 References.

a. NAVSEA DWG DD 963 120-4537822, Rev N, Suction Seachest Misc.

17-8.2.17 Rodmeter (Underwater Log).

17-8.2.17.1 The rodmeter (also known as the pit sword) is the part of the underwater log that projects from the ship’s hull. The underwater log is a device for measuring the ship’s speed through the water. Ships in this class have a 72-inch retractable rodmeter. Retractable rodmeters can be retracted through an opening in the hull through a sea valve for maintenance. They are usually in the retracted (stowed) position and inaccessible to divers while the ship is in port.

17-8.2.17.2 With retractable rodmeters, possible problems include (but are not limited to):

a. Ship unable to receive input from rodmeter.

b. Ship unable to retract rodmeter.

17-8.2.17.3 Location. The rodmeter is located on the port side, 10 feet 6 inches from the centerline at frame 141.

17-8.2.17.4 References.

a. NAVSEA DWG DD 963-120-4537822, Rev N, Suction Seachest Misc.

17-8.2.18 Bow-mounted Sonar Dome.

17-8.2.18.1 The Sonar Dome Rubber Window (SDRW) is a pressure-tight membrane that protects the sonar transducer array, reduces acoustic noise attenuation, and provides the proper hydrodynamic contour to minimize underway noise.

17-8.2.18.2 SDRWs are constructed much like steel-belted automobile tires, with layers of rubber applied over a series of steel plies. They are normally internally pressurized with water to maintain the desired shape. A fairing plate welded to the hull provides a smooth interface between the rubber sonar dome surface and the hull plate.

17-8.2.18.3 Most SDRWs are marked with a series of white grid markings to facilitate diver orientation. The grid markings consist of 2-inch by 2-inch squares along the upper periphery of the upper rubber window/fairing angle interface. These squares are painted every 15° to a point 165° aft on both sides. Directly above each square is a 2-inch number indicating the bearing that the square represents and an “S” or “P” to indicate starboard or port, as appropriate (15S, 135P, etc.). Additionally, in a horizontal line along the periphery of the lower rubber window/fairing angle interface are the same painted squares and numeral/letter combinations. The vertical midpoint of the SDRW is marked by a painted 2-inch square along the SDRW at the midpoint between the upper and lower bearing squares. Divers should use these location marks as reference points when reporting any damage. If the grid marks are not visible, the diver must estimate the location of any discrepancies.

17-8.2.18.4 The sonar dome banjo is a section of steel plate that extends forward from the keel. This plate supports the bottom of the dome. The banjo is narrowest just forward of the keel and increases in size as one moves to the forward end of the banjo.

17-8.2.18.5 Location. The sonar dome is located along the centerline of the ship from frame 52 to 2.

17-8.2.18.6 References.

a. NAVSEA S9165-AH-MMA-010 *Technical Manual for Sonar Dome Rubber Window for DD 963, DDG 993, and CG 47 Class Vessels*

b. NAVSEA DWG DDG-47-100-4537750 Sonar Dome Structural Assembly

c. NAVSEA DWG DD 963 120-4537822, Rev. N, Suction Seachest Misc.

17-8.3 LEVEL 1 INSPECTION PROCEDURES.

17-8.3.1 Introduction.

17-8.3.1.1 This section contains Level 1 inspection procedures for the DD 963 Class Destroyer. The Table 17-8.2 checklist presents components in the order in which the diver would find them when making a stern area, port side, bow, and starboard side inspection dive. Note that all hull openings included on the docking plan are listed in Figure 17-8.1 and Table 17-8.2. Depending on the ship's draft at the time of the inspection, some items may be above the waterline. The Dive Supervisor can refer to Figures 17-8.1 and 17-8.2 and Table 17-8.2 (found at the end of these Level 1 procedures) to pinpoint the exact location of a particular component. These tables and figures can be photocopied and used to document the reported condition of each component. In addition, the NAVSEA Diver Inspection Data Forms for the hull, Sonar Dome Rubber Window, ICCP, and propeller should be used to record the inspection results. These forms are included in Section 5 of this chapter. Underwater color photography should also be used to further depict the damage described in the report and in the forms.

17-8.3.2 Paint and Fouling Inspection.

NOTE

> To accurately report the PDR and FR, the diver must be thoroughly familiar with NSTM Chapter 081, "Waterborne Underwater Hull Cleaning of Navy Ships."

17-8.3.2.1 One of the most important aspects of a Level 1 inspection is the assessment of the Fouling Rating (FR) and the Paint Deterioration Rating (PDR). Values for the FR and the PDR may vary widely along the length of a hull.

17-8.3.2.2 The diver should continuously report the condition of the paint using standard terms such as peeling, blistered (broken or intact), and missing antifouling or anticorrosive paint. Report the color of exposed paint. A diver's light is necessary to report color accurately. Use sections of hull plate to estimate the condition of small areas: flat and curved areas of plate, edges, welds, seams, rivets, and bolt heads. The Dive Supervisor maintains a running log of the conditions and records the FR and PDR for localized areas. This enables the Dive Supervisor to keep track of the total estimate for each section of the hull. These values are then summarized, yielding the overall condition for each area: bow, stern, flat bottom, and sides. Report the docking block areas separately from the flat bottom and sides. For docking block areas, report the average percent of block areas painted and the percent of base metal with pitting. Estimate the average diameter and depth of pitting. For a heavily fouled section of hull, only the FR can be reported since little or no hull paint will be visible.

17-8.3.2.3 This inspection procedure alerts the diver when the inspection process has been completed for each section of the hull to assist in summarizing the overall conditions.

a. Inspect and report the FR.

b. Inspect and report the PDR. Report localized areas of pitting, blisters, peeling, or missing paint.

c. Inspect and report the docking block FR and PDR.

17-8.3.3 General Hull Plate Inspection.

a. Carefully examine the hull plating. Look for areas of bare metal, bleeding rust, and large areas of pitting.

b. Inspect for holes, cracked weld seams, distorted hull plates, localized areas of pitting, corrosion, and any other apparent damage.

c. Estimate and report the extent and location of any damage; report length of cracks and average pit diameter and depth.

17-8.3.4 Rudder.

a. Inspect the entire surface area for any cracked welds or marks, gouges, or scrapes that indicate the rudder surfaces may have made contact with an underwater object.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

b. Inspect the area between the rudder, the rudder stock, and the hull for fouled wire, rope, or foreign material.

c. Measure the rudder clearance. With the rudder amidships, measure between the top of the rudder and the bottom of the hull. Design clearance varies by ship. For hull number DD 963, the clearance is 2 inches. For hull numbers DD 964 -DD 967, design clearance is 2 1/2-inches. For hull numbers DD 968 and above, design clearance is 3 1/2-inches.

d. Verify that the two 1 1/4-inch fill holes (upper) and the two 1 1/4-inch drain holes (lower) plugs are present and have not backed out.

e. Sound the rudder with a rawhide mallet.

(1) Rap on the surface to determine if the rudder has flooded. Begin sounding near the uppermost part of the rudder and continue downward to the lowest point.

NOTE

Internal framing and stiffeners will change the sound. It is necessary to sound the rudder in different locations. A hollow sound indicates the rudder is not flooded, while a dull sound indicates flooding.

(2) If the rudder is found to contain water, make the appropriate report and arrangements for follow-on dewatering and repair.

f. Inspect and report the FR and the PDR.

17-8.3.5 Propeller (5-Bladed).

a. Inspect the propeller hub end cover and hub cone cover plate for damage, cracks, and loose or missing fasteners.

b. Inspect the propeller hub for fouled wire, rope, or other foreign material. Fiber such as fish netting or manila line may be removed without difficulty. If removal of the material will be excessively time consuming, make the appropriate report and arrangements for follow-on removal.

c. Inspect the propeller blade root and flange areas for cracks and cavitation damage. Cavitation damage can be identified by an area of small pocked holes or a rough-textured surface.

(1) Verify that the blade bolt caps (4 each side of each blade) are in place and secure.

(2) Verify that the 1 1/8-inch thread savers (one in each side of the blade) are in place on the blade flange.

d. Inspect the overall physical appearance and FR of each blade, starting with blade “A.”

(1) Inspect the leading and trailing edges for nicks, curls, chips, dents, flat spots, cracks, or other apparent damage.

(2) Inspect the suction (forward) and pressure (aft) face of each blade for defects caused by cavitation.

(3) Inspect the 1 3/4-inch prairie air channel cover plate on the blade pressure (aft) face for damage or cracked welds. Inspect both the pressure (aft) and suction (forward) face air emitter holes for fouling.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively fouled, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(4) Measure and record the extent of all damage.

(5) Inspect and report the FR of the propeller.

17-8.3.6 Rope Guard.

a. Verify that the rope guard is securely in place.

NOTE

A missing rope guard is a serious casualty.

b. Inspect all welds for corrosion, damage, or cracks.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Inspect for the presence of fouled rope, wire, or foreign material.

d. Verify that the 1 inch running clearance between the rope guard and propeller hub is uniform all around. Take clearance measurements at the 3, 6, 9, and 12 o'clock positions.

e. Inspect the 3/64-inch prairie air emitter holes spaced 1 inch apart around the guards for fouling or blockage.

f. Inspect for the presence of the 1 inch 14-UNF prairie air clean-out plug. Verify that it is flush and staked at a minimum of two places.

g. Inspect and report the FR and the PDR of the rope guard.

17-8.3.7 Main Bearing Housing and Struts.

NOTE

The main struts on this class have a history of severe corrosion. Most main struts have been repaired with clad welding, epoxy or both.

a. Inspect the bearing housing for the presence of the four top and bottom 1 inch plugs; ensure they are flush and staked at a minimum of two places.

b. Inspect the main strut columns for corrosion damage and the presence of wire or other foreign material.

c. Inspect the surface paint condition.

(1) At best, the surface of the struts will be very rough due to previous damage or repairs.

(2) Inspect for loose or missing epoxy.

d. Inspect the strut columns and the immediate hull plate area at the strut/hull interface for cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Inspect and report the FR and the PDR of the strut.

17-8.3.8 Main Bearing Housing Fairwaters.

a. Verify the presence of fairwaters.

NOTE

A missing fairwater is considered a serious casualty.

b. Verify that the 1 inch gap between the fairwater and the shaft is uniform all around. Take measurements at the 3, 6, 9, and 12 o'clock positions.

c. Inspect the 1/16-inch prairie air emitter holes spaced 1 inch apart around the forward main strut fairwater for fouling or blockage.

d. Inspect all welds for corrosion damage and cracks.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Inspect and report the FR and the PDR of the fairwaters.

17-8.3.9 Shafting.

a. Inspect the full length of all accessible glass-reinforced plastic (fiberglass) covering.

(1) Inspect for evidence of deterioration, loss of adhesion, or any apparent physical damage. Loss of adhesion of shaft covering is characterized by one or more of the following: loss of covering (total or partial), delaminations, or bare metal.

(2) Inspect for damage such as nicks or cuts in the coating, missing covering, or loose covering. The covering may also have rust stains indicating where rust has leaked through near a cut, pinhole, area of porosity, patch, joint, or other flaw.

NOTE

Rust stains on the shaft coating indicate corrosion of the shaft. This is a serious problem.

b. If any of the above conditions exist, make the appropriate report and arrangements for follow-on Level 2 inspection.

17-8.3.10 Intermediate Bearing Housing and Struts.

a. Inspect the strut columns and bearing housing for corrosion damage and for the presence of wire or other foreign material.

b. At the strut/hull interface, inspect the strut columns and immediate hull plate area for cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Inspect the bearing housing for the presence of the three top and bottom 1/2 inch plugs; ensure that they are flush and staked at a minimum of two places.

17-8.3.11 Intermediate Bearing Housing Fairwaters.

a. Verify the presence of the forward and after fairwaters.

NOTE

A missing fairwater is considered a serious casualty.

b. Verify that the 1 1/2 inch gap between the fairwater and the shaft is uniform all around. Take measurements at the 3, 6, 9, and 12 o'clock positions.

c. Inspect all welds for corrosion damage and cracks.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

d. Inspect and report the FR and the PDR of the fairwaters.

17-8.3.12 Stern Tube.

a. Inspect the stern tube fairwater.

(1) Inspect for corrosion damage and cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(2) Verify that the gap between the fairwater and the shaft is uniform all around. Take measurements at the 3, 6, 9, and 12 o'clock positions.

b. Inspect and report the FR and the PDR of the stern tube and immediate hull plate area.

17-8.3.13 Impressed Current Cathodic Protection (ICCP) Anode.

NOTE

The presence of marine fouling indicates a non-functioning anode.

CAUTION

Avoid disturbing the white calcium buildup on the dielectric shield that protects areas of bare metal from corrosion.

a. Inspect the anode for damage, missing or broken wires, and missing or damaged platinum coating on the wires.

b. Inspect the dielectric shield for chips, cracks, blisters, or missing epoxy.

c. Inspect the hull coating in the area around the anode for missing or peeling paint or blisters. Inspect for calcareous buildup.

d. Inspect and report the FR and the PDR.

17-8.3.14 Reference Electrode (Reference Cell).

a. Inspect for damage, clogged water circulation holes, and loose or missing epoxy.

b. Inspect and report the FR.

17-8.3.15 Overboard Discharge.

a. Inspect for foreign material or corrosion damage.

b. Inspect and report the FR and the PDR.

17-8.3.16 Sea Chest and Seawater Suction.

a. Inspect screens and grates for clogged holes and loose or missing fasteners.

b. Inspect splitter bars for corrosion damage, broken or missing bars, cracked welds, and missing or loose fasteners.

c. Inspect and report the FR and the PDR.

17-8.3.17 Bilge Keel.

a. Inspect the bilge keel for dents, cracks, curled edges, missing plate, or other apparent damage.

b. Inspect for foreign material and loose or missing plugs. There are three plugs on each bilge keel. Two are located on the top at frames 346 and 212, and the other is located on the bottom, 48 inches forward of frame 292.

c. Measure and record the location of any damage.

d. Inspect and report the FR and the PDR.

17-8.3.18 Masker Belt.

17-8.3.18.1 The Flat Tube/Epoxy Configuration.

a. Inspect for crushed, cracked, or missing masker belt.

b. Inspect for displaced masker belt, sprung from the channel.

c. Inspect for loose, missing, or excess epoxy.

d. Inspect the full length of weld between the backing plate and the fairing plate (the backing plate is the plate welded to the hull) and the weld between the backing plate and the hull for cracks. Inspect both sides.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Inspect for holes in the fairing plate/welds.

f. Inspect the 3/64-inch emitter holes for fouling. Emitter holes are spaced in sections and the spacing varies in density for each section.

g. If installed, inspect the support straps for missing Lexan insulator.

h. Inspect for a loose or missing 1 1/2-inch NPT clean-out plug located 2 1/2 inches from the keel termination support strap.

i. Inspect any previously repaired areas.

j. Inspect and report the FR and if painted, the PDR.

17-8.3.18.2 The Flat Plate Configuration.

a. Inspect for crushed, dented, or missing sections of masker belt.

b. Inspect the full length of weld between the backing plate and the hull (the backing plate is the plate welded to the hull) and the weld between the emitter plate and the backing plate for cracks. Inspect both sides.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Inspect the 3/64-inch air emitter holes for fouling. Emitter holes are spaced 1/2 inch forward and aft of the emitter pipe vertical centerline. Emitter holes are spaced in sections and the spacing varies in density for each section.

d. Inspect for a loose or missing 1 1/4-inch NPT clean-out plug located 2 inches from the end of the emitter pipe at the keel.

e. Inspect and report the FR and the PDR.

17-8.3.19 Transducer (UQN-4).

a. Inspect sensor covers for tears, gouges, or delaminations.

b. Inspect the 16 evenly spaced 3/4-inch thread savers around the perimeter of the sensor flange; ensure they are flush and have not backed out.

c. Inspect for loose or missing fasteners and loose or missing fairing compound.

d. Inspect for signs of structural failure or damage caused by contact with underwater objects.

e. Inspect and report the FR.

17-8.3.20 Transducer (AUTEC Range Pinger).

a. Inspect sensor covers for tears, gouges, or delaminations.

b. Inspect the plugs around the perimeter of the sensor flange; ensure they are flush and have not backed out.

c. Inspect for loose or missing fasteners and loose or missing fairing compound.

d. Inspect for signs of structural failure or damage caused by contact with underwater objects.

17-8.3.21 Rodmeter (Underwater Log).

a. Inspect the hull opening to verify that it is free of any obstruction.

b. Inspect and report the FR

17-8.3.22 Bow-mounted Sonar Dome.

WARNING

Divers must exercise care when touching a dome with steel wires exposed.

WARNING

Avoid direct bare skin contact with NOFOUL rubber surfaces. Avoid contact between hands and eyes if hands have been exposed to the NOFOUL rubber material. Wash hands thoroughly before eating or smoking.

a. Inspect the entire surface of the sonar dome and banjo using a latitudinal inspection pattern. Survey a swath approximately 3 feet wide on each pass until complete. Inspect for cuts, pits, gouges, bulges, soft spots, and any previous repairs that may have become faulty or deteriorated.

b. Inspect and report the FR of the dome. The rubber surface of the dome is made of NOFOUL rubber. However, the anti-fouling properties of the dome may become ineffective as the dome ages or from over-spraying of paint while the ship is in dry-dock. Fouling degrades the performance of the sonar.

c. Inspect the entire perimeter of the rubber dome and steel closure plate for separation, cracks, damage or corrosion of the steel.

d. Inspect the banjo and fairing with the hull for damage, cracks or corrosion. Report the FR and PDR of the banjo.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Inspect the hull/sonar dome fairing interface for cracked welds or structural damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

f. Rubber damage with exposed wires, cracked welds, or structural damage are severe conditions. If any such discrepancies are noted, make the appropriate report and arrangements for a follow-on Level 2 inspection.

Name of Ship ________________
Inspection Activity ________________
Inspection Location ________________
Inspection Date ________________
Type of Inspection (Level 1 or Level 2) ________________

Table 17-8.2. Checklist of Major Hull Components. (sheet 1 of 7)
(Item Numbers Correspond to Numbers on Figure 17-8.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
1		Stern Area Paint and Fouling		Transom-Frame 412		
2		Stern Area General Hull Plate		Transom-Frame 412		
3	57	Overboard Discharge	Compartment 2-506-O. E.	Frame 529 Stbd, 7′ 9″ off CL*	3 1/2″ dia	
4		Rudder, Stbd		Frame 526-512 Stbd	9′ x 16′ area	
4.a		Rudder Drop Measurement				
4.b		Paint and Fouling				
4.c		Fill and Drain Plugs				
4.d		Plating, Welds				
4.e		Sound Rudder				
5	44	Overboard Discharge	Eductor E-1 in Steering Gear Room	Frame 513 Stbd, 18′ 6″ off CL*	3″ dia	
6		Propeller, CP, 5-Bladed, Stbd		Frame 502-494 Stbd		
6.a		Hub		Frame 502		
6.b		Blades		Frame 496		
6.b.1		Blade Bolt Caps and Thread Savers				
6.b.2		Blade FR and Damage				
6.b.3		Prairie Air Channels		Frame 482		
7		Main Bearing Housing and Strut, Stbd		Frame 494-482 Stbd		
7.a		Rope Guard		Frame 494		
7.a.1		Prairie Air Holes				
7.b		Bearing Housing		Frame 493-487		
7.c		Forward Fairwater		Frame 484		
7.c.1		Prairie Air Holes				
7.d		Strut				
8		Propeller Shaft, Stbd		Frame 482-455 Stbd		
9	43	Overboard Discharge	Seawater Service High Pressure Air Compressor #3	Frame 471 Stbd, 21′ 1″ off CL	2″ dia	

Name of Ship
Inspection Activity
Inspection Location
Inspection Date
Type of Inspection (Level 1 or Level 2)

Table 17-8.2. Checklist of Major Hull Components. (sheet 2 of 7)
(Item Numbers Correspond to Numbers on Figure 17-8.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
10	63	Impressed Current Cathodic Protection (ICCP) Anode (4 Foot Anode)		Frame 492-464 Stbd, 17′ 6″ off CL	8′ x 12′ area	
11		Intermediate Bearing Housing and Strut, Stbd		Frame 452-439		
11.a		Aft Fairwater		Frame 452		
11.b		Bearing Housing		Frame 446		
11.c		Strut				
11.d		Forward Fairwater		Frame 441		
12	76	Overboard Discharge	Seawater Service Cooler Generator #3	Frame 443 Stbd, 23′ 10″ off CL*	3″ dia	
13	75	Overboard Discharge	Lube Oil Cooler	Frame 431 Stbd, 23′ 11″ off CL*	2 1/2″ dia	
14		Intermediate Shaft, Stbd		Frame 440-390 Stbd		
15		Stern Tube, Stbd	Starboard Shaft	Frame 414-390 Stbd		
16		Rudder, Port		Frame 526-512 Port, 11′ off CL	9′ x16′ dia	
16.a		Rudder Drop Measurement				
16.b		Paint and Fouling				
16.c		Fill and Drain Plugs				
16.d		Plating, Welds				
16.e		Sound Rudder				
17		Propeller, CP, 5-Bladed, Port		Frame 502-494 Port		
17.a		Hub		Frame 502 Port		
17.b		Blades		Frame 496 Port		
17.b.1		Blade Bolt Caps and Thread Savers				
17.b.2		Blade FR and Damage				
17.b.3		Prairie Air Channels		Frame 482 Port		
18		Main Bearing Housing and Strut, Port		Frame 494-482 Port		
18.a		Rope Guard		Frame 494 Port		
18.a.1		Prairie Air Holes				

Name of Ship
Inspection Activity
Inspection Location
Inspection Date
Type of Inspection (Level 1 or Level 2)

Table 17-8.2. Checklist of Major Hull Components. (sheet 3 of 7)
(Item Numbers Correspond to Numbers on Figure 17-8.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
18.b		Bearing Housing		Frame 493-487 Port		
18.c		Forward Fairwater		Frame 484 Port		
18.c.1		Prairie Air Holes				
18.d		Strut				
19	62	Impressed Current Cathodic Protection (ICCP) Anode (4 Foot Anode)		Frame 482-474 Port, 12′ 7″ off CL	8′ x 12′ area	
20	29	Overboard Discharge	Plumbing Waste Drain	Frame 474 Port, 23′ 3″ off CL*	2 1/2″ dia	
21	28	Overboard Discharge	Battery Shop	Frame 469 Port, 23′ 7″ off CL*	2″ dia	
22		Propeller Shaft, Port		Frame 482-455 Port		
23		Intermediate Bearing Housing and Strut, Port		Frame 452-439 Port		
23.a		Aft Fairwater		Frame 452 Port		
23.b		Bearing Housing		Frame 446 Port		
23.c		Strut				
23.d		Forward Fairwater		Frame 441 Port		
24		Intermediate Shaft, Port		Frame 440-390 Port		
25	74	Overboard Discharge	Plumbing Waste Drain	Frame 432 Port, 24′ 10″ off CL*	3″ dia	
26	42	Overboard Discharge	Eductor E3 Pump Room #3	Frame 425 Port, 23′ 5″ off CL*	3″ dia	
27	83	Overboard Discharge	Plumbing Waste Drain	Frame 419 Port, 25′ 5″ off CL	2 1/2″ dia	
28		Stern Tube, Port	Port Shaft	Frame 408-390 Port		
Note: This completes the stern area for reporting FR and PDR values. Transom to frame 412.						
29		Port Side Paint and Fouling		Frame 412-136 Port		
30		Port Side General Hull Plate		Frame 412-136 Port		
30.a		Port Side Docking Block Area (Include Keel Block Areas) FR and PDR		Frame 412-136 Port		
31	82	Overboard Discharge	Combined Waste Drain	Frame 410 Port, 25′ 7″ off CL*	4″ dia	
32	40	Overboard Discharge	Air Conditioning Chilled Water Plant #3	Frame 397 Port, 24′ 8″ off CL	5″ dia	
33	60	Reference Electrode	Reference Cell	Frame 388-379 Port, 21′ 9″ off CL		

Name of Ship
Inspection Activity
Inspection Location
Inspection Date
Type of Inspection (Level 1 or Level 2)

Table 17-8.2. Checklist of Major Hull Components. (sheet 4 of 7)
(Item Numbers Correspond to Numbers on Figure 17-8.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
34	77	Overboard Discharge	Plumbing Waste Drain	Frame 356 Port, 27′ 1″ off CL*	4 1/2″ dia	
35		Bilge Keel		Frame 346-212 Port		
36	68	Plug, Skeg Drain		Frame 348 CL	1 1/2″ dia	
37	33	Seawater Suction	Firemain and Seawater Service	Frame 330-328 Port 6′ 4″ off CL	24 1/2″ dia	
38	32	Overboard Discharge	Seawater Service Ship Service Air Compressor #2	Frame 331 Port, 27′ 0″ off CL	2 1/2″ dia	
39	14	Overboard Discharge	Lube Oil Cooler	Frame 326 Port, 27′ 4″ off CL*	3″ dia	
40	30	Overboard Discharge	Bilge Pump Main Engine Room #2	Frame 326 Port, 25′ 9″ off CL	4″ dia	
41	31	Overboard Discharge	Seawater Service Masker Air Cooler #2	Frame 325 Port, 27′ 2″ off CL	3″ dia	
42	26	Seawater Suction	Gas Turbine Cooling	Frame 305-304 Port, 5′ 9″ off CL	8 3/4″ dia	
43		Masker Belt		Frame 300-296 Port		
44	59	Overboard Discharge	Eductor, Machinery Room #2	Frame 294 Port, 26′ 6″ off CL	10″ dia	
45	69	Overboard Discharge	Plumbing Waste Drain	Frame 289 Port, 27′ 6″ off CL*	2 1/2″ dia	
46	71	Overboard Discharge	Plumbing Waste Drain Commissary	Frame 281 Port, 27′ 6″ off CL*	4″ dia	
47	48	Impressed Current Cathodic Protection (ICCP) Anode (4 Foot Anode)		Frame 283-271 Port, 26′ 5″ off CL	12′ x 8′ area	
48	45	Overboard Discharge	Waste Drain Tank	Frame 274 Port, 25′ 1″ off CL	4″ dia	
49	54	Overboard Discharge	Recirculation/Ventilation Pump #1	Frame 259 Port, 26′ 9″ off CL	2 1/2″ dia	
50		Masker Belt		Frame 258-254 Port		
51	23	Overboard Discharge	Seawater Service Chilled Water Air Conditioning Plant #2	Frame 253 Port, 26′ 5″ off CL	5″ dia	
52	64	Overboard Discharge	Commissary Space Waste Drain	Frame 246 Port, 25′ 11″ off CL*	4″ dia	
53	18	Overboard Discharge	Distiller #1 and #2	Frame 241 Port, 5′ 4″ off CL	3″ dia	
54	19	Overboard Discharge	Seawater Service Refrigeration Condenser #1 and #2	Frame 237 Port, 26′ 1″ off CL	3 1/2″ dia	
55	41	Overboard Discharge	Classified Waste Drain	Frame 225 Port, 24′ 11″ off CL	2 1/2″ dia	
56	17	Overboard Discharge	Seawater Service Chilled Water Air Conditioning Plant #1	Frame 224 Port, 24′ 4″ off CL	6″ dia	
57	65	Overboard Discharge	Eductor Auxiliary Machinery Room #1	Frame 222-221 Port, 22′ 6″ of CL	10″ dia	
58	80	Overboard Discharge	Waste Drain Tank	Frame 221 Port, 25′ 4″ off CL*	4″ dia	

Name of Ship
Inspection Activity
Inspection Location
Inspection Date
Type of Inspection (Level 1 or Level 2)

Table 17-8.2. Checklist of Major Hull Components. (sheet 5 of 7)
(Item Numbers Correspond to Numbers on Figure 17-8.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
59		Masker Belt		Frame 218-214 Port		
60	79	Overboard Discharge	Seawater Service Lube Oil Cooler #1	Frame 217 Port, 22′ 4″ off CL	8″ dia	
61	8	Seawater Suction	Main Engine Room #1 Fireroom	Frame 193-192 Port, 3′ 8″ off CL	16 1/4″ dia	
62	9	Overboard Discharge	Seawater Service Prairie Air Heat Exchange	Frame 193 Port, 21′ 8″ off CL	3″ dia	
63	6	Overboard Discharge	Recirculating and Ventilation Pump #2	Frame 177 Port, 19′ 9″ off CL	2″ dia	
64		Masker Belt		Frame 172-168 Port		
65	3	Overboard Discharge	Eductor E2, Pump Room #1	Frame 154 Port, 12′ 8″ off CL	3″ dia	
66	4	Overboard Discharge	Sewage Treatment Plant #1	Frame 151 Port, 16′ 2″ off CL	4″ dia	
67	16	Overboard Discharge	Waste Water Drain Tank	Frame 149 Port, 15′ 10″ off CL	3 1/2″ dia	
68	46	Rodmeter	Underwater Log	Frame 141 Port, 10′ 6″ off CL	8″ dia	
Note: This completes the port side for reporting FR and PDR value. Frames 412 to 136.						
69		Bow Paint and Fouling		Frame 136-Bow		
70		Bow General Hull Plate		Frame 136-Bow		
70.a		Bow Docking Block Area FR and PDR		Frame 136-Bow		
71	50	Impressed Current Cathodic Protection (ICCP) Anode (4 Foot Anode)		Frame 89-77 Port, 8′ 6″ off CL	8′ x 12′ area	
72	47	Overboard Discharge	Sonar Seawater/Freshwater Heat Exchanger	Frame 71 Port, 7′ 10″ off CL	3″ dia	
73	1	Overboard Discharge	Eductor Sonar Equipment Room	Frame 36 Port, 2′ 7″ off CL	4″ dia	
74		Bow-mounted Sonar Dome		Frame 56-4 CL		
75	51	Impressed Current Cathodic Protection (ICCP) Anode (4 Foot Anode)		Frame 119-107 Stbd, 11′ 8″ off CL	8′ x 12′ area	
Note: This completes the bow area for reporting FR and PDR value. Frames 136 and Forward.						
76		Stbd Side Paint and Fouling		Frame 136-412 Stbd		
77		Stbd Side General Hull Plate		Frame 136-412 Stbd		
77.a		Stbd Docking Block Area (Include Keel Block Areas) FR and PDR		Frame 136-412 Stbd		
78	2	Seawater Suction	Firepump #1, Pump Room #1	Frame 142 Stbd, 3′ 8″ off CL	16 1/4″ dia	
79	5	Overboard Discharge	Recirculation and Ventilation of Pump #1	Frame 149 Stbd, 16′ 3″ off CL	2″ dia	

Name of Ship ____
Inspection Activity ____
Inspection Location ____
Inspection Date ____
Type of Inspection (Level 1 or Level 2) ____

Table 17-8.2. Checklist of Major Hull Components. (sheet 6 of 7)
(Item Numbers Correspond to Numbers on Figure 17-8.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
80	58	Transducer (UQN 1)		Frame 151 Stbd, 3′ 8″ off CL	11″ dia	
81	56	Transducer (AUTEC)		Frame 153 Stbd, 3′ 4″ off CL	16″ dia	
82		Masker Belt		Frame 172-168 Stbd		
83	7	Overboard Discharge	Seawater Circulating Masker Air #1	Frame 183 Stbd, 20′ 10″ off CL	3″ dia	
84	10	Overboard Discharge	Gas Turbine Cooling	Frame 195 Stbd, 5′ 10″ off CL	8 3/4″ dia	
85	15	Overboard Discharge	Seawater Cooling Ship Service Air Compressor	Frame 202 Stbd, 22′ 4″ off CL	2 1/2″ dia	
86	11	Overboard Discharge	Bilge Pump Main Engine Room #1	Frame 205 Stbd, 20′ 10″ off CL	6″ dia	
87	78	Overboard Discharge	Seawater Service Pump #1 Generator	Frame 206 Stbd, 23′ 11″ off CL*	3″ dia	
88	55	Overboard Discharge	Condensate Drain (Capped Off)	Frame 211 Stbd, 23′ 7″ off CL	2″ dia	
89	13	Overboard Discharge	Eductor E6, Main Engine Room #1	Frame 213 Stbd, 21′ 10″ off CL	10″ dia	
90		Masker Belt		Frame 218-214 Stbd		
91		Bilge Keel		Frame 346-212 Stbd		
92	20	Overboard Discharge	Cooling Water High Pressure Air Compressor	Frame 235 Stbd, 25′ 8″ off CL	3″ dia	
93	81	Overboard Discharge	Battery Room Waste Drain Tank	Frame 240 Stbd, 25′ 11″ off CL*	2 1/2″ dia	
94	66	Overboard Discharge	Plumbing Waste Drain	Frame 248 Stbd, 26′ 11″ off CL*	4″ dia	
95	22	Seawater Suction	Firemain Distiller Plant	Frame 250-248 Stbd, 6′ 2″ off CL	24 1/2″ dia	
96	52	Overboard Discharge	Hertz Converter	Frame 251 Stbd, 26′ 5″ off CL	1 1/2″ dia	
97		Masker Belt		Frame 258-254 Stbd		
98	73	Overboard Discharge	Garbage Grinder	Frame 270 Stbd, 27′ 5″ off CL*	3″ dia	
99	70	Overboard Discharge	Plumbing Waste Drain Combined	Frame 280 Stbd, 27′ 6″ off CL*	3″ dia	
100	49	Impressed Current Cathodic Protection (ICCP) Anode (4 Foot Anode)		Frame 283-271 Stbd, 26′ 5″ off CL	12′ x 8′ area	
101	24	Seawater Suction	Firemain and Seawater Service	Frame 283-281 Stbd, 6′ 2″ off CL	24 1/2″ dia	
102	72	Overboard Discharge	Plumbing Waste Drain Commissary	Frame 287 Stbd, 27′ 6″ off CL *	4″ dia	
103	53	Overboard Discharge	Firemain Pump #4, Recirculation/Ventilation	Frame 291 Stbd, 27′ 5″ off CL	3″ dia	
104		Masker Belt		Frame 300-296 Stbd		
105	27	Overboard Discharge	Eductor E7, Main Engine Room #2	Frame 301-300 Stbd, 25′ 7″ off CL	10″ dia	

Name of Ship ____________________
Inspection Activity ____________________
Inspection Location ____________________
Inspection Date ____________________
Type of Inspection (Level 1 or Level 2) ____________________

Table 17-8.2. Checklist of Major Hull Components. (sheet 7 of 7)
(Item Numbers Correspond to Numbers on Figure 17-8.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
106	67	Overboard Discharge	Waste Drain	Frame 301 Stbd, 27′ 6″ off CL*	2 1/2″ dia	
107	25	Overboard Discharge	Seawater Lube Oil Cooler #2	Frame 303 Stbd, 27′ 4″ off CL	6″ dia	
108	12	Overboard Discharge	Plumbing Waste and Hangar Drains	Frame 335 Stbd, 27′ 4″ off CL*	4″ dia	
109	35	Overboard Discharge	Pump Ventilation and Recirculation	Frame 345 Stbd, 26′ 3″ off CL	2 1/2″ dia	
110	34	Overboard Discharge	Eductor E2, Shaft Alley	Frame 346 Stbd, 10′ 2″ off CL	3″ dia	
111	36	Sea Chest	Gas Turbine Cooling	Frame 352 Stbd, 5′ 8″ off CL	8 3/4″ dia	
112	37	Overboard Discharge	Sewage Plant #2	Frame 356 Stbd, 25′ 9″ off CL	4″ dia	
113	38	Overboard Discharge	Firemain Pump #6, Recirculation, Vent	Frame 357 Stbd, 25′ 7″ off CL	2 1/2″ dia	
114	21	Overboard Discharge	Seawater Duplex Strainer	Frame 360 Stbd, 25′ 8″ off CL	2″ dia	
115	39	Seawater Suction	Firemain Sewage Plant #2	Frame 365-364 Stbd, 5′ 8″ off CL	16 1/4″ dia	
116	61	Reference Electrode	Reference Cell	Frame 388-379 Stbd, 21′ 9″ off CL		
117		Plug, Skeg Fill		Frame 411 Stbd	1 1/2″ dia	
Note: This completes the starboard side for reporting FR and PDR value. Frames 136 to 412.						

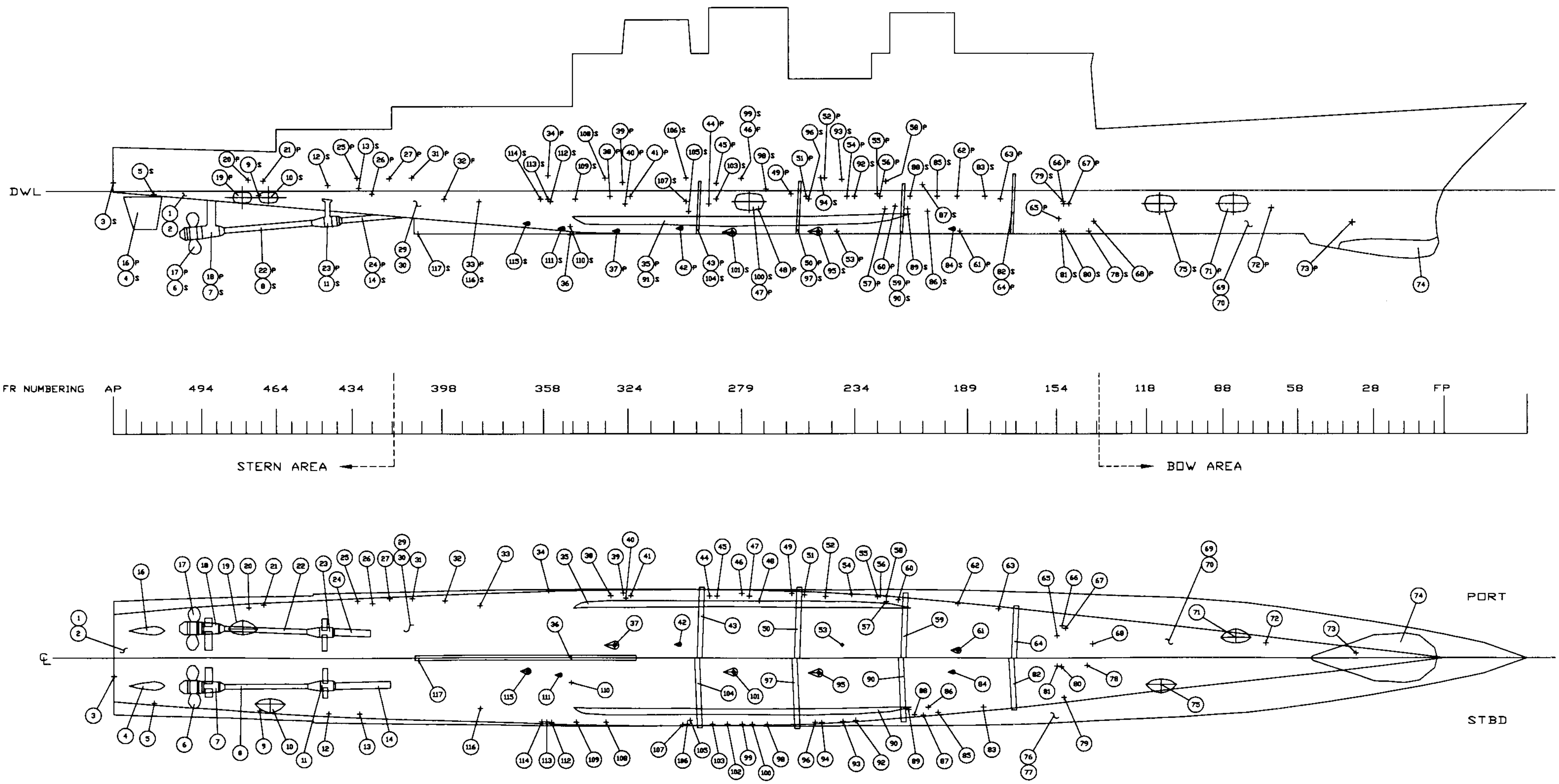


Figure 17-8.1 DD 963 Class Plan and Profile.

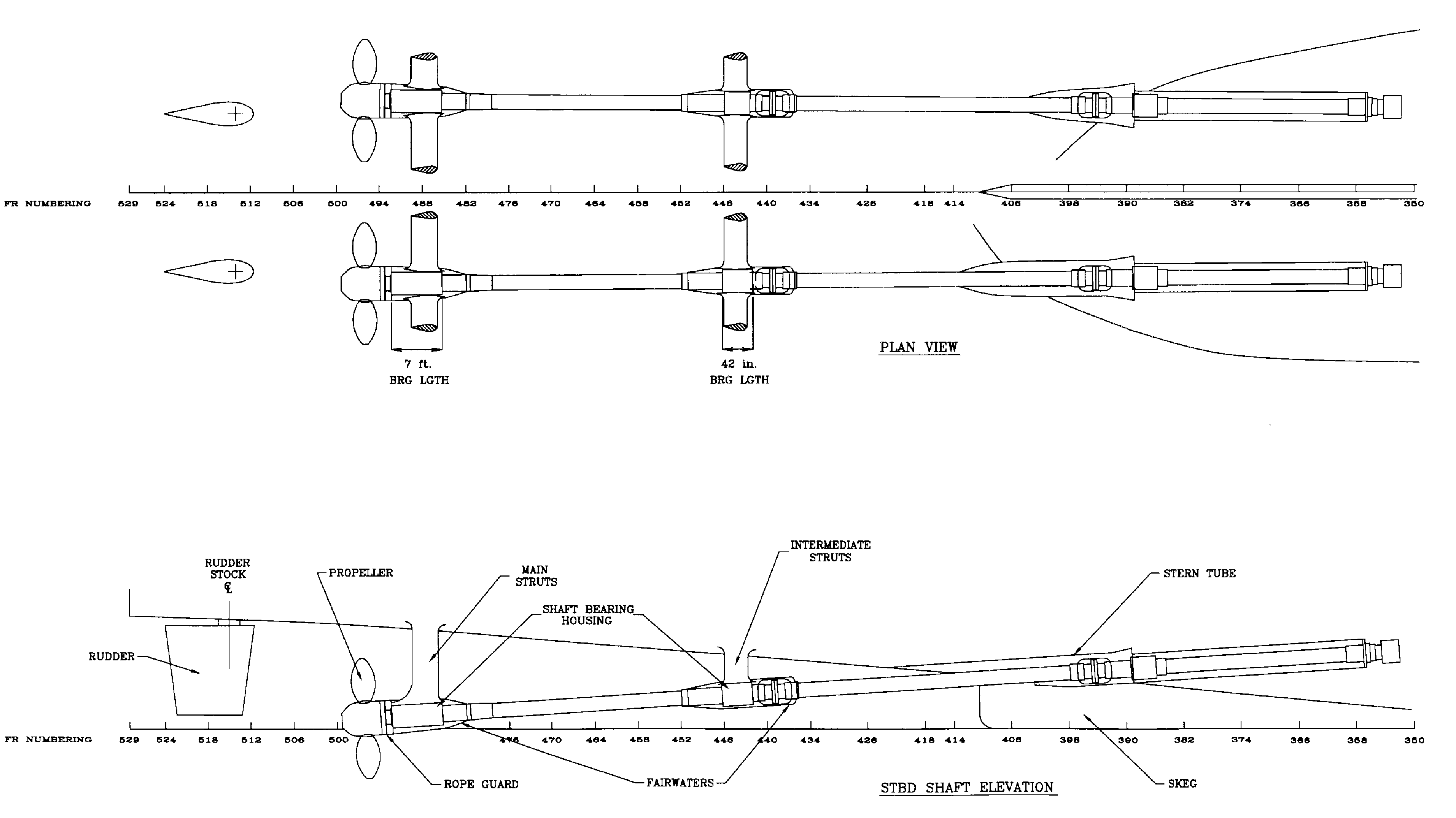


Figure 17-8.2 DD 963 Class Running Gear.

17-8.4 LEVEL 2 INSPECTION PROCEDURES.

17-8.4.1 Introduction.

17-8.4.1. This section contains Level 2 inspection procedures for the DD 963 Class Destroyer. The procedures are presented in the order in which the diver would find the components when making a stern-to-stem swim. The Dive Supervisor can refer back to Table 17-8.2 to pinpoint the exact location of a particular component.

17-8.4.1.1 The purpose of a Level 2 inspection is to conduct a detailed inspection of the malfunctioning or damaged component. The diver must gather sufficient information for further evaluation. For this reason, the diver must make precise measurements and record the exact coordinates of any discrepancies that require further repair. The drawings in this chapter can be photocopied and marked to show the location and extent of damage. The diver can also refer to the appropriate forms for recording damage on certain types of systems. Underwater color video and/or photography should also be used to further depict the damage described on the report and on the forms.

17-8.4.2 Hull Coating And Hull Plate.

17-8.4.2.1 The purpose of a Level 2 hull coating and hull plate inspection is to accurately assess the extent of known or suspected damage resulting from collision, grounding, or other mishap. The inspection requires a detailed description (with measurements) of the exact location and extent of all damage.

17-8.4.2.2 Damage Description Requirements.

17-8.4.2.2.1 Report all areas, size, and location of paint damage, areas of exposed metal, and condition of surrounding paint. Use definable reference points such as suctions, discharges, bilge keel, flat bottom, turn of the bilge, etc.

17-8.4.2.2.2 Hull plate damage must be detailed in terms of the amount of distortion, orientation, and size, length, and maximum width of cracks or gouges; proximity and orientation of closest weld seams; torn or missing plate; and condition of exposed stiffeners and framing.

17-8.4.2.2.3 Damage at or near the keel must include a detailed inspection of the keel. Locate and measure any cracks or distortion.

17-8.4.2.2.4 Example of Report. “10-foot by 35-foot damaged area running fore and aft, 15 feet outboard port of the keel beginning 38 feet aft of the rodmeter. Damage begins with an area of scraped paint, approximately 10 feet long, and continues to a maximum plate distortion of four inches by six feet wide by 20 feet long, 50 percent bare metal, no visible hull plate cracks, no suctions or discharges are located in the damaged area.”

17-8.4.2.3 Inspection Procedure.

17-8.4.2.3.1 Gross Damage Assessment.

a. Conduct a quick inspection of the damaged area and immediate surrounding area.

   (1) Inspect the condition of the hull paint and locate the closest hull appendages and openings.

   (2) If only paint damage has occurred, report the size and location; if distorted, gouged, or cracked metal is found, continue with the detailed inspection.

   (3) Measure extent of pitting: percent, diameter, and depth.

17-8.4.2.3.2 Detailed Damage Inspection.

a. Thoroughly inspect all damaged areas: length, width, and orientation of all cracks, area of distorted or missing hull plate, maximum depression of plate, presence of torn or bulging plate.

b. If hull plate is torn or missing, report condition of all exposed framing.

NOTE

Damage at or near the keel is a serious casualty. Exact details of the condition are required to determine the seaworthiness of the hull.

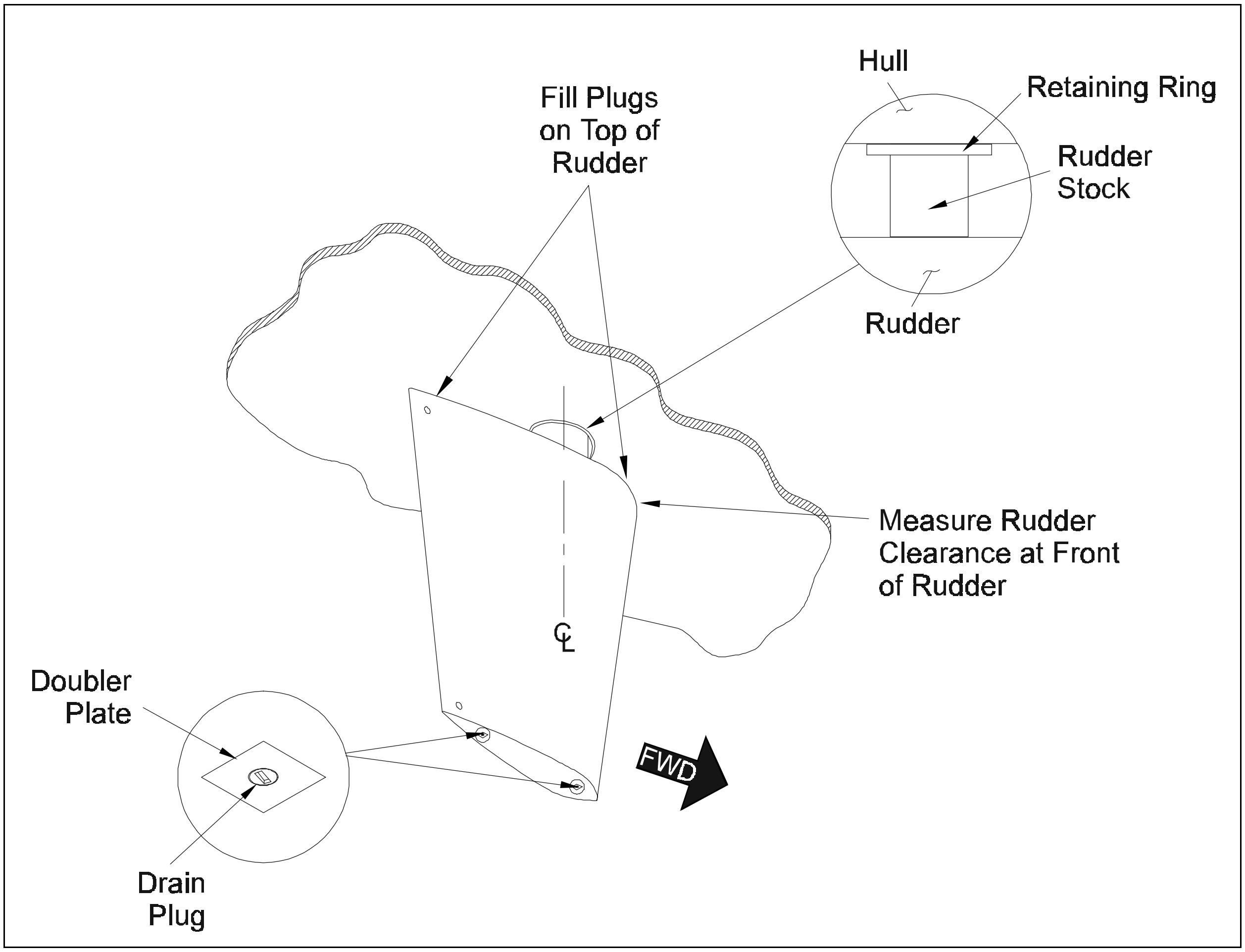


Figure 17-8.3. Spade Rudder without Stool.

17-8.4.3 Rudder.

17-8.4.3.1 Damage Description Requirements.

17-8.4.3.1.1 Inspection of rudders requires a detailed description (with measurements) of the exact location and size of all corrosion, damage, and flaws. As a minimum, the description must include:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference point (top/bottom/side/leading edge).

b. Length, maximum width, and orientation of all cracks; give closest weld seam information, include the direction of the crack with respect to the weld (perpendicular or parallel) and the proximity of the crack to the weld (center of weld, base metal). If cracks are found in or near any clad welding, describe the location with respect to the cladding (center, edge, parallel to weld bead, etc.).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage.

e. PDR and FR.

17-8.4.3.1.2 Example of Report. “Pitting on leading edge of port rudder, inboard side, starting 30 inches from forward bottom, 6-inch by 8-inch area. Maximum pit depth: 1/8-inch depth by 1/4-inch diameter. Average pit depth: 1/8-inch depth by 1/4-inch diameter.”

17-8.4.3.2 Inspection Procedure. See Figure 17-8.3.

a. Inspect the rudder stock area.

(1) Inspect rudder and around the rudder stock for fouled wire, rope, or other foreign material.

b. Measure the rudder clearance.

(1) With the rudder amidships take the clearance measurement between the top of the rudder (at the forward most point of the rudder) and the hull. Design clearance varies by ship. For hull number DD 963, the clearance is 2 inches. For hull numbers DD 964 -DD 967, design clearance is 2 1/2-inches. For hull numbers DD 968 and above, design clearance is 3 1/2-inches.

c. Inspect the rudder surface.

(1) Verify that the two fill plugs on top of the rudder are present and secure.

(2) Determine the overall FR of the rudder. If the FR is 40 or greater, inspect for clean areas which indicate areas of recent damage from grounding or contact with submerged objects. If any such areas are found, thoroughly inspect for cracks, dents, or gouges.

(3) Conduct a detailed inspection of the rudder surface for any cracked welds, marks, gouges, or scrapes. Inspect for areas of bleeding rust and bare metal.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(4) Verify that the two drain plugs on bottom of the rudder are present and secure.

(5) Report the FR and the PDR.

d. Sound the rudder.

(1) Using a rubber or rawhide mallet, rap on the rudder surface to determine if the rudder has flooded. Begin sounding near the uppermost part of the rudder and continue downward to the lowest point.

NOTE

Internal framing and stiffeners will change the sound. It is necessary to sound the rudder in different locations. A hollow sound indicates the rudder is not flooded, while a dull sound indicates flooding.

(2) If the rudder is found to contain water, conduct a detailed inspection to locate the source of flooding. Inspect all plugs for tightness and inspect weld seams for cracks. Make the appropriate report and arrangements for follow-on dewatering and repair.

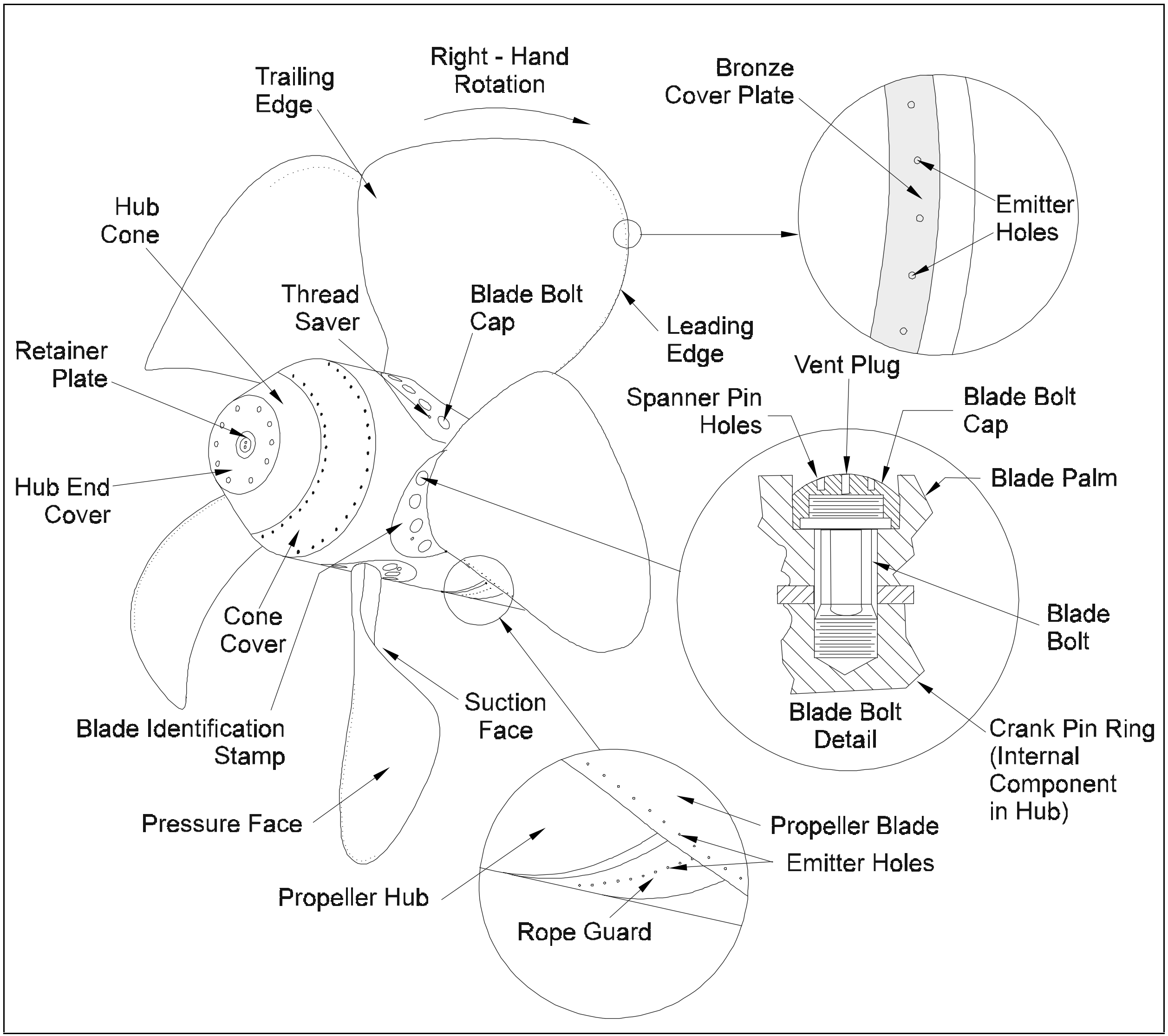


Figure 17-8.4. Controllable Pitch Propeller with Prairie Air System.

7-8.4.4 Propeller (5-Bladed).

17-8.4.4.1 Damage Description Requirements.

17-8.4.4.1.1 The inspection of a propeller requires a detailed description (with measurements) of the exact location and size of any damage, flaws, cracks, porosity, curls, bends, or cavitation erosion. Cavitation erosion results from the rapid formation and collapse of water vapor bubbles on the propeller surfaces while underway. This damage results in a porous, sponge-like, pitted metal surface. Heavy localized concentrations of eroded areas should be interpreted as cavitation erosion.

17-8.4.4.1.2 Propellers are subject to two kinds of cavitation erosion: one caused by propeller damage and the other by design or operating conditions. Therefore, if cavitation damage is found, inspect for the cause. The irregularity ahead of the eroded area can be a nick, gouge, or other damage in the leading edge or a leading edge radius that has been improperly cleaned or finished, leaving flat spots or other unfairness.

17-8.4.4.1.3 Do not confuse cavitation erosion with porosity. Porosity is common and is a manufacturing defect. Porosity will likely be coupled with fouling. Cavitation is uncommon and is often characterized by a trace of worn away metal (area is clean) in the direction of water flow. Porosity is often sharp-edged, whereas cavitation erosion (unless severe) is not.

17-8.4.4.1.4 Damage location descriptions must include reference to obvious points and must use standard nomenclature. Following is a list of common propeller terms:

a. *Blade number*. Although the port propeller rotates clockwise and the starboard propeller rotates counterclockwise, the blades of both propellers on this class ship are numbered in the clockwise direction (when viewed from astern) using letters “A” through “E”. These letters are stamped on the flat surface blade hub flange near the flange edge outboard (12 o’clock position) of the blade bolts.

b. *Blade palm*. The round portion of the propeller blade that bolts to the hub (also referred to as the blade flange).

c. *Blade bolt cap*. A protective cover installed over the blade bolt.

d. *Pressure face*. The portion of the blade that faces aft.

e. *Suction face*. The portion of the blade that faces forward.

f. *Leading edge*. The heavy, thick, more rounded portion of blade closest to the forward end of the hub.

g. *Trailing edge*. The thinner, sharper portion of blade closest to the aft end of the hub.

h. *Fillets*. The area at the base of each blade where the pressure and suction faces are blended into the flange contour (the intersection between the flange and the blade).

i. *Blade tip*. The outermost edge of the blade.

j. *Emitter holes*. Holes drilled into a channel near the leading edge that distribute the prairie masker air.

k. *Hub cone*. A fairing bolted to the aft end of the hub which provides a smooth hydrodynamic flow.

l. *Hub cone cover plate*. Fairing plates that are installed over the bolts used in the attachment of the hub cone to the hub.

m. *Hub end cover*. Aft end of the hub cone cover assembly used to distribute the prairie air past the check valve through the hub cone cover and hub and then out to the blades.

n. *Retainer plate*. This plate is threaded into the hub end cover and retains the prairie air adapter plug.

o. *Prairie air adapter plug*. This plug is threaded into the retainer plate and provides access to the check valve.

17-8.4.4.1.5 It is important that the diver accurately report the size and extent of any damage. The report must reflect an accurate measurement of the area for cavitation erosion, porosity, curls, bends, scrapes, cracks, nicks, gouges, and the maximum width and length of any cracks.

17-8.4.4.1.6 Example of Report. “Blade D, trailing edge, 2 feet from blade palm, 1/8-inch deep by 1-inch long nick. Evidence of cavitation erosion on the suction face, starting 4 inches in from the nick. Erosion damage covers a 2-inch by 4-inch area.”

17-8.4.4.1.7 NAVSEA Form 4730/6 (NSN 0116-LF-047-3035) Propeller Inspection Data should be used to record results.

17-8.4.4.2 Inspection Procedure.

17-8.4.4.2.1 Gross Damage Assessment.

a. Conduct a quick inspection of all surfaces.

   (1) Make note of the overall FR and look for areas of obvious damage (bends, cracks, curls, gouges, and nicks) that indicate the propeller may require changing.

   (2) For moderately or heavily fouled propellers (FR 40 or greater) look for clean areas that indicate recent damage (contact with an object or grounding, or areas of cavitation erosion). If evidence of cavitation erosion is discovered, carefully inspect the area ahead of the erosion for any irregularities (nicks, flat spots, etc., in the leading edge).

b. Inspect the propeller hub for fouled wire, rope, or other foreign material. Fiber such as fish netting or manila line may be removed without difficulty. If removal of the material will be excessively time consuming, make the appropriate report and arrangements for follow-on removal.

c. Conduct a detailed inspection of any obvious major damage and thoroughly document the type, size, and location of the damaged area.

17-8.4.4.2.2 Detailed Damage Inspection.

NOTE

If the FR of the propeller is 40 or greater, the propeller must be cleaned prior to conducting the detailed inspection unless the decision is made that, due to obvious damage, the propeller blades require replacement.

a. Inspect the entire surface of the propeller hub. Inspect for cable marks, scratches, cracks, curls, gouges, porosity, and cavitation erosion. Particular attention must be given to any cracks to determine whether it is one crack, or cracks that run completely around the hub. Record the exact location, size, and orientation of any such cracks.

b. Inspect the blades.

NOTE

Report the exact location and extent of damage as it is found. A running log of the inspection must be maintained by the log keeper to ensure accuracy.

   (1) Inspect the overall physical appearance and FR of each blade, pressure and suction faces, starting with blade “A.”

   (2) Inspect the tip and leading and trailing edges of each blade for nicks, curls, chips, dents, flat spots, cracks, or other apparent damage. Cracks may be found in the edges and tips without any evidence of impact in the area. They can be caused by local vibration, stress corrosion cracking, or residual stresses in the blades.

NOTE

Pay particular attention to areas of the blade where repairs have been made (areas of discoloration caused by welding). Thoroughly inspect these areas for the presence of cracks.

(3) Verify that two 1 1/4-inch thread savers installed in the lifting bolt holes (180° on each side of each blade) are in place on the blade palm.

(4) Verify that the blade bolt caps (four on each side of each blade) are secure and in place.

(5) Inspect the hub for debris, cavitation damage, and leaking hydraulic oil.

(6) Inspect the cone cover plates for damage, loose or missing plates, and loose or missing fasteners. Each cone cover plate is secured with twenty 1/2-inch cap screws.

(7) Inspect the hub cone for damage and leaking hydraulic oil.

(8) Inspect the hub cone end cover plate for loose or missing fasteners and leaking hydraulic oil. There are 10 1-inch cap screws.

(9) Inspect the retainer plate for loose or missing fasteners and leaking hydraulic oil. There is one 5/16-inch socket set screw.

(10) Inspect the prairie air adapter plug for loose or missing fasteners and leaking hydraulic oil. There are two 1/2-inch socket screws and one 3/8-inch socket set screw.

(11) Inspect the suction (forward) and pressure (aft) face of each blade for defects caused by cavitation. Cavitation damage can be identified by an area of small pocked holes or a rough-textured surface.

(12) Inspect the prairie air channel cover plate on the blade pressure (aft) face for damage or cracked welds. The cover plate is 1 1/2 inches wide and is located 3/8 of an inch from the leading edge, starting at the hub. Inspect both the pressure (aft) and suction (forward) face emitter holes for fouling. The prairie air propeller blades have 270 3/64-inch diameter emitter holes; 120 on the suction (forward) and 150 on the pressure (aft) sides. On the suction side, they are spaced 1 inch apart, starting 4 inches from the hub on the leading edge to 5 inches past the vertical blade centerline, 3/4 inch from the leading edge. On the pressure side, they are variably spaced, starting 4 inches from the hub on the leading edge to 5 inches past the vertical blade centerline, 3/4-inch from the leading edge. The first 31 holes are spaced 1/2-inch apart. The next 88 holes are spaced 1 inch apart and the remaining 31 holes are 1/2-inch apart. To function properly, these emitter holes must be free of fouling.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively fouled, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Record the overall FR of the propeller.

d. If any discrepancies are found, make the appropriate report and arrangements for follow-on cleaning and/or repair.

17-8.4.4.2.3 Detailed Inspection of the Propeller Prairie Air System.

NOTE

Before proceeding with the next step, verify that there is sufficient depth between the tip of the lowermost blade and the bottom. A minimum of 5 feet is required to prevent mud or silt from being sucked into the air emitter holes.

NOTE

Performance of the following procedure requires that the dive station have, as a minimum, sound powered communications with Ship's Force personnel.

NOTE

When the diver reports "ready," the Dive Supervisor will have Ship's Force apply low pressure air so that a thorough inspection of the prairie air system can be conducted.

WARNING

Rotating the propeller while divers are in the vicinity may cause serious injury or death. Ensure that the propeller is rotated only at the direction of the Dive Supervisor.

NOTE

Insufficient flow of air to the lower blades may require jacking the shaft over to reposition each blade for the inspection. If air flow is too great to observe individual holes, Ship's Force can decrease the flow.

a. Gross damage assessment.

(1) Begin the inspection procedure by conducting a quick inspection of the system for air leakage other than from the air emitter holes. Check the propeller hub end cover, blade palms, and the air channel weld seams.

(2) Note the general dispersion of air so that areas that appear below normal can be concentrated on during the detailed inspection of each blade. Use a wood block, bronze or Lexan scraper, or a "greenie" to remove light fouling in areas where the holes appear to be fouled.

b. Detailed inspection of the air emitter holes.

(1) Beginning with blade "A," start at the hub of the propeller and conduct the inspection toward the tip.

(a) Inspect to determine that the first five emitter holes are clear of fouling.

(b) Working toward the blade tip, inspect in 10-hole segments. Report the number of holes fouled per 10-hole segment. NAVSEA S9245-AR-TSM-010/PROP, *Technical Manual for Marine Propeller Inspection, Repair and Certification,* stipulates that no more than two holes in any series of 10 may be fouled, and that no two adjacent holes may be fouled.

(c) At the blade tip, inspect to determine that the last five holes are clear of fouling.

NOTE

The maximum allowable number of fouled holes for each blade is 16.

(2) Repeat the inspection process for the remaining propeller blades.

(3) Secure the air flow to the emitter system.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on cleaning and/or repair.

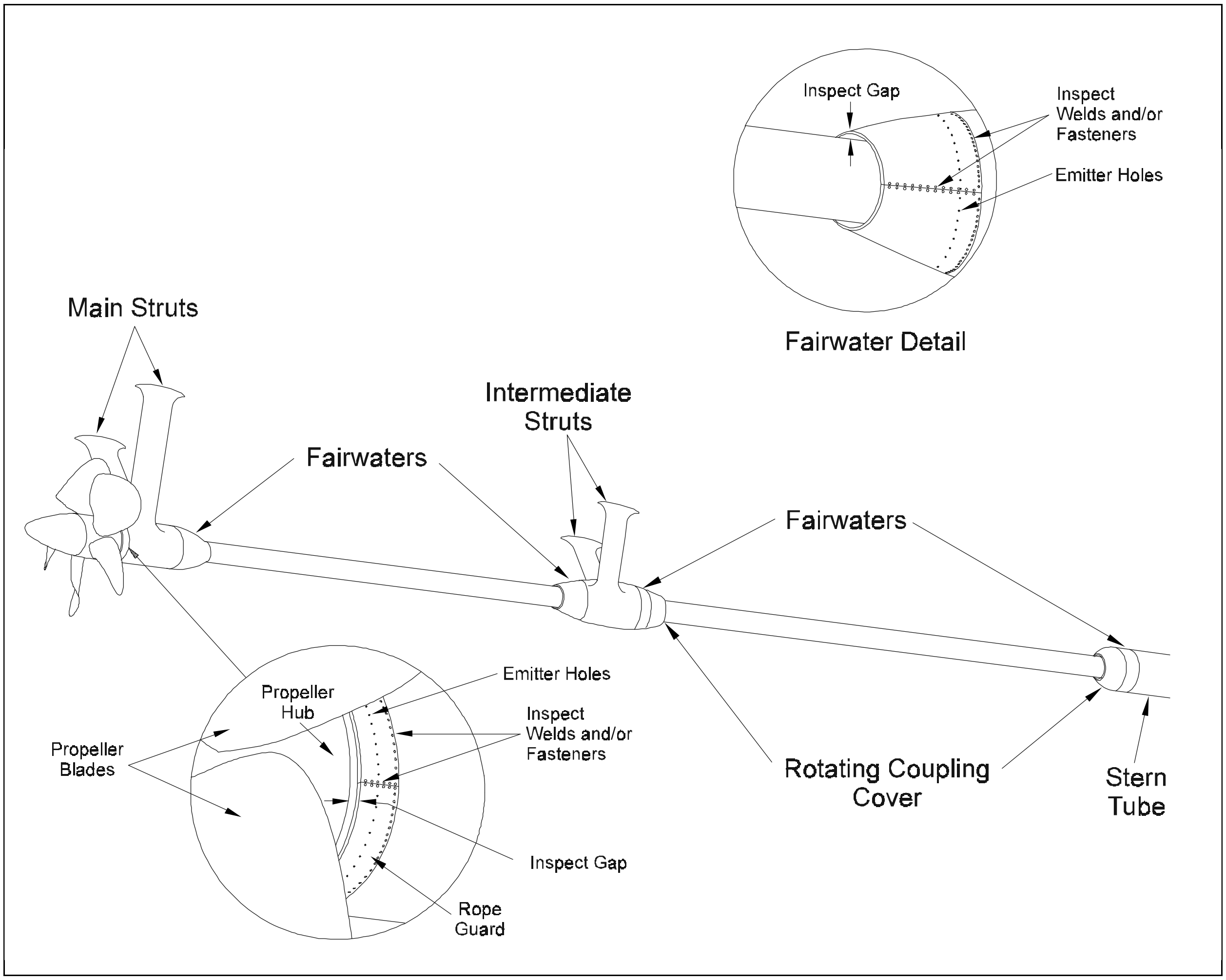


Figure 17-8.5. Main Strut, Intermediate Strut, Shaft, Stern Tube, Rope Guard and Fairwaters.

17-8.4.5 Main Propulsion Assembly (Main Strut, Intermediate Strut, Shaft, Stern Tube, Rope Guard, and Fairwaters).

17-8.4.5.1 Damage Description Requirements.

17-8.4.5.1.1 General condition or damage assessment of the main strut, shaft, stern tube, rope guard, and stern tube requires a detailed description (with measurements) of the exact location and size of any damage or flaws. The description must include:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information: the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage.

e. Exact location and size of all coating damage, tears, or delaminations on the shaft.

17-8.4.5.1.2 Example of Report. "Port shaft, 6 feet 9 inches forward of the strut fairwater, longitudinal gouge in fiberglass coating 2 inches wide by 1 foot long, bare metal showing; subsurface delamination 6 inches by 6 inches, centered on a rust stain, located by sounding."

17-8.4.5.2 Inspection Procedure.

a. Main strut assembly (struts, bearing housing, rope guard, and fairwater)

(1) Inspect the main strut columns (inboard/outboard) and bearing housing for corrosion, damage, and the presence of wire or other foreign material.

(a) At best, the surface of the struts will be very rough due to previous damage or repairs.

(b) Inspect for loose or mixing epoxy.

(2) At the strut/hull interface, inspect the strut columns, doubler plates and immediate area hull plate for cracked welds, corrosion, and damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of the damage.

(a) Verify the presence of the four evenly spaced 1 inch plugs on the top, and the four evenly spaced 1 inch plugs on the bottom of the bearing housing; ensure that they are flush and staked at a minimum of two places.

(3) Verify that the rope guard is present.

NOTE

A missing rope guard is a serious casualty.

(a) This ship class has steel rope guards with prairie air which are welded on. Inspect for any apparent damage and for the presence of fouled wire, rope, or other foreign material.

(b) Use a diver's light or diver-held video equipment light to inspect the area between the propeller hub and the strut bearing housing.

(c) Inspect the rope guards for cracked welds.

(d) Verify that there is a uniform gap all around between the propeller hub and the rope guard by taking measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is 1 inch.

(e) Verify the presence of the prairie air clean out plug on the lower rope guard half Ensure that it is flush and secure.

(4) Verify that the fairwater is present.

NOTE

A missing fairwater is considered a serious casualty.

(a) This ship class has steel fairwaters with prairie air which are welded on. Inspect for any apparent damage and for the presence of fouled wire, rope, or other foreign material.

(b) Inspect the fairwater for cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(c) Verify the presence of the prairie air clean out plug on the lower rope guard half Ensure that it is flush and secure.

(d) Verify that there is a uniform gap between the fairwater and the shaft by taking clearance measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is 1 1/2 inch.

(e) Inspect and report the FR and the PDR of the main strut columns, immediate hull plate area, bearing housing, rope guard, and fairwater.

(5) If discrepancies are found, measure the exact location and size, then make the appropriate report and arrangements for follow-on repair.

(6) Inspect and report the FR and the PDR of the main strut columns, immediate hull plate area, bearing housing, rope guard, and fairwater.

(7) Inspect the rope guard and and main strut fairwater prairie air system.

NOTE

Performance of the following procedure requires that the dive station have as a minimum, sound powered communications with Ship's Force personnel.

NOTE

When the diver reports "ready," Dive Supervisor will have Ship's Force apply low pressure air so that a thorough inspection of the prairie air system can be conducted.

(a) Begin the inspection procedure by conducting a quick inspection of the system for air leakage other than from the air emitter holes.

NOTE

If air flow is too great to observe individual holes, Ship's Force can decrease the flow.

(b) Note the general dispersion of air so that areas that appear below normal can be concentrated on during the detailed inspection. Use a wood block, bronze or lexan scrapper, or a "greenie" to remove light fouling in areas where the holes appear to be fouled.

(c) Beginning with the upper half of the rope guard, inspect to determine the emitter holes are clear of fouling.

(d) Repeat the inspection process for the air emitter holes on the lower half of the rope guard.

(e) Repeat the inspection process for each fairwater half.

NOTE

The maximum allowable number of fouled holes for each rope guard or fairwater half is 5 percent of the total number of holes.

(f) Secure the air flow to the emitter system.

(g) If any discrepancies are found, make the appropriate report and arrangements for follow-on cleaning and/or repair.

b. Shaft.

NOTE

Pay particular attention to the detection of damage or breaks in the covering in the area of shaft nearest the fairwaters and rotating coupling. Propeller shafts are covered with a hard metal sleeve at all bearing areas. The shaft coating at the sleeve ends are the most vulnerable areas of the waterborne shafting. Therefore, give special attention to the detection of breaks in the covering or leakage in the joint (rust stains) in these critical areas.

(1) Inspect the full length of all accessible glass-reinforced plastic (fiberglass) covering for evidence of deterioration, loss of adhesion, or any apparent physical damage.

(2) Inspect for loss of covering, cuts, tears, surface delaminations, and other damage.

(3) Inspect for rust stains indicating where corrosion has leaked through the covering near a cut, pinhole, area of porosity, patch, joint, or other flaw.

(4) Inspect for internal separation of the fiberglass covering from the metal shaft. Use a rubber or rawhide mallet to sound the covering at approximately 18-inch intervals along the length of the shaft.

(a) Rap the shaft in the 3, 6, 9, and 12 o'clock positions while holding the palm of one hand against the covering on the opposite side of the shaft. Continue sounding the shaft around and along its entire length.

NOTE

Discernible vibration, movement of the covering, or an audible, hollow sound is evidence of probable loose bond and must be explored or further examined. To determine the full extent of the damaged area, reduce the distance for sounding the shaft from 18 inches to 4 inches. The important criterion is to isolate and fully determine the extent of the damaged or delaminated area.

(5) If discrepancies are found, measure the exact location and size, then make the appropriate report

and arrangements for follow-on repair.

c. Intermediate strut assembly.

(1) Inspect the intermediate strut columns and bearing housing for corrosion, damage, and the presence of wire or other foreign material.

(2) At the strut/hull interface, inspect the strut columns, doubler plates and immediate area hull plate for cracked welds, corrosion, and damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(a) Verify the presence of the three-evenly spaced 1/2 inch plugs on the top and three evenly-spaced 1/2 inch plugs on the bottom of the bearing housing; ensure that they are flush and staked at a minimum of two places.

(3) Verify that the fairwaters are present.

NOTE

A missing fairwater is considered a serious casualty.

(a) This class ship has Steel fairwaters forward and aft of the intermediate strut which are welded on. Inspect for any apparent damage and for the presence of fouled wire, rope, or other foreign material.

(b) Inspect the fairwater for cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(c) Verify that there is a uniform gap all around between the fairwater and the shaft by taking clearance measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is 1 1/2 inch.

(d) Inspect and report the FR and the PDR of the main strut columns, immediate hull plate area, bearing housing, rope guard, and fairwater.

(4) Inspect the intermediate strut forward fairwater prairie air system.

NOTE

Only hull numbers 963 through 982 have intermediate strut forward prairie air.

NOTE

Performance of the following procedure requires that the dive station have as a minimum, sound powered communications with Ship’s Force personnel.

NOTE

When the diver reports “ready” Dive Supervisor will have Ship’s Force apply low pressure air so that a thorough inspection of the prairie air system can be conducted.

(a) Begin the inspection procedure by conducting a quick inspection of the system for air leakage other than from the air emitter holes.

NOTE

If air flow is too great to observe individual holes, Ship's Force can decrease the flow.

(b) Note the general dispersion of air so that areas that appear below normal can be concentrated on during the detailed inspection. Use a wood block, bronze or lexan scraper, or a "greenie" to remove light fouling in areas where the holes appear to be fouled.

(c) Beginning with the upper half of the fairwater, inspect to determine the emitter holes are clear of fouling.

(d) Repeat the inspection process for the air emitter holes on the lower half of the fairwater.

NOTE

The maximum allowable number of fouled holes for each fairwater half is five percent of the total number of holes.

(e) Secure the air flow to the emitter system.

(f) If any discrepancies are found, make the appropriate report and arrangements for follow on cleaning and/or repair.

d. Stern tube and fairwater

(1) Verify that the stern tube fairwater is present.

NOTE

A missing fairwater is considered a serious casualty.

(a) Inspect for any apparent damage and for the presence of fouled wire, rope, or other foreign material.

(b) Verify that the gap between the fairwater and the shaft is uniform all around by taking clearance measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is not less than 1/4 inch.

(2) Inspect and report the FR and the PDR of the stern tube, immediate hull plate area, and fairwater.

(3) If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

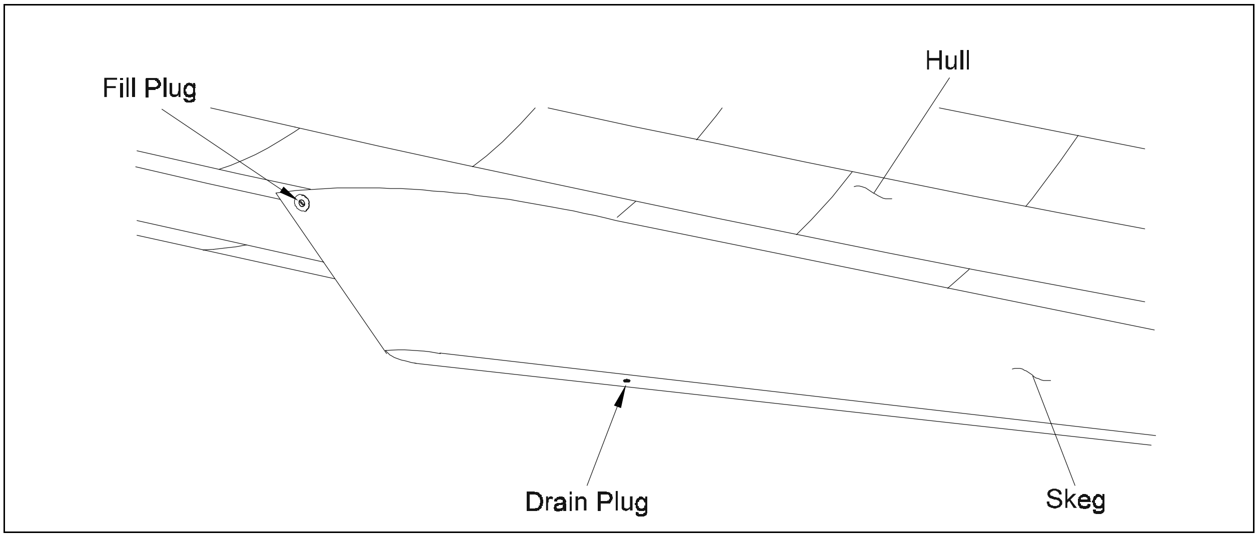


Figure 17-8.6. Skeg with Fill and Drain Plugs.

17-8.4.6 Skeg.

17-8.4.6.1 Damage Description Requirements.

17-8.4.6.1.1. Include the exact location and size of all damage or flaws. Description must include as a minimum:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information: the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage. For example: “Weld crack 1 foot long by 1/2 inch wide, port side, 18 feet forward of after end along the skeg/hull interface.”

17-8.4.6.2 Inspection Procedure.

a. Verify the presence of the fill plug (frame 411, starboard side, 6 inches forward of the upper trailing edge) and ensure that it has not backed out.

b. Verify the presence of the two drain plugs (centerline at the bottom of the skeg, frame 354,) and ensure that it has not backed out.

c. Inspect the entire length of the skeg for dents, cracks, curled edges, or other apparent damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

d. Inspect and report the FR and the PDR.

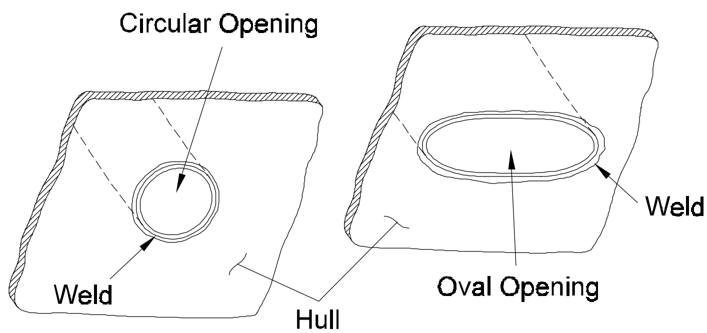


Figure 17-8-7. Seawater Discharge Openings.

17-8.4.7 Overboard Discharge.

17-8.4.7.1 Inspection Procedure.

a. Inspect for foreign material or corrosion damage.

b. Inspect and report the FR and the PDR.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

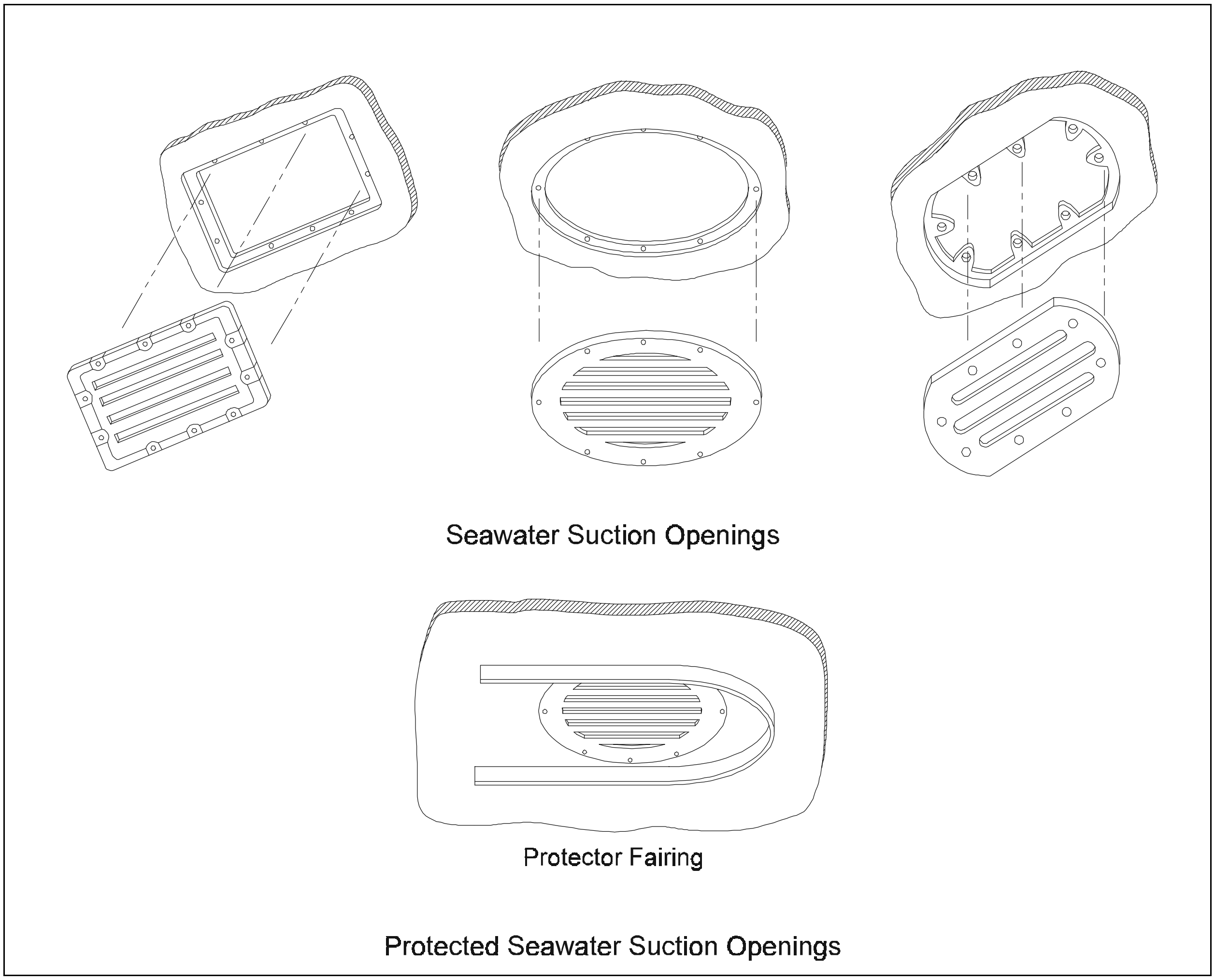


Figure 17-8-8. Seawater Suctions.

17-8.4.8 Sea Chest and Seawater Suction.

17-8.4.8.1 Inspection Procedure.

a. Clean and inspect screens or grates for clogged holes and loose or missing fasteners.

b. Inspect strainer bars for corrosion damage, broken or missing bars, cracked welds, and missing or loose fasteners.

c. Inspect and report the FR and the PDR.

d. If any discrepancies are found, make the appropriate report and follow-on arrangements for repair.

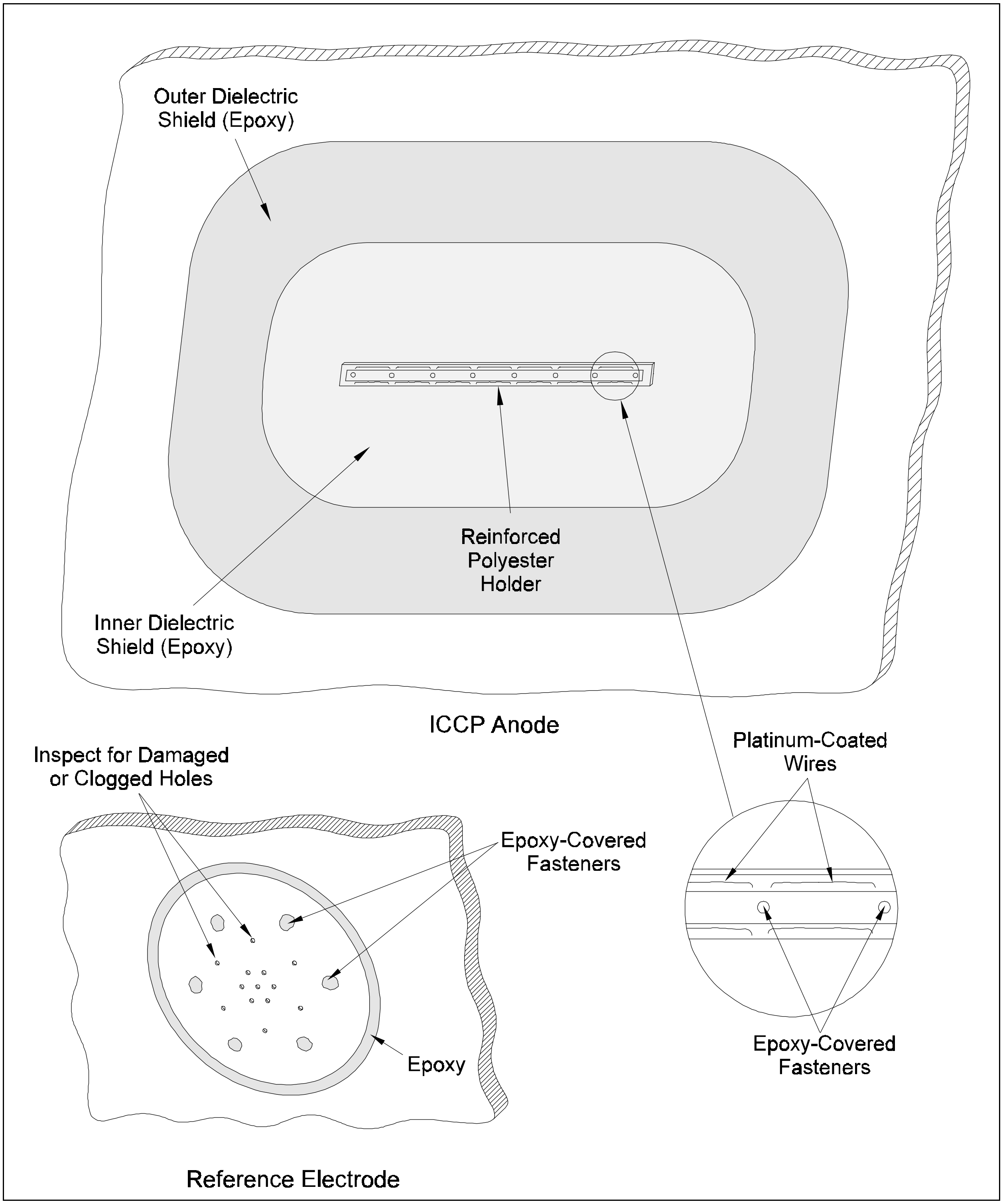


Figure 17-8.9. Impressed Current Cathodic Protection (ICCP) Anode.

17-8.4.9 Impressed Current Cathodic Protection (ICCP) Anode.

17-8.4.9.1 Inspection Procedure.

a. Begin the inspection procedure by conducting a quick inspection of the anode, dielectric shield, and the immediate hull plate area out to a distance of 20 feet. Inspect for obvious damage: large areas of bare metal, cracked, peeling, or blistered epoxy or paint, large areas of calcium buildup.

b. Conduct a detailed inspection of the anode.

(1) Inspect the anode for damage and missing or broken wires and missing or damaged platinum coating on the wires. Count the number of missing or broken wires. Report the position of each broken or missing wire relative to the center of the anode.

(2) Inspect the bond between the dielectric shield and the anode holder. Check that the dielectric shield is evenly faired up to the face of the anode and is not cracked or chipped.

NOTE

The presence of marine fouling indicates a non-functioning anode.

CAUTION

Avoid disturbing the white calcium buildup on the capastic shield that protects areas of bare metal from corrosion.

c. Conduct a detailed inspection of the dielectric shield.

(1) Report the percentage of dielectric shield with calcareous deposits.

(2) Inspect the dielectric shield for chips, cracks, blisters, or missing epoxy.

(3) Report the percentage of deterioration of the dielectric shield.

(4) Inspect the hull coating in the area around the anode for missing or peeling paint or blisters. Inspect for calcareous buildup. Report the FR and the PDR.

17-8.4.10 Impressed Current Cathodic Protection (ICCP) Reference Electrode.

17-8.4.10.1 Inspection Procedure.

a. Inspect for damage, clogged holes, and loose or missing epoxy.

CAUTION

Do not attempt to unclog holes with any pointed objects. Potential damage to internal components may result.

b. Inspect and report the FR.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair

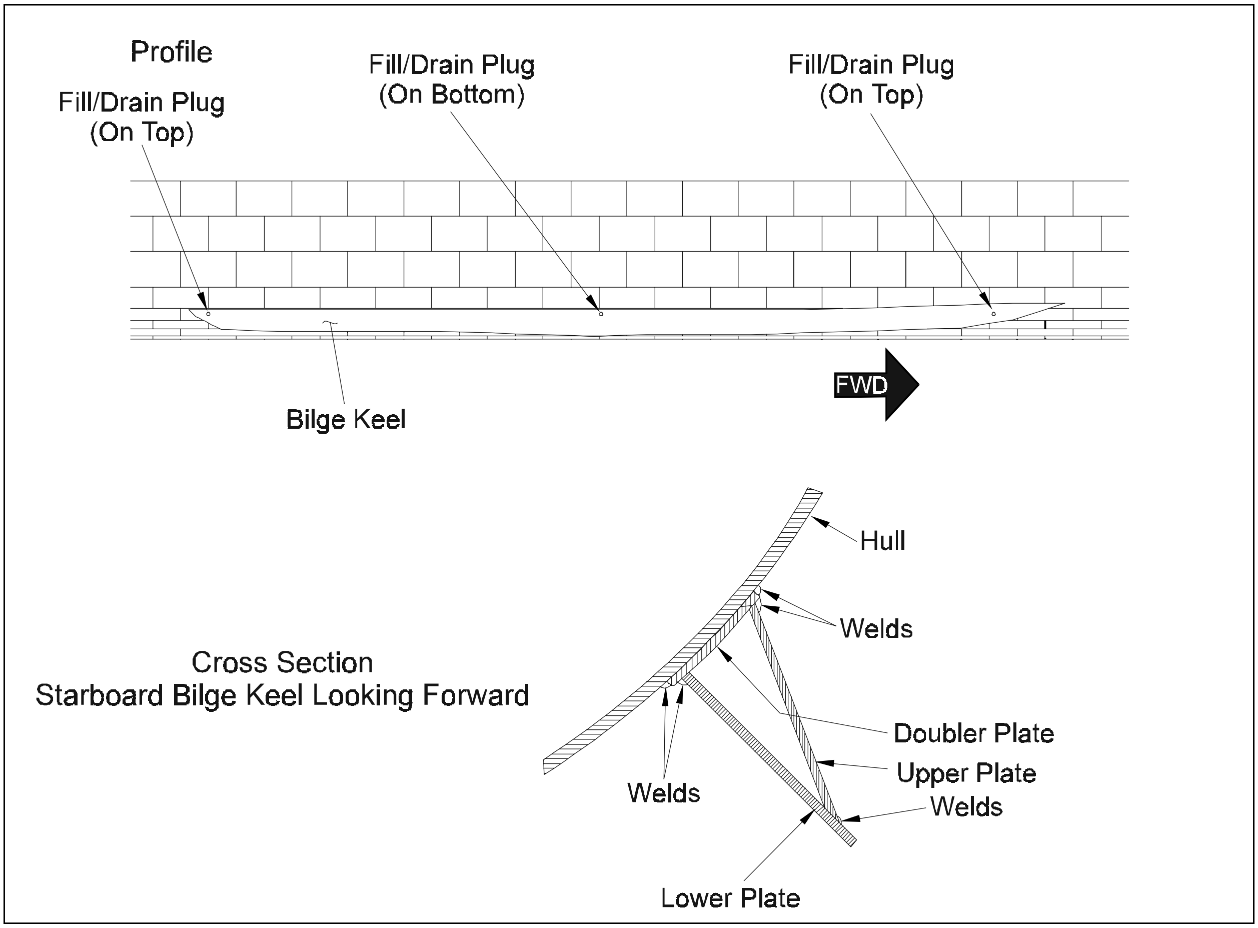


Figure 17-8.10. Bilge Keel.

17-8.4.11 Bilge Keel.

17-8.4.11.1 Damage Description Requirements.

17-8.4.11.1.1. Include exact location of all damage or flaws. Description must include as a minimum:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information; the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage. For example: “Port bilge keel, 1 foot long by 1/2 inch wide crack in weld between upper and lower plates located 18 feet forward of after end.”

17-8.4.11.2 Inspection Procedure.

a. Inspect the bilge keel for dents, cracks, curled edges, missing plate, or other apparent damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

b. Inspect for foreign material and loose or missing plugs. There are three 1-inch NPT fill/drain plugs located on each bilge keel. There are two plugs on the top located at frames 322 and 178, and one on the bottom at frame 248.

c. Measure and record the location of any damage.

d. Inspect and report the FR and the PDR.

e. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

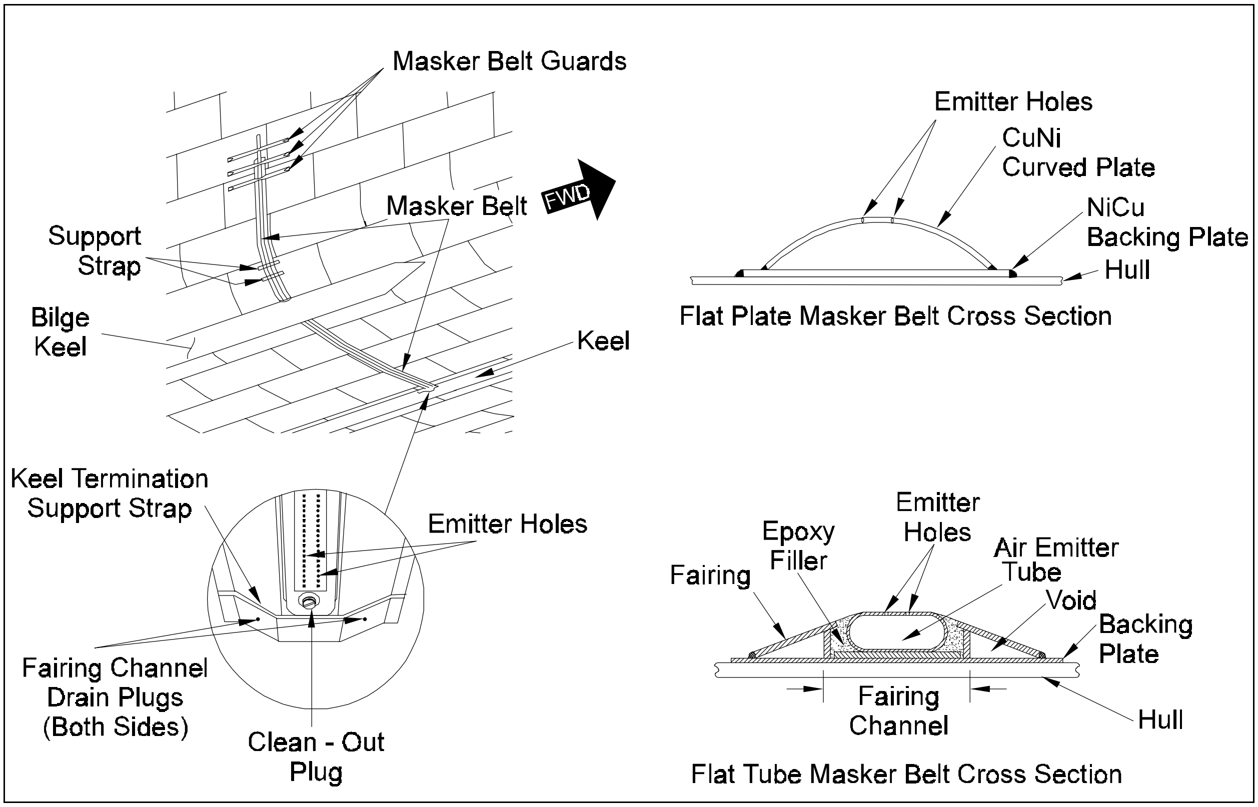


Figure 17-8.11. Masker Emitter Belt.

17-8.4.12 Masker Belt.

17-8.4.12.1 Damage Description Requirements.

NOTE

Emitter hole blockage is difficult to inspect. Checking for blockage when the ship is pier side is not recommended. Procedures for assessing blockage by measuring flow rate while the ship is underway are detailed in the shipboard PMS. Diver cleaning procedures are provided in NAVSEA S0600-AA-PRO-050.

17-8.4.12.1.1 Inspection of masker belt systems requires a detailed description (with measurements) of the exact location and size of any damage or flaws. As a minimum, the description must include:

a. Identity of masker belt emitter system (forward/aft, port/starboard, frame number) and type (flat tube or flat plate).

b. On the fairing plate, the length, maximum width, and orientation of all cracks, including closest weld seam information. Also include the direction of the crack with respect to the weld (perpendicular or parallel) and the proximity of the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or any other damage. Take all measurements from the keel up.

17-8.4.12.1.2 Location must include reference to obvious points and use standard nomenclature. Following is a list of common terms used by the diver to describe the location of damage. The majority of these terms apply to the flat tube configuration.

a. *Fairing channel*. A channel constructed of two flat plates welded at an angle on the backing plate. The fairing channel houses the flattened pipe which is epoxied into it.

b. *Backing plate*. A flat plate welded to the hull to which the fairing plate/channel is welded.

c. *Air emitter tube*. A flattened Cu-Ni pipe within a fairing channel that contains 3/64-inch air emitter holes.

d. *Support strap*. When an emitter belt is replaced or repaired while the ship is waterborne, a Lexan-insulated strap is welded to the fairing channel to provide extra support to the belt.

e. *Keel termination support strap*. A metal strap cradling the end of the masker belt at the keel.

f. *Epoxy filler*. Rigid fairing and support compound which fills the space between the fairing and flattened air emitter tube.

17-8.4.12.1.3 Example of Report "3-inch section of epoxy missing, starting at the keel termination support strap, aft starboard masker emitter system. The next three feet of epoxy is hard and cracking."

17-8.4.12.2 Inspection Procedure.

17-8.4.12.2.1 Gross Damage Assessment.

a. Begin the inspection procedure by conducting a quick inspection of the masker belt and surrounding hull plate area.

b. Make note of the overall FR and the PDR and look for areas of obvious damage (crushed, twisted, or missing sections of masker belt).

17-8.4.12.2.2 Flat Tube Configuration Detailed Damage Inspection.

a. Inspect for crushed, cracked, or missing masker belt.

b. Inspect for displaced masker belt, sprung from the channel.

c. Inspect for loose, missing, or excess epoxy.

d. Starting at the keel, inspect the full length of weld between the backing plate and the fairing plate (the backing plate is the plate welded to the hull) and the weld between the backing plate and the hull for cracks. Inspect both sides.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Inspect the 3/64-inch emitter holes for fouling. Emitter holes are spaced in sections and the spacing varies in density for each section.

f. Inspect for holes in the fairing plate and welds.

g. If installed, inspect the support straps for missing Lexan insulator.

h. Inspect for a loose or missing 1 1/2-inch NPT clean-out plug located 2 1/2 inches from the keel termination support strap.

i. Inspect any previously repaired areas.

j. Inspect and report the FR and, if painted, the PDR.

k. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

17-8.4.12.2.3 Flat Plate Configuration Detailed Damage Inspection.

a. Inspect for crushed, cracked, or missing masker belt.

b. Starting at the keel, inspect the full length of weld between the backing plate and the hull and the weld between the Cu-Ni masker air channel and backing plate.

c. Inspect the 3/64-inch emitter holes for fouling. Emitter holes are spaced in sections and the spacing varies in density for each section.

d. Inspect for a loose or missing 1 1/4-inch NPT clean-out plug located 2 1/2 inches from the keel termination support strap.

e. Inspect and report the FR and, if painted, the PDR.

f. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

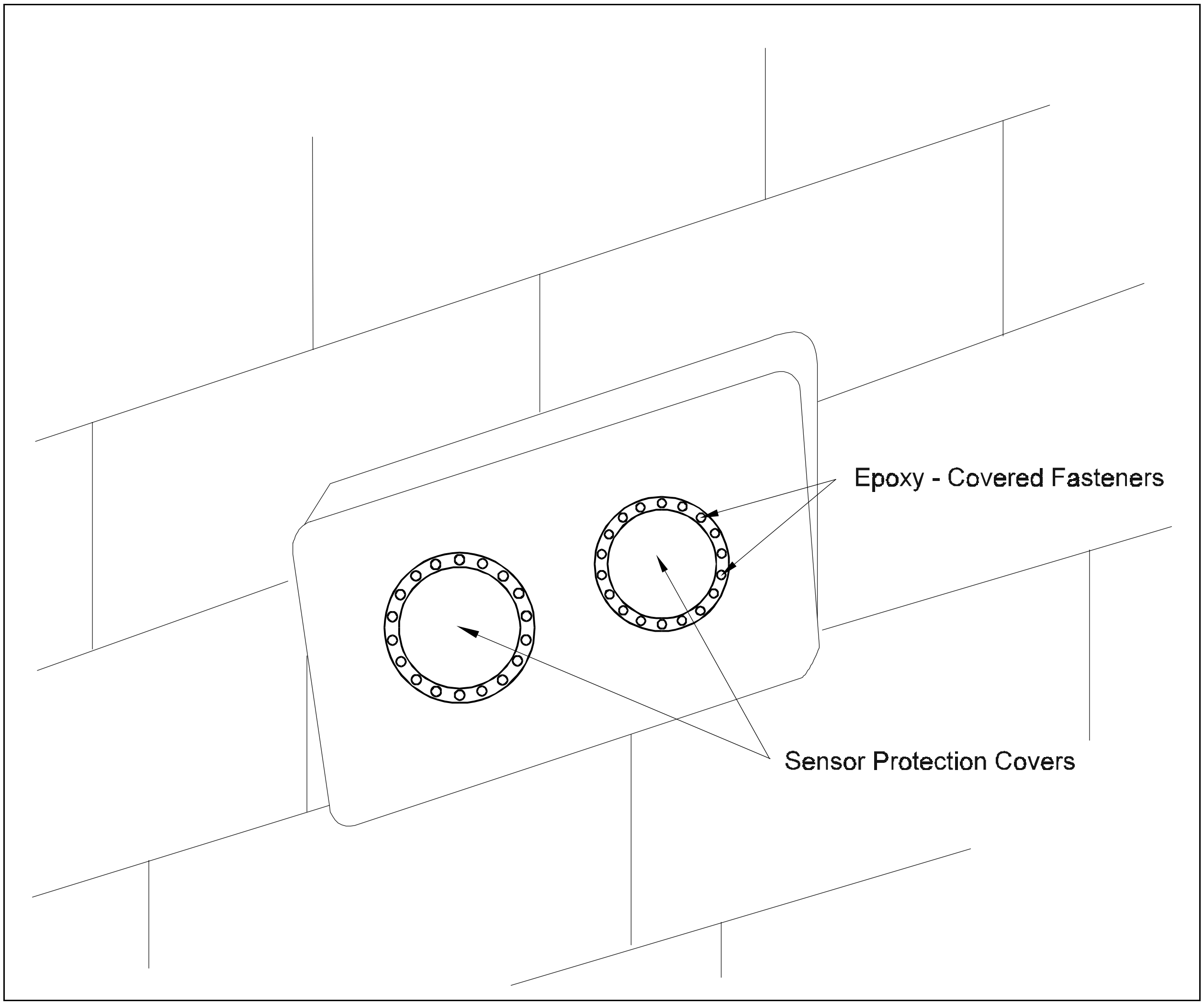


Figure 17-8.13. Transducer.

17-8.4.13 Transducer.

17-8.4.13.1 Damage Description Requirements.

17-8.4.13.1.1 Inspection of transducers requires a detailed description (with measurements) of the exact location and extent of all damage and flaws. As a minimum, the description must include:

a. Length, maximum width, and orientation of all cracks or flaws in the sensor cover.

b. Total area affected, including the diameter and depth of any pitting. Also include both the maximum and average pit size.

c. Area and location of corrosion or any other damage. It is important that the diver accurately report the size and extent of any damage. The report must reflect an accurate measurement of the damage. For example: "1-inch x 2-inch diagonal gouge on sensor cover, maximum depth 1/16-inch located at the 8 o'clock position."

17-8.4.13.2 Inspection Procedure.

a. Begin the inspection procedure by conducting a quick inspection of the transducer and the surrounding hull plate area.

(1) Make note of the FR and the PDR of the immediate hull plate area and look for areas of obvious damage or flaws.

17-8.4.13.2.1 Detailed Damage Inspection.

a. Conduct a detailed inspection of the entire transducer assembly.

(1) Using a "greenie," gently scrub light fouling off the sensor head and inspect the sensor protective covers.

(2) Inspect rubber covers for tears, cracks, scrapes, or gouges.

(3) Inspect for signs of structural failure or damage caused by contact with underwater objects.

(4) Inspect for loose or missing fasteners.

(5) Verify the presence of the 3/4-inch thread savers around the perimeter of the sensor flanges; ensure they are present and have not backed out.

(6) Inspect and report the FR.

b. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

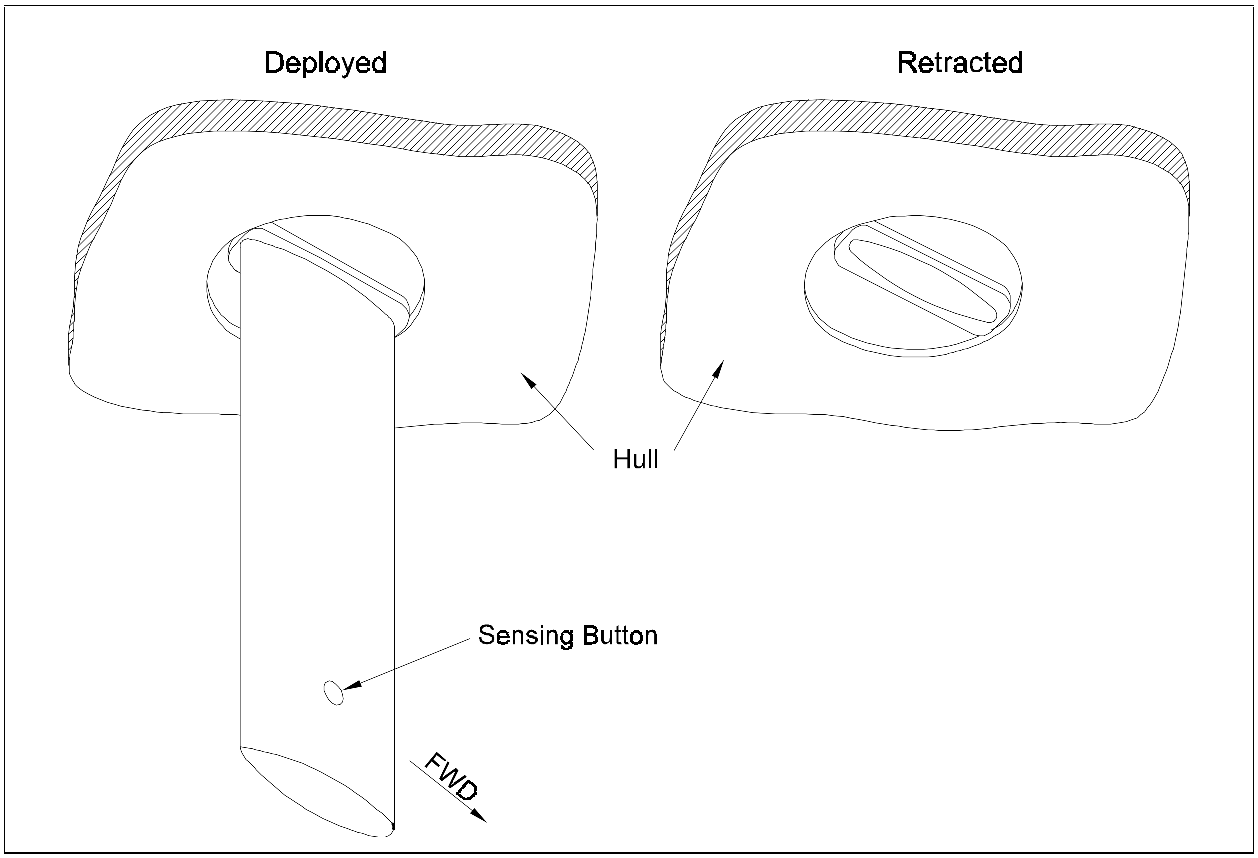


Figure 17-8.14. Rodmeter.

17-8.4.14 Rodmeter.

17-8.4.14.1. Normally, divers will only be called upon to inspect the rodmeter opening. Ship's force personnel perform maintenance and repairs on the rodmeter after retracting it into the hull. However, divers may be called upon to inspect the hull opening if the ship reports damage to the rodmeter (scratches, gouges, etc.) or is unable to either retract or deploy the rodmeter.

17-8.4.14.2 Inspection Procedure.

a. If Ship's Force reports damage to the rodmeter, (scratches, gouges, etc.) or is unable to retract or deploy the rodmeter, inspect the hull opening and verify that it is clear of barnacles, sea growth, or other foreign material.

b. If ship's force is unable to retract the rodmeter, inspect for a bent or broken unit.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

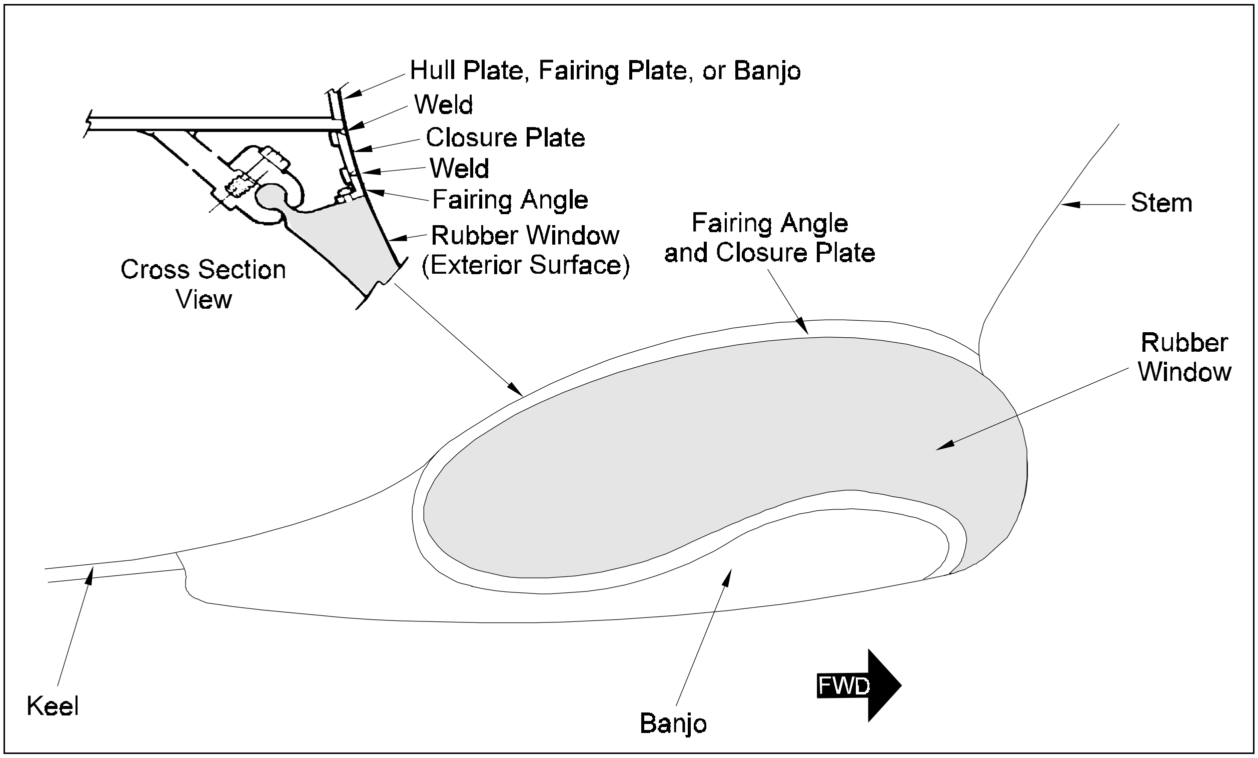


Figure 17-8.15. Bow-mounted Sonar Dome.

17-8.4.15 Bow-mounted Sonar Dome.

17-8.4.15.1 Damage Description Requirements.

17-8.4.15.1.1 Inspection of sonar domes requires a detailed description (with measurements) of the exact location and size of all damage and flaws. For location, use distance measurements from the closest relative bearing grid marks, or if grid marks are not present, use exact measurements, horizontal and vertical, from definable points such as the centerline (i.e., 1 foot 3 inches above the lower marriage line). Measurements will require the use of bear paw magnets and tape measures. The following is a list of standard Sonar Dome Rubber Window terms:

a. *Marriage line*: That area where the hull meets the dome, often referred to as the upper and lower marriage lineg

b. *Banjo*: A section of steel plate that extends forward from the keel. It supports the bottom of the dome.

c. *Stem*: Vertical forward-most part of the ship.

d. *Vertical midpoint*: An imaginary continuation of the stem vertically down the dome.

e. *Horizontal midpoint*: A horizontal line midway between the upper and lower marriage line.

f. *Fairing angle*: Metal band which attaches directly to the dome material and is welded to the closure plate.

g. *Closure plate*: A metal band which covers the bolts which hold the dome in place. It is welded to the shell plating on one edge and the fairing angle on the other.

17-8.4.15.1.2 The description of damage must include:

a. Rubber dome material.

(1) Exact location and size (length, width and depth) of all gouges, tears, delaminations, blisters, flap, or other damage.

(2) Layers of wire plies exposed.

(3) FR.

b. Fairing and closure plates.

(1) Exact location and size of all damage or flaws. As a minimum, the description must include:

(a) Distance and direction (port/starboard/forward/aft) from a known degree marker and/or other reference point.

(b) Length, maximum width, and orientation of all cracks, including closest weld seam information. Also include the direction of the crack with respect to weld seams on the marriage line (perpendicular or parallel) and distance of the crack from the rubber interface with the fairing angle.

(c) Amount of separation between the fairing angle and the rubber dome material, including the overall length and maximum width of the separation.

(d) Total area affected, including the diameter and depth of any pitting. Also include both the maximum and average pit size.

(e) Any damage, bare metal, scratches, or abrasions on the banjo.

(f) Area and location of corrosion or other damage, including the FR and the PDR.

17-8.4.15.1.3 Example of Report. "Torn rubber 2 feet 9 inches above the 15° mark at the lower marriage line. Torn area measures 2 inches in width, 6 inches long. Three plies of rubber peeled back."

17-8.4.15.1.4 NAVSEA Form 4730/4 (NSN 0116-LF-047-3025) Sonar Dome Rubber Window Inspection Data is available to record results.

17-8.4.15.2 Inspection Procedure.

17-8.4.15.2.1 Specific Noise Source Inspection.

WARNING

Divers must exercise care when touching a dome with steel wires exposed.

WARNING

Avoid direct bare skin contact with NOFOUL rubber surfaces. Avoid contact between hands and eyes if hands have been exposed to the NOFOUL rubber material. Wash hands thoroughly before eating or smoking.

NOTE

Dome must be pressurized with air to 15 psig to conduct this inspection.

a. Prior to beginning the inspection, get the latest Sonar Self Noise Test report from the ship's Engineer. This report will show the location of all noise spokes. Use these spokes as the starting point for the inspection. Conduct a detailed inspection of these areas until the source of the noise is located. Possible noise sources to inspect for that will be located at or forward of the noise spoke location are:

(1) Cuts, pits, flaps, and gouges in the outer surface.

(2) Separation in rubber plies as indicated by bulges or soft spots.

(3) Previous repairs which have become faulty.

(4) Exposed or broken structural steel wires.

b. To assist the diver in orienting himself on the dome, starting at the waterline, follow the stem down, surveying the hull plate for damage on both sides (port and starboard) and continue down to the upper marriage line (0° marker). From here, follow the upper marriage line to the relative heading (port or starboard) of the noise spoke. Drop down from that point to begin the detailed inspection.

(1) Attach a bear paw magnet to the hull at the point above the noise source.

(2) Lower a tape measure down from the bear paw to establish a vertical reference for the diver. Drop down from that point to begin the detailed inspection.

(3) Conduct a detailed (visual and hand) inspection of the area of suspected damage.

NOTE

Because of limited visual contrast, the diver's hands (even with gloves) may often sense damage that the eye cannot detect.

(4) If the noise source is not located, move the bear paw forward 18 to 24 inches and repeat the process until the damage is located.

17-8.4.15.2.1 Detailed Damage Inspection.

a. Return to the upper marriage line. Start at 0° to begin the overall damage inspection.

b. Inspect the marriage line (rubber dome and steel interface with the hull). Inspect the entire perimeter of the dome for:

(1) Separation of the rubber dome from the steel in the area of the fairing angles.

(2) Dents or cracks in the fairing angle and closure plate welds, or immediate hull area.

NOTE

Be particularly alert for the presence of cracks. If any cracks are discovered, particular attention must be given to determine if the crack is running parallel to or vertically into the shell plating.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(3) PDR and FR of the fairing angle, closure plate, and immediate hull plate area.

c. Inspect the rubber surface of the dome. To ensure complete coverage of the SDRW surface, begin the inspection at the 0° marker at the upper marriage line. Follow the marriage line to starboard and inspect the general area while swimming aft. After reaching the most aft point of the window, drop down no more than 3 feet (depending on water clarity) and work forward to the dome 0° marker. Follow this sweeping pattern until the complete starboard side has been inspected. Inspect the port side using the same procedure. Inspect the following conditions and report the physical dimensions and relative bearing and vertical location of each:

(1) Cuts, pits, and gouges in the outer surface of the rubber window and the structural area within approximately 4 feet of the rubber window.

(2) Separation in rubber plies, which are indicated as bulges or soft spots.

(3) Previous repairs to the rubber window which have become faulty or have deteriorated.

(4) Exposed structural steel wire of the rubber window.

NOTE

If rubber window steel wires are exposed, contact Naval Sea Systems Command Code SEA 00C5 for an analysis of the repair.

(5) Inspect and report the FR of the dome. The rubber surface of the dome is made of NOFOUL rubber. However, the antifouling properties of the dome may become ineffective as the dome ages or from over-spray of paint while in dry-dock. Fouling degrades the performance of the sonar.

17-8.4.15.2.2 Inspect the banjo area and the structural area surrounding the dome to the water surface.

a. Inspect for dents, cracks, pitting or corrosion in the steel areas of the dome, including the closure plate.

b. Inspect for scrapes, abrasions, bare metal, corrosion, peeling, or absence of protective paint on the steel structural portion of the dome, including the banjo.

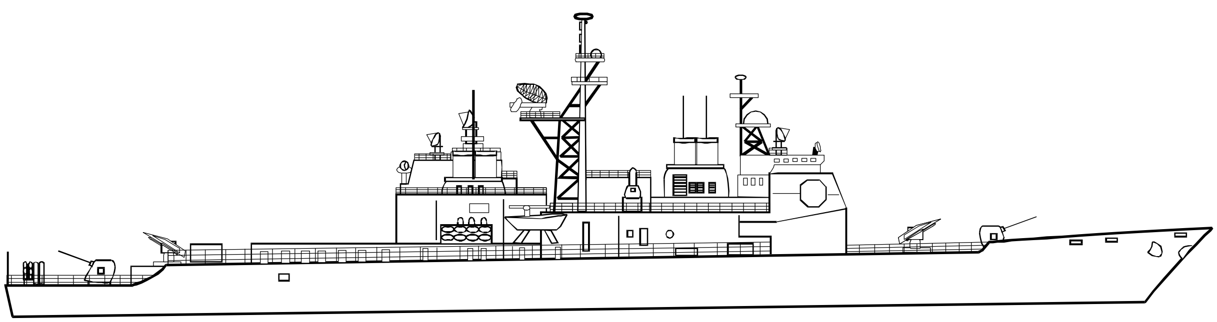
c. Report the PDR and FR.

d. If any discrepancies are noted, make the appropriate report and arrangements for follow-on repair.

UNDERWATER SHIP HUSBANDRY MANUAL

CHAPTER 17
SECTION 9

CG 47 CLASS
UNDERWATER SHIP HUSBANDRY
INSPECTION PROCEDURES



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CHAPTER 17
UNDERWATER SHIP HUSBANDRY INSPECTION PROCEDURES

SECTION 9 CG 47 TICONDEROGA CLASS GUIDED MISSILE CRUISER

17-9.1 INTRODUCTION.

17-9.1.1 This section of the *Underwater Ship Husbandry Manual* contains inspection procedures for the CG 47 Ticonderoga Class Guided Missile Cruisers. It consists of a general introduction to the CG 47 Class, a description of the major hull components found on this ship, a set of Level 1 inspection procedures, and a set of Level 2 inspection procedures.

17-9.1.2 Table 17-9.1 contains a general hull description of the CG 47 Class. Table 17-9.2 (found at the end of the Level 1 inspection procedures) contains a checklist of all ship systems covered by these inspection procedures. Item numbers in this table correspond to the hull system numbers in Figure 17-9.1 and are arranged in order to facilitate a typical diver inspection of all components: stern area, port side, bow, and starboard side. Figure 17-9.1, “CG 47 Class Plan and Profile,” and Figure 17-9.2, “CG 47 Class Running Gear,” are located after Table 17-9.2 and provide points of reference for the procedures described in this section. These figures augment the typical ship drawings and can be used as a quick reference by diving personnel. Figure 17-9.1 is derived from NAVSEA Drawing No. 845-5773853, Rev. F, Docking Plan for the CG 47 Ticonderoga Class Guided Missile Cruiser. Figure 17-9.2 is derived from class arrangement drawings. These figures are also useful in locating the coordinates of components requiring Level 2 inspections. Figures of the individual components appear throughout the Level 2 inspection procedures.

17-9.1.3 Diving activities may photocopy Table 17-9.2 and use it to record data during inspections. Upon completion of the inspection, the results should be transferred to the standard Diver’s Underwater Hull Inspection Data Form, NAVSEA 4730/3 (NSN 0116-LF-047-3020). Figures found in the Level 2 inspection procedures section of this chapter may be photocopied and used to assist in sketching the extent of damage reported during inspections. These sheets should be attached to the Diver’s Underwater Hull Inspection Data Form upon completion of the inspection.

17-9.1.4 CG 47 Class ships were constructed at two different ship yards, thus there may be ships within a class whose individual hull systems may not be identically located. For this reason, it is recommended that the Dive Supervisor also refer to a Docking Plan for the individual ship being inspected.

Table 17-9.1. General Hull Description.

Length Between Perpendiculars:	529 feet
Beam:	55 feet, 1 inch
Max Draft:	23 feet, 1 inch
Frame Spacing:	See Docking Plan Profile
Rudders:	Port and starboard, spade without stool
Propellers:	Twin, 5-bladed, controllable pitch
Masker Air Emitter Belts:	Port, frames 170, 215, 257 and 297 Starboard, frames 169, 214, 256 and 296
Prairie Air:	Propeller and main strut fairwater and rope guard
Sonar Dome:	Bow-mounted
Class Problems:	The main struts on this class have a history of severe corrosion. Most main struts have been repaired with clad welding, epoxy or both.

17-9.2 DESCRIPTION OF MAJOR HULL COMPONENTS.

17-9.2.1 Hull Coating.

17-9.2.1.1 The underwater hull coating system is applied to the hull, shaft, and appendages (i.e., rudder, struts, bearing housing, rope guard, fairwaters, rotating coupling, stern tube and skeg). The coating system is comprised of two types of coatings: an anticorrosion coating and an antifouling coating. The anticorrosion coating is applied on the majority of metal components to provide the primary protection from corrosion and deterioration of the surfaces. The antifouling coating is applied over the anticorrosion coating and is directly applied to nonmetallic components (e.g., the glass-reinforced shaft coating). The antifouling coating is designed to protect the underwater systems from biological fouling.

17-9.2.1.2 Multiple coats of anticorrosive and antifouling coatings are applied to the hull. Each coat is a different color except for the boot top area where all coats are black. Use a diver's light to help accurately identify the color of the exposed coating for both large hull areas and areas of damage. This will allow accurate assessment of the remaining life of the coating system. The hull coating system can easily become damaged from impact with underwater objects or collisions and groundings. Typical damage is minor abrasion to the antifouling coating, exposing the anticorrosion coating and permitting biological fouling. More severe abrasion of the anticorrosion coating exposing bare metal will result in corrosion and deterioration of the metal. As the age of the coating increases, the antifouling coating may become less effective in preventing biological fouling and could easily become damaged if the biological fouling is allowed to reach a destructive level. Even the smallest amount of biological fouling can drastically impact the ship's operational capabilities and could eventually destroy the anticorrosion coating system.

17-9.2.1.3 References.

a. NAVSEA S9086-CQ-STM-010/CH081, "Waterborne Underwater Hull Cleaning of Navy Ships"

b. NAVSEA S9086-VD-STM-010/CH631, "Preservation of Ships in Service"

17-9.2.2 Rudders.

17-9.2.2.1 The rudders are rectangular, hydrodynamically shaped metal blades located aft of the propellers and used to steer the ship. Rudders on large ships are hollow structures that have been flushed with a preservative and then dried. Rudders on this class ship have two 1 1/4-inch drain plugs: one located approximately 38 inches forward of the after trailing edge and the other approximately 21 inches aft of the forward edge on the bottom center. There are also two 1 1/4-inch fill plugs in the top: one located approximately 44 inches from the after edge, the other approximately 25 inches from the forward edge. The rudder is supported and positioned by a rotating rudder stock. The area where the rudder stock enters the hull contains the rudder bearings, seals, and gland ring.

17-9.2.2.2 Ships in this class have two spade rudders with no stool. The spade rudder is of one-piece construction. The entire rudder moves to steer the ship.

17-9.2.2.3 While underway, rudders are subject to severe loading, high flow, and turbulence as well as to possible damage from contact with underwater objects. Previous repairs (such as clad welding or installation of doubler plates) that have been painted may cause a rough-textured surface on the rudder, making inspection for damage difficult. While inspecting the rudder surface, the primary indications of new deterioration or damage is poor or missing paint. Bare metal or corrosion damage may be present. Report any such findings.

17-9.2.2.4 As a result of impact damage, bearing wear, or improper installation, the rudder may drop down from the hull. One of the main aspects of a rudder inspection is the measurement to determine if the rudder has dropped. The ship's Engineering Officer compares the current measurements with previous measurements. A change in the measurements indicates the rudder has dropped.

17-9.2.2.5 Location. Each rudder is located 11 feet off the centerline, port and starboard, beginning at frame 524 and ending at frame 510.

17-9.2.2.6 References.

a. NAVSEA DWG CG 47-562-5386289, Rev. E, Rudder Assembly And Details

17-9.2.3 Propellers (5-Bladed).

17-9.2.3.1 This class of ship is propelled by two 17-foot diameter, 5-bladed, controllable pitch propeller (CPP) systems equipped with prairie air systems. A CPP system allows the ship to go from ahead to astern without changing the direction of shaft rotation. Rigid propeller blades are bolted on to hydraulically operated mounts on the propeller hub. This system positions the blades for the desired thrust, either ahead or astern. The controllable pitch propeller (CPP) system is bolted to the tailshaft flange.

17-9.2.3.2 The prairie air propeller blades have 270 3/64-inch diameter holes: 120 on the suction (forward) and 150 on the pressure (aft) sides. On the suction side, they are evenly spaced 1 inch apart starting 4 inches from the vertical blade center line, and 3/4 inch from the leading edge. On the pressure side, they are variably spaced starting 4 inches from the hub on the leading edge to 5 inches past the vertical blade center line, and 3/4 inch from the leading edge. The first 31 holes are spaced 1/2 inch apart. The next 88 holes are spaced 1 inch apart and the remaining 31 holes are 1/2 inch apart. To function properly, these emitter holes must be free of fouling.

17-9.2.3.3 The port propeller is right-hand and turns clockwise (when viewed from astern). Most ships number the blades in the direction opposite of the direction in which the blades turn. However, the port propeller blades in this class ship are numbered in the same direction. The blades of the port propeller are numbered in the clockwise direction.

17-9.2.3.4 The starboard propeller is left-hand and turns counterclockwise (when viewed from astern). The blades are numbered in the clockwise direction.

17-9.2.3.5 The five controllable pitch blades are lettered “A” through “E.” The CPP hub does not have a lifting eye to assist in identifying blade “A.” The letters are stamped on the flat surface blade hub flange near the flange edge (blade palm), outboard of the blade bolts. Blade identification may be in the form of serial numbers such as “LH17A, LH17B” or “RH8A, RH8B,” etc.

17-9.2.3.6 A blade bolt identification number is stamped adjacent to each blade bolt hole on the top surface of the flange (blade palm) of each blade. Numbering is sequential, with 1 denoting the blade bolt on the suction face nearest the trailing edge and 8 denoting the blade bolt on the pressure face nearest the trailing edge.

17-9.2.3.7 Location. The propellers are located 12 feet 9 inches off centerline at frame 496, port and starboard.

17-9.2.3.8 References.

a. NAVSEA S9086-HP-STM-010/CH245, “Propellers”

b. NAVSEA S9245-AR-TSM-010/PROP, *Technical Manual for Marine Propeller Inspection, Repair and Certification*

c. NAVSEA S0600-AA-PRO-120, *Underwater Ship Husbandry Manual*, Chapter 12, “Controllable Pitch Propellers”

d. Bird-Johnson Co. Drawing 115651005, Rev. B, Propeller Blade CG 47 Class

17-9.2.4 Main Bearing Housing and Struts.

17-9.2.4.1 Immediately forward of the propeller is the propeller or main bearing housing and struts. The main struts consist of two columns extending down from the hull forming a “V” shape that attaches to the main bearing housing and supports the shaft. The struts are subjected to severe dynamic loading while the ship is underway. They are also subject to corrosion, vibration damage, and damage from rope and wire or other foreign material. At the top and bottom of each strut bearing housing are four evenly spaced 1-inch IPS pipe plugs. These holes are used for maintenance during dry-docking. Inspection includes a complete examination of the strut surface, bearing housing, rope guards, and fairwaters.

17-9.2.4.2 Location. The main struts are located immediately forward of the propellers at frame 490, port and starboard.

17-9.2.4.3 References.

a. NAVSEA DWG DDG 47-161-5384512, Rev. E, Strut - Main Casting

17-9.2.5 Rope Guards.

17-9.2.5.1 Rope guards are circular plates fitted between the propeller hub and the ends of the main strut bearing housings. They are streamlined in shape to eliminate abrupt changes in water flow and they serve to protect the rotating shaft from becoming fouled by wire, rope, or other material. The design clearance between the propeller hub and the rope guard is 1 inch. The rope guards on ships of this class are made up of two halves constructed of steel, which are welded to the bearing housing. The rope guards are equipped with 112 3/64-inch diameter prairie air emitter holes. There are 49 on the upper half and 63 on the lower half. There are also two 1-inch 14-UNF prairie air cleanout plugs per each rope guard half. These plugs are flush with the rope guard and secured by means of nylon inserts.

17-9.2.5.2 Location. The rope guards are located immediately forward of the propellers at frame 494.

17-9.2.5.3 References.

a. NAVSEA DWG CG 47-114-5919475, Rev. H, Shaft Fairwaters and Rope Guards

17-9.2.6 Fairwaters.

17-9.2.6.1 Fairwaters are circular plates fitted at the forward and aft ends of the intermediate bearing housings and forward of the main bearing housings. On this class ship the stern tube fairwater is faired and welded to the hull plating. They are shaped to streamline these parts to eliminate abrupt changes in water flow. The design clearance from the shaft is 1 inch. The fairwaters on ships of this class are made up of two halves constructed of steel, which are welded to the bearing housing. The main strut fairwaters are equipped with 112 3/64-inch prairie air emitter holes evenly spaced around the circumference. There are 49 holes on the upper half and 63 on the lower half. There is also one 1-inch 14-UNF prairie air cleanout plug per fairwater half. These plugs are flush with the fairwater and secured by means of nylon inserts.

17-9.2.6.2 Location. The fairwaters are located forward of the main struts and forward and aft of the intermediate struts.

17-9.2.6.3 References.

a. NAVSEA DWG CG 47-114-5919475, Rev. H, Shaft Fairwaters and Rope Guards

17-9.2.7 Shafting.

17-9.2.7.1 The shafting transmits torque from the main engine to the propeller and axial thrust from the propeller to the hull. The section of shaft between the stern tube and intermediate strut is called the intermediate shaft. The section of shaft between the intermediate strut and propeller is called the propeller shaft. The shaft couplings are protected by rotating coupling covers. On this ship class, these rotating coupling covers are not visible to the diver. The propeller shaft is bolted to the intermediate shaft forward of the intermediate strut and is protected by the forward fairwater. A glass-reinforced plastic (fiberglass) coating covers the exposed shafting.

17-9.2.7.2 Location. The shafts extend from the reduction gears to the propellers. They are exposed from frame 482 to 402 on the port shaft and frame 482 to 414 on the starboard shaft.

17-9.2.7.3 References.

a. NAVSEA DWG CG 47-243-5385457, Rev. N, Shafting Arrangement

b. NAVSEA DWG CG 47-243-5385459, Shafting Details Waterborne

17-9.2.8 Intermediate Bearing Housing and Struts.

17-9.2.8.1 The intermediate strut supports the shaft midway between the main strut and the stern tube. These struts are also subject to corrosion, vibration damage, and damage from rope and wire or other foreign material. At the top and bottom of each intermediate strut bearing housing are three evenly spaced, 1-inch IPS pipe plugs. These holes are used for maintenance during dry-docking. Inspection includes a complete examination of the strut surface, bearing housing, and fairwaters.

17-9.2.8.2 The fairwaters attached to the intermediate strut bearings do not have prairie air. They are shaped to streamline these parts to eliminate abrupt changes in water flow. The design clearance from the shaft is 1 inch. The fairwaters are made up of two halves constructed of steel, which are welded to the bearing housing.

17-9.2.8.3 Location. The intermediate struts are located at frame 446.

17-9.2.8.4 References.

a. NAVSEA DWG CG 47-161-5384510, Rev. F, Strut - Intermediate Casting

17-9.2.9 Stern Tube.

17-9.2.9.1 The free-flood area where the shaft penetrates the hull is the stern tube. The stern tube supports the shaft as it enters the hull. It houses one or more shaft bearings. A fairing is installed where the shaft enters the hull. The stern tube and fairwaters are not the same for the port and starboard shafts, because the shafts exit the hull at different locations and angles.

17-9.2.9.2 Location. The port stern tube extends from frame 403 to 389. The starboard stern tube extends from frame 414 to 390.

17-9.2.9.3 References.

a. NAVSEA DWG CG 47-244-5385457, Shafting Arrangement

17-9.2.10 Skeg.

17-9.2.10.1 The skeg is a long narrow vertical fin attached to the keel serving to assist keeping the ship on course. The skeg is flushed with preservative and then drained and dried. It has three 1 inch plugs. The fill plug is located on the starboard side, six inches forward of the upper trailing edge at frame 411. The two drain plugs are located on the bottom of the skeg, six inches port/starboard of centerline, at frame 354.

17-9.2.10.2 Location. The skeg extends forward from frame 411 to 332.

17-9.2.10.3 References.

a. NAVSEA DWG CG 47-114-5919476, Rev. E, Skeg Plating and Framing

17-9.2.11 Overboard Discharge.

17-9.2.11.1 Overboard discharges are round or oval openings used for discharging sea water or other fluids from the ship. Overboard discharges are not usually covered with screens or gratings.

17-9.2.11.2 Location. Overboard discharges are located in various positions along the hull.

17-9.2.11.3 References.

a. NAVSEA DWG CG 47-845-5773853, Docking Drawing

17-9.2.12 Sea Chests and Seawater Suction.

17-9.2.12.1 Seawater suctions are openings for bringing seawater into the ship. Multiple suctions located together at one hull opening are called sea chests. Suctions and sea chests are covered with either mesh screens, grates, or strainer bars to prevent objects or foreign material from entering.

17-9.2.12.2 Location. The seawater suctions and sea chests are located in various positions along the hull.

17-9.2.12.3 References.

a. NAVSEA DWG CG 47-845-5773853, Docking Drawing

b. NAVSEA DWG CG 47-163-5384515, Rev. N, Suction Sea Chests Misc., MDL - ALL

17-9.2.13 Impressed Current Cathodic Protection (ICCP) System.

17-9.2.13.1 The Impressed Current Cathodic Protection (ICCP) system uses ship's power to provide galvanic corrosion protection for the hull and all underwater appendages. The system consists of two major hull-mounted components:

a. Reference Electrode (Reference Cell): The reference electrode is a cell constructed of a silver mesh screen that has been treated with silver chloride. It is mounted in a domed, 9-inch diameter circular polyvinyl chloride holder that electrically isolates the reference electrode from the hull. The reference electrode is secured to a base or sole plate by a pattern of screws. A series of holes in the reference electrode permit passage of seawater at the hull, allowing the controller to detect electromechanical activity at the hull and measure the potential of the hull versus the reference electrode. The holes in the reference electrode must remain open for it to function, and should never be covered by paint or epoxy. A stuffing tube is used to pass a cable from the electrode to the controller. The controller measures the potential of the hull versus the reference electrode and signals a power supply to increase or decrease current output as required to reduce the potential difference between the hull potential and the preset desired potential. Two reference electrodes are installed for each controller. Reference electrodes are located on each side of the hull approximately halfway between anode sites.

b. Anodes: ICCP anodes are constructed of pairs of platinum-coated tantalum rods mounted in an insulating glass-reinforced polyester holder, which is bolted to the outside of the ship's hull. The direct current produced by the power supply is provided to the anode by a conductor through a stuffing tube. The current flows into the seawater through the platinum surface of the tantalum rods. The platinum surface of the anode corrodes very slowly, and the replacement period for anodes, unless physically damaged, is normally greater than 10 years. Two sizes of anodes are used on this class ship: 4 feet (75 amperes) and 8 feet (150 amperes).

17-9.2.13.2 A dielectric shield prevents shorting of the anode current to the hull near the anode and aids in wider current distribution. The dielectric shield is applied as a thick coating around each anode. It consists of a high-solids epoxy with high dielectric strength. It is applied with the hull coating system. The dielectric shield changes thickness as one moves away from the anode. For this class of ship, the 4-foot anode is surrounded by a dielectric shield approximately 100 mils thick out to a 7-foot by 10-foot area (inner shield). An additional dielectric shield (22 mils) extends out to 13 feet by 16 feet (outer shield). Eight-foot anodes are surrounded by a dielectric shield approximately 100 mils thick out to a 7-foot by 14-foot area (inner shield). Additional dielectric shield (22 mils) extends out to 13 feet by 20 feet (outer shield).

17-9.2.13.3 Anodes that have excessive output of protective current for prolonged periods will cause a failure of the hull coating in the immediate area causing blisters, peeling or missing paint, and large areas of bare metal. When the anode is active or energized, small bubbles are generated on the anode wires. The anode and the hull area above it will be free of marine fouling. In addition, if the dielectric shield becomes damaged and the system is working properly, a layer of calcium will be deposited over the exposed bare metal area. This calcium (calcareous deposits) may be mistaken for deteriorated portions of the coating system. Because calcareous deposits form an additional protective barrier to the hull they should not be removed. This condition, however, indicates a damaged coating and should be reported. Biological fouling is not the same as calcareous deposits.

17-9.2.13.4 An anode that has been turned off for prolonged periods will have a heavy layer of marine fouling on the anode strip and possibly the dielectric shield.

17-9.2.13.5 Location. This class ship has six anodes, three per side, located at frames 465, 277, and 83.

17-9.2.13.6 References.

a. NAVSEA S9086-VF-STM-010/CH-633, Chapter 633, “Cathodic Protection”

b. NAVSEA DWG DE 1052-600-4466754, Anode and Reference Electrode for Impressed Current Cathodic Protection System

c. NAVSEA S0600-AA-PRO-190, *Underwater Ship Husbandry Manual*, Chapter 19, “Cathodic Protection Systems”

17-9.2.14 Bilge Keel.

17-9.2.14.1 The bilge keel is a long narrow fin near or at the turn of the bilge in the middle portion of the ship. It resists and decreases the magnitude of rolling of the ship. It extends forward from frame 346 to frame 212. Bilge keels on ships in this class are of the V-shaped section type and are 39 inches wide. The bilge keel is a hollow structure that has been flushed with a preservative and then dried. There are three 1 inch NPT fill/drain plugs on each bilge keel. Two are located on the top at frames 346 and 212, and one is located on the bottom, 48 inches forward of frame 292.

17-9.2.14.2 Locations. The bilge keels extend forward from frame 346 to 212, port and starboard.

17-9.2.14.3 References.

a. NAVSEA DWG DDG 47-114-5384477, Rev. C, Bilge Keel - MDL 2

17-9.2.15 Masker Belt.

17-9.2.15.1 Masker emitter belts are installed at the forward end and the after end of the ship’s machinery spaces. They run vertically down both sides of the external hull from a point above the waterline to a termination point in the vicinity of the keel.

17-9.2.15.2 The masker emitter belt configuration found on this class is the flat plate. The flat plate configuration consists of a flat plate rolled into a half-pipe-shaped air channel, welded to a backing plate. The backing plate is welded to the hull and runs vertically down both sides from a point above the waterline to a termination point at the keel.

17-9.2.15.3 Where bilge keels obstruct masker belt installation, an access is cut in the bilge to allow the masker belt to pass through. They are located at frames 297, 257, and 215. On each access there are six 3/8-inch UNC preservative fill and drain plugs: three on top and three on the bottom.

17-9.2.15.4 Air is supplied via a through-hull penetration to the upper end of the belt. The air is emitted through a series of 3/64-inch diameter holes drilled in a specific pattern along the underwater length of the belt.

17-9.2.15.5 Ships that have the flat plate configuration have a 1 1/4-inch cleanout plug installed on the masker belt 2 inches from the keel. The clean-out plug is removable to permit periodic clean-out flushing of the masker emitter belt system.

17-9.2.15.6 Ship's Force personnel measure the flow rate to the masker belts while underway per MRC Code 551G U-3. This maintenance requirement determines whether or not cleaning of the system is required. Failure of the system to deliver a flow of 400-600 scfm at a pressure of 12-17 psig is indicative of failure or a requirement for cleaning. This would necessitate the inspection services of a diver.

17-9.2.15.7 Location. The CG 47 Class ship has a total of eight masker belt emitter systems, four per side. On the starboard side, they are located at frames 296, 256, 214, and 169. On the port side, they are located at frames 297, 257, 215, and 170.

17-9.2.15.8 References.

a. NAVSEA S0600-AA-PRO-050, *Underwater Ship Husbandry Manual*, Chapter 5, “Masker Emitter Belts”

b. NAVSEA DWG DDG 47-551-5386256, Rev. F, Masker Air System Girth Emitters

17-9.2.16 Transducers.

17-9.2.16.1 Transducers are transmitting and receiving heads for various kinds of underwater acoustic signals. Transducer heads are protected by Buna-N rubber covers that are bolted to the hull. The mounting flange for the transducer has a series of 3/4-inch 10-UNC thread saver plugs for installation of a protective steel cover used while dry-docking the ship. This class ship has two hull-mounted transducers, the UQN-4 and the AUTEC range pinger.

17-9.2.16.2 Location. The transducers are located on the starboard side from frames 154 to 150, 3 feet 6 inches off centerline.

17-9.2.16.3 References.

a. NAVSEA DWG CG 47-163-5384515, Rev. N, Suction Sea Chests Misc., MDL - ALL

17-9.2.17 Rodmeter (Underwater Log).

17-9.2.17.1 The rodmeter (also known as the pit sword) is the part of the underwater log that projects from the ship's hull. The underwater log is a device for measuring the ship's speed through the water. Ships in this class have a 72-inch retractable rodmeter. Retractable rodmeters can be retracted through an opening in the hull through a sea valve for maintenance. They are usually in the retracted (stowed) position and inaccessible to divers while the ship is in port.

17-9.2.17.2 With retractable rodmeters, possible problems include (but are not limited to):

a. Ship unable to receive input from rodmeter.

b. Ship unable to retract rodmeter.

17-9.2.17.3 Location. The rodmeter is located on the starboard side, 5 feet 7 inches from the centerline.

17-9.2.17.4 References.

a. NAVSHIPS DWG CG 47-163-5384515, Rev. N, Suction Sea Chests Misc., MDL-ALL

17-9.2.18 Bow-mounted Sonar Dome.

17-9.2.18.1 The Sonar Dome Rubber Window (SDRW) is a pressure-tight membrane that protects the sonar transducer array, reduces acoustic noise attenuation, and provides the proper hydrodynamic contour to minimize underway noise.

17-9.2.18.2 SDRWs are constructed much like steel-belted automobile tires, with layers of rubber applied over a series of steel plies. They are normally internally pressurized with water to maintain the desired shape. A fairing plate welded to the hull provides a smooth interface between the rubber sonar dome surface and the hull plate.

17-9.2.18.3 Most SDRWs are marked with a series of white grid markings to facilitate diver orientation. The grid markings consist of 2-inch by 2-inch squares along the upper periphery of the upper rubber window/fairing angle interface. These squares are painted every 15° to a point 165° aft on both sides. Directly above each square is a 2-inch number indicating the bearing that the square represents and an "S" or "P" to indicate starboard or port, as appropriate (15S, 135P, etc.). Additionally, in a horizontal line along the periphery of the lower rubber window/fairing angle interface are the same painted squares and numeral/letter combinations. The vertical midpoint of the SDRW is marked by a painted 2-inch square along the SDRW at the midpoint between the upper and lower bearing squares. Divers should use these location marks as reference points when reporting any damage. If the grid marks are not visible, the diver must estimate the location of any discrepancies.

17-9.2.18.4 The sonar dome banjo is a section of steel plate that extends forward from the keel. This plate supports the bottom of the dome. The banjo is narrowest just forward of the keel and increases in size as one moves to the forward end of the banjo.

17-9.2.18.5 Location. The sonar dome is located along the centerline of the ship from frame 52 to frame 2.

17-9.2.18.6 References.

a. NAVSEA S9165-AH-MMA-010, *Technical Manual for Sonar Dome Rubber Window for DD 963, DDG 993, and CG 47 Class Vessels*

b. NAVSEA DWG DDG-47-100-453750, Sonar Dome

17-9.3 LEVEL 1 INSPECTION PROCEDURES.

17-9.3.1 Introduction.

17-9.3.1.1 This section contains Level 1 inspection procedures for the CG 47 Class Guided Missile Cruiser. The Table 17-9.2 checklist presents components in the order in which the diver would find them when making a stern area, port side, bow, and starboard side inspection dive. Note that all hull openings included on the docking plan are listed in Figure 17-9.1 and Table 17-9.2. Depending on the ship's draft at the time of the inspection, some items may be above the waterline. The Dive Supervisor can refer to Figures 17-9.1 and 17-9.2 and Table 17-9.2 (found at the end of these Level 1 procedures) to pinpoint the exact location of a particular component. These tables and figures can be photocopied and used to document the reported condition of each component. In addition, the NAVSEA Diver Inspection Data Forms for the hull, Sonar Dome Rubber Window, ICCP, and propeller should be used to record the inspection results. These forms are included in Section 5 of this chapter. Underwater color photography should also be used to further depict the damage described in the report and in the forms.

17-9.3.2 Paint and Fouling Inspection.

NOTE

To accurately report the PDR and FR, the diver must be thoroughly familiar with NSTM Chapter 081, "Waterborne Underwater Hull Cleaning of Navy Ships."

17-9.3.2.1 One of the most important aspects of a Level 1 inspection is the assessment of the Fouling Rating (FR) and the Paint Deterioration Rating (PDR). Values for the FR and the PDR may vary widely along the length of a hull.

17-9.3.2.2 The diver should continuously report the condition of the paint using standard terms such as peeling, blistered (broken or intact), and missing antifouling or anticorrosive paint. Report the color of exposed paint. A diver's light is necessary to report color accurately. Use sections of hull plate to estimate the condition of small areas: flat and curved areas of plate, edges, welds, seams, rivets, and bolt heads. The Dive Supervisor maintains a running log of the conditions and records the FR and PDR for localized areas. This enables the Dive Supervisor to keep track of the total estimate for each section of the hull. These values are then summarized, yielding the overall condition for each area: bow, stern, flat bottom, and sides. Report the docking block areas separately from the flat bottom and sides. For docking block areas, report the average percent of block areas painted and the percent of base metal with pitting. Estimate the average diameter and depth of pitting. For a heavily fouled section of hull, only the FR can be reported since little or no hull paint will be visible.

17-9.3.2.3 This inspection procedure alerts the diver when the inspection process has been completed for each section of the hull to assist in summarizing the overall conditions.

a. Inspect and report the FR.

b. Inspect and report the PDR. Report localized areas of pitting, blisters, peeling, or missing paint.

c. Inspect and report the docking block FR and PDR.

17-9.3.3 General Hull Plate Inspection.

a. Carefully examine the hull plating. Look for areas of bare metal, bleeding rust, and large areas of pitting.

b. Inspect for holes, cracked weld seams, distorted hull plates, localized areas of pitting, corrosion, and any other apparent damage.

c. Estimate and report the extent and location of any damage; report length of cracks and average pit diameter and depth.

17-9.3.4 Rudder.

a. Inspect the entire surface area for any cracked welds or marks, gouges, or scrapes that indicate the rudder surfaces may have made contact with an underwater object.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

b. Inspect the area between the rudder, the rudder stock, and the hull for fouled wire, rope, or foreign material.

c. Measure the rudder clearance. With the rudder amidships, measure between the top of the rudder and the bottom of the casting. Design clearance is 2 5/8 inches.

d. Verify that the two 1 1/4-inch fill holes (upper) and the two 1 1/4-inch drain holes (lower) plugs are present and have not backed out.

e. Sound the rudder by using a rubber or rawhide mallet.

(1) Rap on the surface to determine if the rudder has flooded. Begin sounding near the uppermost part of the rudder and continue downward to the lowest point.

NOTE

Internal framing and stiffeners will change the sound. It is necessary to sound the rudder in different locations. A hollow sound indicates the rudder is not flooded, while a dull sound indicates flooding.

(2) If the rudder is found to contain water, make the appropriate report and arrangements for follow-on dewatering and repair.

f. Inspect and report the FR and the PDR.

17-9.3.5 Propeller (5-Bladed).

a. Inspect the propeller hub end cover and hub cone cover plate for damage, cracks, and loose or missing fasteners.

b. Inspect the propeller hub for fouled wire, rope, or other foreign material. Fiber such as fish netting or manila line may be removed without difficulty. If removal of the material will be excessively time consuming, make the appropriate report and arrangements for follow-on removal.

c. Inspect the propeller blade root and flange areas for cracks and cavitation damage. Cavitation damage can be identified by an area of small pocked holes or a rough-textured surface.

(1) Verify that the blade bolt caps (4 each side of each blade) are in place and secure.

(2) Verify that the 1 1/8-inch thread savers (one in each side of the blade) are in place on the blade flange.

d. Inspect the overall physical appearance and FR of each blade, starting with blade “A.”

(1) Inspect the leading and trailing edges for nicks, curls, chips, dents, flat spots, cracks, or other apparent damage.

(2) Inspect the suction (forward) and pressure (aft) face of each blade for defects caused by cavitation.

(3) Inspect the 1 3/4-inch prairie air channel cover plate on the blade pressure (aft) face for damage or cracked welds. Inspect both the pressure (aft) and suction (forward) face air emitter holes for fouling.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively fouled, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(4) Measure and record the extent of all damage.

(5) Inspect and report the FR of the propeller.

17-9.3.6 Rope Guard.

a. Verify that the rope guard is securely in place.

NOTE

A missing rope guard is a serious casualty.

b. Inspect all welds for corrosion, damage, or cracks.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Inspect for the presence of fouled rope, wire, or foreign material.

d. Verify that the 1 inch running clearance between the rope guard and propeller hub is uniform all around. Take clearance measurements at the 3, 6, 9, and 12 o'clock positions.

e. Inspect the 3/16-inch prairie air emitter holes spaced 1 inch apart around the guard for fouling or blockage.

f. Inspect for the presence of the two 1 inch 14-UNF prairie air cleanout plugs (one in each guard half). Verify that they are flush and staked at a minimum of two places.

g. Inspect and report the FR and the PDR of the rope guard.

17-9.3.7 Main Bearing Housing and Struts.

NOTE

The main struts on this class have a history of severe corrosion. Most main struts have been repaired with clad welding, epoxy or both.

a. Inspect the bearing housing for the presence of the four top and bottom 1-inch plugs. Ensure that they are flush and staked at a minimum of two places.

b. Inspect the main strut columns for corrosion damage and the presence of wire or other foreign material.

c. Inspect the surface paint condition.

(1) At best, the surface of the struts will be very rough due to previous damage or repairs.

(2) Inspect for loose or missing epoxy.

d. Inspect the strut columns and the immediate hull plate area at the strut/hull interface for cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Inspect and report the FR and the PDR of the strut.

17-9.3.8 Main Bearing Housing Fairwaters.

a. Verify the presence of fairwaters.

NOTE

A missing fairwater is considered a serious casualty.

b. Verify that the 1-inch gap between the fairwater and the shaft is uniform all around. Take measurements at the 3, 6, 9, and 12 o'clock positions.

c. Inspect the 3/64-inch prairie air emitter holes around the fairwater for fouling or blockage.

d. Inspect all welds for corrosion damage and cracks.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Inspect and report the FR and the PDR of the fairwaters.

f. Repeat this inspection process for the other fairwaters.

17-9.3.9 Shafting.

a. Inspect the full length of all accessible glass-reinforced plastic (fiberglass) covering.

(1) Inspect for evidence of deterioration, loss of adhesion, or any apparent physical damage. Loss of adhesion of shaft covering is characterized by one or more of the following: loss of covering (total or partial), delaminations, or bare metal.

(2) Inspect for damage such as nicks or cuts in the coating, missing covering, or loose covering. The covering may also have rust stains indicating where rust has leaked through near a cut, pinhole, area of porosity, patch, joint, or other flaw.

NOTE

Rust stains on the shaft coating indicate corrosion of the shaft. This is a serious problem.

b. If any of the above conditions exist, make the appropriate report and arrangements for follow-on Level 2 inspection.

17-9.3.10 Intermediate Bearing Housing and Struts.

a. Inspect the strut columns and bearing housing for corrosion damage and for the presence of wire or other foreign material.

b. At the strut/hull interface, inspect the strut columns and immediate hull plate area for cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Inspect the bearing housing for the presence of the three top and bottom 1-inch plugs. Ensure that they are flush and staked at a minimum of two places.

17-9.3.11 Intermediate Bearing Housing Fairwaters.

a. Verify the presence of fairwaters.

NOTE

A missing fairwater is considered a serious casualty.

b. Verify that the 1-inch gap between the fairwater and the shaft is uniform all around. Take measurements at the 3, 6, 9, and 12 o'clock positions.

c. Inspect all welds for corrosion damage and cracks.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

d. Inspect and report the FR and the PDR of the fairwaters.

e. Repeat this inspection process for the other fairwaters.

17-9.3.12 Stern Tube.

a. Inspect the stern tube fairwater.

(1) Inspect for corrosion damage and cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(2) Verify that the gap between the fairwater and the shaft is uniform all around. Take measurements at the 3, 6, 9, and 12 o'clock positions.

b. Inspect and report the FR and the PDR of the stern tube and immediate hull plate area. Repeat this inspection process for the other stern tube. This completes the inspection of the running gear.

17-9.3.13 Impressed Current Cathodic Protection (ICCP) Anode (4-Foot and 8-Foot Anode).

NOTE

The presence of marine fouling indicates a non-functioning anode.

CAUTION

Avoid disturbing the white calcium buildup on the dielectric shield that protects areas of bare metal from corrosion.

a. Inspect the anode for damage, missing or broken wires, and missing or damaged platinum coating on the wires.

b. Inspect the dielectric shield for chips, cracks, blisters, or missing epoxy.

c. Inspect the hull coating in the area around the anode for missing or peeling paint or blisters. Inspect for calcareous buildup.

d. Inspect and report the FR and the PDR.

17-9.3.14 Reference Electrode (Reference Cell).

a. Inspect for damage, clogged water circulation holes, and loose or missing epoxy.

b. Inspect and report the FR and the PDR.

17-9.3.15 Overboard Discharge.

a. Inspect for foreign material or corrosion damage.

b. Inspect and report the FR and the PDR.

17-9.3.16 Sea Chest and Seawater Suction.

a. Inspect screens and grates for clogged holes and loose or missing fasteners.

b. Inspect splitter bars for corrosion damage, broken or missing bars, cracked welds, and missing or loose fasteners.

c. Inspect and report the FR and the PDR.

17-9.3.17 Bilge Keel.

a. Inspect the bilge keel for dents, cracks, curled edges, missing plate, or other apparent damage.

b. Inspect for foreign material and loose or missing plugs.

c. Measure and record the location of any damage.

d. Inspect and report the FR and the PDR.

17-9.3.18 Masker Belt.

a. Inspect for crushed, dented, or missing sections of masker belt.

b. Inspect the full length of weld between the backing plate and the hull (the backing plate is the plate welded to the hull) and the weld between the emitter plate and the backing plate for cracks. Inspect both sides.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Inspect the 3/64-inch air emitter holes for fouling. Emitter holes are spaced

1/2 inch forward and aft of the emitter pipe vertical centerline. Emitter holes are spaced in sections and the spacing varies in density for each section.

d. Inspect for a loose or missing 1 1/4-inch NPT clean-out plug located 2 inches from the end of the emitter pipe at the keel.

e. Inspect and report the FR and if painted, the PDR.

17-9.3.19 Transducer (UQN-4).

a. Inspect sensor covers for tears, gouges, or delaminations.

b. Inspect the plugs around the perimeter of the sensor flange. Ensure that they are flush and have not backed out.

c. Inspect for loose or missing fasteners and loose or missing fairing compound.

d. Inspect for signs of structural failure or damage caused by contact with underwater objects.

e. Inspect and report the FR.

17-9.3.20 Transducer (AUTEC Range Pinger).

a. Inspect sensor covers for tears, gouges, or delaminations.

b. Inspect the plugs around the perimeter of the sensor flange. Ensure that they are flush and have not backed out.

c. Inspect for loose or missing fasteners and loose or missing fairing compound.

d. Inspect for signs of structural failure or damage caused by contact with underwater objects.

17-9.3.21 Rodmeter (Underwater Log).

a. Inspect the hull opening to verify that it is free of any obstruction.

b. Inspect and report the FR

17-9.3.22 Bow-mounted Sonar Dome.

WARNING

Divers must exercise care when touching a dome with steel wires exposed.

WARNING

Avoid direct bare skin contact with NOFOUL rubber surfaces. Avoid contact between hands and eyes if hands have been exposed to the NOFOUL rubber material. Wash hands thoroughly before eating or smoking.

a. Inspect the entire surface of the sonar dome and banjo using a latitudinal inspection pattern. Survey a swath approximately 3 feet wide on each pass until complete. Inspect for cuts, pits, gouges, bulges, soft spots, and any previous repairs that may have become faulty or deteriorated.

b. Inspect and report the FR of the dome. The rubber surface of the dome is made of NOFOUL rubber. However, the antifouling properties of the dome may become ineffective as the dome ages or from over-spraying of paint while the ship is in dry-dock. Fouling degrades the performance of the sonar.

c. Inspect the entire perimeter of the rubber dome and steel closure plate for separation, cracks, damage or corrosion of the steel.

d. Inspect the banjo and fairing with the hull for damage, cracks or corrosion. Report the FR and PDR of the banjo.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Inspect the hull/sonar dome fairing interface for cracked welds or structural damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

f. Rubber damage with exposed wires, cracked welds, or structural damage are severe conditions. If any such discrepancies are noted, make the appropriate report and arrangements for a follow-on Level 2 inspection.

Name of Ship ______
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Inspection Location ______
Inspection Date ______
Type of Inspection (Level 1 or Level 2) ______

Table 17-9.2. Checklist of Major Hull Components (sheet 1 of 7)
(Item Numbers Correspond to Numbers on Figure 17-9.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
1		Stern Area Paint and Fouling		Frame 529-340		
2		Stern Area Hull Plate		Frame 529-340		
3		Rudder, Stbd		Frame 524-510 Stbd,		
3.a		Rudder Drop Measurement				
3.b		Paint and Fouling				
3.c		Plating, Welds				
3.d		Rudder Fill and Drain Plugs				
3.e		Sound Rudder				
4		Propeller, CP, 5-Bladed, Stbd		Frame 496 Stbd, 12′ 9″ off CL		
4.a		Hub				
4.b		Blades				
4.b.1		Blade Bolt Caps and Thread Savers				
4.b.2		Blade FR and Damage				
4.b.3		Prairie Air Channels				
5		Main Bearing Housing and Struts, Stbd		Frame 490 Stbd		
5.a		Rope Guard with Prairie Air				
5.b		Bearing Housing				
5.c		Fill and Drain Plugs				
5.d		Struts				
5.e		Fairwater with Prairie Air				
6		Propeller Shaft, Stbd				
7		Intermediate Bearing Housing and Struts, Stbd		Frame 446 Stbd		
7.a		Fairwaters, (Forward and Aft)				
7.b		Bearing Housing				
7.c		Fill and Drain Plugs				

Name of Ship ____
Inspection Activity ____
Inspection Location ____
Inspection Date ____
Type of Inspection (Level 1 or Level 2) ____

Table 17-9.2. Checklist of Major Hull Components (sheet 2 of 7)
(Item Numbers Correspond to Numbers on Figure 17-9.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
7.d		Struts				
8		Intermediate Shaft, Stbd				
9		Stern Tube, Stbd		Frame 414-390		
10	6	Sea Chest	Firemain Sewage Plant #2	Frame 364 Stbd, 5′ 7″ off CL	16 1/4″ dia opening, fairing plate 33″ x 53″	
11	9	Sea Chest	Gas Turbine Generator Cooling and Sewage Plant #2	Frame 352 Stbd, 5′ 9″ off CL	8 3/4″ dia opening, fairing plate 26 3/4″ x 41 7/8″	
12	31	Overboard Discharge	Eductor (E-7)	Frame 349 Stbd, 10′ 2″ off CL	4 1/2″ dia	
13	53	Overboard Discharge	Fire Pump #5 Recirculation and Vent	Frame 345 Stbd, 26′ 2″ off CL	3″ dia	
14	87	Overboard Discharge	Collecting Holding Tank Transfer Waste Drain: AFFF Locker	Frame 359 Stbd, 27′ 0″ off CL *	4 5/8″ dia	
15	84	Overboard Discharge	Medical Soil and Waste Drain	Frame 393 Stbd, 26′ 2″ off CL *	4″ dia	
16	81	Overboard Discharge	Air Conditioning Chilled Water Plants #3 and #4	Frame 402 Stbd, 25′ 2″ off CL *	8 3/4″ dia	
17	82	Overboard Discharge	Eductor (E-8)	Frame 422 Stbd, 23′ 8″ off CL	3 1/2″ dia	
18	67	Overboard Discharge	Steam Condenser #3	Frame 432 Stbd, 24′ 1″ off CL *	6 1/2″ dia	
19	73	Overboard Discharge	Waste Heat Boiler #3 Bottom Blow	Frame 435 Stbd, 23′ 9″ off CL *	1 1/2″ dia	
20	70	Overboard Discharge	Seawater Service Cutout	Frame 441 Stbd, 24′ 3″ off CL *	5 1/2″ dia	
21	14	Hull Cathodic Protection	ICCP System 150 Amp Anode	Frame 465 Stbd, 12′ 11″ off CL	5 1/4″ x 96″ area	
22	68	Overboard Discharge	Seawater Service HP/ LP Air Compressor	Frame 471 Stbd, 21′ 2″ off CL	3″ dia	
23	86	Overboard Discharge	Battery Shop Plumbing Drain	Frame 505 Stbd, 22′ 6″ off CL *	3 1/2″ dia	
24	85	Overboard Discharge	Eductor (E-9)	Frame 511 Stbd, 19′ 4″ off CL *	3 5/8″ dia	
25	23	Reference Electrode (Reference Cell)	ICCP System	Frame 513 Stbd, 3′ 0″ off CL	9″ dia area	
26	22	Reference Electrode (Reference Cell)	ICCP System	Frame 513 Port, 3′ 0″ off CL	9″ dia area	
27		Rudder, Port		Frame 524-510 Port		
27.a		Rudder Drop Measurement				
27.b		Paint and Fouling				
27.c		Plating, Welds				
27.d		Rudder Fill and Drain Plugs				

Name of Ship
Inspection Activity
Inspection Location
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Type of Inspection (Level 1 or Level 2)

Table 17-9.2. Checklist of Major Hull Components (sheet 3 of 7)
(Item Numbers Correspond to Numbers on Figure 17-9.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
27.e		Sound Rudder				
28		Propeller, CP, 5-Bladed, Port		Frame 496 Port, 12′ 9″ off CL		
28.a		Hub				
28.b		Blades				
28.b.1		Blade Bolt Caps and Thread Savers				
28.b.2		Blade FR and Damage				
28.b.3		Prairie Air Channels				
29		Main Bearing Housing and Struts, Port		Frame 490 Port		
29.a		Rope Guard with Prairie Air				
29.b		Bearing Housing				
29.c		Fill and Drain Plugs				
29.d		Struts				
29.e		Fairwater with Prairie Air				
30		Propeller Shaft, Port				
31		Intermediate Bearing Housing and Struts, Port		Frame 446 Port		
31.a		Fairwaters, (Forward and Aft)				
31.b		Bearing Housing				
31.c		Fill and Drain Plugs				
31.d		Struts				
32		Intermediate Shaft, Port				
33		Stern Tube, Port		Frame 403-389		
34	75	Overboard Discharge	Decontamination Station	Frame 441 Port, 24′ 8″ off CL *	2 7/8″ dia	
35	13	Hull Cathodic Protection	ICCP System 150 Amp Anode	Frame 465 Port, 12′ 11″ off CL	5 1/4″ x 96″ area	
36	69	Overboard Discharge	Battery Shop	Frame 472 Port, 23′ 6″ off CL *	2 1/2″ dia	
37	76	Overboard Discharge	Decontamination Station AFFF	Frame 496 Port, 22′ 7″ off CL *	3 1/2″ dia	
38		Skeg		Frame 411-340		
38.a		Plug, Skeg Fill, 1 ea.		6″ Fwd of Frame 411, Stbd Side	1″ dia	

Name of Ship ____________________
Inspection Activity ____________________
Inspection Location ____________________
Inspection Date ____________________
Type of Inspection (Level 1 or Level 2) ____________

Table 17-9.2. Checklist of Major Hull Components (sheet 4 of 7)
(Item Numbers Correspond to Numbers on Figure 17-9.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
38.b	10	Plug, Skeg Drain, 2 ea.		Frame 350 Port/Stbd, 6″ off CL	1″ dia	
38.c		Skeg Keel Docking Block Area, FR and PDR				
39	88	Overboard Discharge	Collecting Holding Tank and Laundry Surge Tank Waste Drain	Frame 359 Port, 27′ 0″ off CL *	4 5/8″ dia	
40	24	Overboard Discharge	AEGIS Cooling Skid	Frame 390 Port, 24′ 9″ off CL *	3 1/2″ dia	
41	25	Overboard Discharge	Plumbing Drain	Frame 395 Port, 24′ 7″ off CL *	3″ dia	
Note: This completes the stern area for reporting FR and PDR values. Transom to frame 340.						
42		Port Side Paint and Fouling		Frame 340-94		
43		Port Side General Hull Plate		Frame 340-94		
43.a		Port Side Docking Block Areas (Include Keel Block Areas) FR and PDR				
44	5	Sea Chest	Firemain Main Engine Room #2	Frame 329 Port, 5′ 7″ off CL	27″ dia opening, fairing plate 42″ x 69 1/2″	
45	40	Overboard Discharge	Plumbing Drain	Frame 335 Port, 27′ 4″ off CL *	3 1/2″ dia	
46	48	Overboard Discharge	Seawater Service Ship Service Air Compressor #2	Frame 331 Port, 26′ 11″ off CL	3″ dia	
47	47	Overboard Discharge	Seawater Service Masker Air Cooler	Frame 325 Port, 27′ 1″ off CL	4 1/2″ dia	
48	45	Overboard Discharge	Ship Service Gas Turbine Generator #2 Cooling	Frame 326 Port, 27′ 5″ off CL *	4 1/2″ dia	
49	49	Overboard Discharge	Gas Turbine Drain Tank Drain	Frame 325 Port, 26′ 0″ off CL	2 1/2″ dia	
50	50	Overboard Discharge	Oily Waste Transfer Pump	Frame 325 Port, 25′ 5″ off CL	2 1/2″ dia	
51	78	Overboard Discharge	Waste Heat Boiler #2 Bottom Blow	Frame 313 Port, 26′ 0″ off CL	1 1/2″ dia	
52	43	Overboard Discharge	AFFF Station	Frame 305 Port, 27′ 6″ off CL *	3 1/2″ dia	
53	46	Overboard Discharge	Seawater Service Secondary Condenser and Drain Cooler	Frame 304 Port, 27′ 5″ off CL *	6 5/8″ dia	
54	8	Sea Chest	Gas Turbine Generator Cooling Engine Room #2	Frame 304 Port, 5′ 7″ off CL	8 3/4 dia opening, fairing plate 26 3/4″ x 41 7/8″	
55		Masker Emitter Belt 4 P		Frame 297 Port, 27′ 6″ off CL	2 7/16″ dia	
56		Bilge Keel, Port		Frame 346-212		
56.a		Bilge Keel Fill and Drain Plugs (3)				

Name of Ship
Inspection Activity
Inspection Location
Inspection Date
Type of Inspection (Level 1 or Level 2)

Table 17-9.2. Checklist of Major Hull Components (sheet 5 of 7)
(Item Numbers Correspond to Numbers on Figure 17-9.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
57	39	Overboard Discharge	Main Drain Eductor-3	Frame 293 Port, 26′ 5″ off CL	9 5/8″ dia	
58	74	Overboard Discharge	Waste Drain/Commissary Drain and Soil Discharge	Frame 291 Port, 27′ 6″ off CL *	3 3/4″ dia	
59	15	Hull Cathodic Protection	ICCP System 75 Amp Anode	Frame 277 Port, 26′ 6″ off CL	5 1/4″ x 48 3/8″ area	
60	35	Overboard Discharge	Fire Pump #3 Recirculation Vent	Frame 260 Port, 26′ 10″ off CL	3″ dia	
61		Masker Emitter Belt 3 P		Frame 257 Port, 27′ 4″ off CL	2 7/16″ dia	
62	34	Overboard Discharge	Air Conditioning Chilled Water Plant #2	Frame 257 Port, 24′ 1″ off CL	5 1/2″ dia	
63	79	Overboard Discharge	Secondary Drain	Frame 254 Port, 27′ 4″ off CL *	2″ dia	
64	44	Overboard Discharge	Refrigeration Tank	Frame 252 Port, 27′ 3″ off CL *	2″ dia	
65	32	Overboard Discharge	Refrigerator Condenser #1 and #2	Frame 233 Port, 25′ 3″ off CL	3″ dia	
66	41	Overboard Discharge	Air Conditioning Plant #1	Frame 226 Port, 24′ 10″ off CL	5 1/2″ dia	
67	60	Overboard Discharge	Plumbing Waste	Frame 225 Port, 25′ 10″ off CL *	3″ dia	
68	29	Overboard Discharge	Firemain	Frame 226 Port, 22′ 0″ off CL	8 3/4″ dia	
69	80	Overboard Discharge	AN/SLQ 32, AN/SPS 49, PHALANX (CIWS)	Frame 221 Port, 24′ 4″ off CL	4 1/8″ dia	
70	30	Overboard Discharge	Brine Pump	Frame 238 Port, 3′ 2″ off CL	6 1/4″ dia	
71		Masker Emitter Belt 2 P		Frame 215 Port, 25′ 0″ off CL	2 7/16″ dia	
72	61	Overboard Discharge	Seawater System 44: Main Lube Oil Cooler #2	Frame 217 Port, 23′ 1″ off CL	6 3/4″ dia	
73	56	Overboard Discharge	Weather Deck/SSTG #2	Frame 215 Port, 25′ 2″ off CL *	4 5/8″ dia	
74	57	Overboard Discharge	Seawater System CPP Hydraulic Oil Cooler	Frame 203 Port, 21′ 7″ off CL	3 3/8″ dia	
75	55	Overboard Discharge	Weather Deck	Frame 195 Port, 23′ 6″ off CL *	4 5/8″ dia	
76	58	Overboard Discharge	Seawater System Prairie Air Heat Exchanger	Frame 193 Port, 21′ 8″ off CL	3 1/2″ dia	
77	2	Sea Chest	Firemain Main Engine Room #1	Frame 193 Port, 3′ 4″ off CL	16 1/4″ dia opening, fairing plate 33″ x 53″	
78	59	Overboard Discharge	Fire Pump #2 Recirculation and Ventilation	Frame 177 Port, 19′ 7″ off CL	3 1/2″ dia	
79		Masker Emitter Belt 1P		Frame 170 Port, 21′ 5″ off CL	2 7/16″ dia	
80	89	Overboard Discharge	Collecting, Holding Tank, Transfer and OVFL, Soil and Waste	Frame 150 Port, 19′ 9″ off CL *	4 5/8″ dia	
81	19	Reference Electrode (Reference Cell)	ICCP System	Frame 144 Port, 14′ 9″ off CL	9″ dia area	
82	91	Overboard Discharge	Eductor (E-2)	Frame 146 Port, 12′ 1″ off CL	3 3/4″ dia	

Name of Ship ______
Inspection Activity ______
Inspection Location ______
Inspection Date ______
Type of Inspection (Level 1 or Level 2) ______

Table 17-9.2. Checklist of Major Hull Components (sheet 6 of 7)
(Item Numbers Correspond to Numbers on Figure 17-9.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
83	12	Sea Chest	Underwater Log Rodmeter	Frame 153 Port, 3′ 0″ off CL	8″ dia	
Note: This completes the port side for reporting FR and PDR values. Frames 340 to 94.						
84		Bow Paint and Fouling		Frame 94-Bow		
85		Bow General Hull Plate		Frame 94-Bow		
85.a		Bow Keel Docking Block Areas, FR and PDR				
86	17	Hull Cathodic Protection	ICCP System 75 Amp Anode	Frame 83 Port, 8′ 6″ off CL	5 1/4″ x 48 3/8″ area	
87	28	Overboard Discharge	Sonar Cutout	Frame 71 Port, 8′ 0″ off CL	4 1/8″ dia	
88	27	Overboard Discharge	Sonar Dome Eductor Cutout	Frame 35 Port, 2′ 6″ off CL	5 1/4″ dia	
89		Bow-mounted Sonar Dome				
90	18	Hull Cathodic Protection	ICCP System 75 Amp Anode	Frame 83 Stbd, 8′ 6″ off CL	5 1/4″ x 48 3/8″ area	
Note: This completes the bow area for reporting FR and PDR values. Frame 94 and forward.						
91		Stbd Side Paint and Fouling		Frame 94-340		
92		Stbd Side General Hull Plate		Frame 94-340		
92.a		Stbd Side Docking Block Areas FR and PDR				
93	1	Sea Chest	Pump Room #1 Sewage Plant	Frame 142 Stbd, 3′ 6″ off CL	16 1/4″ dia	
94	11	Sea Chest	UQN-4 Transducer	Frame 151 Stbd, 3′ 3″ off CL	16 1/4″ dia, cover plate 17 3/4″	
95	26	Overboard Discharge	Combined Recirc. and Vent	Frame 149 Stbd, 16′ 2″ off CL	3 3/4″ dia	
96	90	Overboard Discharge	Waste Drain	Frame 146 Stbd, 22′ 7″ off CL *	Not provided	
97	20	Reference Electrode (Reference Cell)	ICCP System	Frame 153 Stbd, 15′ 9″ off CL	9″ dia area	
98		Masker Emitter Belt 1S		Frame 169 Stbd, 21′ 4″ off CL	2 7/16″ dia	
99	83	Overboard Discharge	SWS AEGIS Cooling Skid	Frame 179 Stbd, 20′ 3″ off CL	3″ dia	
100	37	Overboard Discharge	Masker Air Cooler	Frame 187 Stbd, 20′ 8″ off CL	3″ dia	
101	62	Overboard Discharge	Ship Service Air Compressor	Frame 202 Stbd, 22′ 4″ off CL	3″ dia	
102	7	Sea Chest	Gas Turbine Cooling Main Engine Room #1	Frame 195 Stbd, 5′ 6″ off CL	8 3/4″ dia opening, fairing plate 26 3/4″ x 41 7/8″	
103	65	Overboard Discharge	Seawater Service Cutout	Frame 206 Stbd, 24′ 0″ off CL *	3 3/4″ dia	

Name of Ship ______
Inspection Activity ______
Inspection Location ______
Inspection Date ______
Type of Inspection (Level 1 or Level 2) ______

Table 17-9.2. Checklist of Major Hull Components (sheet 7 of 7)
(Item Numbers Correspond to Numbers on Figure 17-9.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull * = Item may be above waterline	Size	Conditions Found
104	66	Overboard Discharge	Waste Heat Boiler Bottom Blow	Frame 211 Stbd, 23′ 6″ off CL	2″ dia	
105	63	Overboard Discharge	Engine Room #1 Eductor	Frame 213 Stbd, 21′ 9″ off CL	8 3/8″ dia	
106	42	Overboard Discharge	Sea Water System 26	Frame 216 Stbd, 23′ 11″ off CL	6 1/2″ dia	
107		Masker Emitter Belt 2 S		Frame 214 Stbd, 24′ 11″ off CL	2 7/16″ dia	
108	71	Overboard Discharge	HP/LP Air Compressor	Frame 235 Stbd, 25′ 3″ off CL	3 1/2″ dia	
109	64	Overboard Discharge	Soil Drain and Commissary Drain	Frame 242 Stbd, 26′ 9″ off CL *	3 3/4″ dia	
110	3	Sea Chest	Seawater Service and Firemain and Distiller	Frame 249 Stbd, 5′ 7″ off CL	27″ dia opening, fairing plate 42″ x 69 1/2″	
111		Masker Emitter Belt 3 S		Frame 256 Stbd, 27′ 3″ off CL	2 7/16″ dia	
112		Bilge Keel, Stbd		Frame 346-212		
112.a		Bilge Keel Fill and Drain Plugs (3)				
113	16	Hull Cathodic Protection	ICCP System 75 Amp Anode	Frame 277 Stbd, 26′ 6″ off CL	5 1/4″ x 48 3/8″ area	
114	72	Overboard Discharge	Waste Drain/ Commissary Drain and CHT OVFL	Frame 283 Stbd, 27′ 6″ off CL *	3 3/4″ dia	
115	4	Sea Chest	Seawater Service Firemain and AEGIS Cooler Pump	Frame 282 Stbd, 5′ 7″ off CL	27″ dia opening, fairing plate 42″ x 69 1/2″	
116	36	Overboard Discharge	Fire Pump #4 Recirculation and Vent	Frame 291 Stbd, 27′ 2″ off CL	3″ dia	
117	77	Overboard Discharge	Garbage Grinder	Frame 295 Stbd, 27′ 6″ off CL *	1 5/8″ dia	
118		Masker Emitter Belt 4 S		Frame 296 Stbd, 27′ 6″ off CL	2 7/16″ dia	
119	51	Overboard Discharge	Seawater Service 141/Main Lube Oil, Prairie Air and Compressor Cooler	Frame 303 Stbd, 27′ 1″ off CL	8 3/4″ dia	
120	52	Overboard Discharge	Ship Service Turbine Generator #2	Frame 307 Stbd, 27′ 6″ off CL *	3″ dia	
121	33	Overboard Discharge	Engine Room #2 Eductor	Frame 305 Stbd, 25′ 4″ off CL	9 5/8″ dia	
122	38	Overboard Discharge	Helicopter Hangar Drain	Frame 327 Stbd, 27′ 5″ off CL	3 1/2″ dia	
123	54	Overboard Discharge	Uptake High Hat No. 2 Drain	Frame 335 Stbd, 27′ 4″ off CL	5 1/2″ dia	
Note: This completes the starboard side for reporting FR and PDR values. Frames 94 to 340.						

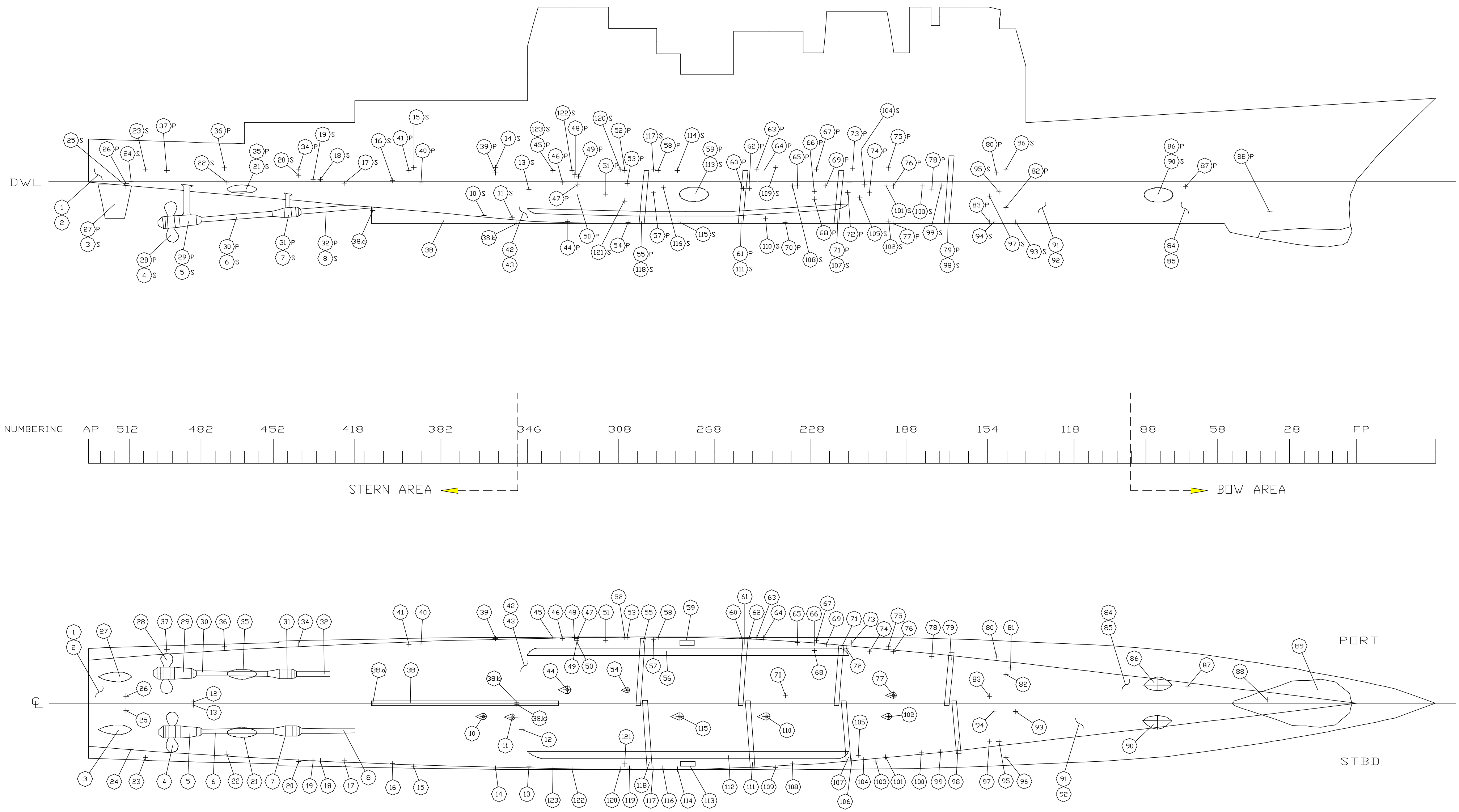


Figure 17-9.1 CG 47 Class Plan and Profile.

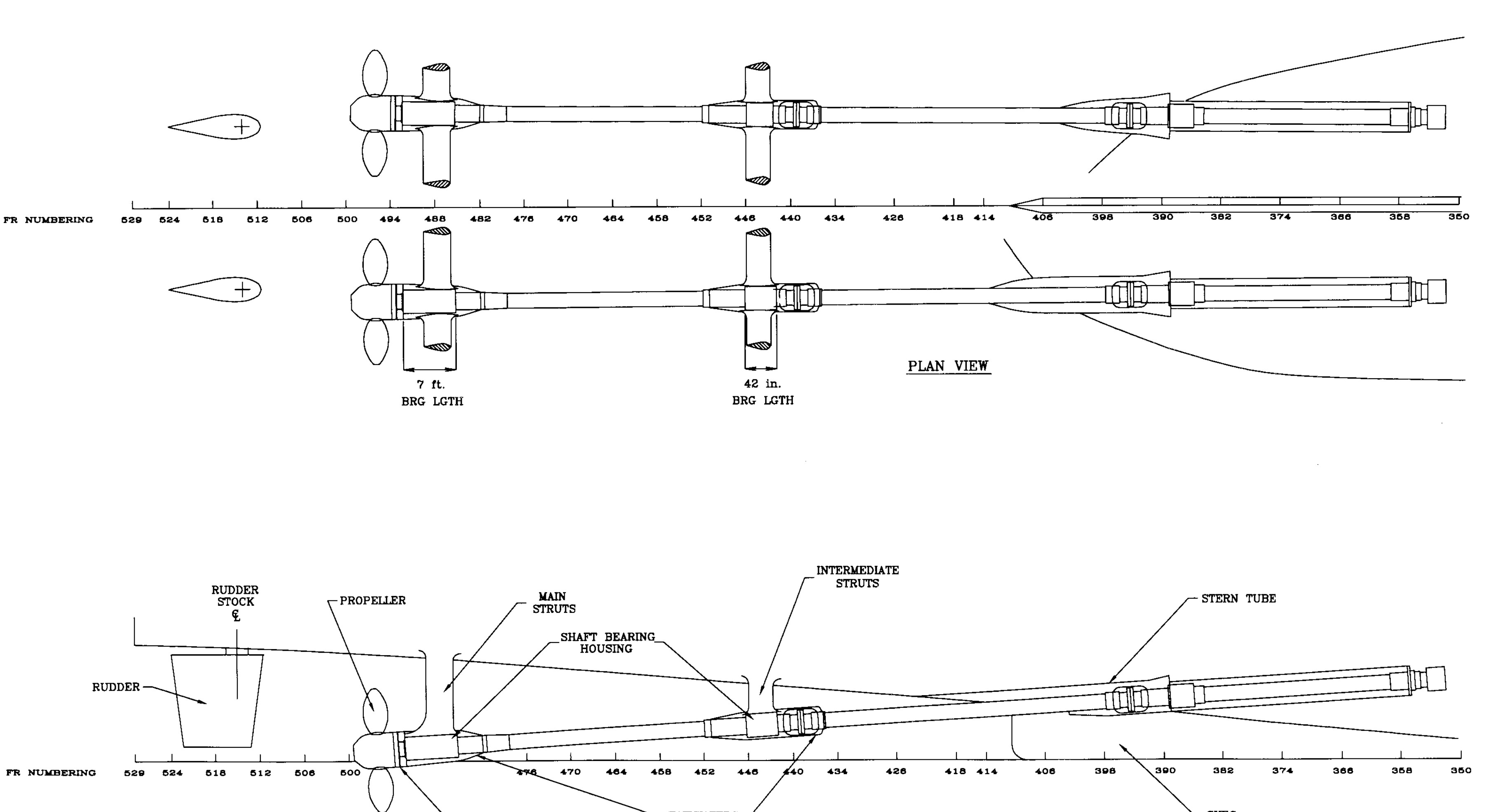


Figure 17-9.2 CG 47 Class Running Gear.

17-9.4 LEVEL 2 INSPECTION PROCEDURES.

17-9.4.1 Introduction.

17-9.4.1.1 This section contains Level 2 inspection procedures for the CG47 Class Ticonderoga Class Cruiser. The procedures are presented in the order in which the diver would find the components when making a stern-to-stem swim. The Dive Supervisor can refer back to Table 17-9.2 to pinpoint the exact location of a particular component.

17-9.4.1.2 The purpose of a Level 2 inspection is to conduct a detailed inspection of the malfunctioning or damaged component. The diver must gather sufficient information for further evaluation. For this reason, the diver must make precise measurements and record the exact coordinates of any discrepancies that require further repair. The drawings in this chapter can be photocopied and marked to show the location and extent of damage. The diver can also refer to the appropriate forms for recording damage on certain types of systems. Underwater color video and/or photography should also be used to further depict the damage described on the report and on the forms.

17-9.4.2 Hull Coating and Hull Plate.

17-9.4.2.1 The purpose of a Level 2 hull coating and hull plate inspection is to accurately assess the extent of known or suspected damage resulting from collision, grounding, or other mishap. The inspection requires a detailed description (with measurements) of the exact location and extent of all damage.

17-9.4.2.2 Damage Description Requirements.

17-9.4.2.2.1 Report all areas, size, and location of paint damage, areas of exposed metal, and condition of surrounding paint. Use definable reference points such as suctions, discharges, bilge keel, flat bottom, turn of the bilge, etc.

17-9.4.2.2.2 Hull plate damage must be detailed in terms of the amount of distortion, orientation, and size, length, and maximum width of cracks or gouges; proximity and orientation of closest weld seams; torn or missing plate; and condition of exposed stiffeners and framing.

17-9.4.2.2.3 Damage at or near the keel must include a detailed inspection of the keel. Locate and measure any cracks or distortion.

17-9.4.2.2.4 Example of Report. "10-foot by 35-foot damaged area running fore and aft, 15 feet outboard port of the keel beginning 38 feet aft of the rodmeter. Damage begins with an area of scraped paint, approximately 10 feet long, and continues to a maximum plate distortion of four inches by six feet wide by 20 feet long, 50 percent bare metal, no visible hull plate cracks, no suctions or discharges are located in the damaged area."

17-9.4.2.3 Inspection Procedure.

17-9.4.2.3.1 Gross Damage Assessment.

a. Conduct a quick inspection of the damaged area and immediate surrounding area.

   (1) Inspect the condition of the hull paint and locate the closest hull appendages and openings.

   (2) If only paint damage has occurred, report the size and location; if distorted, gouged, or cracked metal is found, continue with the detailed inspection.

   (3) Measure extent of pitting: percent, diameter, and depth.

17-9.4.2.3.2 Detailed Damage Inspection.

a. Thoroughly inspect all damaged areas: length, width, and orientation of all cracks, area of distorted or missing hull plate, maximum depression of plate, presence of torn or bulging plate.

b. If hull plate is torn or missing, report condition of all exposed framing.

NOTE

Damage at or near the keel is a serious casualty. Exact details of the condition are required to determine the seaworthiness of the hull.

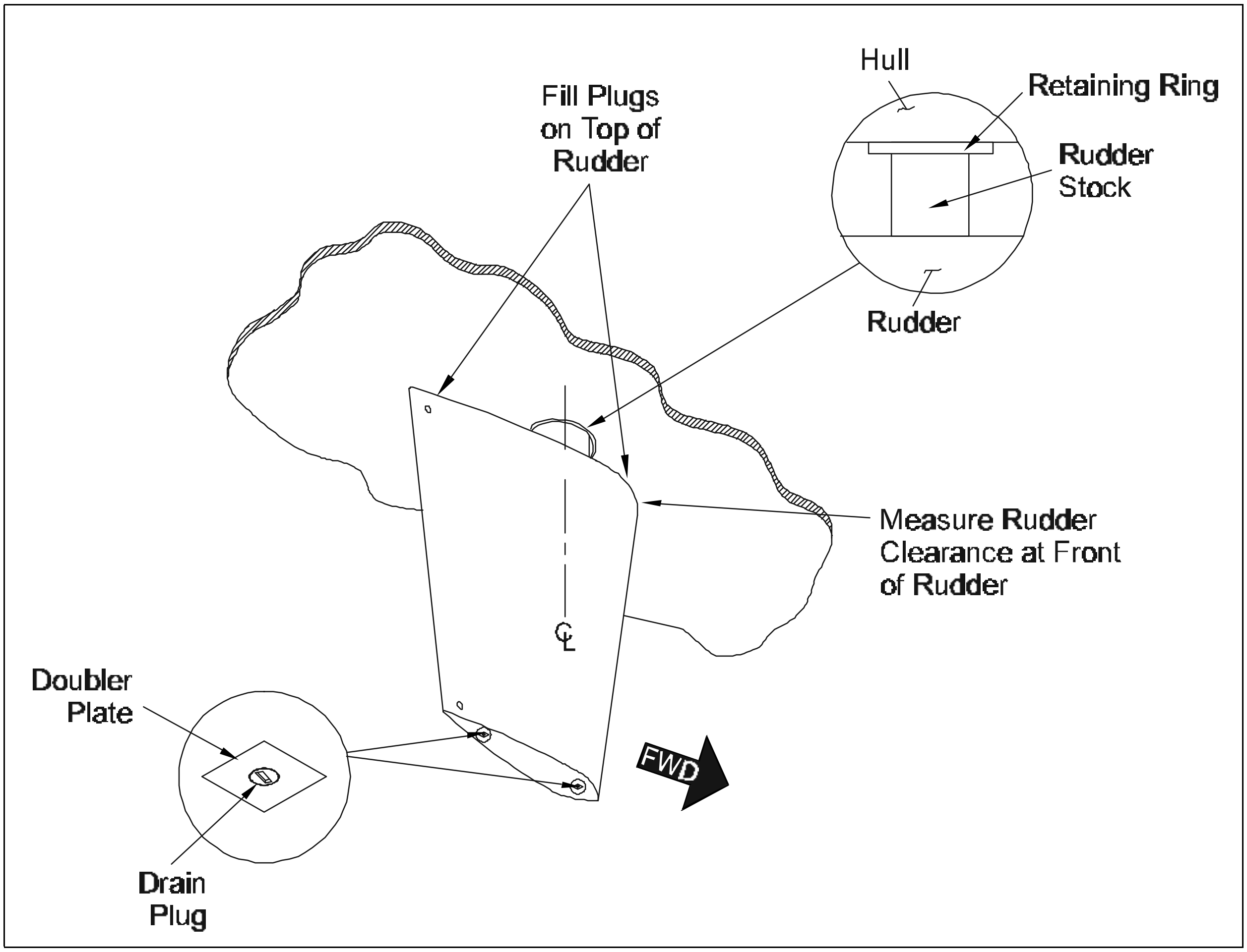


Figure 17-9.3. Spade Rudder without Stool.

17-9.4.3 Rudder.

17-9.4.3.1 Damage Description Requirements.

17-9.4.3.1.1 Inspection of rudders requires a detailed description (with measurements) of the exact location and size of all corrosion, damage, and flaws. As a minimum, the description must include:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference point (top/bottom/side/leading edge).

b. Length, maximum width, and orientation of all cracks; give closest weld seam information, include the direction of the crack with respect to the weld (perpendicular or parallel) and the proximity of the crack to the weld (center of weld, base metal). If cracks are found in or near any clad welding, describe the location with respect to the cladding (center, edge, parallel to weld bead, etc.).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage.

e. PDR and FR.

17-9.4.3.1.2 Example of Report. "Pitting on leading edge of port rudder, inboard side, starting 30 inches from forward bottom, 6-inch by 8-inch area. Maximum pit depth: 1/8-inch depth by 1/4-inch diameter. Average pit depth: 1/8-inch depth by 1/4-inch diameter."

17-9.4.3.2 Inspection Procedure. See Figure 17-9.3.

a. Inspect the rudder stock area.

  (1) Inspect rudder and around the rudder stock for fouled wire, rope, or other foreign material.

b. Measure the rudder clearance.

  (1) With the rudder amidships take the clearance measurement between the top of the rudder (at the forward most point of the rudder) and the hull. Design clearance measurement is 2 5/8 inches.

  (2) Verify that the two fill plugs on top of the rudder are present and secure.

c. Inspect the rudder surface.

  (1) Determine the overall FR of the rudder. If the FR is 40 or greater, inspect for clean areas which indicate areas of recent damage from grounding or contact with submerged objects. If any such areas are found, thoroughly inspect for cracks, dents, or gouges.

  (2) Conduct a detailed inspection of the rudder surface for any cracked welds, marks, gouges, or scrapes. Inspect for areas of bleeding rust and bare metal.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

  (3) Verify that the drain plug on bottom of the rudder is present and secure.

  (4) Report the FR and the PDR.

d. Sound the rudder.

  (1) Using a rubber or rawhide mallet, rap on the rudder surface to determine if the rudder has flooded. Begin sounding near the uppermost part of the rudder and continue downward to the lowest point.

NOTE

Internal framing and stiffeners will change the sound. It is necessary to sound the rudder in different locations. A hollow sound indicates the rudder is not flooded, while a dull sound indicates flooding.

  (2) If the rudder is found to contain water, conduct a detailed inspection to locate the source of flooding. Inspect all plugs for tightness and inspect weld seams for cracks. Make the appropriate report and arrangements for follow-on dewatering and repair.

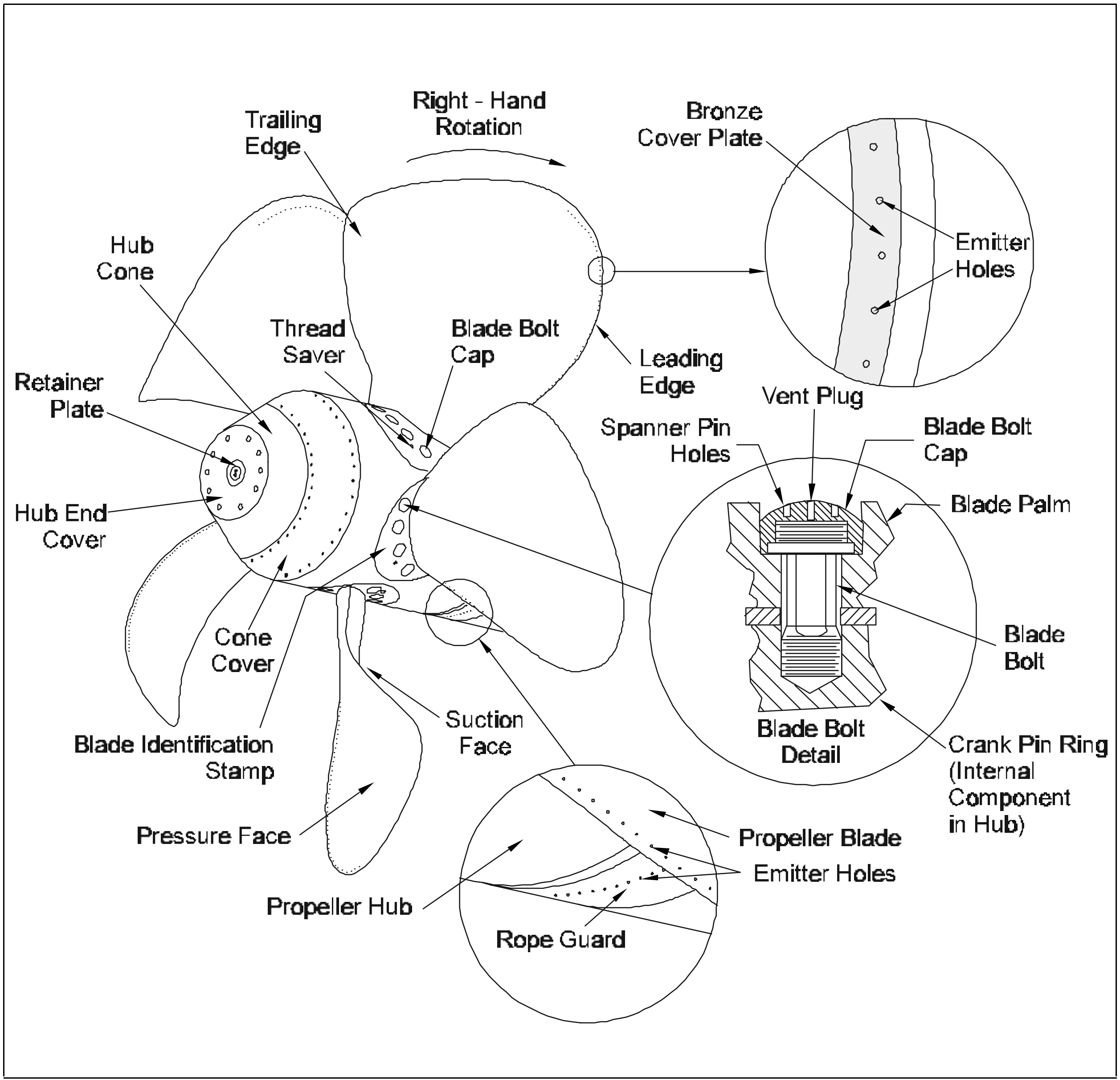


Figure 17-9.4. Controllable Pitch Propeller with Prairie Air System.

17-9.4.4 Propeller (5-Bladed).

17-9.4.4.1 Damage Description Requirements.

17-9.4.4.1.1 The inspection of a propeller requires a detailed description (with measurements) of the exact location and size of any damage, flaws, cracks, porosity, curls, bends, or cavitation erosion. Cavitation erosion results from the rapid formation and collapse of water vapor bubbles on the propeller surfaces while underway. This damage results in a porous, sponge-like, pitted metal surface. Heavy localized concentrations of eroded areas should be interpreted as cavitation erosion.

17-9.4.4.1.2 Propellers are subject to two kinds of cavitation erosion: one caused by propeller damage and the other by design or operating conditions. Therefore, if cavitation damage is found, inspect for the cause. The irregularity ahead of the eroded area can be a nick, gouge, or other damage in the leading edge or a leading edge radius that has been improperly cleaned or finished, leaving flat spots or other unfairness.

17-9.4.4.1.3 Do not confuse cavitation erosion with porosity. Porosity is common and is a manufacturing defect. Porosity will likely be coupled with fouling. Cavitation is uncommon and is often characterized by a trace of worn away metal (area is clean) in the direction of water flow. Porosity is often sharp-edged, whereas cavitation erosion (unless severe) is not.

17-9.4.4.1.4 Damage location descriptions must include reference to obvious points and must use standard nomenclature. Following is a list of common propeller terms:

a. *Blade number*. Both port and starboard propeller blades are numbered in the opposite direction of rotation (when viewed from astern) using letters “A” through “E.” These letters are stamped on the flat surface blade hub flange near the flange edge outboard (12 o’clock position) of the blade bolts.

b. *Blade palm*. The round portion of the propeller blade that bolts to the hub (also referred to as the blade flange).

c. *Blade bolt cap*. A protective cover installed over the blade bolt.

d. *Pressure face*. The portion of the blade that faces aft.

e. *Suction face*. The portion of the blade that faces forward.

f. *Leading edge*. The heavy, thick, more rounded portion of blade closest to the forward end of the hub.

g. *Trailing edge*. The thinner, sharper portion of blade closest to the aft end of the hub.

h. *Fillets*. The area at the base of each blade where the pressure and suction faces are blended into the flange contour (the intersection between the flange and the blade).

i. *Blade tip*. The outermost edge of the blade.

j. *Emitter holes*. Holes drilled into a channel near the leading edge that distribute the prairie masker air.

k. *Hub cone*. A fairing bolted to the aft end of the hub which provides a smooth hydrodynamic flow.

l. *Hub cone cover plate*. Fairing plates that are installed over the bolts used in the attachment of the hub cone to the hub.

m. *Hub end cover*. Aft end of the hub cone cover assembly used to distribute the prairie air past the check valve through the hub cone cover and hub and then out to the blades.

n. *Retainer plate*. This plate is threaded into the hub end cover and retains the prairie air adapter plug.

o. *Prairie air adapter plug*. This plug is threaded into the retainer plate and provides access to the check valve.

17-9.4.4.1.5 It is important that the diver accurately report the size and extent of any damage. The report must reflect an accurate measurement of the area for cavitation erosion, porosity, curls, bends, scrapes, cracks, nicks, gouges, and the maximum width and length of any cracks.

17-9.4.4.1.6 Example of Report. “Blade D, trailing edge, 2 feet from blade palm, 1/8-inch deep by 1-inch long nick. Evidence of cavitation erosion on the suction face, starting 4 inches in from the nick. Erosion damage covers a 2-inch by 4-inch area.”

17-9.4.4.1.7 NAVSEA Form 4730/6 (NSN 0116-LF-047-3035) Propeller Inspection Data should be used to record results.

17-9.4.4.2 Inspection Procedure.

17-9.4.4.2.1 Gross Damage Assessment.

a. Conduct a quick inspection of all surfaces.

(1) Make note of the overall FR and look for areas of obvious damage (bends, cracks, curls, gouges, and nicks) that indicate the propeller may require changing.

(2) For moderately or heavily fouled propellers (FR 40 or greater) look for clean areas that indicate recent damage (contact with an object or grounding, or areas of cavitation erosion). If evidence of cavitation erosion is discovered, carefully inspect the area ahead of the erosion for any irregularities (nicks, flat spots, etc., in the leading edge).

b. Inspect the propeller hub for fouled wire, rope, or other foreign material. Fiber such as fish netting or manila line may be removed without difficulty. If removal of the material will be excessively time consuming, make the appropriate report and arrangements for follow-on removal.

c. Conduct a detailed inspection of any obvious major damage and thoroughly document the type, size, and location of the damaged area.

17-9.4.4.2.2 Detailed Damage Inspection.

NOTE

If the FR of the propeller is 40 or greater, the propeller must be cleaned prior to conducting the detailed inspection unless the decision is made that, due to obvious damage, the propeller blades require replacement.

a. Inspect the entire surface of the propeller hub. Inspect for cable marks, scratches, cracks, curls, gouges, porosity, and cavitation erosion. Particular attention must be given to any cracks to determine whether it is one crack, or cracks that run completely around the hub. Record the exact location, size, and orientation of any such cracks.

b. Inspect the blades.

NOTE

Report the exact location and extent of damage as it is found. A running log of the inspection must be maintained by the log keeper to ensure accuracy.

(1) Inspect the overall physical appearance and FR of each blade, pressure and suction faces, starting with blade “A.”

(2) Inspect the tip and leading and trailing edges of each blade for nicks, curls, chips, dents, flat spots, cracks, or other apparent damage. Cracks may be found in the edges and tips without any evidence of impact in the area. They can be caused by local vibration, stress corrosion cracking, or residual stresses in the blades.

NOTE

Pay particular attention to areas of the blade where repairs have been made (areas of discoloration caused by welding). Thoroughly inspect these areas for the presence of cracks.

(3) Verify that two 1 1/4-inch thread savers installed in the lifting bolt holes (180° on each side of each

blade) are in place on the blade palm.

(4) Verify that the blade bolt caps (four on each side of each blade) are secure and in place.

(5) Inspect the hub for debris, cavitation damage, and leaking hydraulic oil.

(6) Inspect the cone cover plates for damage, loose or missing plates, and loose or missing fasteners. Each cone cover plate is secured with twenty 1/2-inch cap screws.

(7) Inspect the hub cone for damage and leaking hydraulic oil.

(8) Inspect the hub cone end cover plate for loose or missing fasteners and leaking hydraulic oil. There are 10 1-inch cap screws.

(9) Inspect the retainer plate for loose or missing fasteners and leaking hydraulic oil. There is one 5/16-inch socket set screw.

(10) Inspect the prairie air adapter plug for loose or missing fasteners and leaking hydraulic oil. There are two 1/2-inch socket screws and one 3/8-inch socket set screw.

(11) Inspect the suction (forward) and pressure (aft) face of each blade for defects caused by cavitation. Cavitation damage can be identified by an area of small pocked holes or a rough-textured surface.

(12) Inspect the prairie air channel cover plate on the blade pressure (aft) face for damage or cracked welds. The cover plate is 1 1/2 inches wide and is located 3/8 of an inch from the leading edge, starting at the hub. Inspect both the pressure (aft) and suction (forward) face emitter holes for fouling. The prairie air propeller blades have 270 3/64-inch diameter emitter holes; 120 on the suction (forward) and 150 on the pressure (aft) sides. On both sides, the holes begin 4 inches from the hub and continue to 5 inches past the vertical blade centerline, 3/4 inch from the leading edge. On the suction side, they are evenly spaced 1 inch apart. On the pressure side, they are variably spaced, with the first 31 holes spaced 1/2 inch apart, the next 88 holes spaced 1 inch apart, and the remaining 31 holes spaced 1/2 inch apart. To function properly, these emitter holes must be free of fouling.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively fouled, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Record the overall FR of the propeller.

d. If any discrepancies are found, make the appropriate report and arrangements for follow-on cleaning and/or repair.

17-9.4.4.2.3 Detailed Inspection of the Propeller Prairie Air System.

NOTE

Before proceeding with the next step, verify that there is sufficient depth between the tip of the lowermost blade and the bottom. A minimum of 5 feet is required to prevent mud or silt from being sucked into the air emitter holes.

NOTE

Performance of the following procedure requires that the dive station have, as a minimum, sound powered communications with Ship's Force personnel.

NOTE

When the diver reports "ready," the Dive Supervisor will have Ship's Force apply low pressure air so that a thorough inspection of the prairie air system can be conducted.

WARNING

Rotating the propeller while divers are in the vicinity may cause serious injury or death. Ensure that the propeller is rotated only at the direction of the Dive Supervisor.

NOTE

Insufficient flow of air to the lower blades may require jacking the shaft over to reposition each blade for the inspection. If air flow is too great to observe individual holes, Ship's Force can decrease the flow.

a. Gross damage assessment.

(1) Begin the inspection procedure by conducting a quick inspection of the system for air leakage other than from the air emitter holes. Check the propeller hub end cover, blade palms, and the air channel weld seams.

(2) Note the general dispersion of air so that areas that appear below normal can be concentrated on during the detailed inspection of each blade. Use a wood block, bronze or Lexan scraper, or a "greenie" to remove light fouling in areas where the holes appear to be fouled.

b. Detailed inspection of the air emitter holes.

(1) Beginning with blade "A," start at the hub of the propeller and conduct the inspection toward the tip.

(a) Inspect to determine that the first five emitter holes are clear of fouling.

(b) Working toward the blade tip, inspect in 10-hole segments. Report the number of holes fouled per 10-hole segment. NAVSEA S9245-AR-TSM-010/PROP, *Technical Manual for Marine Propeller Inspection, Repair and Certification,* stipulates that no more than two holes in any series of 10 may be fouled, and that no two adjacent holes may be fouled.

(c) At the blade tip, inspect to determine that the last five holes are clear of fouling.

NOTE

The maximum allowable number of fouled holes for each blade is 14.

(2) Repeat the inspection process for the remaining propeller blades.

(3) Secure the air flow to the emitter system.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on cleaning and/or repair.

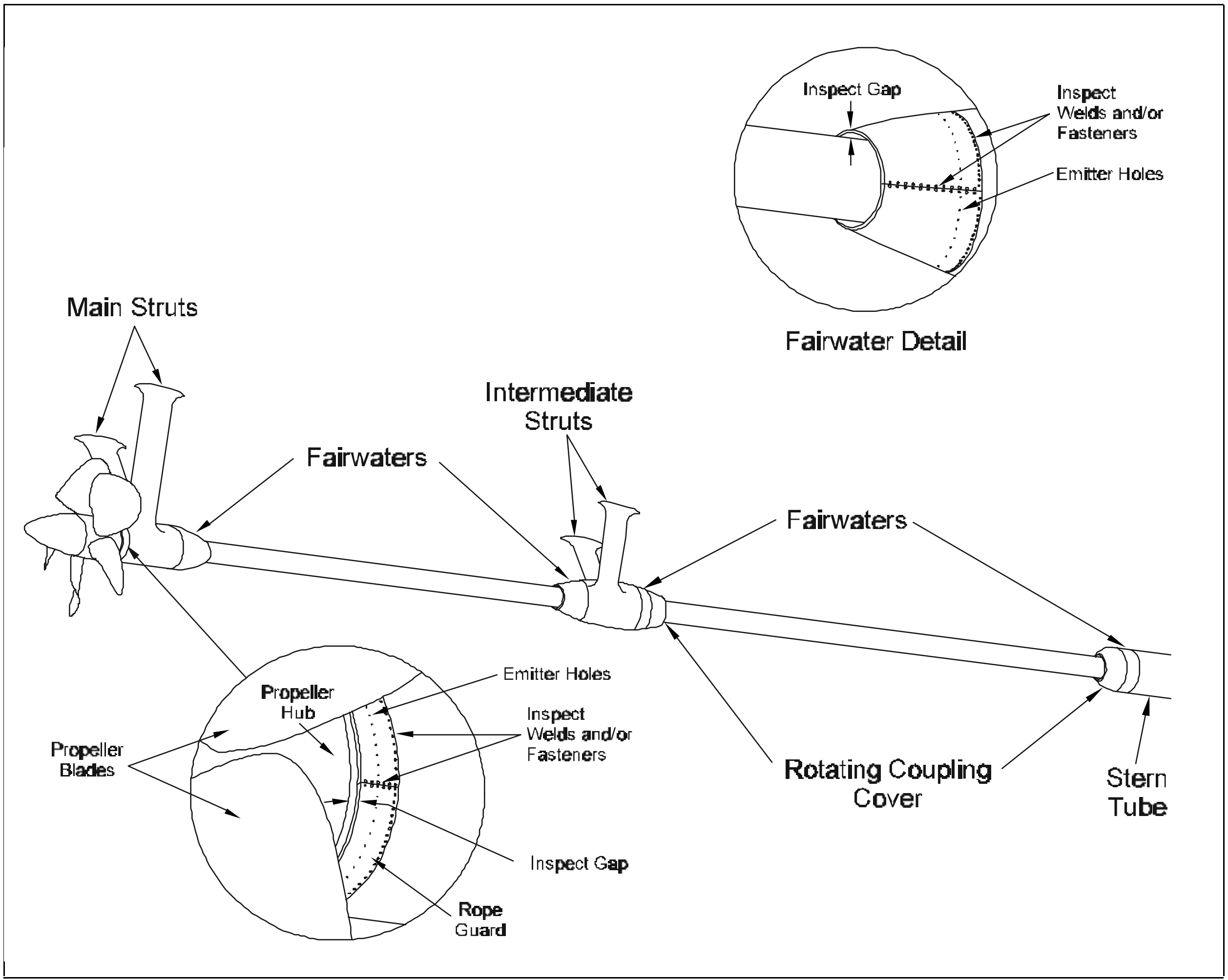


Figure 17-9.5. Main Strut, Intermediate Strut, Shaft, Stern Tube, Rope Guard and Fairwaters.

17-9.4.5 Main Propulsion Assembly (Main Strut, Intermediate Strut, Shaft, Stern Tube, Rope Guard, and Fairwaters).

17-9.4.5.1 Damage Description Requirements.

17-9.4.5.1.1 General condition or damage assessment of the main strut, shaft, stern tube, rope guard, and stern tube requires a detailed description (with measurements) of the exact location and size of any damage or flaws. The description must include:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information: the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage.

e. Exact location and size of all coating damage, tears, or delaminations on the shaft.

17-9.4.5.1.2 Example of Report. "Port shaft, 6 feet 9 inches forward of the strut fairwater, longitudinal gouge in fiberglass coating 2 inches wide by 1 foot long, bare metal showing; subsurface delamination 6 inches by 6 inches, centered on a rust stain, located by sounding."

17-9.4.5.2 Inspection Procedure.

a. Main strut assembly (struts, bearing housing, rope guard, and fairwaters)

(1) Inspect the main strut columns (inboard/outboard) and bearing housing for corrosion, damage, and the presence of wire or other foreign material.

(a) At best, the surface of the struts will be very rough due to previous damage or repairs.

(b) Inspect for loose or mixing epoxy.

(2) At the strut/hull interface, inspect the strut columns, doubler plates and immediate area hull plate for cracked welds, corrosion, and damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of the damage.

(3) Verify the presence of the four evenly spaced 1 inch plugs on the top, and the four evenly spaced 1 inch plugs on the bottom of the bearing housing. Ensure that they are flush and staked at a minimum of two places.

(4) Verify that the rope guard is present.

NOTE

A missing rope guard is a serious casualty.

(a) This ship class has steel rope guards with prairie air which are welded on. Inspect for any apparent damage and for the presence of fouled wire, rope, or other foreign material.

(b) Use a diver's light or diver-held video equipment light to inspect the area between the propeller hub and the strut bearing housing.

(c) Inspect the rope guards for cracked welds.

(d) Verify that there is a uniform gap all around between the propeller hub and the rope guard by taking measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is 1 inch.

(5) Verify that the fairwater is present.

NOTE

A missing fairwater is considered a serious casualty.

(a) This ship class has steel fairwaters with prairie air which are welded on. Inspect for any apparent damage and for the presence of fouled wire, rope, or other foreign material.

(b) Inspect the fairwater for cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(c) Verify that there is a uniform gap between the fairwater and the shaft by taking clearance measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is 1 inch.

(6) Inspect and report the FR and the PDR of the main strut columns, immediate hull plate area, bearing housing, rope guard, and fairwater.

(7) If discrepancies are found, measure the exact location and size, then make the appropriate report and arrangements for follow-on repair.

(8) Inspect the rope guard and main strut fairwater prairie air system.

NOTE

Performance of the following procedure requires that the dive station have as a minimum, sound powered communications with Ship's Force personnel.

NOTE

When the diver reports "ready," Dive Supervisor will have Ship's Force apply low pressure air so that a thorough inspection of the prairie air system can be conducted.

(a) Begin the inspection procedure by conducting a quick inspection of the system for air leakage other than from the air emitter holes.

NOTE

If air flow is too great to observe individual holes, Ship's Force can decrease the flow.

(b) Note the general dispersion of air so that areas that appear below normal can be concentrated on during the detailed inspection. Use a wood block, bronze or Lexan scrapper, or a "greenie" to remove light fouling in areas where the holes appear to be fouled.

(c) Beginning with the upper half of the rope guard, inspect to determine the emitter holes are clear of fouling.

(d) Repeat the inspection process for the air emitter holes on the lower half of the rope guard.

NOTE

The maximum allowable number of fouled holes for each rope guard half is 5 percent of the total number of holes.

(e) Secure the air flow to the emitter system.

(f) If any discrepancies are found, make the appropriate report and arrangements for follow-on cleaning and/or repair.

b. Shaft.

NOTE

Pay particular attention to the detection of damage or breaks in the covering in the area of shaft nearest the fairwaters and rotating coupling. Propeller shafts are covered with a hard metal sleeve at all bearing areas. The shaft coating at the sleeve ends are the most vulnerable areas of the waterborne shafting. Therefore, give special attention to the detection of breaks in the covering or leakage in the joint (rust stains) in these critical areas.

(1) Inspect the full length of all accessible glass-reinforced plastic (fiberglass) covering for evidence of deterioration, loss of adhesion, or any apparent physical damage.

(2) Inspect for loss of covering, cuts, tears, surface delaminations, and other damage.

(3) Inspect for rust stains indicating where corrosion has leaked through the covering near a cut, pinhole, area of porosity, patch, joint, or other flaw.

(4) Inspect for internal separation of the fiberglass covering from the metal shaft. Use a rubber or rawhide mallet to sound the covering at approximately 18-inch intervals along the length of the shaft.

(a) Rap the shaft in the 3, 6, 9, and 12 o'clock positions while holding the palm of one hand against the covering on the opposite side of the shaft. Continue sounding the shaft around and along its entire length.

NOTE

Discernible vibration, movement of the covering, or an audible, hollow sound is evidence of probable loose bond and must be explored or further examined. To determine the full extent of the damaged area, reduce the distance for sounding the shaft from 18 inches to 4 inches. The important criterion is to isolate and fully determine the extent of the damaged or delaminated area.

(5) If discrepancies are found, measure the exact location and size, then make the appropriate report and arrangements for follow-on repair.

c. Intermediate strut assembly.

(1) Inspect the intermediate strut columns and bearing housing for corrosion, damage, and the presence of wire or other foreign material.

(2) At the strut/hull interface, inspect the strut columns, doubler plates and immediate area hull plate for cracked welds, corrosion, and damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(3) Verify the presence of the three evenly spaced 1-inch plugs on the top and three evenly spaced 1-inch plugs on the bottom of the bearing housing. Ensure that they are flush and staked at a minimum of two places.

(4) Verify that the fairwaters are present.

NOTE

A missing fairwater is considered a serious casualty.

(a) This class ship has steel fairwaters forward and aft of the intermediate strut which are welded on. Inspect for any apparent damage and for the presence of fouled wire, rope, or other foreign material.

(b) Inspect the fairwaters for cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(c) Verify that there is a uniform gap all around between the fairwater and the shaft by taking clearance measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is 1 inch.

(5) Inspect and report the FR and the PDR of the intermediate strut columns, immediate hull plate area, bearing housing, rope guard, and fairwater.

(6) Continue the detailed inspection of the shaft between the intermediate strut and stern tube.

d. Stern tube and fairwater.

(1) Verify that the stern tube fairwater is present.

NOTE

A missing fairwater is considered a serious casualty.

(a) Inspect for any apparent damage and for the presence of fouled wire, rope, or other foreign material.

(b) Verify that the gap between the fairwater and the shaft is uniform all around by taking clearance measurements at the 3, 6, 9, and 12 o’clock positions. Design clearance is not less than 1/4 inch.

(2) Inspect and report the FR and the PDR of the stern tube, immediate hull plate area, and fairwater.

(3) If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

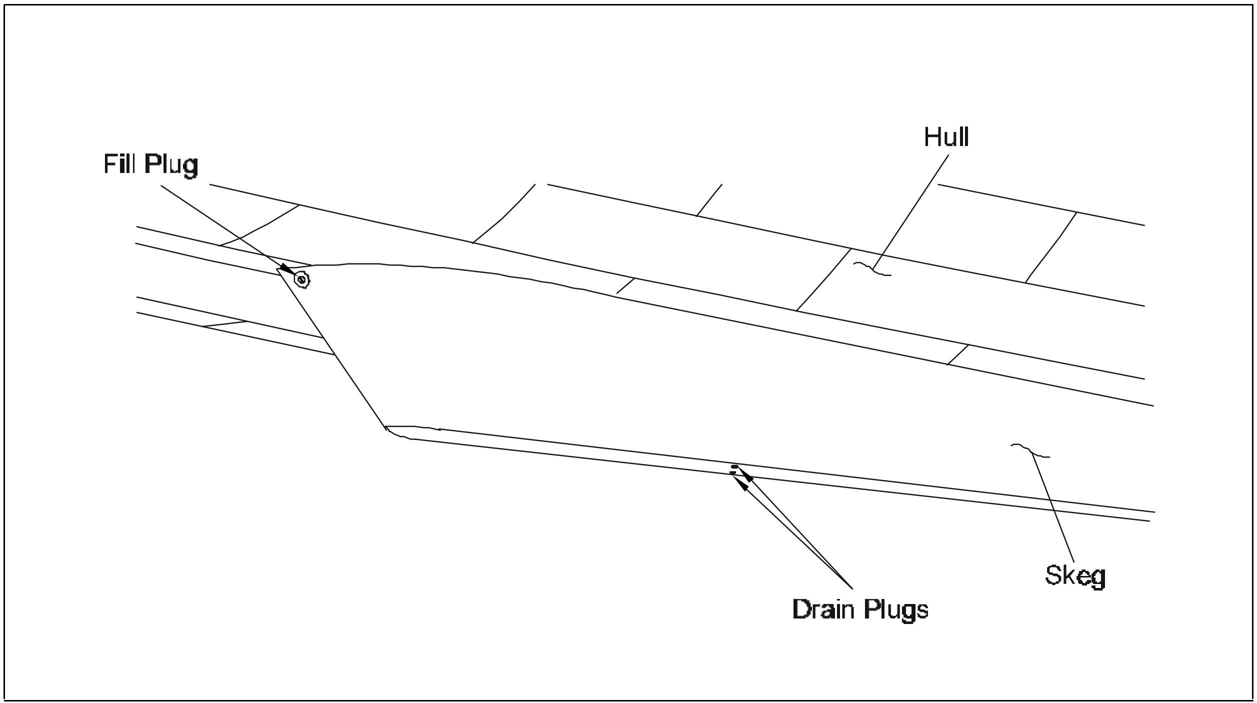


Figure 17-9.6. Skeg with Fill and Drain Plugs.

17-9.4.6 Skeg.

17-9.4.6.1 Damage Description Requirements.

17-9.4.6.1.1 Include the exact location and size of all damage or flaws. Description must include as a minimum:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information: the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage. For example: “Weld crack 1 foot long by 1/2 inch wide, port side, 18 feet forward of after end along the skeg/hull interface.”

17-9.4.6.2 Inspection Procedure.

a. Verify the presence of the fill plug (frame 411, starboard side, 6 inches forward of the upper trailing edge) and ensure that it has not backed out.

b. Verify the presence of the two drain plugs (six inches off centerline at the bottom of the skeg, frame 354, port and starboard) and ensure that they have not backed out.

c. Inspect the entire length of the skeg for dents, cracks, curled edges, or other apparent damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

d. Inspect and report the FR and the PDR.

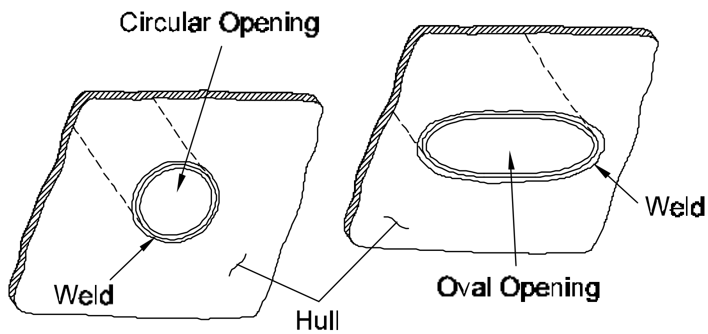


Figure 17-9.7. Seawater Discharge Openings.

17-9.4.7 Overboard Discharge.

17-9.4.7.1 Inspection Procedure.

a. Inspect for foreign material or corrosion damage.

b. Inspect and report the FR and the PDR.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

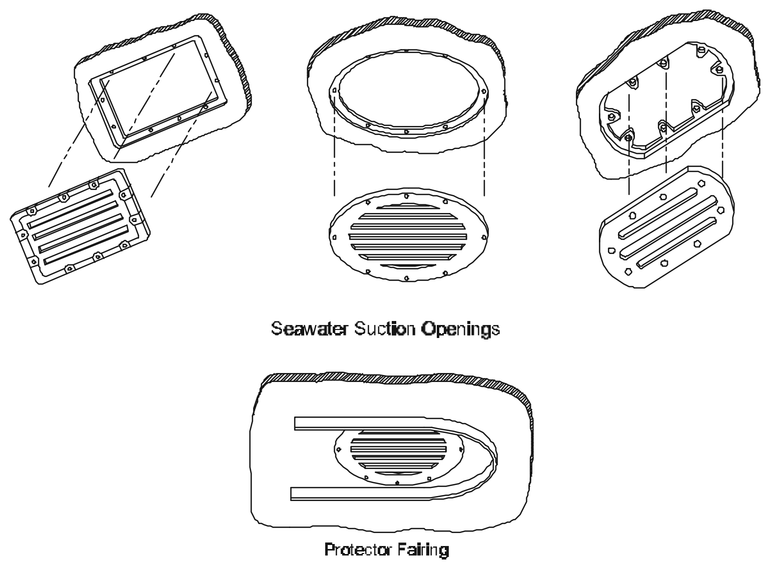


Figure 17-9.8. Seawater Suctions.

17-9.4.8 Sea Chest and Seawater Suction.

17-9.4.8.1 Inspection Procedure.

a. Clean and inspect screens or grates for clogged holes and loose or missing fasteners.

b. Inspect strainer bars for corrosion damage, broken or missing bars, cracked welds, and missing or loose fasteners.

c. Inspect and report the FR and the PDR.

d. If any discrepancies are found, make the appropriate report and follow-on arrangements for repair.

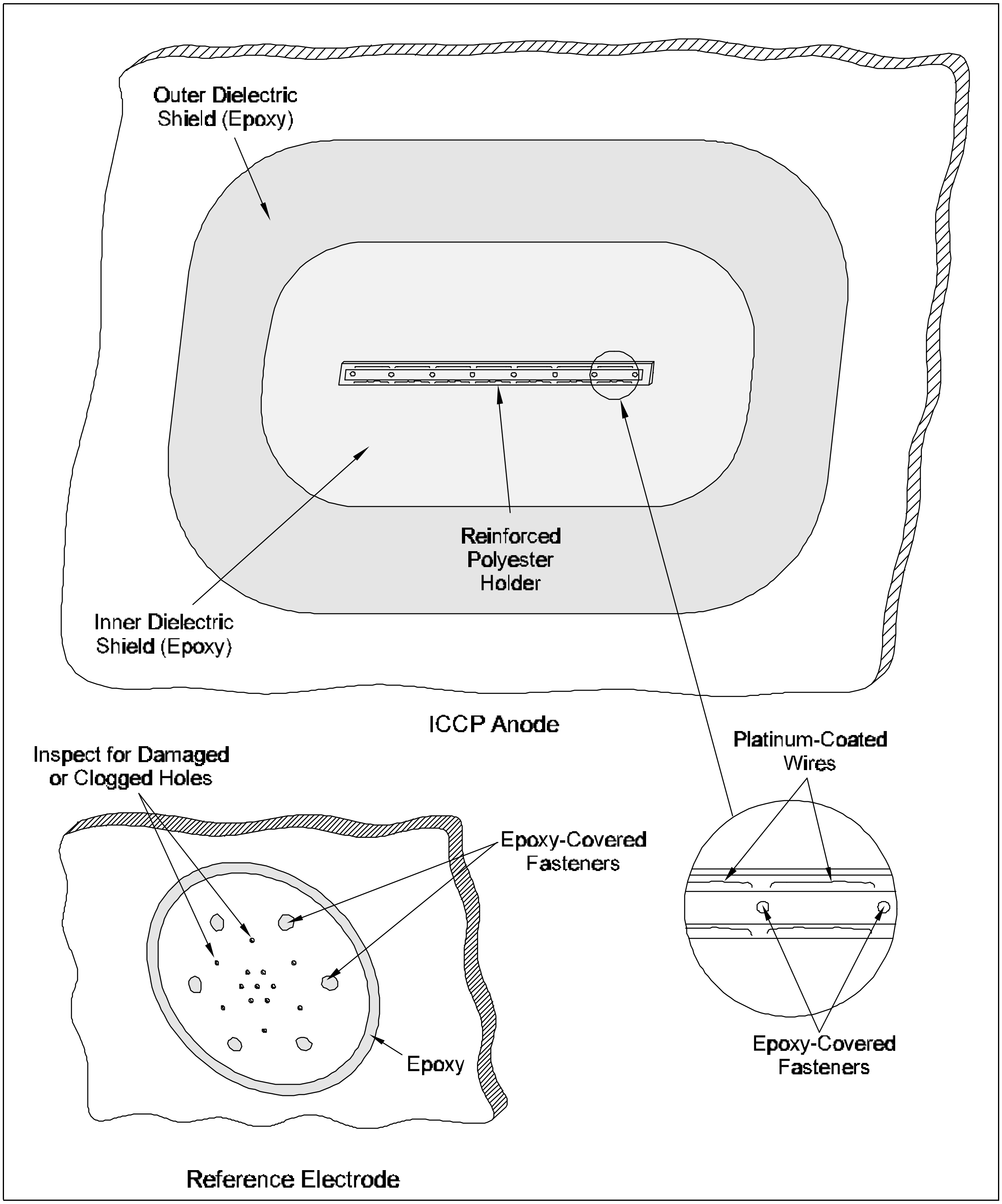


Figure 17-9.9. Impressed Current Cathodic Protection (ICCP) Anode.

17-9.4.9 Impressed Current Cathodic Protection (ICCP) Anode.

17-9.4.9.1 Inspection Procedure.

a. Begin the inspection procedure by conducting a quick inspection of the anode, dielectric shield, and the immediate hull plate area out to a distance of

20 feet. Inspect for obvious damage: large areas of bare metal, cracked, peeling, or blistered epoxy or paint, large areas of calcium buildup.

b. Conduct a detailed inspection of the anode.

(1) Inspect the anode for damage and missing or broken wires and missing or damaged platinum coating on the wires. Count the number of missing or broken wires. Report the position of each broken or missing wire relative to the center of the anode.

(2) Inspect the bond between the dielectric shield and the anode holder. Check that the dielectric shield is evenly faired up to the face of the anode and is not cracked or chipped.

NOTE

The presence of marine fouling indicates a non-functioning anode.

CAUTION

Avoid disturbing the white calcium buildup on the dielectric shield that protects areas of bare metal from corrosion.

c. Conduct a detailed inspection of the dielectric shield.

(1) Report the percentage of dielectric shield with calcareous deposits.

(2) Inspect the dielectric shield for chips, cracks, blisters, or missing epoxy.

(3) Report the percentage of deterioration of the dielectric shield.

(4) Inspect the hull coating in the area around the anode for missing or peeling paint or blisters. Inspect for calcareous buildup. Report the FR and the PDR.

17-9.4.10 Impressed Current Cathodic Protection (ICCP) Reference Electrode.

17-9.4.10.1 Inspection Procedure.

a. Inspect for damage, clogged holes, and loose or missing epoxy.

CAUTION

Do not attempt to unclog holes with any pointed objects. Potential damage to internal components may result.

b. Inspect and report the FR.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

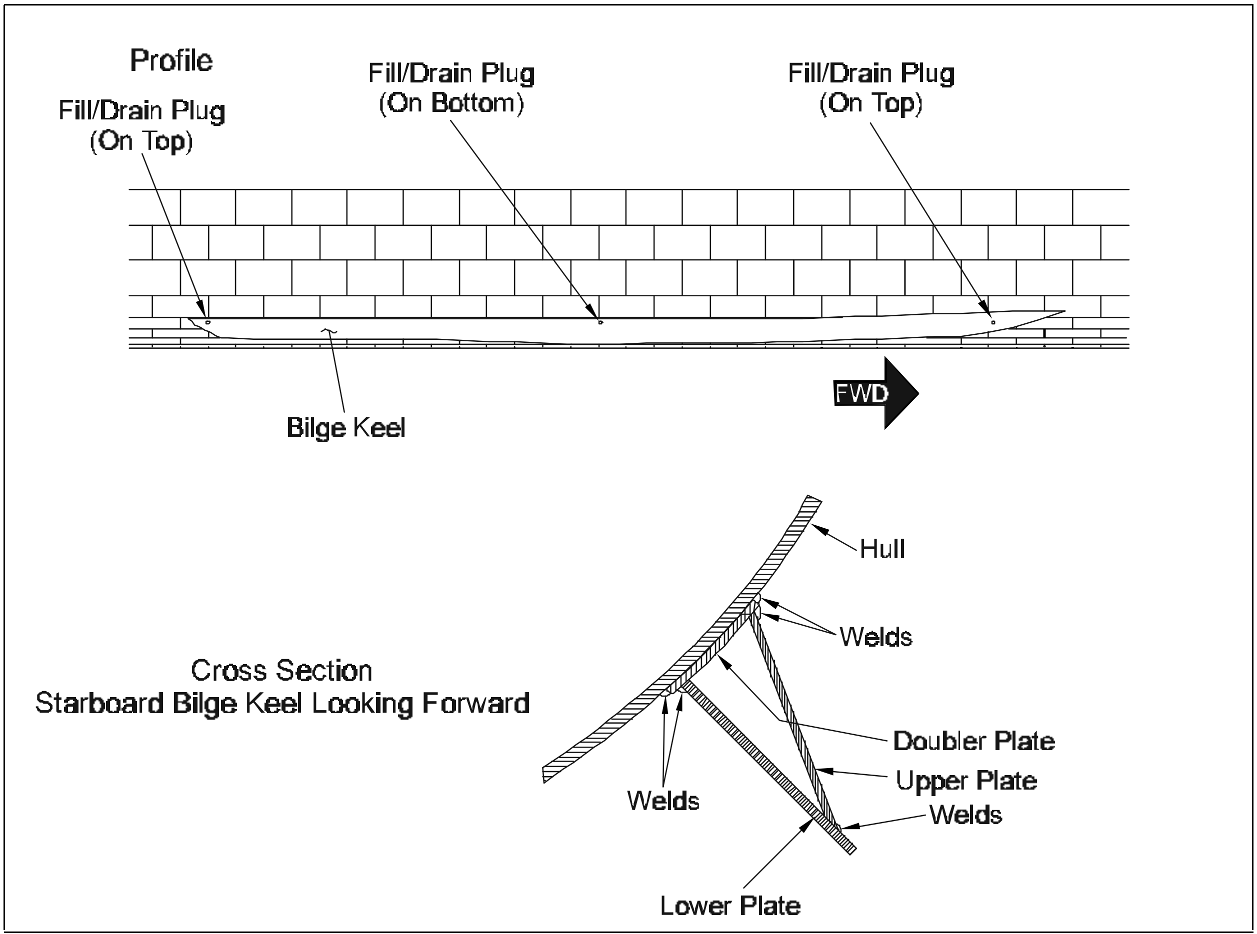


Figure 17-9.10. Bilge Keel.

17-9.4.11 Bilge Keel.

17-9.4.11.1 Damage Description Requirements.

17-9.4.11.1.1 Include exact location of all damage or flaws. Description must include as a minimum:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information; the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage. For example: “Port bilge keel, 1 foot long by 1/2 inch wide crack in weld between upper and lower plates located 18 feet forward of after end.”

17-9.4.11.2 Inspection Procedure.

a. Inspect the bilge keel for dents, cracks, curled edges, missing plate, or other apparent damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

b. Inspect for foreign material and loose or missing plugs. There are three 1-inch NPT fill/drain plugs located on each bilge keel. There are two plugs on the top located at frames 346 and 212, and one on the bottom at frame 288.

c. Measure and record the location of any damage.

d. Inspect and report the FR and the PDR.

e. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

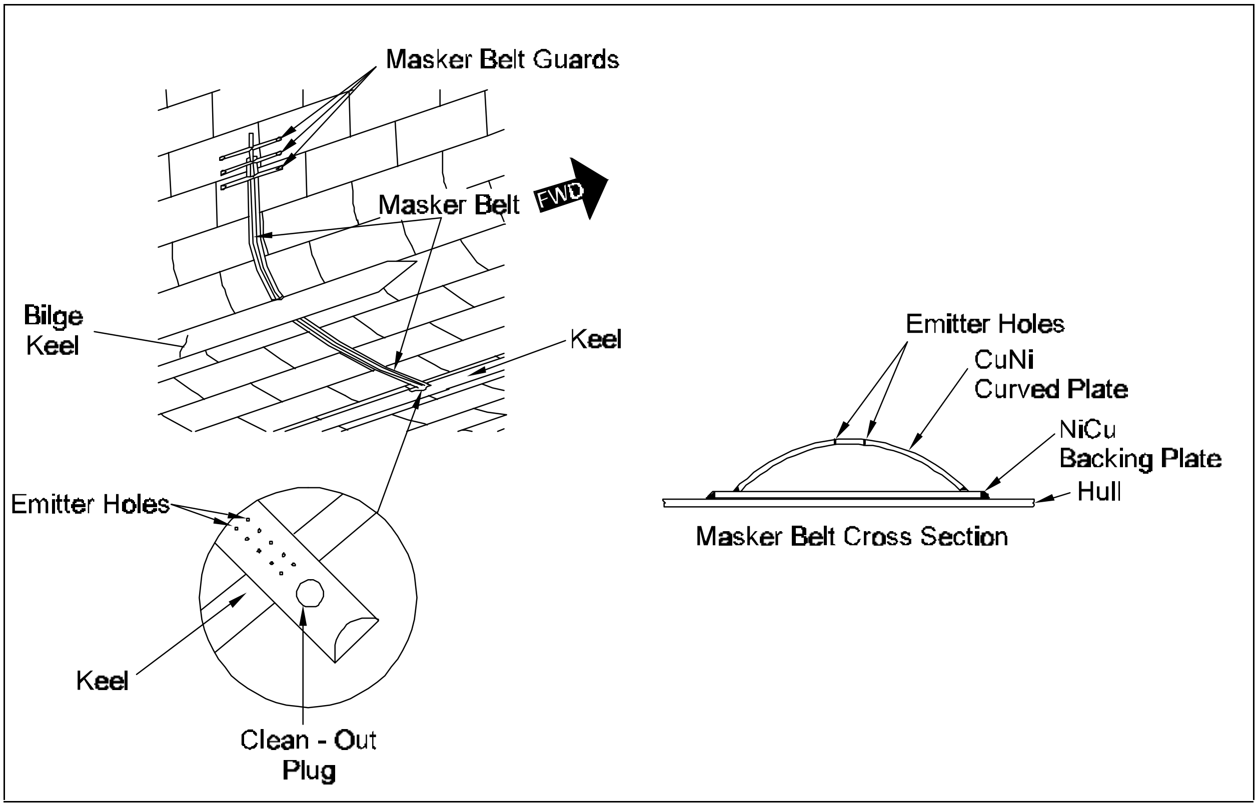


Figure 17-9.11. Masker Emitter Belt.

17-9.4.12 Masker Belt.

17-9.4.12.1 Damage Description Requirements.

NOTE

Emitter hole blockage is difficult to inspect. Checking for blockage when the ship is pier side is not recommended. Procedures for assessing blockage by measuring flow rate while the ship is underway are detailed in the shipboard PMS. Diver cleaning procedures are provided in NAVSEA S0600-AA-PRO-050.

17-9.4.12.1.1 Inspection of masker belt systems requires a detailed description (with measurements) of the exact location and size of any damage or flaws. As a minimum, the description must include:

a. Identity of masker belt emitter system (forward/aft, port/starboard, frame number).

b. On the backing plate, the length, maximum width, and orientation of all cracks, including closest weld seam information. Also include the direction of the crack with respect to the weld (perpendicular or parallel) and the proximity of the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or any other damage. Take all measurements from the keel up.

17-9.4.12.1.2 Location must include reference to obvious points and use standard nomenclature. Following is a list of common terms used by the diver to describe the location of damage.

a. *Backing plate*. A flat plate welded to the hull to which the rolled emitter plate is welded.

b. *Air emitter tube*. A rolled Cu-Ni pipe welded to the backing plate. The tube contains 3/64-inch aft starboard emitter system.

17-9.4.12.1.3 Example of Report "3-inch horizontal crack in the weld seam of two sections of the rolled plate of the air emitter tube, aft starboard masker emitter system."

17-9.4.12.2 Inspection Procedure.

17-9.4.12.2.1 Gross Damage Assessment.

a. Begin the inspection procedure by conducting a quick inspection of the masker belt and surrounding hull plate area.

b. Make note of the overall FR and the PDR and look for areas of obvious damage (crushed, twisted, or missing sections of masker belt).

17-9.4.12.2.3 Detailed Damage Inspection.

a. Inspect for crushed, cracked, or missing masker belt.

b. Starting at the keel, inspect the full length of weld between the backing plate and the hull and the weld between the Cu-Ni masker air channel and backing plate.

c. Inspect the 3/64-inch emitter holes for fouling. Emitter holes are spaced in sections and the spacing varies in density for each section.

d. Inspect for a loose or missing 1 1/4-inch NPT clean-out plug located 2 1/2 inches from the keel termination.

e. Inspect and report the FR and if painted, the PDR.

f. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

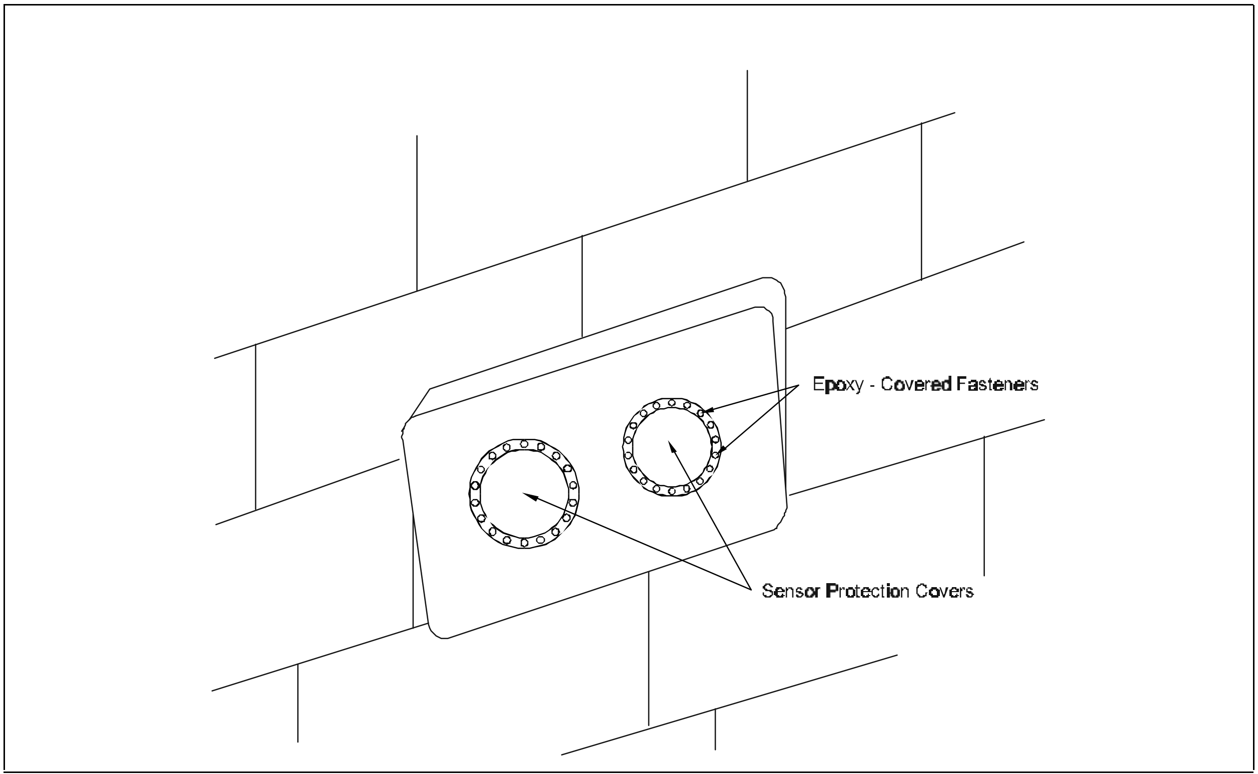


Figure 17-9.12. Transducer.

17-9.4.13 Transducer.

17-9.4.13.1 Damage Description Requirements.

17-9.4.13.1.1 Inspection of transducers requires a detailed description (with measurements) of the exact location and extent of all damage and flaws. As a minimum, the description must include:

a. Length, maximum width, and orientation of all cracks or flaws in the sensor cover.

b. Total area affected, including the diameter and depth of any pitting. Also include both the maximum and average pit size.

c. Area and location of corrosion or any other damage. It is important that the diver accurately report the size and extent of any damage. The report must reflect an accurate measurement of the damage. For example: "1-inch by 2-inch diagonal gouge on sensor cover, maximum depth 1/16 inch located at the 8 o'clock position."

17-9.4.13.2 Inspection Procedure.

a. Begin the inspection procedure by conducting a quick inspection of the transducer and the surrounding hull plate area.

   (1) Make note of the FR and the PDR of the immediate hull plate area and look for areas of obvious damage or flaws.

17-9.4.13.2.1 Detailed Damage Inspection.

a. Conduct a detailed inspection of the entire transducer assembly.

   (1) Using a "greenie," gently scrub light fouling off the sensor head and inspect the sensor protective covers.

   (2) Inspect rubber covers for tears, cracks, scrapes, or gouges.

(3) Inspect for signs of structural failure or damage caused by contact with underwater objects.

(4) Inspect for loose or missing fasteners.

(5) Verify the presence of the 3/4-inch thread savers around the perimeter of the sensor flanges; ensure they are present and have not backed out.

(6) Inspect and report the FR.

b. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

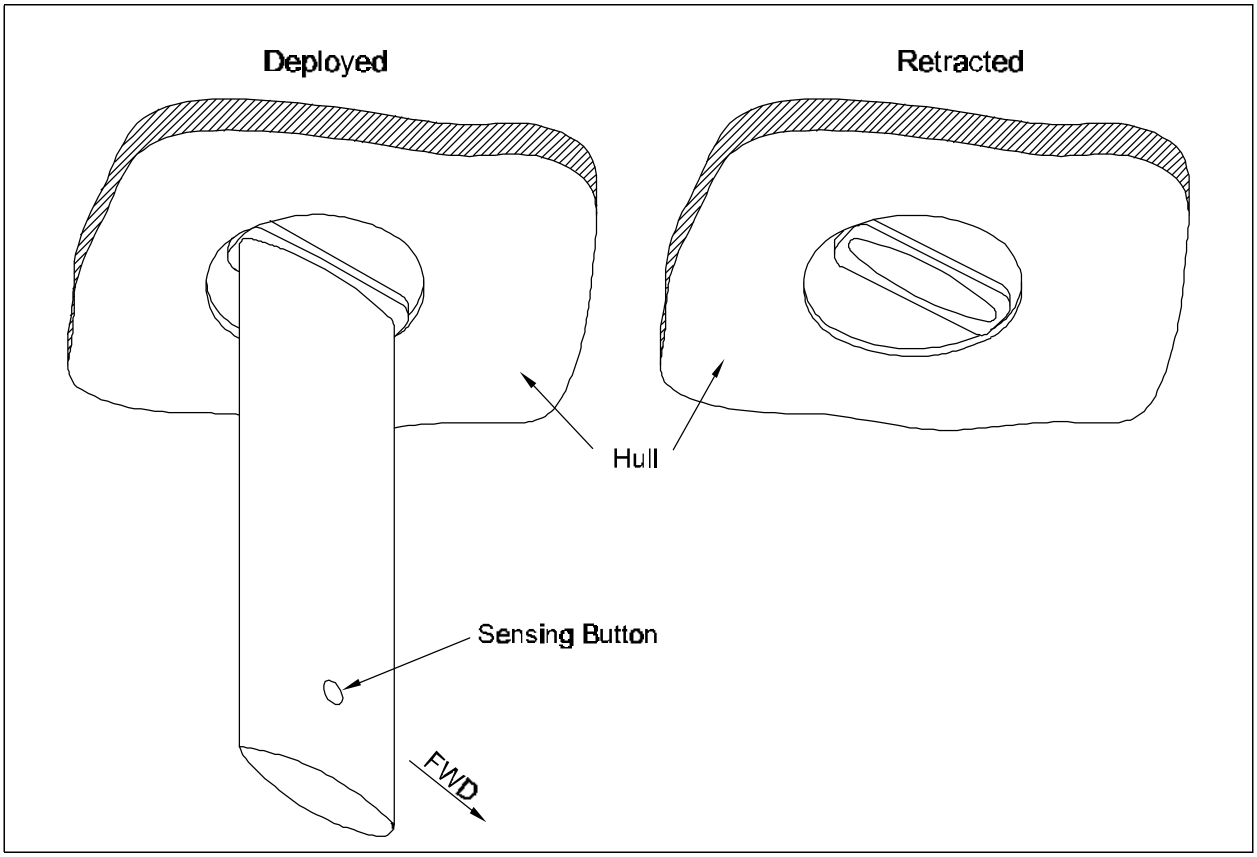


Figure 17-9.13. Rodmeter.

17-9.4.14 Rodmeter.

17-9.4.14.1 Normally, divers will only be called upon to inspect the rodmeter opening. Ship's force personnel perform maintenance and repairs on the rodmeter after retracting it into the hull. However, divers may be called upon to inspect the hull opening if the ship reports damage to the rodmeter (scratches, gouges, etc.) or is unable to either retract or deploy the rodmeter.

17-9.4.14.2 Inspection Procedure.

a. If Ship's Force reports damage to the rodmeter, (scratches, gouges, etc.) or is unable to retract or deploy the rodmeter, inspect the hull opening and verify that it is clear of barnacles, sea growth, or other foreign material.

b. If Ship's Force is unable to retract the rodmeter, inspect for a bent or broken unit.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

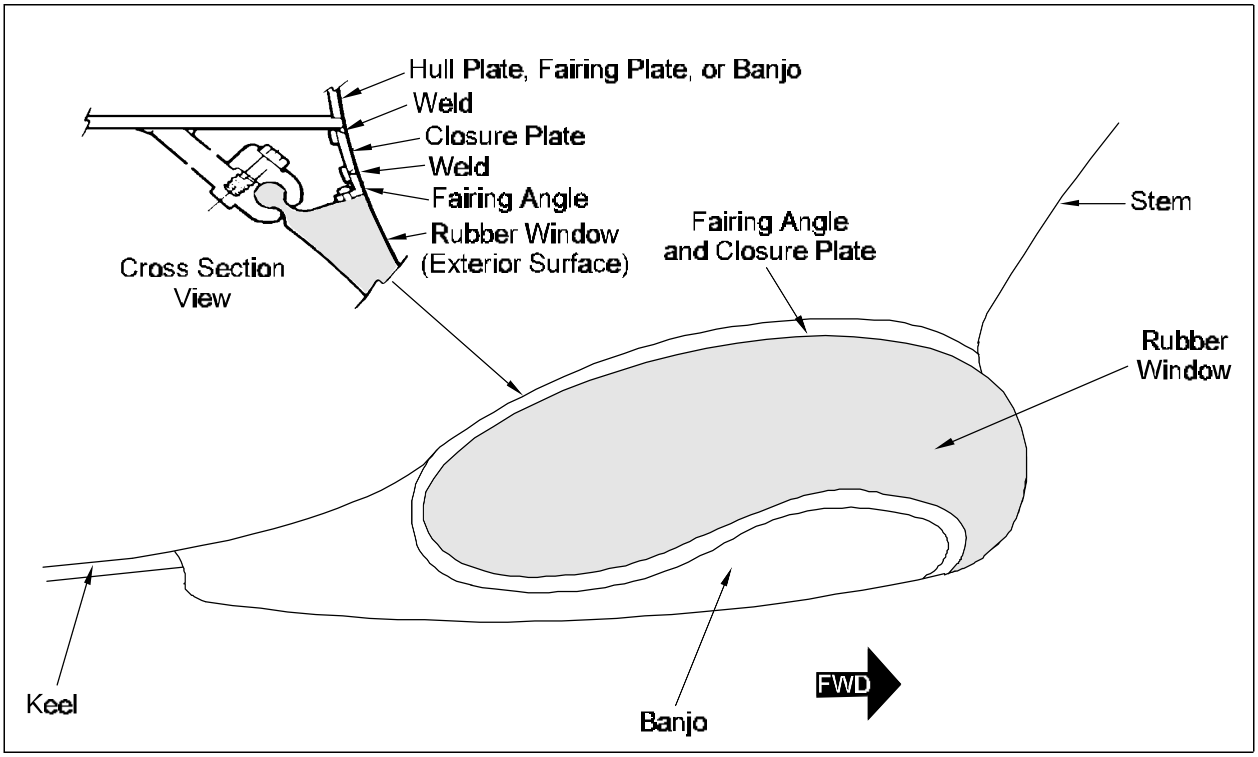


Figure 17-9.14. Bow-mounted Sonar Dome.

17-9.4.15 Bow-mounted Sonar Dome.

17-9.4.15.1 Damage Description Requirements.

17-9.4.15.1.1 Inspection of sonar domes requires a detailed description (with measurements) of the exact location and size of all damage and flaws. For location, use distance measurements from the closest relative bearing grid marks, or if grid marks are not present, use exact measurements, horizontal and vertical, from definable points such as the centerline (i.e., 1 foot 3 inches above the lower marriage line). Measurements will require the use of bear paw magnets and tape measures. The following is a list of standard Sonar Dome Rubber Window terms:

a. *Marriage line*. That area where the hull meets the dome, often referred to as the upper and lower marriage line.

b. *Banjo*. A section of steel plate that extends forward from the keel. It supports the bottom of the dome.

c. *Stem*. Vertical forward-most part of the ship.

d. *Vertical midpoint*. An imaginary continuation of the stem vertically down the dome.

e. *Horizontal midpoint*. A horizontal line midway between the upper and lower marriage line.

f. *Fairing angle*. Metal band which attaches directly to the dome material and is welded to the closure plate.

g. *Closure plate*. A metal band which covers the bolts which hold the dome in place. It is welded to the shell plating on one edge and the fairing angle on the other.

17-9.4.15.1.2 The description of damage must include:

a. Rubber dome material.

(1) Exact location and size (length, width and depth) of all gouges, tears, delaminations, blisters, flap, or other damage.

(2) Layers of wire plies exposed.

(3) FR.

b. Fairing and closure plates.

(1) Exact location and size of all damage or flaws. As a minimum, the description must include:

(a) Distance and direction (port/ starboard/forward/aft) from a known degree marker and/or other reference point.

(b) Length, maximum width, and orientation of all cracks, including closest weld seam information. Also include the direction of the crack with respect to weld seams on the marriage line (perpendicular or parallel) and distance of the crack from the rubber interface with the fairing angle.

(c) Amount of separation between the fairing angle and the rubber dome material, including the overall length and maximum width of the separation.

(d) Total area affected, including the diameter and depth of any pitting. Also include both the maximum and average pit size.

(e) Any damage, bare metal, scratches, or abrasions on the banjo.

(f) Area and location of corrosion or other damage, including the FR and the PDR.

17-9.4.15.1.3 Example of Report. “Torn rubber 2 feet 9 inches above the 15° mark at the lower marriage line. Torn area measures 2 inches in width, 6 inches long. Three plies of rubber peeled back.”

17-9.4.15.1.4 NAVSEA Form 4730/4 (NSN 0116-LF-047-3025) Sonar Dome Rubber Window Inspection Data is available to record results.

17-9.4.15.2 Inspection Procedure.

17-9.4.15.2.1 Specific Noise Source Inspection.

WARNING

Divers must exercise care when touching a dome with steel wires exposed.

WARNING

Avoid direct bare skin contact with NOFOUL rubber surfaces. Avoid contact between hands and eyes if hands have been exposed to the NOFOUL rubber material. Wash hands thoroughly before eating or smoking.

NOTE

Dome must be pressurized with air to 15 psig to conduct this inspection.

a. Prior to beginning the inspection, get the latest Sonar Self Noise Test report from the ship’s Engineer. This report will show the location of all noise spokes. Use these spokes as the starting point for the inspection. Conduct a detailed inspection of these areas until the source of the noise is located. Possible noise sources to inspect for that will be located at or forward of the noise spoke location are:

(1) Cuts, pits, flaps, and gouges in the outer surface.

(2) Separation in rubber plies as indicated by bulges or soft spots.

(3) Previous repairs which have become faulty.

(4) Exposed or broken structural steel wires.

b. To assist the diver in orienting himself on the dome, starting at the waterline, follow the stem down, surveying the hull plate for damage on both sides (port and starboard) and continue down to the upper marriage line (0° marker). From here, follow the upper marriage line to the relative heading (port or starboard) of the noise spoke. Drop down from that point to begin the detailed inspection.

(1) Attach a bear paw magnet to the hull at the point above the noise source.

(2) Lower a tape measure down from the bear paw to establish a vertical reference for the diver. Drop down from that point to begin the detailed inspection.

(3) Conduct a detailed (visual and hand) inspection of the area of suspected damage.

NOTE

Because of limited visual contrast, the diver's hands (even with gloves) may often sense damage that the eye cannot detect.

(4) If the noise source is not located, move the bear paw forward 18 to 24 inches and repeat the process until the damage is located.

17-7.4.15.2.2 Detailed Damage Inspection.

a. Return to the upper marriage line. Start at 0° to begin the overall damage inspection.

b. Inspect the marriage line (rubber dome and steel interface with the hull). Inspect the entire perimeter of the dome for:

(1) Separation of the rubber dome from the steel in the area of the fairing angles.

(2) Dents or cracks in the fairing angle and closure plate welds, or immediate hull area.

NOTE

Be particularly alert for the presence of cracks. If any cracks are discovered, particular attention must be given to determine if the crack is running parallel to or vertically into the shell plating.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(3) PDR and FR of the fairing angle, closure plate, and immediate hull plate area.

c. Inspect the rubber surface of the dome. To ensure complete coverage of the SDRW surface, begin the inspection at the 0° marker at the upper marriage line. Follow the marriage line to starboard and inspect the general area while swimming aft. After reaching the most aft point of the window, drop down no more than 3 feet (depending on water clarity) and work forward to the dome 0° marker. Follow this sweeping pattern until the complete starboard side has been inspected. Inspect the port side using the same procedure. Inspect the following conditions and report the physical dimensions and relative bearing and vertical location of each:

(1) Cuts, pits, and gouges in the outer surface of the rubber window and the structural area within approximately 4 feet of the rubber window.

(2) Separation in rubber plies, which are indicated as bulges or soft spots.

(3) Previous repairs to the rubber window which have become faulty or have deteriorated.

(4) Exposed structural steel wire of the rubber window.

NOTE

If rubber window steel wires are exposed, contact Naval Sea Systems Command Code SEA 00C5 for an analysis of the repair.

(5) Inspect and report the FR of the dome. The rubber surface of the dome is made of NOFOUL rubber. However, the antifouling properties of the dome may become ineffective as the dome ages or from over-spray of paint while in dry-dock. Fouling degrades the performance of the sonar.

d. Inspect the banjo area and the structural area surrounding the dome to the water surface.

(1) Inspect for dents, cracks, pitting or corrosion in the steel areas of the dome, including the closure plate.

(2) Inspect for scrapes, abrasions, bare metal, corrosion, peeling, or absence of protective paint on the steel structural portion of the dome, including the banjo.

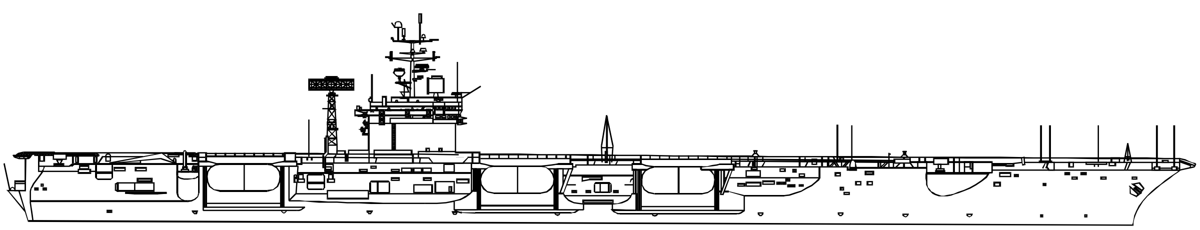
(3) Report the PDR and FR.

(4) If any discrepancies are noted, make the appropriate report and arrangements for follow-on repair.

UNDERWATER SHIP HUSBANDRY MANUAL

CHAPTER 17
SECTION 10

CVN 68 CLASS
UNDERWATER SHIP HUSBANDRY
INSPECTION PROCEDURES



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CHAPTER 17
UNDERWATER SHIP HUSBANDRY INSPECTION PROCEDURES

SECTION 10 CVN 68 NIMITZ CLASS AIRCRAFT CARRIER

17-10.1 INTRODUCTION.

17-10.1.1 This section of the *Underwater Ship Husbandry Manual* contains inspection procedures for the CVN 68 Nimitz Class Aircraft Carrier. It consists of a general introduction to the CVN 68 Class, a description of the major hull components found on this ship, a set of Level 1 inspection procedures, and a set of Level 2 inspection procedures.

17-10.1.2 Table 17-10.1 contains a general hull description of the CVN 68 Class. Table 17-10.2 (found at the end of the Level 1 inspection procedures) contains a checklist of all ship systems covered by these inspection procedures. Item numbers in this table correspond to the hull system numbers in Figure 17-10.1 and are arranged in order to facilitate a typical diver inspection of all components: stern area, port side, bow, and starboard side. Figure 17-10.1, "CVN 68 Class Plan and Profile," and Figure 17-10.2, "CVN 68 Class Running Gear," are located after Table 17-10.2 and provide points of reference for the procedures described in this section. These figures augment the typical ship drawings and can be used as a quick reference by diving personnel. Figure 17-10.1 is derived from NAVSEA Drawing 845-4365935, Rev. L, Docking Plan for the CVN 68 Nimitz Class Aircraft Carrier. Figure 17-10.2 is derived from class arrangement drawings. These figures are also useful in locating the coordinates of components requiring Level 2 inspections. Figures of the individual components appear throughout the Level 2 inspection procedures.

17-10.1.3 Diving activities may photocopy Table 17-10.2 and use it to record data during inspections. Upon completion of the inspection, the results should be transferred to the standard Diver's Underwater Hull Inspection Data Form, NAVSEA 4730/3 (NSN 0116-LF-047-3029). Figures found in the Level 2 inspection procedures section of this chapter may be photocopied and used to assist in sketching the extent of damage reported during inspections. These sheets should be attached to the Diver's Underwater Hull Inspection Data Form upon completion of the inspection.

17-10.1.4 Ships of this class were constructed over a number of years and system changes may have occurred, therefore individual hull systems may not be identically located. For this reason, it is recommended that the Dive Supervisor also refer to a Docking Plan for the individual ship being inspected.

Table 17-10.1. General Hull Description.

Length between Perpendiculars:	1040 feet
Beam:	134 feet
Frame Spacing:	48 inches
Rudders:	Port and starboard, semi-balanced
Propellers:	Four, 5-bladed, fixed-pitch
Dunce Cap:	One-piece
Class Problems:	None noted

17-10.2 DESCRIPTION OF MAJOR HULL COMPONENTS.

17-10.2.1 Hull Coating.

17-10.2.1.1 The underwater hull coating system is applied to the hull, shaft, and appendages (i.e., rudder, struts, bearing housing, rope guard, fairwaters, rotating coupling, stern tube and skeg). The coating system is comprised of two types of coatings: an anticorrosion coating and an antifouling coating. The anticorrosion coating is applied on the majority of metal components to provide the primary protection from corrosion and deterioration of the surfaces. The antifouling coating is applied over the anticorrosion coating and is directly applied to nonmetallic components (e.g., the glass-reinforced shaft coating). The antifouling coating is designed to protect the underwater systems from biological fouling.

17-10.2.1.2 Multiple coats of anticorrosive and antifouling coatings are applied to the hull. Each coat is a different color except for the boot top area where all coats are black. Use a diver's light to help accurately identify the color of the exposed coating for both large hull areas and areas of damage. This will allow accurate assessment of the remaining life of the coating system. The hull coating system can easily become damaged from impact with underwater objects or collisions and groundings. Typical damage is minor abrasion to the antifouling coating, exposing the anticorrosion coating and permitting biological fouling. More severe abrasion of the anticorrosion coating exposing bare metal will result in corrosion and deterioration of the metal. As the age of the coating increases, the antifouling coating may become less effective in preventing biological fouling and could easily become damaged if the biological fouling is allowed to reach a destructive level. Even the smallest amount of biological fouling can drastically impact the ship's operational capabilities and could eventually destroy the anticorrosion coating system.

17-10.2.1.3 References.

a. NAVSEA S9086-CQ-STM-010/CH081, "Waterborne Underwater Hull Cleaning of Navy Ships"

b. NAVSEA S9086-VD-STM-010/CH631, "Preservation of Ships in Service"

17-10.2.2 Rudders.

17-10.2.2.1 The rudders are rectangular, hydrodynamically shaped metal blades located aft of the propellers and used to steer the ship. Rudders on large ships are hollow structures that have been flushed with a preservative and then dried. Rudders on this class ship have three 1 1/2-inch copper-nickel (Cu-Ni) pipe drain plugs on the bottom: one located 42 inches from the after edge, one located bottom center, and one located 20 inches aft of the leading edge. Additionally, there are two 1 1/2-inch Cu-Ni pipe fill plugs in the top: one located approximately 27 inches from the upper after edge and one located approximately 20 inches from the forward edge. The rudder is supported and positioned by a rotating rudder stock. The area where the rudder stock enters the hull contains the rudder bearings, seals, and gland ring. A rudder post gland ring supports the rudder packing where the stock enters the hull.

17-10.2.2.2 Ships in this class have two semi-balanced rudders. The semi-balanced rudder is of one-piece construction. The rudder moves around a skeg and fairing arrangement welded to the hull which provides support to the rudder post. This is also known as the horn. There is approximately a 2 1/2-inch clearance between the rudder and the skeg/fairwater (horn) structure.

17-10.2.2.3 While underway, rudders are subject to severe loading, high flow, and turbulence as well as to possible damage from contact with underwater objects. Previous repairs (such as clad welding or installation of doubler plates) that have been painted may cause a rough-textured surface on the rudder, making inspection for damage difficult. While inspecting the rudder surface, the primary indication of new deterioration or damage is poor or missing paint. Bare metal or corrosion damage may be present. Report any such findings.

17-10.2.2.4 As a result of impact damage, bearing wear, or improper installation, the rudder may drop down from the hull. One of the main aspects of a rudder inspection is the measurement to determine if the rudder has dropped. The ship's Engineering Officer compares the current measurements with previous measurements. A change in the measurements indicates that the rudder has dropped.

17-10.2.2.5 Location. Both rudders are located 25 feet off the centerline, port and starboard, beginning at frame 255 and ending at frame 249.

17-10.2.2.6 References.

a. NAVSEA DWG CVN 68-119-2649338, Rev. K, Rudder and Rudder Stock

17-10.2.3 Lifting Fittings.

17-10.2.3.1 Lifting fittings are sections of pipe bent into a "U" shape (or 180° returns) and recessed into the hull. Lifting fittings or "lifting tunnels" provide convenient rigging attachment points for handling the rudder and propeller. There are 14 lifting fittings installed on this class ship, two for each outboard propeller and five for each inboard (aft) propeller and rudder.

17-10.2.3.2 Location. Each outboard propeller has one lifting fitting at frame 227, 48 feet 11 inches from the centerline, and one at frame 229, 49 feet 3 inches from the centerline. Each inboard propeller has a lifting fitting at frame 245, 22 feet 1 inch from centerline. Each rudder has two lifting fittings at frame 255: 21 feet 6 inches and 28 feet 6 inches from the centerline, and two at frame 247: 21 feet 11 inches and 31 feet 3 inches from the centerline.

17-10.2.3.3 References.

a. NAVSEA DWG CVN 68-203-4323822, Rev. D, Shell Fittings for Lifting Propellers and Rudders

17-10.2.4 Propellers.

17-10.2.4.1 CVN 68 Class ships are propelled by four 21-foot diameter, fixed-pitch propellers. The blades are an integral part of the hub and their position relative to the hub cannot be changed. There is a propeller cap or dunce cap attached to the after end of the propeller. It serves to fair the flow of water off the propeller and to protect the aft end of the tail shaft. The two-piece fairwater is installed between the hub and dunce cap and screwed on, with each screw staked in a minimum of two places. The propeller hub and cap are filled with preservative.

17-10.2.4.2 Starboard propellers are right-hand and turn clockwise (when viewed from astern). The blades are numbered in the counterclockwise direction, starting with the first blade adjacent to the lifting eye plug.

17-10.2.4.3 Port propellers are left-hand and turn counterclockwise (when viewed from astern). The blades are numbered in the clockwise direction, starting with the first blade adjacent to the lifting eye plug.

17-10.2.4.4 Location. The inboard propellers are located at frame 246, 22 feet 0 inches off the centerline, port and starboard. The outboard propellers are located at frame 227 1/2, 49 feet 0 inches off the centerline, port and starboard.

17-10.2.4.5 References.

a. NAVSEA S9086 HP STM 010/CH 245, “Propellers”

b. NAVSEA S9245 AR TSM 010/PROP, *Technical Manual for Marine Propeller Inspection, Repair and Certification*

c. NAVSEA S0600-AA-PRO-030, *Underwater Ship Husbandry Manual*, Chapter 3, “Propellers”

d. NAVSEA CVAN 68-203-4325159, Rev. A, Propeller, 5 Blade

17-10.2.5 Main Bearing Housing and Struts.

17-10.2.5.1 Immediately forward of the propeller is the main strut. The main strut consists of two columns extending down from the hull forming a “V” shape that attaches to the bearing housing and supports the shaft. The struts are subjected to severe dynamic loading while the ship is underway. They are also subject to corrosion, vibration damage, and damage from rope and wire or other foreign material. At the top of the bearing housing are two 3/4-10 UNC fill and vent plugs located 4 inches from each end, 7 1/2 inches inboard from the vertical centerline. These holes are used for maintenance during dry-docking. Inspection includes a complete examination of the strut surface, bearing housing, rope guard, and fairwaters.

17-10.2.5.2 The fairwaters attached to the forward main strut bearings are shaped to streamline these parts to eliminate abrupt changes in water flow. The design clearance from the shaft is 1/2 inch. The fairwaters are made up of two halves constructed of steel and are welded to the bearing housing. Each fairwater half is equipped with four 2 1/2-inch water circulation holes. Each fairwater half also has a 5/8-11 UNC lifting eye bolt hole plug. The plugs are flush with the fairwater half and secured by staking in two places.

17-10.2.5.3 Location. The inboard main struts are located at frame 244, forward of the inboard propellers. The outboard main struts are located at frame 225 1/2, forward of the outboard propellers.

17-10.2.5.4 References.

a. NAVSEA DWG CVAN 68-119-2649205, Rev. AG, Shaft Struts Main Outboard

b. NAVSEA DWG CVAN 68 119-2649205, Rev. AG, Shaft Struts Main Inboard

c. NAVSEA DWG CVAN 68 203-4325158, Rev. L, Fairwaters, Rope Guards and Rotating Coupling Covers

17-10.2.6 Rope Guards.

17-10.2.6.1 Rope guards are circular plates fitted between the propeller hub and the ends of the main strut bearings. They are streamlined in shape to eliminate abrupt changes in water flow and they protect the rotating shaft from becoming fouled by wire, rope, or other material. The design clearance between the propeller hub and the rope guard is 1/2 inch. The rope guards on ships of this class are made up of two halves constructed of steel, which are welded to the bearing housing. Each rope guard half on this ship class is equipped with four 2 1/2-inch water circulation holes.

17-10.2.6.2 Location. The rope guards are located immediately forward of the propellers at frames 246 and 227.

17-10.2.6.3 References.

a. NAVSEA DWG CVAN 68 203-4325158, Rev. L, Fairwaters, Rope Guards and Rotating Coupling Covers.

17-10.2.7 Shafting.

17-10.2.7.1 The shafting transmits torque from the main engine to the propeller and axial thrust from the propeller to the hull. The section of shaft between the stern tube and intermediate strut is called the intermediate shaft. The section of shaft between the intermediate strut and the propeller is called the propeller shaft. The shaft couplings are protected by rotating coupling covers. A glass-reinforced plastic (fiberglass) coating covers the propeller and intermediate shafting.

17-10.2.7.2 Location. The shafts extend from the reduction gears to the propellers and are exposed from frames 242 1/2 to 222 1/2 inboard and frames 224 to 204 outboard.

17-10.2.7.3 References.

a. NAVSEA S0600-AA-PRO-130, *Underwater Ship Husbandry Manual*, Chapter 13, "Propulsion Shafting Coating Repair"

b. NAVSEA DWG CVAN 68 203-4364808, Rev. R, Shafting Arrangement

17-10.2.8 Intermediate Bearing Housings and Struts.

17-10.2.8.1 The intermediate strut supports the shaft midway between the main strut and the stern tube. They are also subject to corrosion, vibration damage, and damage from rope and wire or other foreign material. At the top of the housing are two 3/4-inch fill and vent IPS pipe plugs located 4 inches from each end, 2 inches inboard from the vertical center line. These holes are used for maintenance during dry-docking. Inspection includes a complete examination of the strut surface, bearing housing, and fairwaters.

17-10.2.8.2 The fairwaters attached to the intermediate strut bearings are shaped to streamline these parts to eliminate abrupt changes in water flow. The design clearance from the shaft is 1/2 inch. The fairwaters are made up of two halves constructed of steel, which are welded to the bearing housing. Each after fairwater half is equipped with four 2 1/2-inch water circulation holes. Each fairwater half also has a 5/8-inch 11-UNC lifting eye bolt hole plug. The plugs are flush with the fairwater half and are secured by staking in two places. The forward fairwater is welded to the bearing housing and has an upward rake. This fairwater streamlines the water flow between the rotating coupling and the bearing housing.

17-10.2.8.3 Location. The intermediate struts are located at frame 232 on the inboard shafts and at frame 213 on the outboard shafts.

17-10.2.8.4 References.

a. NAVSEA CVAN 68 119-2649204, Rev. Y, Outboard Shaft Intermediate Strut

b. NAVSEA CVAN 68 119-2649206, Rev. T, Inboard Shaft Intermediate Strut

c. NAVSEA DWG CVAN 68 203-4325158, Rev. L, Fairwaters, Rope Guards and Rotating Coupling Covers

17-10.2.9 Rotating Couplings.

17-10.2.9.1 Rotating couplings are installed on both ends of the intermediate shafts. The couplings are covered by a tack-welded, streamlined coupling cover to eliminate abrupt changes in water flow. Four IPS pipe plugs are installed: two 1-inch fill plugs located on either side of the shaft flanges, one 1/2-inch vent plug between the fill plugs, and a 5/8-inch 11-UNC lifting eye plug in the center.

17-10.2.9.2 Location. The rotating couplings are located forward of the intermediate struts at frames 231 and 212 and aft of the stern tubes at frames 222 1/2 and 204.

17-10.2.9.3 References.

a. NAVSEA DWG CVAN 68 203-4325158, Rev. L, Fairwaters, Rope Guards and Rotating Coupling Covers

17-10.2.10 Stern Tube.

17-10.2.10.1 The free-flood area where the shaft penetrates the hull is the stern tube. The stern tube supports the shaft as it enters the hull. It houses one or more shaft bearings. A fairwater is installed between a rotating coupling and where the shaft enters the hull. The stern tube fairwaters on this class ship are constructed of steel and are welded to the hull. The design clearance between the fairwater and the shaft and between the fairwater and rotating coupling is 1 1/8 inch. The stern tube fairwaters on ships of this class are made up of two halves constructed of steel, which are welded to the bearing housing. Each fairwater half is equipped with four 2 1/2-inch water circulation holes.

17-10.2.10.2 Location. The stern tubes extend from frame 222 to frame 217 1/2 on the inboard shafts and from frame 204 to frame 199 1/2 on the outboard shafts.

17-10.2.10.3 References.

a. NAVSEA DWG CVN 70 203-5005087, Rev. B, Stern Tube and Strut Bearings

17-10.2.11 Skeg.

17-10.2.11.1 The skeg is a long narrow vertical fin attached to the keel serving to assist keeping the ship on course. It also protects the keel, propellers, and rudders. The skeg is flushed with preservative and then drained and dried. It has three 1-inch plugs. The fill plug is located on the starboard side, 6 inches forward of the upper trailing edge at frame 230. The two drain plugs are located on the bottom skeg, 6 inches port/starboard of centerline, at frame 228.

17-10.2.11.2 Location. The skeg extends forward from frame 230 to 223.

17-10.2.11.3 References.

a. NAVSEA S0600 AA PRO 020, *Underwater Ship Husbandry Manual*, Chapter 2, “General Information and Safety Precautions”

17-10.2.12 Overboard Discharge.

17-10.2.12.1 Overboard discharges are round or oval openings used for discharging seawater or other fluids from the ship. Overboard discharges are not usually covered with screens or gratings.

17-10.2.12.2 Location. The overboard discharges are located in various places on the hull.

17-10.2.12.3 References.

a. NAVSEA DWG CVAN 68 845-4365935, Rev. K, Aircraft Carrier CVAN 68 Docking Drawing

17-10.2.13 Sea Chests and Seawater Suction.

17-10.2.13.1 Seawater suctions are openings for bringing seawater into the ship. Multiple suctions located together at one hull opening are called sea chests. On this class ship, sea chests may also be called flood inlets. Suctions and sea chests are covered with either mesh screens, grates, or strainer bars to prevent objects or foreign material from entering.

17-10.2.13.2 Location. The seawater suctions and sea chests are located in various places on the hull.

17-10.2.13.3 References.

a. NAVSEA DWG CVAN 68 845-4365935, Rev. K, Aircraft Carrier CVAN 68 Docking Drawing

b. NAVSEA DWG CVAN 68 120-4364408, Rev. V, 28 Inch Sea Chest

17-10-2.14 Impressed Current Cathodic Protection (ICCP) System.

17-10.2.14.1 The Impressed Current Cathodic Protection (ICCP) system uses ship's power to provide galvanic corrosion protection for the hull and all underwater appendages. The system consists of two major hull-mounted components:

a. Reference Electrode (Reference Cell): The reference electrode is a cell constructed of a silver mesh screen that has been treated with silver chloride. It is mounted in a domed, 9-inch diameter circular polyvinyl chloride holder that electrically isolates the reference electrode from the hull. The reference electrode is secured to a base or sole plate by a pattern of screws. A series of holes in the reference electrode permit passage of seawater at the hull, allowing the controller to detect electromechanical activity at the hull and measure the potential of the hull versus the reference electrode. The holes in the reference electrode must remain open for it to function, and should never be covered by paint or epoxy. A stuffing tube is used to pass a cable from the electrode to the controller. The controller measures the potential of the hull versus the reference electrode and signals a power supply to increase or decrease current output as required to reduce the potential difference between the hull potential and the preset desired potential. Two reference electrodes are installed for each controller. Reference electrodes are located on each side of the hull approximately halfway between anode sites.

b. Anodes: ICCP anodes are constructed of pairs of platinum-coated tantalum rods mounted in an insulating glass-reinforced polyester holder, which is bolted to the outside of the ship's hull. The direct current produced by the power supply is provided to the anode by a conductor through a stuffing tube. The current flows into the seawater through the platinum surface of the tantalum rods. The platinum surface of the anode corrodes very slowly, and the replacement period for anodes, unless physically damaged, is normally greater than 10 years. Two sizes of anodes are used on this class ship: 4 feet (75 amperes) and 8 feet (150 amperes).

17-10.2.14.2 A dielectric shield prevents shorting of the anode current to the hull near the anode and aids in wider current distribution. The dielectric shield is applied as a thick coating around each anode. It consists of a high-solids epoxy with high dielectric strength. It is applied with the hull coating system. The dielectric shield changes thickness as one moves away from the anode. For this class of ship, the 4-foot anode is surrounded by a dielectric shield approximately 100 mils thick out to a 7-foot by 10-foot area (inner shield). An additional dielectric shield (22 mils) extends out to 13 feet by 16 feet (outer shield). Eight-foot anodes are surrounded by a dielectric shield approximately 100 mils thick out to a 7-foot by 14-foot area (inner shield). Additional dielectric shield (22 mils) extends out to 13 feet by 20 feet (outer shield).

17-10.2.14.3 Anodes that have excessive output of protective current for prolonged periods will cause a failure of the hull coating in the immediate area causing blisters, peeling or missing paint, and large areas of bare metal. When the anode is active or energized, small bubbles are generated on the anode wires. The anode and the hull area above it will be free of marine fouling. In addition, if the dielectric shield becomes damaged and the system is working properly, a layer of calcium will be deposited over the exposed bare metal area. This calcium (calcareous deposits) may be mistaken for deteriorated portions of the coating system. Because calcareous deposits form an additional protective barrier to the hull they should not be removed. This condition, however, indicates a damaged coating and should be reported. Biological fouling is not the same as calcareous deposits.

17-10.2.14.4 An anode that has been turned off for prolonged periods will have a heavy layer of marine fouling on the anode strip and possibly the dielectric shield.

17-10.2.14.5 Location. This class ship has eight 4-foot anodes and eight 8-foot anodes. The port side 4 foot anodes are located at frames 31, 67, 155, and 188. The port side 8-foot anodes are located at frames 88, 125, 219, and 239. The starboard side four-foot anodes are located at frames 31, 67, 155, and 188. The starboard side 8-foot anodes are located at frames 93, 125, 219, and 239.

17-10.2.14.6 References.

a. NAVSEA S9086-VF-STM-010/CH-633, Chapter 633, "Cathodic Protection"

b. NAVSEA DWG DE 1052-600-4466754, Anode and Reference Electrode for Impressed Current Cathodic Protection System

c. NAVSEA S0600-AA-PRO-190, *Underwater Ship Husbandry Manual*, Chapter 19, "Cathodic Protection Systems"

17-10.2.15 Bilge Keel.

17-10.2.15.1 The bilge keel is a long narrow fin near or at the turn of the bilge in the middle portion of the ship. It resists and decreases the magnitude of rolling of the ship. It extends forward from frame 175 to frame 104, port and starboard sides. Bilge keels on this class ship are of the V-shaped section type and are 48 inches wide. The bilge keel is a hollow structure that has been flushed with a preservative and then dried. The bilge keels in this class ship are internally divided into 15 compartments (voids). Each compartment has a fill/drain hole with a 3/4-inch STD pipe plug installed. The exact location of each of the 15 fill/drain plugs varies from ship to ship.

17-10.2.15.2 Location. The bilge keel extends forward from frames 175 to 104, port and starboard.

17-10.2.15.3 References.

a. NAVSEA DWG CVAN 68 100-2649313, Rev. K, Bilge Keel

17-10.2.16 Scoop Injections.

17-10.2.16.1 Scoop injections are seawater intakes that use the motion of the ship through the water to provide cooling water to interior machinery. They are nearly rectangular openings in the bottom of the hull. The motion of the ship through the water forces water into the opening. Typically, the openings are protected with a series of 1 1/2-inch by 42-inch bars welded to the opening to prevent foreign material from entering the system. The bars are normally referred to as splitter bars or grates. Ships in this class have two types of grates installed. On those ships with the original configuration, the grates are welded on. On those ships on which a SHIPALT was performed, the grates are bolted on for diver access.

17-10.2.16.2 Location. Scoop injections are located port and starboard, at frames 164 and 112.

17-10.2.16.3 References.

a. NAVSEA DWG CVAN 68 845-4365935, Rev. K, Aircraft Carrier CVAN 68 Docking Drawing

17-10.2.17 Transducer (Fathometer).

17-10.2.17.1 Transducers are transmitting and receiving heads for various kinds of underwater acoustic signals. Transducer heads are protected by Buna-N rubber covers that are bolted to the hull. This class ship has one hull-mounted transducer.

17-10.2.17.2 Location. The transducer is located on the port side, at frame 74, 2 feet from the centerline.

17-10.2.18 Rodmeter (Underwater Log).

17-10.2.18.1 The rodmeter (also known as the pit sword) is the part of the underwater log that projects from the ship's hull. The underwater log is a device for measuring the ship's speed through the water. Ships in this class have a 72-inch retractable rodmeter. Retractable rodmeters can be retracted through an opening in the hull through a sea valve for maintenance. They are usually in the retracted (stowed) position and inaccessible to divers while the ship is in port.

17-10.2.18.2 With retractable rodmeters, possible problems include (but are not limited to):

a. Ship unable to receive input from rodmeter.

b. Ship unable to retract rodmeter.

17-10.2.18.3 Location. The rodmeter is located on the port side, at frame 74, one foot from the centerline.

17-10.2.18.4 References.

a. F24558 Rev. F, 2699744, Electromagnetic Underwater Log. Electromagnetic Underwater Log Sea Valve Outline and Installation Drawing.

17-10.3 LEVEL 1 INSPECTION PROCEDURES.

17-10.3.1 Introduction.

17-10.3.1.1 This section contains Level 1 inspection procedures for the CVN 68 Class Aircraft Carrier. The Table 17-10.2 checklist presents components in the order in which the diver would find them when making a stern area, port side, bow, and starboard side inspection dive. Note that all hull openings included on the docking plan are listed in Figure 17-10.1 and Table 17-10.2. Depending on the ship's draft at the time of the inspection, some items may be above the waterline. The Dive Supervisor can refer to Figures 17-10.1 and 17-10.2 and Table 17-10.2 (found at the end of these Level 1 procedures) to pinpoint the exact location of a particular component. These tables and figures can be photocopied and used to document the reported condition of each component. In addition, the NAVSEA diver inspection data forms for the hull and propeller should be used to record the inspection results. These forms are included in Section 5 of this chapter. Underwater color photography should also be used to further depict the damage described in the report and in the forms.

17-10.3.2 Paint and Fouling Inspection.

NOTE

> To accurately report the PDR and FR, the diver must be thoroughly familiar with NSTM Chapter 081, "Waterborne Underwater Hull Cleaning of Navy Ships."

17-10.3.2.1 One of the most important aspects of a Level 1 inspection is the assessment of the Fouling Rating (FR) and the Paint Deterioration Rating (PDR). Values for the FR and the PDR may vary widely along the length of a hull.

17-10.3.2.2 The diver should continuously report the condition of the paint using standard terms such as peeling, blistered (broken or intact), and missing antifouling or anticorrosive paint. Report the color of exposed paint. A diver's light is necessary to report color accurately. Use sections of hull plate to estimate the condition of small areas: flat and curved areas of plate, edges, welds, seams, rivets, and bolt heads. The Dive Supervisor maintains a running log of the conditions and records the FR and PDR for localized areas. This enables the Dive Supervisor to keep track of the total estimate for each section of the hull. These values are then summarized, yielding the overall condition for each area: bow, stern, flat bottom, and sides. Report the docking block areas separately from the flat bottom and sides. For docking block areas, report the average percent of block areas painted and the percent of base metal with pitting. Estimate the average diameter and depth of pitting. For a heavily fouled section of hull, only the FR can be reported since little or no hull paint will be visible.

17-10.3.2.3 This inspection procedure alerts the diver when the inspection process has been completed for each section of the hull to assist in summarizing the overall conditions.

a. Inspect and report the FR.

b. Inspect and report the PDR. Report localized areas of pitting, blisters, peeling, or missing paint.

c. Inspect and report the docking block FR and PDR.

17-10.3.3 General Hull Plate Inspection.

a. Carefully examine the hull plating. Look for areas of bare metal, bleeding rust, and large areas of pitting.

b. Inspect for holes, cracked weld seams, distorted hull plates, localized areas of pitting, corrosion, and any other apparent damage.

c. Estimate and report the extent and location of any damage; report length of cracks and average pit diameter and depth.

17-10.3.4 Lifting Fittings.

a. Inspect and report the FR.

b. Inspect and report the PDR. Report localized areas of pitting, blisters, peeling, or missing paint.

c. Inspect for cracked or corroded weld seams.

17-10.3.5 Rudder.

a. Inspect the entire rudder and rudder horn surface area for any cracked welds or any marks, gouges, or scrapes that indicate the rudder surface may have made contact with an underwater object.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

b. Inspect the area between the rudder, the rudder stock, the rudder skeg/fairwater, and the hull for fouled wire, rope, or foreign material.

c. Measure the rudder clearance. With the rudder amidships, take readings in two places. Measure the gap between the lower leading edge of the fixed horn and the top of the moveable rudder, and also the gap between the lower trailing edge of the horn and top of the moveable rudder. Design clearance is 2 1/2 inches.

d. Verify that the two 1 1/2-inch fill holes (upper) and the three 1 1/2-inch drain holes (lower) plugs are present and have not backed out.

e. Inspect the rudder lifting fittings for cracked or corroded weld seams. Inspect and report the FR and PDR.

f. Sound the rudder and horn by using a rubber or rawhide mallet.

(1) Rap on the surface to determine if the rudder has flooded. Begin sounding near the uppermost part of the rudder and continue downward to the lowest point.

NOTE

Internal framing and stiffeners will change the sound. It is necessary to sound the rudder and horn in different locations. A hollow sound indicates the rudder or horn is not flooded, while a dull sound indicates flooding.

(2) If the rudder is found to contain water, make the appropriate report and arrangements for follow-on dewatering and repair.

g. Inspect and report the FR and the PDR.

17-10.3.6 Propeller.

a. Inspect the propeller cap for damage or cracks.

b. Verify the presence of the fairing plate halves and ensure that the fasteners are staked at a minimum of two places.

c. Verify the presence of the 1-inch fill/lifting eye pipe plug and the 1/2-inch vent pipe plug; ensure that they are staked at a minimum of two places.

d. Inspect the propeller hub for fouled wire, rope, or foreign material. Fiber such as fish netting or manila line is usually removed without difficulty. If removal of the material will be excessively time consuming, make the appropriate report and arrangements for follow-on removal.

e. Locate the 4 1/2-inch lifting eye plug in the hub of the propeller. Verify that the plug is in place staked at a minimum of two places. Use this plug as the starting point for numbering the blades. Further identify each propeller as inboard or outboard, for example: “Port Inboard Blade #1.”

f. Verify the presence of four 1/2 inch fill/drain pipe plugs located 180° apart on the hub. The forward plugs are located 1 5/8 inches from the hub edge and the after plugs are 1 1/2 inches from the edge; ensure that the plugs are flush and staked at a minimum of two places.

g. Inspect the propeller blade root areas for cracks and cavitation damage. Cavitation damage can be identified by an area of small pocked holes or a rough textured surface.

h. Inspect the overall physical appearance and FR of each blade, starting with blade number one.

    (1) Inspect the leading and trailing edges for nicks, curls, chips, dents, flat spots, cracks, or other apparent damage.

    (2) Inspect the suction (forward) and pressure (aft) face of each blade for defects caused by cavitation.

    (3) Measure and record the extent of all damage.

    (4) Inspect and report the FR of the propeller.

17-10.3.7 Rope Guard.

a. Verify that the rope guard is securely in place.

NOTE

A missing rope guard is a serious casualty.

b. Inspect all welds for corrosion, damage, or cracks.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Inspect for the presence of fouled rope, wire, or foreign material.

d. Verify that the 1/2-inch running clearance between the rope guard and propeller hub is uniform all around. Take clearance measurements at the 3, 6, 9, and 12 o’clock positions.

e. Verify the presence of the twenty-four 5/8-11 UNC fasteners. Ensure that they are staked at a minimum of two places.

f. Ensure that the 12 evenly spaced water circulation holes are clear of any foreign material.

g. Inspect and report the FR and the PDR of the rope guard.

17-10.3.8 Main Bearing Housing and Struts.

a. Inspect the strut columns and bearing housing for corrosion damage and the presence of wire or other foreign material.

b. Inspect the strut columns at the strut/hull interface and the bearing housing for cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Inspect the top of the bearing housing for the presence of the two fill/vent plugs; ensure that they are flush and staked at a minimum of two places.

d. Inspect and report the FR and the PDR of the strut and bearing housings.

17-10.3.9 Main Bearing Housing Fairwater.

a. Verify the presence of fairwaters.

NOTE

A missing fairwater is considered a serious casualty.

b. Verify that the 1/2-inch gap between the fairwater and the shaft is uniform all around. Take measurements at the 3, 6, 9, and 12 o'clock positions.

c. Inspect all welds for corrosion damage and cracks.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

d. Inspect and report the FR and the PDR of the fairwaters.

17-10.3.10 Shafting.

a. Inspect the full length of all accessible glass-reinforced plastic (fiberglass) covering.

(1) Inspect for evidence of deterioration, loss of adhesion, or any apparent physical damage. Loss of adhesion of shaft covering is characterized by one or more of the following: loss of covering (total or partial), delaminations, or bare metal.

(2) Inspect for damage such as nicks or cuts in the coating, missing covering, or loose covering. The covering may also have rust stains indicating where rust has leaked through near a cut, pinhole, area of porosity, patch, joint, or other flaw.

NOTE

Rust stains on the shaft coating indicate corrosion of the shaft. This is a serious problem.

b. If any of the above conditions exist, make the appropriate report and arrangements for follow-on Level 2 inspection.

17-10.3.11 Intermediate Bearing Housing and Struts.

a. Inspect the strut columns and bearing housing for corrosion damage and the presence of wire or other foreign material.

b. Inspect the strut columns at the strut/hull interface and the bearing housing for cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

c. Inspect the top of the bearing housing for the presence of the two top 15/16-inch plugs; ensure that they are flush and staked at a minimum of two places.

d. Inspect and report the PR and the PDR of the strut and bearing housing.

17-10.3.12 Intermediate Bearing Housing Fairwaters.

NOTE

A missing fairwater is considered a serious casualty.

a. Verify the presence of fairwaters.

b. Verify that the 1/2-inch gap between the after fairwater and the shaft is even all around. Take measurements at the 3, 6, 9, and 12 o'clock positions.

c. The forward fairwater is flared outward from the rotating coupling. Verify an even gap between the forward fairwater and rotating coupling.

d. Inspect all welds for corrosion damage and cracks.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

e. Inspect and report the FR and PDR of the fairwaters.

17-10.3.13 Rotating Coupling Covers.

a. Inspect the rotating coupling covers.

(1) Inspect for corrosion damage and cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

b. Inspect each side of the coupling cover for the presence of the two 1 inch fill plugs and the 1/2-inch vent plug between them; ensure that they are flush and staked at a minimum of two places.

c. Inspect the center of the rotating coupling cover for the presence of the 5/8-inch lifting eye plug; ensure that it is flush and staked at a minimum of two places.

d. Inspect and report the FR and the PDR of the rotating coupling covers.

17-10.3.14 Stern Tube.

a. Inspect the stern tube fairwater.

(1) Inspect for corrosion damage and cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(2) Verify that the 1 1/8-inch gap between the fairwater and the shaft is uniform all around. Take measurements at the 3, 6, 9, and 12 o'clock positions.

(3) Inspect to verify that the water circulation holes are free of any foreign material.

b. Inspect and report the FR and the PDR.

17-10.3.15 Skeg.

a. Inspect the skeg for damage, corrosion, or cracked welds.

b. Inspect for loose or missing plugs. The skeg has one fill plug located at frame 230, starboard, 6 inches forward of the upper trailing edge and two drain plugs located at frame 228, 6 inches from the centerline, port and starboard.

c. Inspect and report the FR and PDR.

17-10.3.16 Impressed Current Cathodic Protection (ICCP) Anode (4-Foot and 8-Foot Anode).

NOTE

The presence of marine fouling indicates a non-functioning anode.

CAUTION

Avoid disturbing the white calcium buildup on the dielectric shield that protects areas of bare metal from corrosion.

a. Inspect the anode for damage, missing or broken wires, and missing or damaged platinum coating on the wires.

b. Inspect the dielectric shield for chips, cracks, blisters, or missing epoxy.

c. Inspect the hull coating in the area around the anode for missing or peeling paint or blisters. Inspect for calcareous buildup.

d. Inspect and report the FR and the PDR.

17-10.3.17 Reference Electrode (Reference Cell).

a. Inspect for damage, clogged water circulation holes, and loose or missing epoxy.

b. Inspect and report the FR.

17-10.3.18 Overboard Discharge.

a. Inspect for foreign material or corrosion damage.

b. Inspect and report the FR and the PDR.

17-10.3.19 Sea Chest, Seawater Suction, and Flood Inlet.

a. Inspect screens and grates for clogged holes and loose or missing fasteners.

b. Inspect splitter bars for corrosion damage, broken or missing bars, cracked welds, and missing or loose fasteners.

c. Inspect and report the FR and the PDR.

17-10.3.20 Bilge Keel.

a. Inspect the bilge keel for dents, cracks, curled edges, missing plate, or other apparent damage.

b. Inspect for foreign material and loose or missing plugs. Each of the 15 compartment has a fill/drain hole with a 3/4-inch STD pipe plug installed. The exact location varies from ship to ship.

c. Measure and record the location of any damage.

d. Inspect and report the FR and the PDR.

17-10.3.21 Scoop Injection.

a. Inspect for the presence of foreign material and for damaged or missing bars.

b. If bolted on, inspect for the presence of all splitter bar fasteners.

c. Inspect all welds for cracks or corrosion damage.

d. Inspect and report the FR and the PDR.

17-10.3.22 Transducer (Fathometer).

a. Inspect sensor protective covers.

   (1) Inspect rubber/fiberglass covers for delaminations, tears, cracks, scrapes, or gouges.

b. Inspect for signs of structural failure or damage caused by contact with underwater objects.

c. Inspect for loose or missing fasteners and loose or missing fairing compound.

d. Inspect and report the FR.

17-10.3.23 Rodmeter (Underwater Log).

a. Inspect the hull opening to verify that it is free of any obstruction.

b. Inspect and report the FR.

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Table 17-10.2 Checklist of Major Hull Components. (sheet 1 of 14)

(Item Numbers Correspond to Numbers on Figure 17-10.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull	Size	Conditions Found
1		Stern Area Paint and Fouling		Transom - Frame 200		
2		Stern Area General Hull Plate		Transom - Frame 200		
3		Rudder Control Surface and Rudder Horn, Stbd		Frame 255-249 Stbd, 25′ off CL		
3.a		Rudder Drop Measurement				
3.b		Paint and Fouling				
3.c		Plating, Welds				
3.d		Rudder Fill and Drain Plugs				
3.e		Sound Rudder and Horn				
3.f		Rudder Lifting Fittings		Frame 255 (2 ea.)		
4		Propeller (5-Bladed), Stbd Inboard		Frame 248-246 Stbd, 22′ off CL	21′ dia	
4.a		Hub		Frame 247 Stbd, 22′ off CL		
4.a.1		Lifting Eye Plug			4 1/2″ Plug	
4.a.2		Fill and Drain Plugs			1/2″ Plug	
4.a.3		Propeller Cap				
4.a.3.a		Cover Plate and Fasteners				
4.a.3.b		Lifting Eye Plug			1″ Plug	
4.a.3.c		Vent Plug			1/2″ Plug	
4.b		Blades		Frame 246 Stbd		
4.b.1		Blade FR and Damage				
4.c		Propeller Lifting Fittings		Frame 247 (2 ea.), Frame 245 (1 ea.)		
5		Main Bearing Housing and Strut, Stbd Inboard		Frame 246 Stbd		
5.a		Rope Guard		Frame 246 Stbd, 22′ off CL		
5.b		Bearing Housing		Frame 246-242 Stbd, 22′ off CL		
5.c		Strut		Frame 244 Stbd		
5.d		Fairwater		Frame 242 Stbd, 22′ off CL		

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Table 17-10.2 Checklist of Major Hull Components. (sheet 2 of 14)
(Item Numbers Correspond to Numbers on Figure 17-10.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull	Size	Conditions Found
6		Propeller Shaft, Stbd Inboard		Frame 242 1/2-233 Stbd, 22′ off CL		
7		Impressed Current Cathodic Protection (ICCP) Anode (8 Foot Anode)		Frame 239 Stbd		
8		Intermediate Bearing Housing and Strut, Stbd Inboard		Frame 232 Stbd, 22′ off CL		
8.a		Aft Fairwater		Frame 233 1/2 Stbd, 22′ off CL		
8.b		Forward Fairwater		Frame 231 Stbd, 22′ off CL		
8.c		Rotating Coupling		Frame 231 Stbd		
9		Intermediate Shaft, Stbd Inboard		Frame 230-222 1/2 Stbd		
10		Stern Tube, Stbd Inboard		Frame 222 1/2 Stbd		
10.a		Rotating Coupling				
10.b		Stern Tube Fairing				
11		Skeg, Stbd Side and Bottom		Frame 230-223 Stbd		
11.a		FR and PDR				
11.b		Plug, Skeg Fill		Frame 230 Stbd, 6″ Fwd Upper Edge	1″ Pipe Plug	
11.c		Plugs (2), Skeg Drain		Frame 228 Stbd/Port, 6″ off CL	1″ Pipe Plug	
11.d		Keel Block Areas				
12		Propeller (5-Bladed), Stbd Outboard		Frame 229-227 1/2 Stbd, 49′ off CL	21′ dia	
12.a		Hub		Frame 228-227 Stbd, 49′ off CL		
12.a.1		Lifting Eye Plug			4 1/2″ Plug	
12.a.2		Fill and Drain Plugs			1/2″ Plug	
12.a.3		Propeller Cap				
12.a.3.a		Cover Plate and Fasteners				
12.a.3.b		Lifting Eye Plug			1″ Plug	
12.a.3.c		Vent Plug			1/2″ Plug	
12.b		Blades		Frame 227 1/2 Stbd		
12.b.1		Blade FR and Damage				

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Table 17-10.2 Checklist of Major Hull Components. (sheet 3 of 14)
(Item Numbers Correspond to Numbers on Figure 17-10.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull	Size	Conditions Found
12.c		Propeller Lifting Fittings		Frame 229 (1 ea.), frame 227 (1 ea.)		
13		Main Bearing Housing and Strut, Stbd Outboard		Frame 227 Stbd		
13.a		Rope Guard		Frame 227 Stbd, 49′ off CL		
13.b		Bearing Housing		Frame 227-224 Stbd, 49′ off CL		
13.c		Strut		Frame 225 Stbd		
13.d		Fairwater		Frame 224 Stbd, 49′ off CL		
14		Propeller Shaft, Stbd Outboard		Frame 224-215 Stbd		
15		Intermediate Bearing Housing and Strut, Stbd Outboard		Frame 213 Stbd		
15.a		Aft Fairwater		Frame 214 Stbd		
15.b		Forward Fairwater		Frame 212 Stbd		
15.c		Rotating Coupling		Frame 212 Stbd		
16		Intermediate Shaft, Stbd Outboard		Frame 211-205 Stbd		
17		Stern Tube, Stbd Outboard		Frame 205 Stbd		
17.a		Rotating Coupling				
17.b		Stern Tube Fairing				
18		Impressed Current Cathodic Protection (ICCP) Anode (8 Foot Anode)		Frame 219 Stbd		
19	134	Flood Inlet	Void Tank	Frame 209 Stbd, 44′ 4″ off CL	14″ dia	
20		Reference Electrode (Reference Cell)		Frame 206 Stbd		
21	132	Flood Inlet	Void Tank	Frame 204 Stbd, 34′ 10″ off CL	14″ dia	
22		Rudder Control Surface and Rudder Horn, Port		Frame 255-249 Port		
22.a		Rudder Drop Measurement				
22.b		Paint and Fouling				
22.c		Plating, Welds				
22.d		Rudder Fill and Drain Plugs				
22.e		Sound Rudder and Horn				

Name of Ship ______
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Table 17-10.2 Checklist of Major Hull Components. (sheet 4 of 14)
(Item Numbers Correspond to Numbers on Figure 17-10.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull	Size	Conditions Found
22.f		Rudder Lifting Fittings		Frame 255 (2 ea.)		
23		Propeller (5-Bladed), Port Inboard		Frame 248-246 Port, 22′ off CL	21″ dia	
23.a		Hub		Frame 247 Port, 22′ off CL		
23.a.1		Lifting Eye Plug			4 1/2″ Plug	
23.a.2		Fill and Drain Plugs			1/2″ Plug	
23.a.3		Propeller Cap				
23.a.3.a		Cover Plate and Fasteners				
23.a.3.b		Lifting Eye Plug			1″ Plug	
23.a.3.c		Vent Plug			1/2″ Plug	
23.b		Blades		Frame 246 Port		
23.b.1		Blade FR and Damage				
23.c		Propeller Lifting Fittings		Frame 247 (2 ea.), Frame 245 (1 ea.)		
24		Main Bearing Housing and Strut, Port Inboard		Frame 246 Port		
24.a		Rope Guard		Frame 246 Port, 22′ off CL		
24.b		Bearing Housing		Frame 246-242 Port, 22′ off CL		
24.c		Strut		Frame 244 Port		
24.d		Fairwater		Frame 242 Port, 22′ off CL		
25		Propeller Shaft, Port Inboard		Frame 242 1/2-233 Port, 22′ off CL		
26		Intermediate Bearing Housing and Strut, Port Inboard		Frame 232 Port, 22′ off CL		
26.a		Aft Fairwater		Frame 233 1/2 Port, 22′ off CL		
26.b		Forward Fairwater		Frame 231 Port, 22′ off CL		
26.c		Rotating Coupling		Frame 231 Port		
27		Intermediate Shaft, Port Inboard		Frame 230-222 1/2 Port		
28	149	Overboard Discharge	Sea Chest Discharge	Frame 226 Port, 21′ 6″ off CL	11 1/8″ dia	
29		Stern Tube, Port Inboard		Frame 222 1/2 Port		
29.a		Rotating Coupling				

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Table 17-10.2 Checklist of Major Hull Components. (sheet 5 of 14)
(Item Numbers Correspond to Numbers on Figure 17-10.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull	Size	Conditions Found
29.b		Stern Tube Fairing				
30		Impressed Current Cathodic Protection (ICCP) Anode (8 Foot Anode)		Frame 239 Port		
31		Skeg, Port Side		Frame 230-223 Port		
31.a		FR and PDR				
32	150	Sea Chest (Suction)		Frame 230-229 Port, 25′ off CL	27 5/8″ x 42 7/8″	
33		Propeller (5-Bladed), Port Outboard		Frame 229-227 1/2 Port, 49′ off CL	21′ dia	
33.a		Hub		Frame 228-227 Port, 49′ off CL		
33.a.1		Lifting Eye Plug			4 1/2″ Plug	
33.a.2		Fill and Drain Plugs			1/2″ Plug	
33.a.3		Propeller Cap				
33.a.3.a		Cover Plate and Fasteners				
33.a.3.b		Lifting Eye Plug			1″ Plug	
33.a.3.c		Vent Plug			1/2″ Plug	
33.b		Blades		Frame 227 1/2 Port		
33.b.1		Blade FR and Damage				
33.c		Propeller Lifting Fittings		Frame 229 (1 ea.), Frame 227 (1 ea.)		
34		Main Bearing Housing and Strut, Port Outboard				
34.a		Rope Guard		Frame 227 Port		
34.b		Bearing Housing		Frame 227 Port, 49′ off CL		
34.c		Strut		Frame 227-224 Port, 49′ off CL		
34.d		Fairwater		Frame 225 Port		
35		Propeller Shaft, Port Outboard		Frame 224 Port, 49′ off CL		
36		Intermediate Bearing Housing and Strut, Port Outboard		Frame 224-215 Port		
36.a		Aft Fairwater		Frame 213 Port		
36.b		Forward Fairwater		Frame 214 Port		

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Table 17-10.2 Checklist of Major Hull Components. (sheet 6 of 14)
(Item Numbers Correspond to Numbers on Figure 17-10.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull	Size	Conditions Found
36.c		Rotating Coupling		Frame 212 Port		
37		Intermediate Shaft, Port Outboard		Frame 212 Port		
38		Stern Tube, Port Outboard		Frame 211-205 Port		
38.a		Rotating Coupling		Frame 205 Port		
38.b		Stern Tube Fairing				
39		Impressed Current Cathodic Protection (ICCP) Anode (8 Foot Anode)		Frame 219 Port		
40	133	Flood Inlet	Void Tank	Frame 209 Port, 44′ 8″ off CL	14″ dia	
41	145	Sea Chest		Frame 208 Port, 35′ off CL	21 3/16″ dia	
42	184	Overboard Discharge	Air Conditioning Plant #8	Frame 207 Port, 28′ off CL	9 1/2″ dia	
43	131	Flood Inlet	Void Tank	Frame 204 Port, 34′ 10″ off CL	14″ dia	
44	185	Sea Chest	Air Conditioning Plant #8	Frame 200 Port, 30′ 11″ off CL	20 3/4″ dia	
Note: This completes the stern area for reporting FR and PDR values. Transom to frame 200.						
45		Port Side Paint and Fouling		Frame 200-45		
46		Port Side General Hull Plate		Frame 200-45		
46.a		Port Side Docking Block Area (Include Keel Block Areas) FR and PDR				
47	127	Flood Inlet	Void Tank	Frame 199 Port, 60′ 9″ off CL	14″ dia	
48	129	Flood Inlet	Void Tank	Frame 196 Port, 34′ 10″ off CL	14″ dia	
49	135	Flood Inlet	Void Tank	Frame 195 Port, 45′ 10″ off CL	14″ dia	
50	125	Flood Inlet	Void Tank	Frame 194 Port, 61′ 3″ off CL	14″ dia	
51	172	Overboard Discharge	Overboard Eductor Discharge Shaft Alley	Frame 191 Port, 62′ 5″ off CL	11 5/8″ dia	
52	123	Flood Inlet	Void Tank	Frame 189 Port, 61′ 7″ off CL	14″ dia	
53		Impressed Current Cathodic Protection (ICCP) Anode (4 Foot Anode)		Frame 188 Port		
54	121	Flood Inlet	Void Tank	Frame 185 Port, 61′ 10″ off CL	14″ dia	
55	119	Flood Inlet	Void Tank	Frame 179 Port, 62′ 9″ off CL	14″ dia	
56	68	Overboard Discharge	Auxiliary Seawater Circulation	Frame 178 Port, 64″ off CL	3 3/4″ dia	

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Table 17-10.2 Checklist of Major Hull Components. (sheet 7 of 14)
(Item Numbers Correspond to Numbers on Figure 17-10.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull	Size	Conditions Found
57	46	Overboard Discharge	Main Circulating Water	Frame 176 Port, 22′ 6″ off CL	67″ x 46 3/8″	
58	45	Overboard Discharge	Ships Service Generator/Coolant Generator Sea-water	Frame 175 Port, 1′ 9″ off CL	16 1/2″ dia	
59		Bilge Keel		Frame 175-104 Port		
60	117	Flood Inlet	Void Tank	Frame 174 Port, 62′ 11″ off CL	14″ dia	
61	43	Seawater Suction	Ships Service Generator/Coolant Generator Sea-water	Frame 173-172 Port, 11′ 10″ off CL	37 1/4″ x 30 1/2″	
62	42	Seawater Suction	Distiller Plant Feed Pump #4	Frame 170 Port, 11′ 2″ off CL	20″ dia	
63	41	Seawater Suction	Main Circulating Water	Frame 169-168 Port, 34′ 4″ off CL	43 1/4″ x 29 1/2″	
64	115	Flood Inlet	Void Tank	Frame 169 Port, 63′ 10″ off CL	14″ dia	
65	39	Scoop Injection	Main Circulating Water	Frame 166-163 Port, 22′ 10″ off CL	10′ 8″ x 44 1/4″	
66	176	Overboard Discharge	Catapults #1, #2, #3 and #4 Blow Down	Frame 165 Port, 66′ 6″ off CL	11 7/8″ dia	
67	161	Overboard Discharge	Exhaust Relief Valve Escape	Frame 165 Port, 66′ 8″ off CL	18 1/2″ dia	
68	40	Overboard Discharge	Distillery Plant #4 Brine and Aux. Circ. Water	Frame 165 Port, 41′ 10″ off CL	11 3/4″ dia	
69	175	Overboard Discharge	Catapults #1, #2, #3 and #4 Blow Down	Frame 163 Port, 66′ 6″ off CL	11 7/8″ dia	
70	180	Overboard Discharge	Catapults #1, #2, #3 and #4 Blow Down	Frame 163 Port, 66′ 6″ off CL	21 3/4″ dia	
71	179	Overboard Discharge	Catapults #1, #2, #3 and #4 Blow Down	Frame 162 Port, 66′ 6″ off CL	21 3/4″ dia	
72	166	Overboard Discharge	Exhaust Relief Valve Escape	Frame 161 Port, 66′ 10″ off CL	24 1/2″ dia	
73	38	Overboard Discharge	Ships Service Air Conditioning and Auxiliary Machinery Circulating Water	Frame 161 Port, 41′ 7″ off CL	11 7/8″ dia	
74	194	Overboard Discharge	Steam Discharge	Frame 160 Port, 66′ 2″ off CL	8 3/4″ dia	
75	198	Overboard Discharge		Frame 159 Port, 66′ 2″ off CL	3″ dia	
76	112	Flood Inlet	Void Tank	Frame 159 Port, 64′ 1″ off CL	14″ dia	
77	191	Overboard Discharge	Blow Down	Frame 158 Port, 66′ 2″ off CL	3″ dia	
78	189	Overboard Discharge	Relief Discharge	Frame 157 Port, 62′ 2″ off CL	8 3/4″ dia	
79	155	Overboard Discharge	Eductor	Frame 157 Port, 65′ 5″ off CL	10 1/2″ dia	
80	201	Overboard Discharge		Frame 156 Port, 66′ 2″ off CL	3 3/4″ dia	
81	37	Seawater Suction	Fire Pump #12 and Ships Service Air Conditioning	Frame 155 Port, 34′ 7″ off CL	32 1/2″ x 21″	

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Table 17-10.2 Checklist of Major Hull Components. (sheet 8 of 14)
(Item Numbers Correspond to Numbers on Figure 17-10.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull	Size	Conditions Found
82		Impressed Current Cathodic Protection (ICCP) Anode (4 Foot Anode)		Frame 155 Port/Stbd		
83	140	Overboard Discharge	Blow Down Trunk	Frame 155-153 Port, 65′ 6″ off CL	7′ 6″ x 60″	
84	36	Overboard Discharge	Fresh Water Coolers	Frame 154 Port, 44′ 1″ off CL	7 5/8″ dia	
85	35	Overboard Discharge	Fresh Water Coolers	Frame 153 Port, 44′ 5″ off CL	16 5/8″ dia	
86	110	Flood Inlet	Void Tank	Frame 152 Port, 62′ 8″ off CL	14″ dia	
87	139	Overboard Discharge	Blow Down Trunk	Frame 151-149 Port, 66′ off CL	7′ 6″ x 60″	
88	34	Seawater Suction	Fresh Water Coolers	Frame 150-149 Port, 35′ 3″ off CL	37″ x 30 1/2″	
89	108	Flood Inlet	Void Tank	Frame 148 Port, 62′ 7″ off CL	14″ dia	
90	154	Overboard Discharge	Eductor	Frame 147 Port, 66′ 5″ off CL	10 1/2″ dia	
91	106	Flood Inlet	Void Tank	Frame 147 Port, 63′ off CL	14″ dia	
92	168	Overboard Discharge	Exhaust Relief Valve Escape	Frame 139 Port, 67′ off CL	2 5/16″ dia	
93	104	Flood Inlet	Void Tank	Frame 139 Port, 62′ 8″ off CL	14″ dia	
94	164	Overboard Discharge	Exhaust Relief Valve Escape	Frame 138 Port, 67′ off CL	18 1/2″ dia	
95	102	Flood Inlet	Void Tank	Frame 133 Port, 62′ 10″ off CL	14″ dia	
96	100	Flood Inlet	Void Tank	Frame 128 Port, 63′ off CL	14″ dia	
97	182	Sea Chest		Frame 126 Port, 41′ 11″ off CL	21 1/8″ dia	
98	32	Overboard Discharge	Exhaust Relief Valve Escape	Frame 126 Port, 63″ off CL	3 3/4″ dia	
99	33	Overboard Discharge	Main Circulating Water	Frame 125-123 Port, 26′ 1″ off CL	63″ x 47″	
100		Impressed Current Cathodic Protection (ICCP) Anode (8 Foot Anode)		Frame 125 Port		
101	31	Overboard Discharge	Ships Service Generator/Coolant Generator Condenser Seawater	Frame 123 Port, 20″ off CL	16 1/2″ dia	
102	98	Flood Inlet	Void Tank	Frame 123 Port, 62′ 5″ off CL	14″ dia	
103	28	Overboard Discharge	Air Conditioning Plant #5 Seawater Cooling	Frame 122 Port, 41′ 3″ off CL	9 3/8″ dia	
104	30	Seawater Suction	Ships Service Generator/Coolant Generator Condenser Seawater	Frame 121-120 Port, 11′ 9″ off CL	37 1/8″ x 30 7/8″	
105	162	Overboard Discharge	Exhaust Relief Valve Escape	Frame 121 Port, 66′ 7″ off CL	18 1/2″ dia	
106	137	Overboard Discharge	Eductor	Frame 121 Port, 64′ 7″ off CL	11 1/2″ dia	

Name of Ship
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Table 17-10.2 Checklist of Major Hull Components. (sheet 9 of 14)
(Item Numbers Correspond to Numbers on Figure 17-10.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull	Size	Conditions Found
107	29	Seawater Suction	Distilling Plant #2	Frame 118 Port, 11′ 11″ off CL	20″ dia	
108	27	Seawater Suction	Air Conditioning Plant #5 Seawater Cooling	Frame 118 Port, 41′ 4″ off CL	26″ dia	
109	96	Flood Inlet	Void Tank	Frame 118 Port, 63′ 11″ off CL	14″ dia	
110	16	Seawater Suction	Main Circulating Water	Frame 117-116 Port, 37′ 5″ off CL	42″ x 29 1/2″	
111	24	Seawater Suction	Fire Pump #10	Frame 114 Port, 7′ 10″ off CL	20″ dia	
112	25	Scoop Injection	Main Circulating Water	Frame 114-111 Port, 26′ off CL	9′ 8″ x 43″	
113	26	Overboard Discharge	Distilling Plant #2 Brine and Aux. Circulating Water	Frame 113 Port, 42′ 1″ off CL	11 3/4″ dia	
114	94	Flood Inlet	Void Tank	Frame 113 Port, 63′ 2″ off CL	14″ dia	
115	165	Overboard Discharge	Exhaust Relief Valve Escape	Frame 111 Port, 65′ 5″ off CL	24 1/2″ dia	
116	188	Overboard Discharge	Relief Discharge	Frame 108 Port, 63′ 9″ off CL	8 3/4″ dia	
117	92	Flood Inlet	Void Tank	Frame 108 Port, 62′ 5″ off CL	14″ dia	
118	23	Seawater Suction	Fire Pump #7	Frame 104 Port, 32′ 6″ off CL	20″ dia	
119	200	Overboard Discharge		Frame 104 Port, 63′ 7″ off CL	3 3/4″ dia	
120	90	Flood Inlet	Void Tank	Frame 104 Port, 61′ 3″ off CL	14″ dia	
121	192	Overboard Discharge	Steam Discharge	Frame 103 Port, 62′ 10″ off CL	8 3/4″ dia	
122	22	Overboard Discharge	Fresh Water Coolers	Frame 103 Port, 37′ 6″ off CL	7 1/2″ dia	
123	142	Overboard Discharge	Blow Down Trunk	Frame 103-101 Port, 61′ 4″ off CL	7′ 6″ x 60″	
124	88	Flood Inlet	Void Tank	Frame 103 Port, 60′ 5″ off CL	14″ dia	
125	21	Overboard Discharge	Fresh Water Coolers	Frame 101 Port, 38′ off CL	16 3/8″ dia	
126	196	Overboard Discharge	Blow Down	Frame 100 Port, 62′ 9″ off CL	3″ dia	
127	141	Overboard discharge	Blow Down Trunk	Frame 100-98 Port, 60′ 3″ off CL	7′ 6″ x 60″	
128	20	Seawater Suction	Fresh Water Coolers	Frame 98-97 Port, 32′ 7″ off CL	41″ x 27 1/2″	
129	86	Flood Inlet	Void Tank	Frame 97 Port, 59′ 7″ off CL	14″ dia	
130	190	Overboard Discharge		Frame 96 Port, 60′ 1″ off CL	3″ dia	
131	84	Flood Inlet	Void Tank	Frame 94 Port, 57′ 10″ off CL	14″ dia	
132	82	Flood Inlet	Void Tank	Frame 91 Port, 55′ off CL	14″ dia	
133		Impressed Current Cathodic Protection (ICCP) Anode (8 Foot Anode)		Frame 88 Port		

Name of Ship ____________________
Inspection Activity ____________________
Inspection Location ____________________
Inspection Date ____________________
Type of Inspection (Level 1 or Level 2) ____________________

Table 17-10.2 Checklist of Major Hull Components. (sheet 10 of 14)
(Item Numbers Correspond to Numbers on Figure 17-10.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull	Size	Conditions Found
134	80	Flood Inlet	Void Tank	Frame 84 Port, 51′ 7″ off CL	14″ dia	
135	78	Flood Inlet	Void Tank	Frame 81 Port, 50′ off CL	14″ dia	
136	177	Overboard Discharge	Catapults #1, #2, #3 and #4 Blow Down	Frame 80 Port, 53′ 11″ off CL	21 3/4″ x 22 3/8″	
137	174	Overboard Discharge	Catapults #1, #2, #3 and #4 Blow Down	Frame 80 Port, 55′ 1″ off CL	11 7/8″ x 12 1/4″	
138	146	Transducer	Fathometer	Frame 74 Port, 2′ 5″ off CL	11″ dia	
139	148	Sea Chest		Frame 74 Port, 5″ off CL	1 3/8″ dia	
140	147	Rodmeter		Frame 74 Port, 1′ off CL	7 1/4″ dia	
141	76	Flood Inlet	Void Tank	Frame 74 Port, 46′ off CL	14″ dia	
142	151	Overboard Discharge	Overboard Eductor Discharge Pump Room #2	Frame 70 Port, 49′ 11″ off CL	9″ dia	
143	74	Flood Inlet	Void Tank	Frame 70 Port, 44′ 3″ off CL	14″ dia	
144		Impressed Current Cathodic Protection (ICCP) Anode (4 Foot Anode)		Frame 67 Port		
145	72	Flood Inlet	Void Tank	Frame 64 Port, 40′ 3″ off CL	14″ dia	
146	70	Flood Inlet	Void Tank	Frame 59 Port, 36′ 4″ off CL	14″ dia	
147	187	Overboard Discharge	Combination Overboard Discharge	Frame 54 Port, 38′ 6″ off CL	10″ dia	
148	56	Flood Inlet	Void Tank	Frame 54 Port, 33′ 5″ off CL	14″ dia	
149	4	Seawater Suction	Air Condenser Pump and Diesel Generator	Frame 52-51 Port, 13′ 11″ off CL	32 1/2″ x 21″	
150		Reference Electrode (Reference Cell)		Frame 50 Port		
151	44	Flood Inlet	Void Tank	Frame 49 Port, 30′ 3″ off CL	14″ dia	
Note: This completes the port side for reporting FR and PDR values. Frames 200 to 45.						
152		Bow Paint and Fouling		Frame 45 - Bow		
153		Bow General Hull Plate		Frame 45 - Bow		
153.a		Bow Keel Docking Block Areas, FR and PDR				
154	186	Overboard Discharge	Main Drain Eductor Overboard Discharge	Frame 17 Port, 11′ 7″ off CL	10″ dia	
155		Impressed Current Cathodic Protection (ICCP) Anode (4 Foot Anode)		Frame 31 Port		
156		Impressed Current Cathodic Protection (ICCP) Anode (4 Foot Anode)		Frame 31 Stbd		

Name of Ship ______
Inspection Activity ______
Inspection Location ______
Inspection Date ______
Type of Inspection (Level 1 or Level 2) ______

Table 17-10.2 Checklist of Major Hull Components. (sheet 11 of 14)
(Item Numbers Correspond to Numbers on Figure 17-10.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull	Size	Conditions Found
157	1	Overboard Discharge	Air Condenser Pump and Diesel Generator	Frame 45 Stbd, 5′ off CL	12 1/2″ dia	
Note: This completes the bow area for reporting FR and PDR value. Frames 45 and forward.						
158		Stbd Side Paint and Fouling		Frame 45-200		
159		Stbd Side General Hull Plate		Frame 45-200		
159.a		Stbd Side Docking Block Areas				
160	47	Flood Inlet	Void Tank	Frame 49 Stbd, 30′ 2″ off CL	14″ dia	
161	169	Overboard Discharge	Seawater Pump Emergency Diesel Gen.	Frame 51 Stbd, 35′ 8″ off CL	21 3/16″ dia	
162	2	Seawater Suction	Air Condenser Pump and Diesel Generator	Frame 52-51 Stbd, 8′ 6″ off CL	32 1/2″ x 21″	
163	170	Overboard Discharge	Overboard Eductor Discharge Pump	Frame 53 Stbd, 39′ off CL	11 1/2″ dia	
164	3	Sea Chest	Suction, Firemain	Frame 53-52 Stbd, 4′ 10″ off CL	32 1/2″ x 21″	
165	69	Flood Inlet	Void Tank	Frame 54 Stbd, 33′ 4″ off CL	14″ dia	
166	71	Flood Inlet	Void Tank	Frame 59 Stbd, 36′ 4″ off CL	14″ dia	
167	73	Flood Inlet	Void Tank	Frame 64 Stbd, 40′ 7″ off CL	14″ dia	
168		Impressed Current Cathodic Protection (ICCP) Anode (4 Foot Anode)		Frame 67 Stbd		
169	75	Flood Inlet	Void Tank	Frame 70 Stbd, 44′ off CL	14″ dia	
170	152	Overboard Discharge	Overboard Eductor Discharge Pump	Frame 70 Stbd, 49′ 11″ off CL	9″ dia	
171	5	Sea Chest	Suction, Firemain	Frame 72-71 Stbd, 1′ 11″ off CL	32 1/2″ x 21″	
172	77	Flood Inlet	Void Tank	Frame 74 Stbd, 47′ off CL	14″ dia	
173	173	Overboard Discharge	Catapults #1, #2, #3 and #4 Blow Down	Frame 80 Stbd, 54′ 10″ off CL	11 7/8″ x 12 1/4″	
174	79	Flood Inlet	Void Tank	Frame 81 Stbd, 51′ 11″ off CL	14″ dia	
175	178	Overboard Discharge	Catapults #1, #2, #3 and #4 Blow Down	Frame 81 Stbd, 54′ 3″ off CL	21 3/4″ x 22 3/8″	
176	81	Flood Inlet	Void Tank	Frame 84 Stbd, 52′ 6″ off CL	14″ dia	
177	143	Overboard Discharge	Blow Down Trunk	Frame 90-86 Stbd, 56′ 6″ off CL	15′ 10″ x 60″	
178	83	Flood Inlet	Void Tank	Frame 91 Stbd, 56′ 11″ off CL	14″ dia	
179		Impressed Current Cathodic Protection (ICCP) Anode (8 Foot Anode)		Frame 93 Stbd		
180	85	Flood Inlet	Void Tank	Frame 95 Stbd, 58′ 6″ off CL	14″ dia	

Name of Ship

Inspection Activity

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Type of Inspection (Level 1 or Level 2)

Table 17-10.2 Checklist of Major Hull Components. (sheet 12 of 14)
(Item Numbers Correspond to Numbers on Figure 17-10.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull	Size	Conditions Found
181	197	Overboard Discharge	Blow Down	Frame 97 Stbd, 60′ 8″ off CL	3″ dia	
182	87	Flood Inlet	Void Tank	Frame 99 Stbd, 59′ 6″ off CL	14″ dia	
183	193	Overboard Discharge	Steam Discharge	Frame 99 Stbd, 60′ 8″ off CL	8 3/4″ dia	
184	89	Flood Inlet	Void Tank	Frame 100 Stbd, 59′ 2″ off CL	14″ dia	
185	6	Seawater Suction	Coolant Turbine Generator	Frame 100-99 Stbd, 38′ 5″ off CL	41″ x 28″	
186	181	Sea Chest		Frame 102 Stbd, 38′ 5″ off CL	21 1/8″ dia	
187	7	Overboard Discharge	Coolant Turbine Generator	Frame 103 Stbd, 32′ 3″ off CL	16 1/2″ dia	
188	91	Flood Inlet	Void Tank	Frame 104 Stbd, 61′ 3″ off CL	14″ dia	
189	8	Overboard Discharge	Coolant Turbine Generator	Frame 104 Stbd, 34′ 4″ off CL	16 1/2″ dia	
190	93	Flood Inlet	Void Tank	Frame 108 Stbd, 62′ 5″ off CL	14″ dia	
191	9	Seawater Suction	Coolant Turbine Generator	Frame 108-107 Stbd, 28′ off CL	37″ x 31″	
192	156	Overboard Discharge	Eductor	Frame 109 Stbd, 65′ off CL	10 7/16″ dia	
193	160	Overboard Discharge	Exhaust Relief Valve Escape	Frame 109 Stbd, 65′ 3″ off CL	20 1/2″ dia	
194	10	Seawater Suction	Fire Pump #8 and Auxiliary Circulating Water	Frame 110-109 Stbd, 31′ 11″ off CL	41″ x 26″	
195		Reference Electrode (Reference Cell)		Frame 110 Stbd		
196	95	Flood Inlet	Void Tank	Frame 113 Stbd, 63′ 2″ off CL	14″ dia	
197	11	Overboard Discharge	Distilling Plant #1 and Brine	Frame 113 Stbd, 42′ 6″ off CL	9 1/2″ dia	
198	12	Scoop Injection	Main Circulating Water	Frame 113-111 Stbd, 25′ 2″ off CL	10′ 8″ x 43″	
199	14	Seawater Suction	Fire Pump #9	Frame 114 Stbd, 5′ off CL	26″ dia	
200	13	Seawater Suction	Main Circulating Water	Frame 117-116 Stbd, 37′ 4″ off CL	42 1/2″ x 29 1/2″	
201	97	Flood Inlet	Void Tank	Frame 118 Stbd, 63′ 11″ off CL	14″ dia	
202	17	Overboard Discharge	Ships Service Generator Condenser Seawater	Frame 118 Stbd, 1′ 8″ off CL	16″ dia	
203	15	Seawater Suction	Distilling Plant Feed Pump #1	Frame 118 Stbd, 11′ 10″ off CL	20″ dia	
204	18	Seawater Suction	Ships Service Generator Condenser Seawater	Frame 121-120 Stbd, 11′ 8″ off CL	37″ x 31″	
205	99	Flood Inlet	Void Tank	Frame 123 Stbd, 62′ 5″ off CL	14″ dia	
206		Impressed Current Cathodic Protection (ICCP) Anode (8 Foot Anode)		Frame 125 Stbd		
207	19	Overboard Discharge	Main Circulating Water	Frame 125-124 Stbd, 26′ 5″ off CL	67″ x 46 1/2″	

Name of Ship ______
Inspection Activity ______
Inspection Location ______
Inspection Date ______
Type of Inspection (Level 1 or Level 2) ______

Table 17-10.2 Checklist of Major Hull Components. (sheet 13 of 14)
(Item Numbers Correspond to Numbers on Figure 17-10.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull	Size	Conditions Found
208	158	Overboard Discharge	Exhaust Relief Valve Escape	Frame 125 Stbd, 66′ 10″ off CL	20 1/2″ dia	
209	101	Flood Inlet	Void Tank	Frame 128 Stbd, 63′ off CL	14″ dia	
210	163	Overboard Discharge	Exhaust Relief Valve Escape	Frame 132 Stbd, 67′ off CL	18 1/2″ dia	
211	167	Overboard Discharge	Exhaust Relief Valve Escape	Frame 132 Stbd, 67′ off CL	2 5/16″ dia	
212	103	Flood Inlet	Void Tank	Frame 133 Stbd, 63′ 1″ off CL	14″ dia	
213	105	Flood Inlet	Void Tank	Frame 142 Stbd, 62′ 8″ off CL	14″ dia	
214	153	Overboard Discharge	Eductor	Frame 146 Stbd, 66′ 9″ off CL	10 1/2″ dia	
215	107	Flood Inlet	Void Tank	Frame 147 Stbd, 63′ 6″ off CL	14″ dia	
216	109	Flood Inlet	Void Tank	Frame 151 Stbd, 62′ 9″ off CL	14″ dia	
217	67	Seawater Suction	Coolant Turbine Generator	Frame 152-151 Stbd, 38′ 8″ off CL	37″ x 31″	
218	183	Sea Chest		Frame 153 Stbd, 34′ 7″ off CL	21 1/8″ dia	
219	157	Overboard Discharge	Exhaust Relief Valve Escape	Frame 154 Stbd, 67′ off CL	22 1/2″ dia	
220	111	Flood Inlet	Void Tank	Frame 155 Stbd, 64′ 7″ off CL	14″ dia	
221	66	Overboard Discharge	Coolant Turbine Generator	Frame 155 Stbd, 29′ 1″ off CL	16 1/2″ dia	
222		Impressed Current Cathodic Protection (ICCP) Anode (4 Foot Anode)		Frame 155 Stbd		
223	65	Overboard Discharge	Coolant Turbine Generator and Coolant Turbine Generator	Frame 156 Stbd, 31′ 2″ off CL	16 1/2″ dia	
224	195	Overboard Discharge	Steam Discharge	Frame 156 Stbd, 66′ 1″ off CL	8 3/4″ dia	
225	113	Flood Inlet	Void Tank	Frame 158 Stbd, 64′ 1″ off CL	14″ dia	
226	199	Overboard Discharge	Blow Down	Frame 159 Stbd, 66′ 2″ off CL	3″ dia	
227	63	Seawater Suction	Coolant Turbine Generator	Frame 160-159 Stbd, 24′10″ off CL	41″ x 28″	
228	114	Flood Inlet	Void Tank	Frame 161 Stbd, 64′ 4″ off CL	14″ dia	
229	64	Seawater Suction	Auxiliary Machinery Circulating Water and Fire Pump #11	Frame 162-161 Stbd, 28′ 6″ off CL	41″ x 26″	
230	62	Overboard Discharge	Distilling Plant #3 Brine	Frame 165 Stbd, 41′ 10″ off CL	9 1/2″ dia	
231	61	Scoop Injection	Main Circulating Water	Frame 166-163 Stbd, 23′ off CL	10′ 6″ x 42 1/2″	
232	144	Overboard Discharge	Blow Down Trunk	Frame 167-163 Stbd, 63′ 10″ off CL	15′ 10″ x 60″	
233	138	Overboard Discharge	Eductor	Frame 167 Stbd, 65′ 5″ off CL	11 1/2″ dia	

Name of Ship
Inspection Activity
Inspection Location
Inspection Date
Type of Inspection (Level 1 or Level 2)

Table 17-10.2 Checklist of Major Hull Components. (sheet 14 of 14)
(Item Numbers Correspond to Numbers on Figure 17-10.1, Plan and Profile Drawing.)

Item No.	Docking Plan Ref. No.	Component	System Served	Location on Hull	Size	Conditions Found
234	60	Seawater Suction	Fire Pump #13	Frame 167 Stbd, 4′ 10″ off CL	26″ dia	
235	116	Flood Inlet	Void Tank	Frame 169 Stbd, 63′ 10″ off CL	14″ dia	
236	59	Seawater Suction	Main Circulating Water	Frame 169-168 Stbd, 34′ 7″ off CL	37″ x 29″	
237	55	Seawater Suction	Air Conditioning Plant #7 Seawater Cooling	Frame 169 Stbd, 38′ 5″ off CL	26″ dia	
238	58	Seawater Suction	Distiller Plant Feed Pump #3	Frame 170 Stbd, 11′ 2″ off CL	20″ dia	
239	57	Overboard Discharge	Ships Service Generator/Condenser Seawater	Frame 171 Stbd, 21″ off CL	16 1/2″ dia	
240	53	Seawater Suction	Ships Service Generator/Condenser Seawater	Frame 173-172 Stbd, 11′ 9″ off CL	37″ x 30 3/4″	
241	118	Flood Inlet	Void Tank	Frame 174 Stbd, 62′ 11″ off CL	14″ dia	
242		Bilge Keel		Frame 175-104 Stbd		
243	54	Overboard Discharge	Air Conditioning Plant #7 Seawater Cooling	Frame 175 Stbd, 40′ 9″ off CL	9 3/4″ dia	
244	52	Overboard Discharge	Main Circulating Water	Frame 176-175 Stbd, 22′ 3″ off CL	66 1/2″ x 47″	
245	159	Overboard Discharge	Exhaust Relief Valve Escape	Frame 178 Stbd, 65′ 11″ off CL	20 1/2″ dia	
246	120	Flood Inlet	Void Tank	Frame 179 Stbd, 62′ 9″ off CL	14″ dia	
247	51	Seawater Suction	Air Conditioning Plant #3 and #4 Seawater Cooling	Frame 182-181 Stbd, 64″ off CL	32 1/2″ x 21″	
248	122	Flood Inlet	Void Tank	Frame 184 Stbd, 61′ 10″ off CL	14″ dia	
249	49	Overboard Discharge	Air Conditioning Plant #3 and #4 Seawater Cooling	Frame 187 Stbd, 17′ 7″ off CL	12 1/2″ dia	
250		Impressed Current Cathodic Protection (ICCP) Anode (4 Foot Anode)		Frame 188 Stbd		
251	50	Overboard Discharge	Boiler Blow	Frame 189 Stbd, 5′ 1″ off CL	2″ dia	
252	48	Seawater Suction	Fire Pump #14 and #15	Frame 189 Stbd, 15′ off CL	26″ dia	
253	124	Flood Inlet	Void Tank	Frame 189 Stbd, 61′ 7″ off CL	14″ dia	
254	171	Overboard Discharge	Overboard Eductor Discharge Shaft Alley	Frame 191 Stbd, 62′ 5″ off CL	11 5/8″ dia	
255	126	Flood Inlet	Void Tank	Frame 194 Stbd, 61′ 3″ off CL	14″ dia	
256	136	Flood Inlet	Void Tank	Frame 195 Stbd, 46′ 4″ off CL	14″ dia	
257	130	Flood Inlet	Void Tank	Frame 196 Stbd, 34′ 10″ off CL	14″ dia	
258	128	Flood Inlet	Void Tank	Frame 199 Stbd, 60′ 9″ off CL	14″ dia	
Note: This completes the starboard side for reporting FR and PDR value. Frames 45 to 200.						

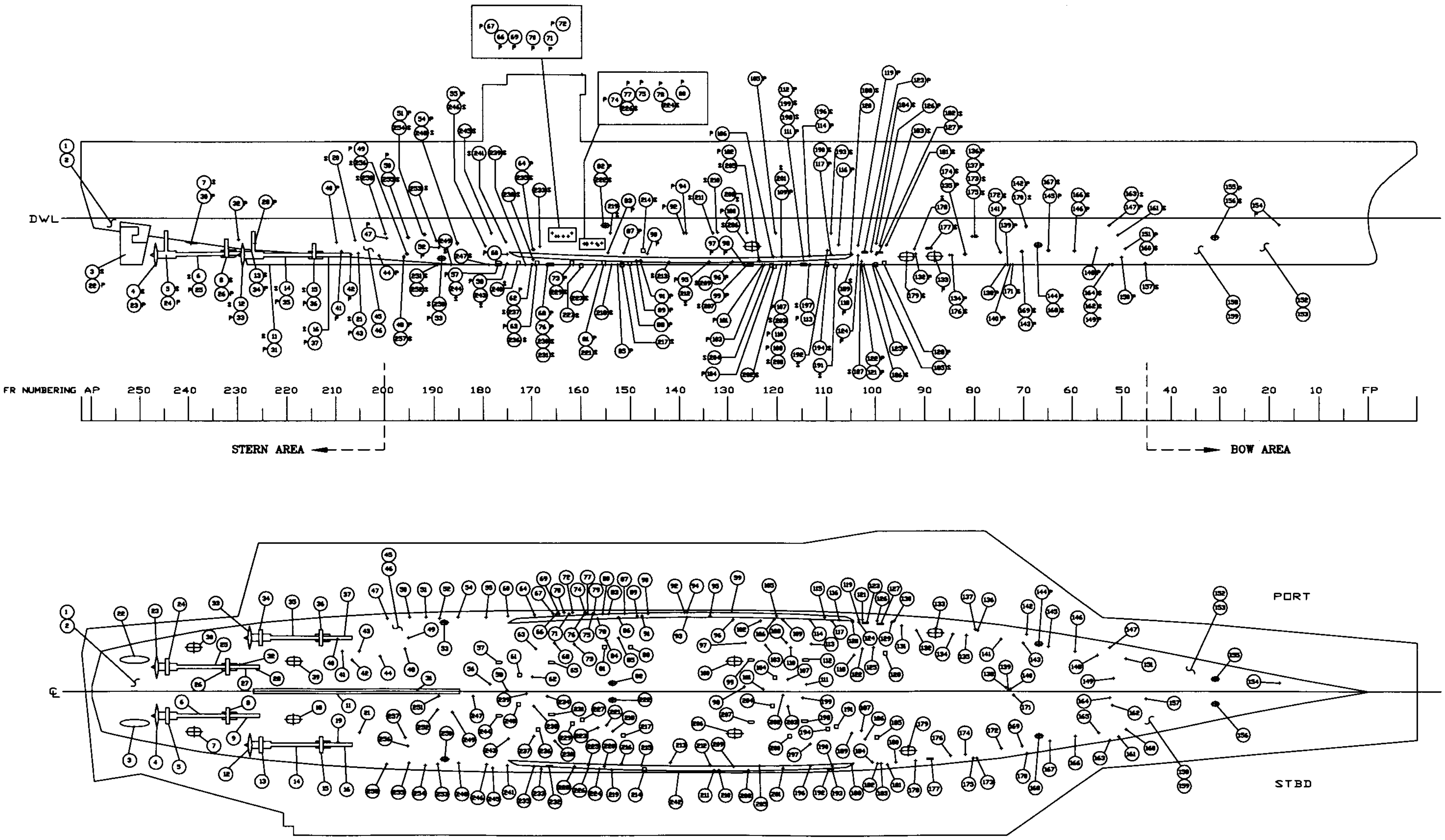

Figure 17-10.1 CVN 68 Class Plan and Profile.

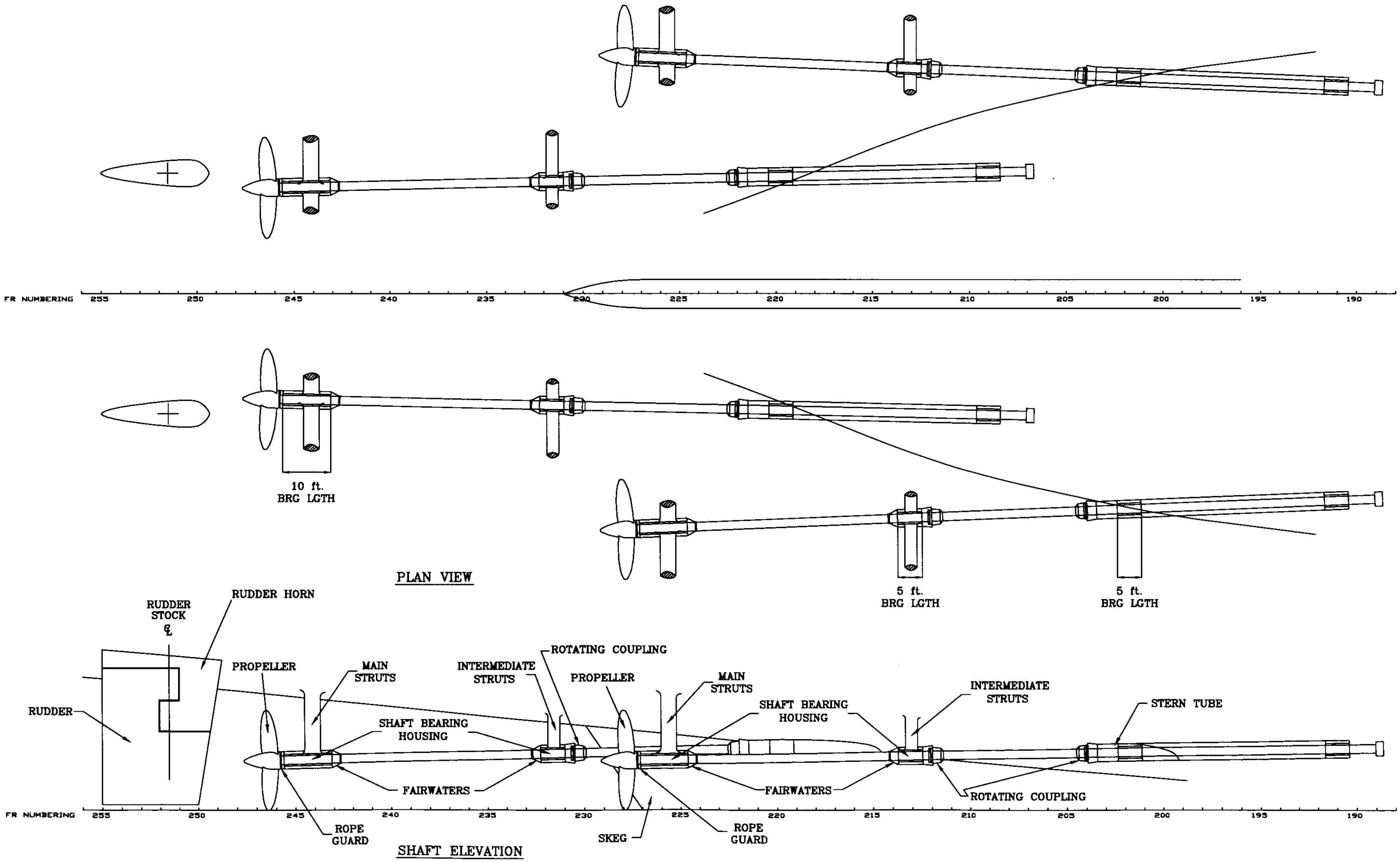

Figure 17-10.2 CVN 68 Class Running Gear.

17-10.4 LEVEL 2 INSPECTION PROCEDURES.

17-10.4.1 Introduction.

17-10.4.1.1 This section contains Level 2 inspection procedures for the CVN 68 Class Aircraft Carrier. The procedures are presented in the order in which the diver would find the components when making a stern-to-stem swim. The Dive Supervisor can refer back to Table 17-10.2 to pinpoint the exact location of a particular component.

17-10.4.1.2 The purpose of a Level 2 inspection is to conduct a detailed inspection of the malfunctioning or damaged component. The diver must gather sufficient information for further evaluation. For this reason, the diver must make precise measurements and record the exact coordinates of any discrepancies that require further repair. The drawings in this chapter can be photocopied and marked to show the location and extent of damage. The diver can also refer to the appropriate forms for recording damage on certain types of systems. Underwater color video and/or photography should also be used to further depict the damage described on the report and on the forms.

17-10.4.2 Hull Coating and Hull Plate.

17-10.4.2.1 The purpose of a Level 2 hull coating and hull plate inspection is to accurately assess the extent of known or suspected damage resulting from collision, grounding, or other mishap. The inspection requires a detailed description (with measurements) of the exact location and extent of all damage.

17-10.4.2.2 Damage Description Requirements.

17-10.4.2.2.1 Report all areas, size, and location of paint damage, areas of exposed metal, and condition of surrounding paint. Use definable reference points such as suctions, discharges, bilge keel, flat bottom, turn of the bilge, etc.

17-10.4.2.2.2 Hull plate damage must be detailed in terms of the amount of distortion; orientation; size, length, and maximum width of cracks or gouges; proximity and orientation of closest weld seams; torn or missing plate; and condition of exposed stiffeners and framing.

17-10.4.2.2.3 Damage at or near the keel must include a detailed inspection of the keel. Locate and measure any cracks or distortion.

17-10.4.2.2.4 Example of Report. “10-foot by 35-foot damaged area running fore and aft, 15 feet outboard port of the keel beginning 38 feet aft of the rodmeter. Damage begins with an area of scraped paint, approximately 10 feet long, and continues to a maximum plate distortion of four inches by six feet wide by 20 feet long, 50 percent bare metal, no visible hull plate cracks, no suctions or discharges are located in the damaged area.”

17-10.4.2.3 Inspection Procedure.

17-10.4.2.3.1 Gross Damage Assessment.

a. Conduct a quick inspection of the damaged area and immediate surrounding area.

   (1) Inspect the condition of the hull paint and locate the closest hull appendages and openings.

   (2) If only paint damage has occurred, report the size and location; if distorted, gouged, or cracked metal is found, continue with the detailed inspection.

   (3) Measure extent of pitting: percent, diameter, and depth.

17-10.4.2.3.2 Detailed Damage Inspection.

a. Thoroughly inspect all damaged areas: length, width, and orientation of all cracks, area of distorted or missing hull plate, maximum depression of plate, presence of torn or bulging plate.

b. If hull plate is torn or missing, report condition of all exposed framing.

NOTE

Damage at or near the keel is a serious casualty. Exact details of the condition are required to determine the seaworthiness of the hull.

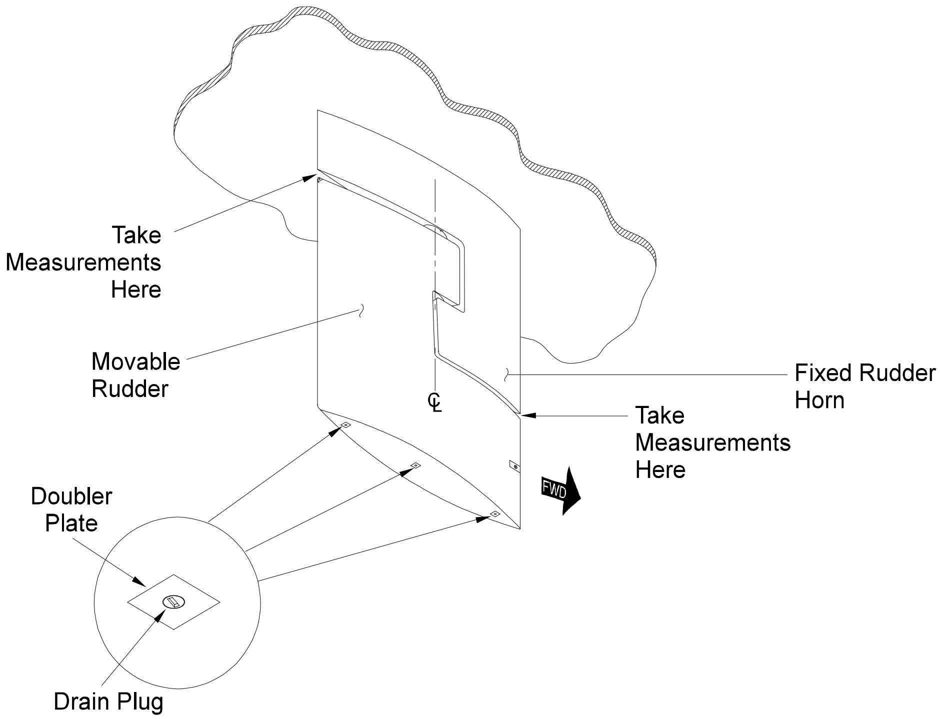

Figure 17-10.3. Semi-Balanced Rudder.

17-10.4.3 Rudder and Rudder Horn Fairwater.

17-10.4.3.1 Damage Description Requirements.

17-10.4.3.1.1 Inspection of rudders requires a detailed description (with measurements) of the exact location and size of all corrosion, damage, and flaws. As a minimum, the description must include:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference point (top/bottom/side/leading edge).

b. Length, maximum width, and orientation of all cracks; give closest weld seam information, include the direction of the crack with respect to the weld (perpendicular or parallel) and the proximity of the crack to the weld (center of weld, base metal). If cracks are found in or near any clad welding, describe the location with respect to the cladding (center, edge, parallel to weld bead, etc.).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage.

e. PDR and FR.

17-10.4.3.1.2 Example of Report. "Pitting on leading edge of port rudder, inboard side, starting 30 inches from forward bottom, 6-inch by 8-inch area. Maximum pit depth: 1/8-inch depth by 1/4-inch diameter. Average pit depth: 1/8-inch depth by 1/4-inch diameter."

17-10.4.3.2 Inspection Procedure. See Figure 17-10.3.

a. Inspect the rudder stock area.

(1) Inspect the area between the rudder and rudder horn, and around the rudder stock for fouled wire, rope, or other foreign material.

b. Measure the rudder clearance.

(1) Take the measurements between the lower leading edge of the fixed rudder horn and the top of the movable rudder and also between the lower trailing edge of the rudder horn and the top of the movable rudder. Design clearance measurement is 2 1/2 inches.

c. Inspect the rudder and rudder horn surface.

(1) Determine the overall FR of the rudder and rudder horn. If the FR is 40 or greater, inspect for clean areas which indicate areas of recent damage from grounding or contact with submerged objects. If any such areas are found, thoroughly inspect for cracks, dents, or gouges.

(2) Conduct a detailed inspection of the rudder and rudder horn surface for any cracked welds, marks, gouges, or scrapes. Inspect for areas of bleeding rust and bare metal. Inspect the rudder horn to hull weld for cracks and corrosion.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(3) Verify that the two fill plugs (top) and three drain plugs (bottom) are present and secure.

(4) Report the FR and the PDR.

d. Sound the rudder and rudder horn.

(1) Using a rubber or rawhide mallet, rap on the rudder and horn surface to determine if the rudder has flooded. Begin sounding near the uppermost part of the rudder and continue downward to the lowest point.

NOTE

Internal framing and stiffeners will change the sound. It is necessary to sound the rudder and skeg fairwater in different locations. A hollow sound indicates the rudder or horn is not flooded, while a dull sound indicates flooding.

(2) If the rudder or horn is found to contain water, conduct a detailed inspection to locate the source of flooding. Inspect all plugs for tightness and inspect weld seams for cracks. Make the appropriate report and arrangements for follow-on dewatering and repair.

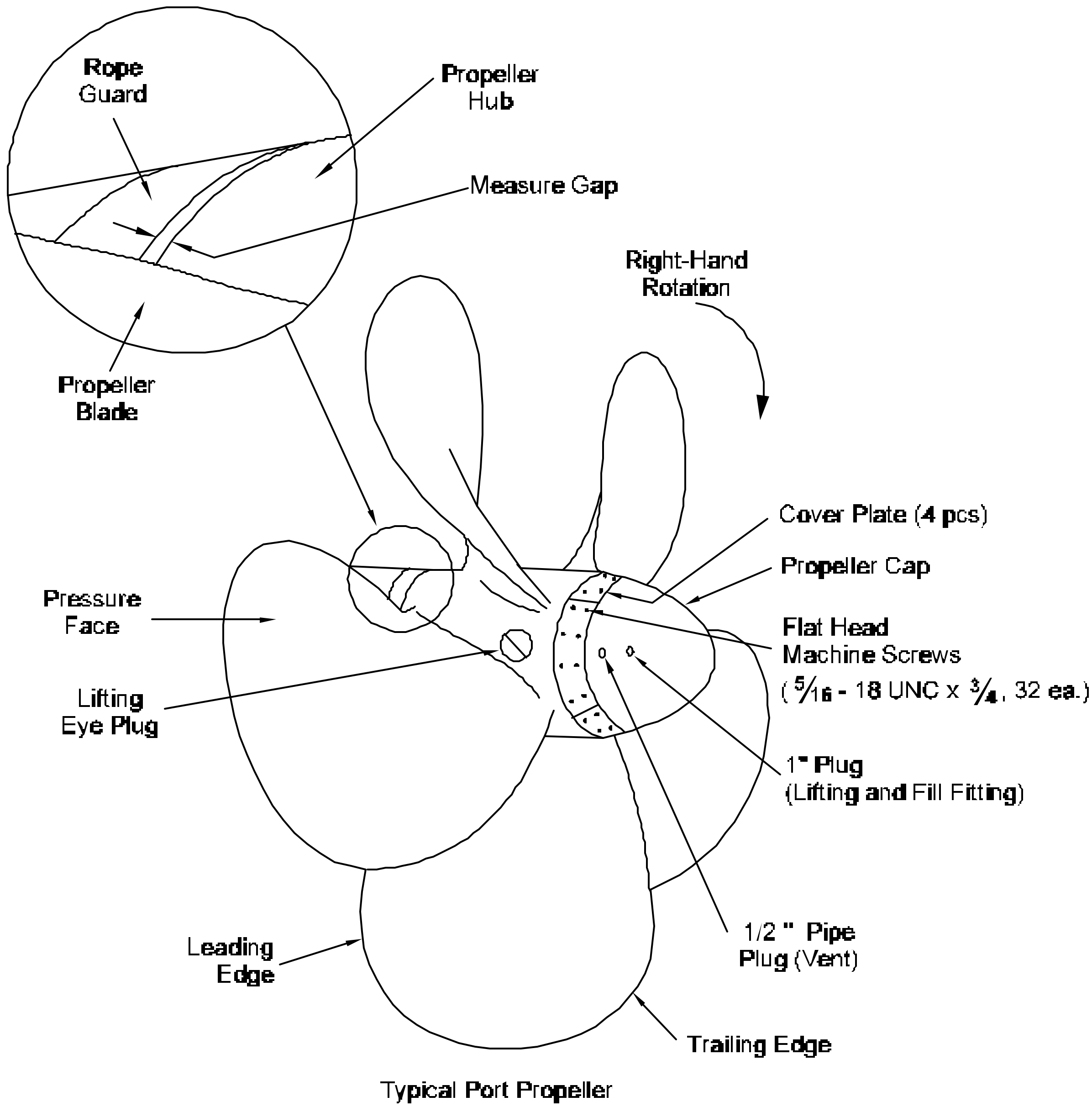

Figure 17-10.4. Fixed-Pitch Propeller.

17-10.4.4 Propeller.

17-10.4.4.1 Damage Description Requirements.

17-10.4.4.1.1 The inspection of a propeller requires a detailed description (with measurements) of the exact location and size of any damage, flaws, cracks, or cavitation erosion. Cavitation erosion results from the rapid formation and collapse of water vapor bubbles on the propeller surfaces while underway. This damage results in a porous, sponge-like, pitted metal surface. Heavy localized concentrations of eroded areas should be interpreted as cavitation erosion.

17-10.4.4.1.2 Propellers are subject to two kinds of cavitation erosion: one caused by propeller damage and the other by design or operating conditions. Therefore, if cavitation damage is found, inspect for the cause. The irregularity ahead of the eroded area can be a nick, gouge, or other damage in the leading edge or a leading edge radius that has been improperly cleaned or finished, leaving flat spots or other unfairness.

17-10.4.4.1.3 Do not confuse cavitation erosion with porosity. Porosity is common and is a manufacturing defect. Porosity will likely be coupled with fouling. Cavitation is uncommon and is often characterized by a trace of worn away metal (area is clean) in the direction of water flow. Porosity is often sharp-edged, whereas cavitation erosion (unless severe) is not.

17-10.4.4.1.4 Damage location descriptions must include reference to obvious points and use standard nomenclature. Following is a list of common propeller terms:

a. *Blade number*. Both port and starboard propeller blades are numbered counter to the direction of rotation, starting with the first blade adjacent to the lifting eye plug.

b. *Pressure face*. That portion of the blade which faces aft.

c. *Suction face*. That portion of the blade which faces forward.

d. *Leading edge*. The heavy, thick, more rounded portion of blade closest to the forward end of the hub.

e. *Trailing edge*. The thinner, sharper portion of blade closest to the aft end of the hub.

f. *Fillets*. The area at the base of each blade where the pressure and suction faces are blended into the hub contour.

g. *Blade tip*. The outermost edge of the blade.

17-10.4.4.1.5 It is important that the diver accurately report the size and extent of any damage. The report must reflect an accurate measurement of the area for cavitation erosion, porosity, curls, bends, scrapes, cracks, nicks, gouges, and the maximum width and length of any cracks.

17-10.4.4.1.6 Example of Report. “Blade #3, leading edge, 4 feet from blade tip, 1/8-inch deep by 1-inch long nick. Evidence of cavitation erosion on the suction face, starting 8 inches in from the nick. Erosion damage covers a 4-inch by 6-inch area.”

17-10.4.4.1.7 NAVSEA Form 4730/6 (NSN 0116 LF 047 3035) Propeller Inspection Data should be used to record results.

17-10.4.4.2 Inspection Procedure.

17-10.4.4.2.1 Gross Damage Assessment.

a. Conduct a quick inspection of all surfaces.

    (1) Make note of the overall FR and look for areas of obvious damage (bends, cracks, curls, gouges, and nicks) that indicate the propeller may require changing.

    (2) For moderately or heavily fouled propellers (FR 40 or greater) look for clean areas that indicate recent damage (contact with an object or grounding, or areas of cavitation erosion). If evidence of cavitation erosion is discovered, carefully inspect the area ahead of the erosion for any irregularities (nicks or flat spots, etc., in the leading edge).

b. Inspect the propeller hub for fouled wire, rope, or other foreign material. Fiber such as fish netting or manila line may be removed without difficulty. If removal of the material will be excessively time consuming, make the appropriate report and arrangements for follow-on removal.

c. Conduct a detailed inspection of any obvious major damage and thoroughly document the type, size, and location of the damaged area.

17-10.4.4.2.2 Detailed Damage Inspection.

NOTE

If the FR of the propeller is 40 or greater, the propeller must be cleaned prior to conducting the detailed inspection unless the decision is made that, due to obvious damage, the propeller blades require replacement.

a. Inspect the propeller cap for damage.

NOTE

A missing fairing plate is considered a serious casualty.

b. Verify the presence of the 1-inch fill/lifting eye pipe plug and the 1/2-inch vent pipe plug. Ensure that they are flush and staked at a minimum of two places.

c. Inspect the entire surface of the propeller hub. Inspect for cable marks, scratches, cracks, curls, gouges, porosity, and cavitation erosion. Particular attention must be given to any cracks to determine whether it is one crack, or cracks that run completely around the hub. Record the exact location, size, and orientation of any such cracks.

(1) Locate the 4 1/2-inch lifting eye plug in the hub of the propeller. Verify that the plug is in place and secure. Use this plug as the starting point for numbering the blades. Further identify each propeller as inboard or outboard, for example: “Port Inboard Blade #1.”

(2) Verify the presence of four 1/2-inch fill/drain pipe plug 180 degrees apart. The forward plugs are located 1 5/8 inches from the hub edge and the after plugs are located 1 1/2 inches from the edge; ensure that the plugs are flush and staked at a minimum of two places.

(3) Inspect and report the FR of the propeller hub.

d. Inspect the blades.

NOTE

Report the exact location and extent of damage as it is found. A running log of the inspection must be maintained by the log keeper to ensure accuracy.

(1) Inspect the overall physical appearance and FR of each blade, pressure and suction faces, starting with blade number one.

(2) Inspect the tip, leading, and trailing edges of each blade for nicks, curls, chips, dents, flat spots, cracks, or other apparent damage. Cracks may be found in the edges and tips without any evidence of impact in the area. They can be caused by local vibration, stress corrosion cracking, or residual stresses in the blades. They are considered serious casualties.

NOTE

Pay particular attention to areas of the blade where repairs have been made (areas of discoloration caused by welding). Thoroughly inspect these areas for the presence of cracks.

(3) Inspect the suction (forward) and pressure (aft) face of each blade for defects caused by cavitation. Cavitation damage can be identified by an area of small pocked holes or a rough-textured surface.

e. Record the overall FR of the propeller.

f. If any discrepancies are found, make the appropriate report and arrangements for follow-on cleaning and/or repair.

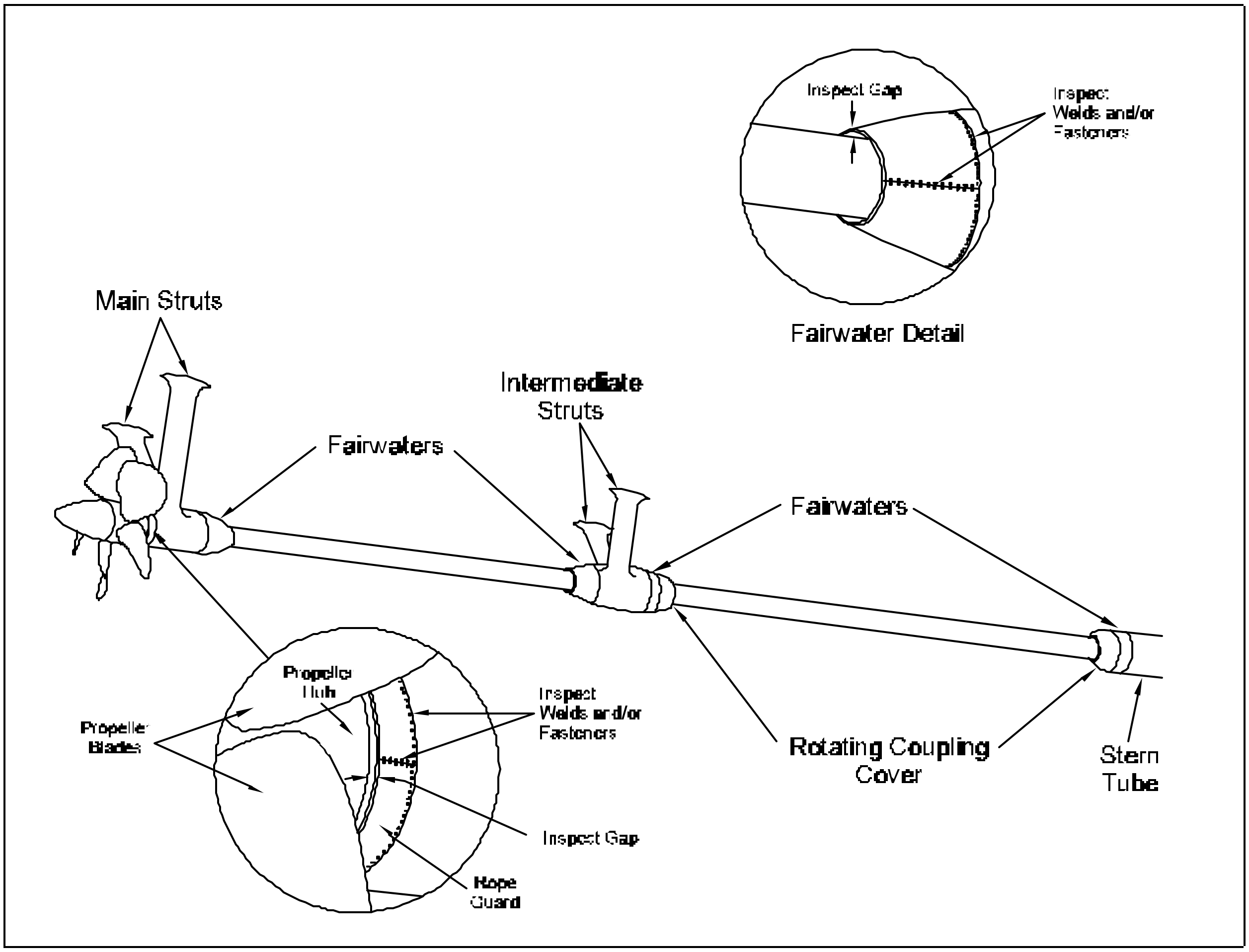

Figure 17-10.5. Main Strut, Intermediate Strut, Shaft, Stern Tube, Rotating Couplings, Rope Guard, and Fairwaters.

17-10.4.5 Main Propulsion Assembly (Main Strut, Intermediate Strut, Shaft, Stern Tube, Rotating Couplings, Rope Guard, and Fairwaters).

17-10.4.5.1 Damage Description Requirements.

17-10.4.5.1.1 General condition or damage assessment of the main strut, intermediate strut, shaft, stern tube, rotating coupling, rope guard, and stern tube requires a detailed description (with measurements) of the exact location and size of any damage or flaws. The description must include:

a. Location (port or starboard and inboard or outboard) and distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information: the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage.

e. Exact location and size of all coating damage, tears, or delaminations on the shaft.

17-10.4.5.1.2 Example of Report. "Port, outboard shaft, 6 feet 9 inches forward of the main strut fairwater, longitudinal gouge in fiberglass coating 2 inches wide by 1 foot long, bare metal showing; subsurface delamination 6 inches by 6 inches, centered on a rust stain, located by sounding."

17-10.4.5.2 Inspection Procedure.

a. Main strut assembly (struts, bearing housing, rope guard, and fairwater).

(1) Inspect the main strut columns (inborad/outboard) and bearing housing for corrosion, damage, and the presence of wire or other foreign material.

(a) At best, the surface of the struts will be very rough due to previous damage or repairs.

(b) Inspect for loose or missing epoxy.

(2) At the strut/hull interface, inspect the strut columns, doubler plates and immediate area hull plate for cracked welds, corrosion, and damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(3) Verify the presence of the two fill and vent plugs on the top of the bearing housing located 4 inches from each end. Ensure that they are flush and staked in at least two places.

(4) Verify that the rope guard is present.

NOTE

A missing rope guard is a serious casualty.

(a) The CVN 68 Class has steel rope guards which are welded on. Inspect for any apparent damage, cracked welds, or corrosion and for the presence of fouled wire, rope, or other foreign material. Inspect the eight 2 1/2-inch diameter water circulation holes (four on each half) to ensure that all are free of fouling and debris.

(b) Use a diver's light or diver-held video equipment light to inspect the area between the propeller hub and the strut bearing housing. There is a 4-inch by 4 1/2-inch inspection port on the top outboard side of each rope guard.

(c) Verify that there is a uniform gap all around between the propeller hub and the rope guard by taking measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is 1/2 inch.

(5) Verify that the fairwater is present. The CVN 68 Class has steel fairwaters that are welded to the bearing housing.

NOTE

A missing fairwater is considered a serious casualty.

(a) Inspect the fairwater for cracked welds and loose or missing cover plates.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(b) Inspect the eight 2 1/2 inch diameter water circulation holes to ensure that all are free of fouling and debris. Verify that the two 5/8-11 UNC lifting eye plugs are in place and secure.

(c) Verify that there is a uniform gap between the fairwater and the shaft by taking clearance measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is 1/2 inch.

(6) Inspect and report the FR and the PDR of the main strut columns, immediate hull plate area, bearing housing, rope guard, and fairwater.

b. Shaft.

NOTE

Pay particular attention to the detection of damage or breaks in the covering in the area of shaft nearest the fairwaters and rotating coupling. Propeller shafts are covered with a hard metal sleeve at all bearing areas. The shaft coating at the sleeve ends are the most vulnerable areas of the waterborne shafting. Therefore, give special attention to the detection of breaks in the covering or leakage in the joint (rust stains) in these critical areas.

(1) Inspect the full length of all accessible glass-reinforced plastic (fiberglass) covering for evidence of deterioration, loss of adhesion, or any apparent physical damage.

(2) Inspect for loss of covering, cuts, tears, surface delaminations, and other damage.

(3) Inspect for rust stains indicating where corrosion has leaked through the covering near a cut, pinhole, area of porosity, patch, joint, or other flaw.

(4) Inspect for internal separation of the fiberglass covering from the metal shaft. Use a rubber or rawhide mallet to sound the covering at approximately 18-inch intervals along the length of the shaft.

(a) Rap the shaft in the 3, 6, 9, and 12 o'clock positions while holding the palm of one hand against the covering on the opposite side of the shaft. Continue sounding the shaft around and along its entire length.

NOTE

Discernible vibration, movement of the covering, or an audible, hollow sound is evidence of probable loose bond and must be explored or further examined. To determine the full extent of the damaged area, reduce the distance for sounding the shaft from 18 inches to 4 inches. The important criterion is to isolate and fully determine the extent of the damaged or delaminated area.

(5) If discrepancies are found, measure the exact location and size, then make the appropriate report and arrangements for follow-on repair.

c. Intermediate strut assembly.

(1) Inspect the intermediate strut columns and bearing housing for corrosion, damage, and the presence of wire or other foreign material.

(2) At the strut/hull interface, inspect the strut columns, doubler plates, and immediate area hull plate for cracked welds, corrosion, and damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(3) Verify the presence of the two 15/16-inch plugs on the top of the bearing housing at each end. Ensure they are flush and staked at a minimum of two places.

(4) Verify that the fairwaters are present.

NOTE

A missing fairwater is considered a serious casualty.

(a) This class of ship has steel fairwaters which are welded on. Inspect for any apparent damage and for the presence of fouled wire, rope, or other foreign material.

(b) Inspect the fairwater guards for cracked welds and loose or missing cover plates.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(c) Inspect the eight 2 1/2-inch diameter water circulation holes to ensure that all are free of fouling and debris. Verify that the two 5/8-11 UNC lifting eye plugs are in place and secure.

(d) Verify that the gap between the after fairwater and the shaft is uniform all around by taking clearance measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is 1/2 inch.

(e) Verify the presence of the two 5/8-inch 11-UNC lifting eye bolt plugs; one on each fairwater half. Ensure that they are flush and staked at a minimum of two places.

(f) Inspect the forward fairwater. This fairwater is flared outward from the rotating coupling. Verify that it is free of fouling and debris. Verify that a uniform gap exists between the fairwater and the rotating coupling.

(5) Inspect and report the FR and the PDR of the intermediate strut columns, immediate hull plate area, bearing housing, rope guard, and fairwater.

(6) If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

d. Rotating couplings covers.

(1) Inspect the two rotating coupling covers, one at the forward end of the intermediate strut and one at the aft end of the stern tube.

(a) Inspect for corrosion damage, cracked welds, and loose or missing cover plates.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(b) Verify the presence of the two 1-inch fill plugs; ensure that they are flush and staked at a minimum of two places.

(c) Verify the presence of the two 1/2-inch vent plugs; ensure they are flush and staked at a minimum of two places.

(d) Verify the presence of the 5/8-inch 11-UNC lifting eye bolt plug. Ensure that it is flush and staked at a minimum of two places

(e) Inspect and report the FR and the PDR of the rotating coupling cover.

(2) If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

(3) Continue the detailed inspection of the shaft between the intermediate strut and stern tube.

f. Stern tube and stern tube fairwater.

(1) Verify that the stern tube fairwater is present.

NOTE

A missing fairwater is considered a serious casualty.

(a) This class of ship has fairwaters constructed of steel, which are welded on. Inspect for any apparent damage and for the presence of fouled wire, rope, or other foreign material. Use a diver's light or diver-held video equipment light to inspect the area by shining the light in the four 2 1/2-inch water circulation holes.

(b) Inspect the fairwater guards for cracked welds.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

(c) Verify that the gap between the fairwater and the shaft is uniform all around by taking clearance measurements at the 3, 6, 9, and 12 o'clock positions. Design clearance is 1 1/8 inch.

(d) Inspect and report the FR and the PDR of the stern tube, immediate hull plate area, and fairwater.

(2) If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

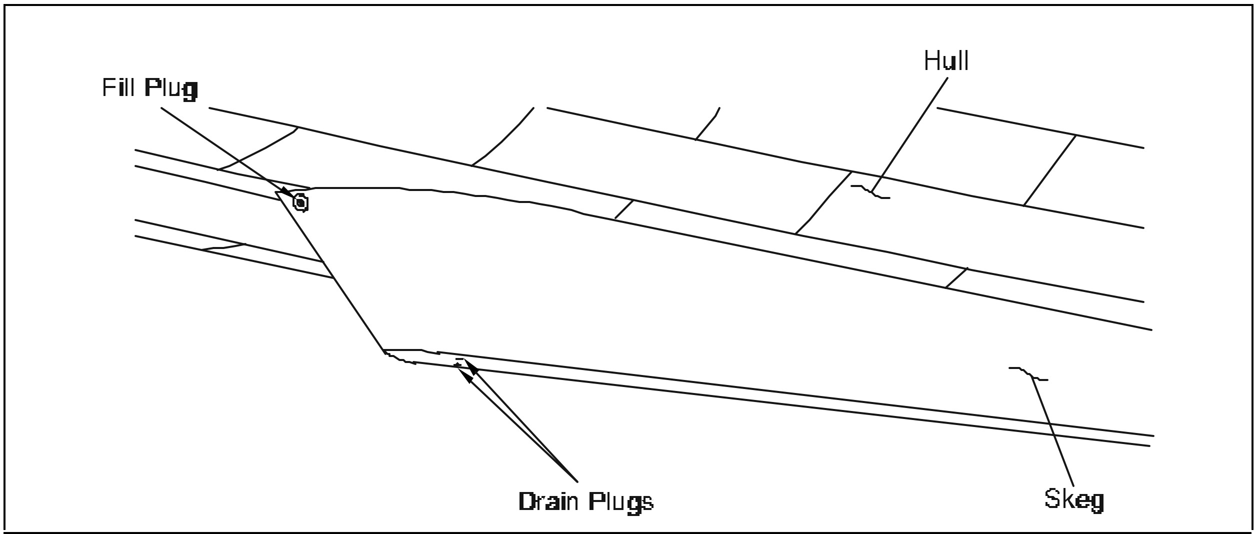

Figure 17-10.6. Skeg with Fill and Drain Plugs.

17-10.4.6 Skeg.

17-10.4.6.1 Damage Description Requirements.

17-10.4.6.1.1 Include the exact location and size of all damage or flaws. Description must include as a minimum:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information; the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld, or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage. For example: "Weld crack, 1 foot long by 1/2 inch wide, port side, 18 feet forward of after end along the skeg/hull interface."

17-10.4.6.2 Inspection Procedure.

a. Verify the presence of the fill plug (frame 230 starboard, 6 inches forward of uppermost trailing edge) and ensure that it has not backed out.

b. Verify the presence of the two drain plugs (frame 228, 6 inches port/starboard off centerline at the bottom of the skeg) and ensure that they have not backed out.

c. Inspect the entire length of the skeg for dents, cracks, curled edges, or other apparent damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

d. Inspect and report the FR and the PDR.

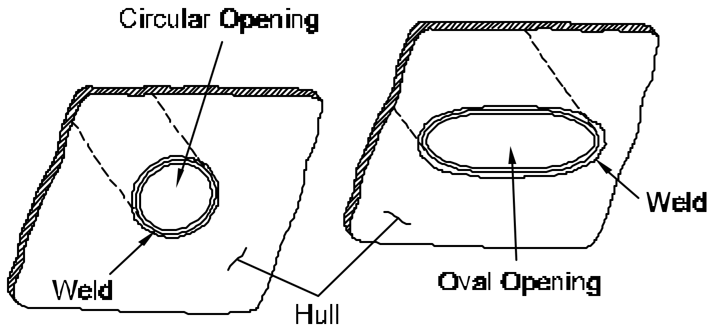

Figure 17-10.7. Seawater Discharge Openings.

17-10.4.7 Overboard Discharge.

17-10.4.7.1 Inspection Procedure.

a. Inspect for foreign material or corrosion damage.

b. Inspect and report the FR and the PDR.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

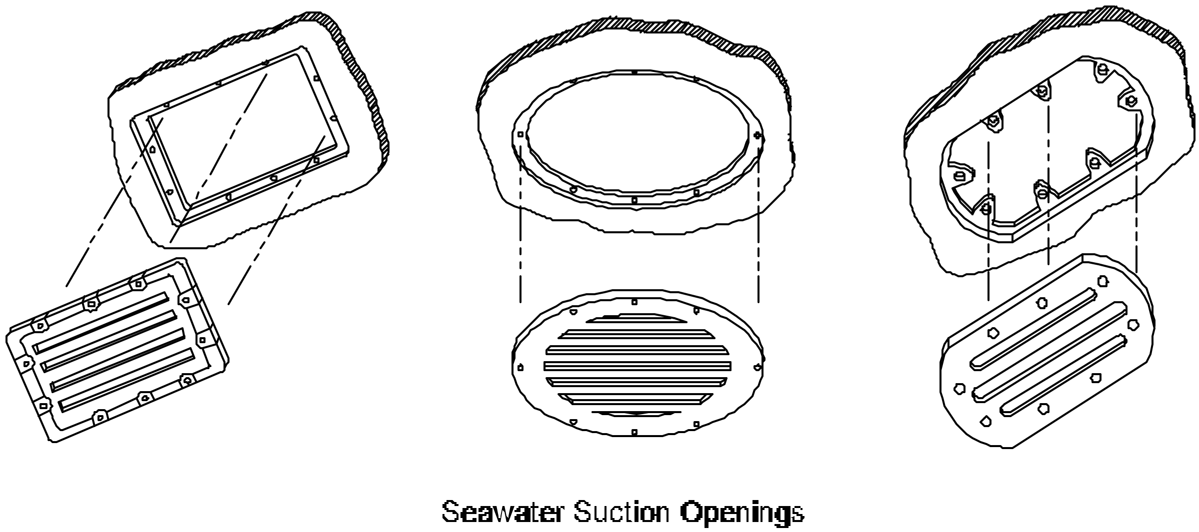

Figure 17-10.8. Seawater Suctions.

17-10.4.8 Sea Chest, Seawater Suction, and Flood Inlet.

17-10.4.8.1 Inspection Procedure.

a. Clean and inspect screens or grates for clogged holes and loose or missing fasteners.

b. Inspect strainer bars for corrosion damage, broken or missing bars, cracked welds, and missing or loose fasteners.

c. Inspect and report the FR and the PDR.

d. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

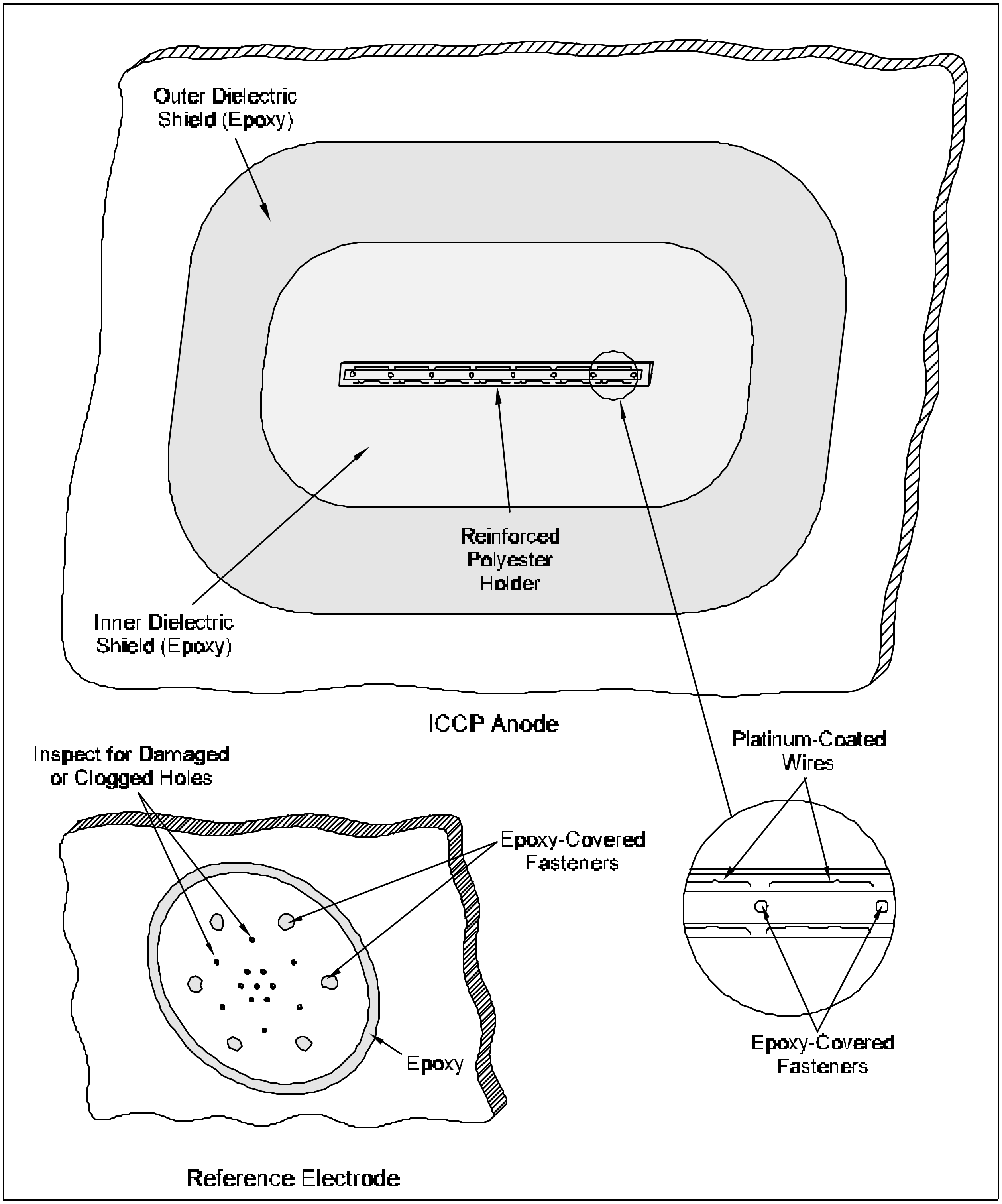

Figure 17-10.9. Impressed Current Cathodic Protection (ICCP) Anode.

17-10.4.9 Impressed Current Cathodic Protection (ICCP) Anode.

17-10.4.9.1 Inspection Procedure.

a. Begin the inspection procedure by conducting a quick inspection of the anode, dielectric shield, and the immediate hull plate area out to a distance of

20 feet. Inspect for obvious damage: large areas of bare metal, cracked, peeling, or blistered epoxy or paint, large areas of calcium buildup.

b. Conduct a detailed inspection of the anode.

(1) Inspect the anode for damage and missing or broken wires and missing or damaged platinum coating on the wires. Count the number of missing or broken wires. Report the position of each broken or missing wire relative to the center of the anode.

(2) Inspect the bond between the dielectric shield and the anode holder. Check that the dielectric shield is evenly faired up to the face of the anode and is not cracked or chipped.

NOTE

The presence of marine fouling indicates a non-functioning anode.

CAUTION

Avoid disturbing the white calcium buildup on the dielectric shield that protects areas of bare metal from corrosion.

c. Conduct a detailed inspection of the dielectric shield.

(1) Report the percentage of dielectric shield with calcareous deposits.

(2) Inspect the dielectric shield for chips, cracks, blisters, or missing epoxy.

(3) Report the percentage of deterioration of the dielectric shield.

(4) Inspect the hull coating in the area around the anode for missing or peeling paint or blisters. Inspect for calcareous buildup. Report the FR and the PDR.

17-10.4.10 Impressed Current Cathodic Protection (ICCP) Reference Electrode.

17-10.4.10.1 Inspection Procedure.

a. Inspect for damage, clogged holes, and loose or missing epoxy.

CAUTION

Do not attempt to unclog holes with any pointed objects. Potential damage to internal components may result.

b. Inspect and report the FR.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

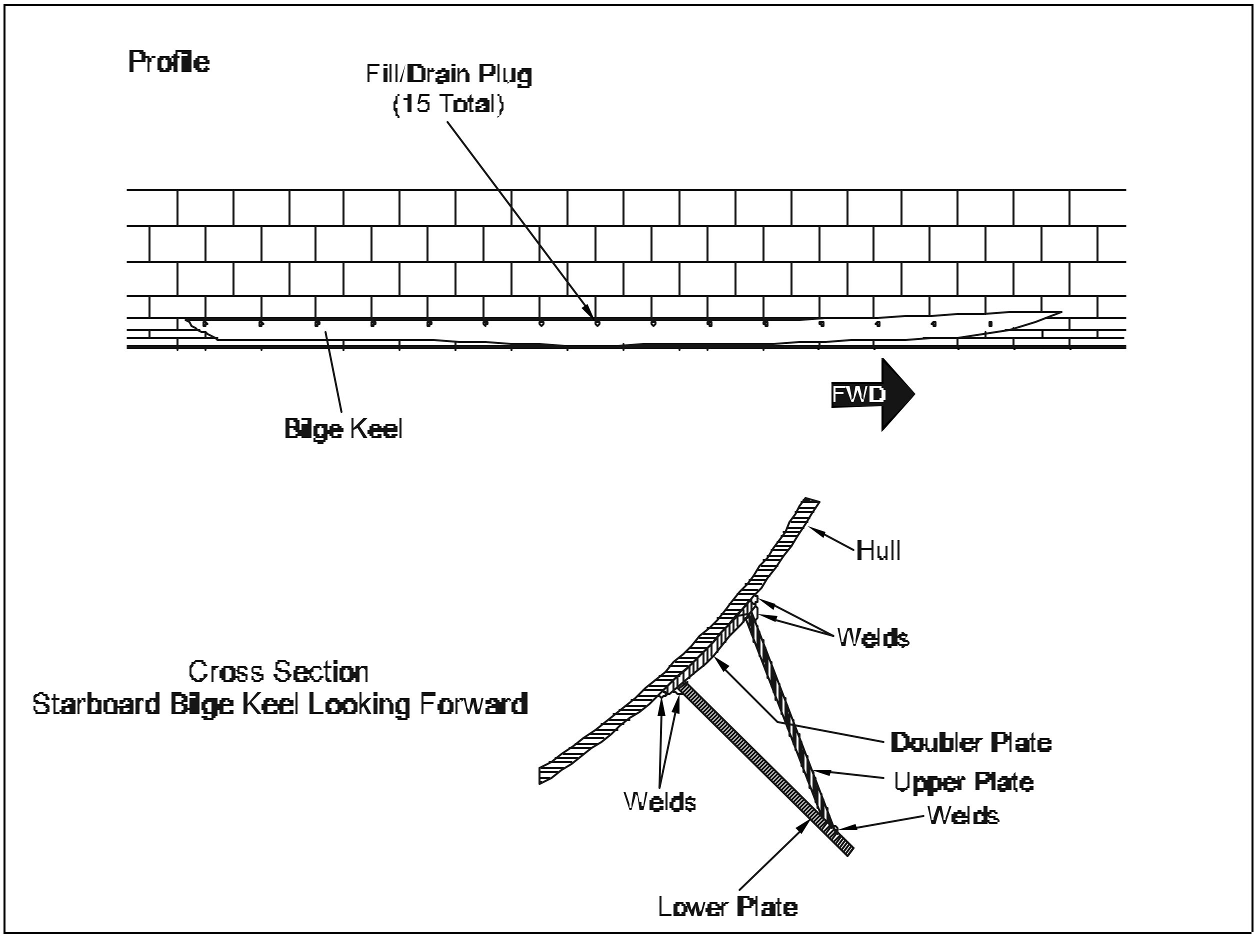

Figure 17-10.10. Bilge Keel.

17-10.4.11 Bilge Keel.

17-10.4.11.1 Damage Description Requirements.

17-10.4.11.1.1 Include exact location of all damage or flaws. Description must include as a minimum:

a. Distance and direction (port/starboard/forward/aft) from an obvious reference.

b. Length, maximum width, and orientation of all cracks. If the crack(s) is on or near a weld seam, include closest weld seam information: the direction of the crack with respect to the weld (perpendicular or parallel) and proximity to the weld (center of the weld or base metal).

c. Total area affected, including the diameter and depth of any pitting; also include both the maximum and average pit size.

d. Area and location of corrosion or other damage. For example: “Port bilge keel, 1 foot long by 1/2 inch wide crack in weld between upper and lower plates located 18 feet forward of after end.”

17-10.4.11.2 Inspection Procedure.

a. Inspect the bilge keel for dents, cracks, curled edges, missing plate, or other apparent damage.

NOTE

If any cracks are detected in the welds or if any welds are discovered that are excessively corroded, thoroughly clean the area with a wire brush and inspect to determine the extent of damage.

b. Inspect for foreign material and loose or missing plugs. Each of the 15 compartments of the bilge keel (compartments are 5 frames in length, except for the end compartments, which are 3 frames in length) has a 3/4-inch pipe plug at the high point of the top plate and a 3/4 inch pipe plug at the low point of the bottom plate.

c. Measure and record the location of any damage.

d. Inspect and report the FR and the PDR.

e. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

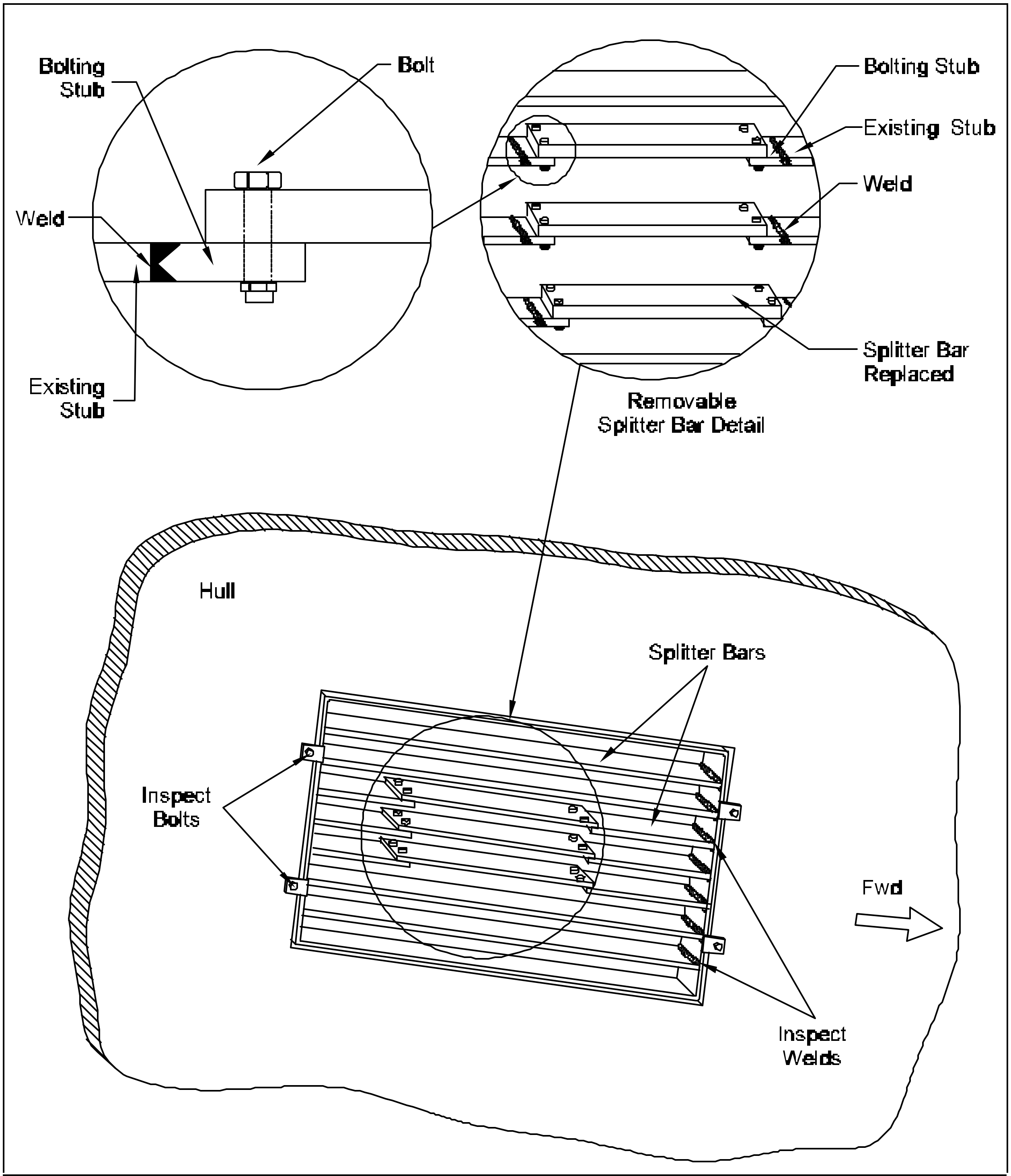

Figure 17-10.11. Scoop Injection.

17-10.4.12 Scoop Injection.

17-10.4.12.1 Damage Description Requirements.

17-10.4.12.1.1 Inspection of scoop injections requires a detailed description (with measurements) of the exact location and extent of all damage and flaws. As a minimum, the description must include:

a. Length, maximum width, and orientation of all cracks, including closest weld seam information. Also include the direction of the crack with respect to the weld (perpendicular or parallel) and the proximity to the weld (center of the weld or base metal).

b. Total area affected, including the diameter and depth of any pitting. Also include both the maximum and average pit size.

c. Area and location of corrosion or any other damage. For example: “Pitting on port side of grate #2, 18 inches aft of the forward end. Pitting covers 3-inch by 11-inch area, maximum pit depth 3/8-inch by 1/2-inch diameter, average depth 1/4-inch by 1/4-inch diameter.”

17-10.4.12.2 Inspection Procedure.

a. If the bars are bolted in place, verify the presence and tightness of all fasteners.

(1) Record the number of missing or loose fasteners.

b. Inspect all bar end welds for cracks or corrosion damage.

c. Use a diver’s light or a diver held video equipment light to inspect the interior of the scoop injection.

d. Inspect and report the FR and the PDR of the scoop, splitter bars, and immediate hull plate area.

e. If any discrepancies are found, make the appropriate report and follow-on arrangements for repair.

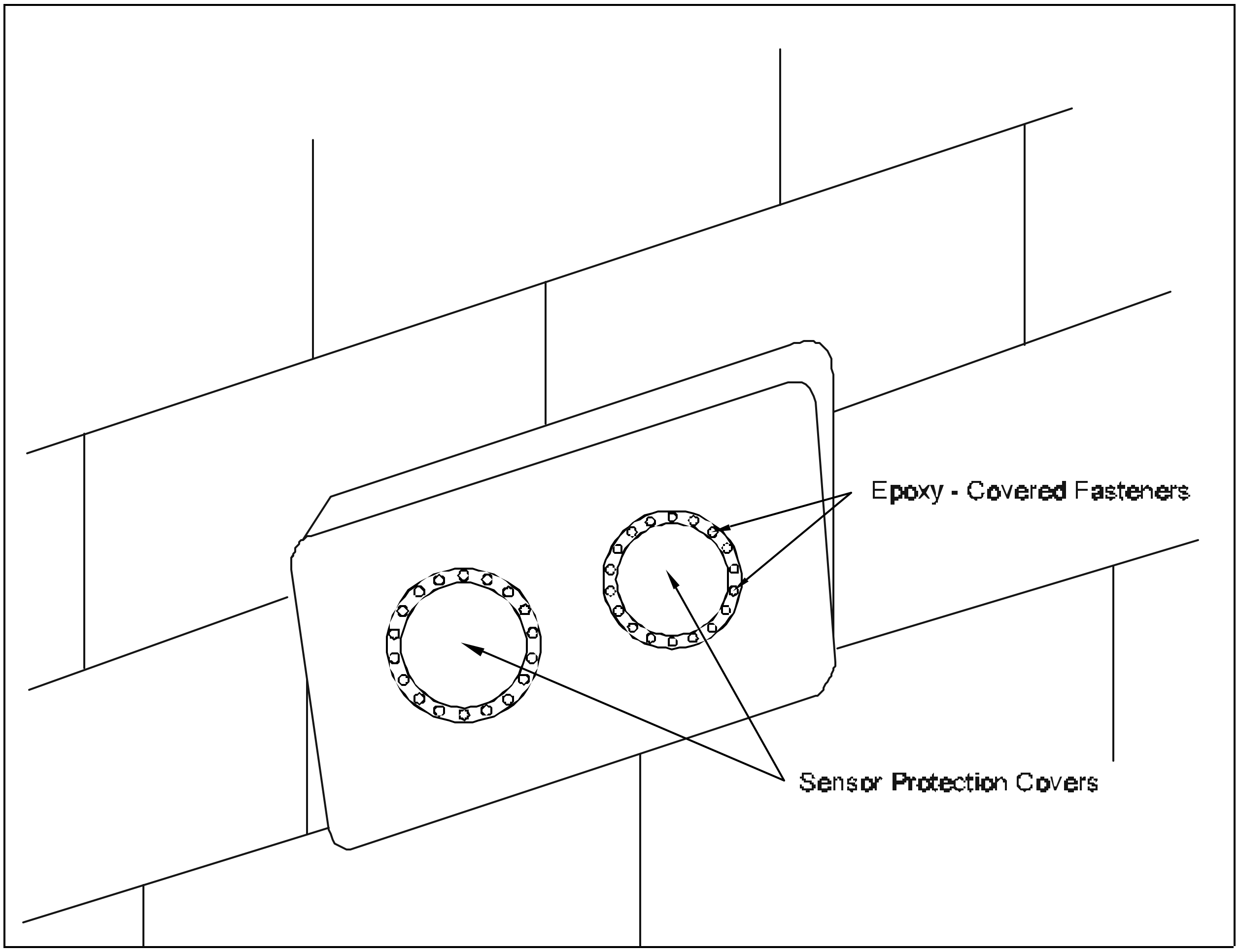

Figure 17-10.12. Transducer.

17-10.4.13 Transducer.

17-10.4.13.1 Damage Description Requirements.

17-10.4.13.1.1 Inspection of transducers requires a detailed description (with measurements) of the exact location and extent of all damage and flaws. As a minimum, the description must include:

a. Length, maximum width, and orientation of all cracks or flaws in the sensor cover.

b. Total area affected, including the diameter and depth of any pitting. Also include both the maximum and average pit size.

17-10.4.13.1.2 Example of Report. "1 inch x 2 inch diagonal gouge on sensor cover, maximum depth 1/16 inch located at the 8 o'clock position."

17-10.4.13.2 Inspection Procedure.

a. Begin the inspection procedure by conducting a quick inspection of the transducer and the surrounding hull plate area.

(1) Make note of the FR and the PDR of the immediate hull plate area and look for areas of obvious damage or flaws.

b. Conduct a detailed inspection of the entire transducer assembly.

(1) Using a “greenie,” gently scrub light fouling off the sensor head and inspect the sensor protective covers.

(2) Inspect rubber covers for tears, cracks, scrapes, or gouges.

(3) Inspect for signs of structural failure or damage caused by contact with underwater objects.

(4) Inspect for loose or missing fasteners and loose or missing fairing compound.

(5) Inspect and report the FR.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.

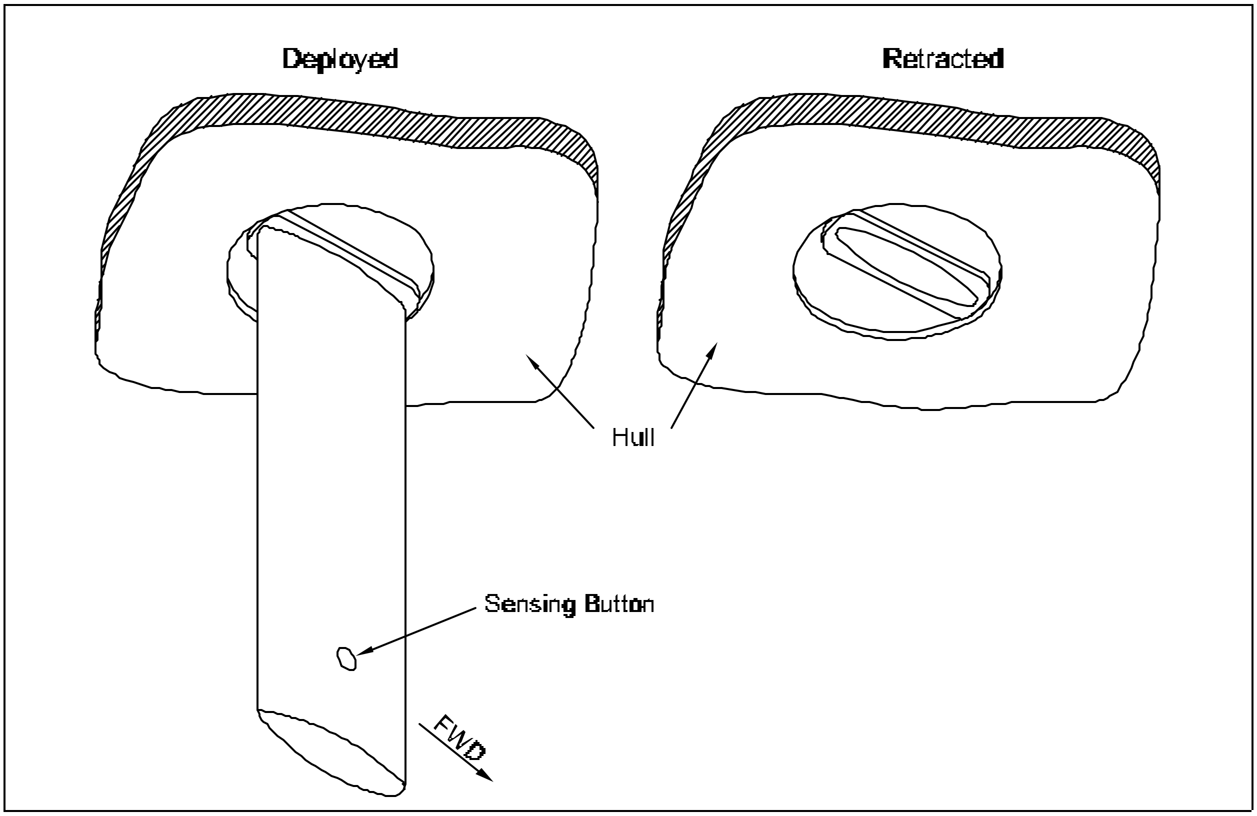

Figure 17-10.13. Rodmeter.

17-10.4.14 Rodmeter.

17-10.4.14.1 Normally, divers will only be called upon to inspect the rodmeter opening. Ship’s force personnel perform maintenance and repairs on the rodmeter after retracting it into the hull. However, divers may be called upon to inspect the hull opening if the ship reports damage to the rodmeter (scratches, gouges, etc.) or is unable to either retract or deploy the rodmeter.

17-10.4.14.2 Inspection Procedure.

a. If ship’s force reports damage to the rodmeter, (scratches, gouges, etc.) or is unable to retract or deploy the rodmeter, inspect the hull opening and verify that it is clear of barnacles, sea growth, or other foreign material.

b. If ship’s force is unable to retract the rodmeter, inspect for a bent or broken unit.

c. If any discrepancies are found, make the appropriate report and arrangements for follow-on repair.