S9086-T8-STM-010

0910-LP-105-8969 **REVISION 5**

NAVAL SHIPS' TECHNICAL MANUAL

CHAPTER 593

POLLUTION CONTROL

SUPERSEDES CHAPTER 593, REVISION 4, SEPTEMBER 1999

DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.

PUBLISHED BY DIRECTION OF COMMANDER, NAVAL SEA SYSTEMS COMMAND.

1 JUN 2008

REVISION RECORD

REVISION NO.	DATE	TITLE AND/OR BRIEF DESCRIPTION/PREPARING ACTIVITY
5	1 JUNE 2008	THIS NSTM COMPLETELY REVISED.

TABLE OF CONTENTS

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

LIST OF TABLES

LIST OF TABLES - Continued

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS - Continued

LIST OF ILLUSTRATIONS - Continued

CHAPTER 593

POLLUTION CONTROL

SECTION 1
INTRODUCTION

593-1.1 GENERAL

593-1.1.1 PURPOSE. This chapter is provided as a guide for Navy ships to conform to pollution control regulations, to consolidate information on available equipment, and to summarize the Navy Afloat Pollution Abatement Program. Included is information on pollution control equipment, and its operation. In certain areas pollution control equipment is in the research and development stage. Sections of this chapter dealing with those areas will be updated as soon as the hardware is available for the fleet. Rules and regulations pertaining to each area of pollution control are covered separately in the respective sections.

593-1.1.1.1 Environmental legislation and Executive Order 12088 state that federal agencies shall conform to federal, state, and local pollution control regulations and that these agencies will provide leadership in the protection and enhancement of the quality of air, water, and land resources. Installation, operation, and maintenance of shipboard pollution-control equipment and systems is mandatory.

593-1.1.1.2 Executive Order 12856 requires DoD to conduct facility management and acquisition activities so that, to the maximum extent practicable, the quantity of toxic chemicals entering any waste stream, including releases to the environment, is reduced as expeditiously as possible through source reduction; that waste that is generated is recycled to the maximum extent practicable; and that any wastes remaining are stored, treated, or disposed of in a manner protective of public health and the environment.

593-1.1.1.3 The continuing effort by the Navy to conform to existing and proposed regulations and to actively protect and enhance the quality of the environment has led to development of new pollution control procedures, systems, and hardware for naval ships. Shipboard personnel must use existing pollution control equipment and procedures to prevent pollution of the seas and coastal areas. This will effectively preserve the water quality of these areas and prevent possible litigation against the Navy.

593-1.1.2 POLICY. OPNAVINST 5090.1C Series, The Environmental and Natural Resources Program Manual, promulgates Navy policy and assigns responsibilities for Navy-wide actions for prevention, control, and abatement of environmental pollution caused by naval ships and facilities. Highlights of Navy policy, as stated in the OPNAVINST 5090.1C Series with regard to shipboard pollution, is given in the following paragraphs. More detailed policy guidance related to afloat pollution control areas is provided in follow-on sections of this manual.

593-1.1.2.1 Participation. The Navy will actively participate in a program to protect and enhance the quality of the environment through strict adherence to all applicable regulatory standards, positive planning and programming actions to control pollution caused by Navy facilities, and establishment of methods of monitoring the effectiveness and compliance of actions.

593-1.1.2.2 According to Executive Order 12088, Navy shore activities and forces afloat, as appropriate, will cooperate with federal, state, and local environmental protection organizations and comply with the official sub-

stantive standards and criteria promulgated by such agencies. The Clean Water Act (CWA) of 1977, PL 95-217 requires that naval facilities also comply with state or local administrative procedures for pollution abatement and control. The Oil Pollution Act (OPA) of 1990 amended the CWA to expand oil spill prevention activities, improve preparedness and response capabilities, and ensure that companies are responsible for damages from spills. In areas where a conflict of interest occurs concerning the national defense or other relevant reasons, or it is considered impractical to comply with standards and criteria, the matter should be referred to the Chief of Naval Operations (CNO) (OP-04), by way of the chain of command, for resolution.

593-1.1.2.3 Overseas naval facilities and installations except those identified in OPNAVINST 5090.1C Series, Chapter 21 shall comply with Final Governing Standards (FGS) as developed by Executive Agents for each country with significant DoD installations. Where FGS have not been issued, Navy shore activities will comply with DoD 4715.5-G, Overseas Environmental Baseline Guidance Document (OEBGD) of March 2000, host nation substantive pollution control laws of general applicability (as required by EO 12088), U.S. law with extraterritorial effect and applicable treaties (including Status of Forces Agreements (SOFAs)). Naval vessels operating in the U.S. restricted waters (up to 12 NM) or when visiting a foreign port, shall abide by environmental provisions contained in port visit clearances and/or in SOFAs. These conditions shall be communicated to visiting ships in the Port Guide or in the Logistics Request (LOGREQ) reply. When port visit clearances and SOFAs do not exist, or do not provide sufficient guidance, Navy ships should attempt to abide by the corresponding requirements for U.S. navigable waters or ports contained in this chapter. In cases where compliance with the corresponding U.S. requirement will not be feasible overseas due to the lack of facilities, environmental services, or some other cause, Navy ships should operate in a manner consistent with the environmental practices of host nation warships.

593-1.1.2.4 Untreated oils, oily wastes, sludge, industrial wastes, food waste, trash, or other refuse collected ashore or from ships in port shall not be discharged to the sea or other waters.

593-1.1.2.5 The preferred method of abatement and control of environmental pollution is at its source. Therefore, environmental pollution prevention shall be integrated into any planned industrial process, operation, or product and be considered as part of the cost of daily operations.

593-1.1.2.6 Consolidated Hazardous Material Reutilization and Inventory Management Program (CHRIMP). CHRIMP is a proven policy-required approach to establish central control and management of common Hazardous Material (HM). CHRIMP, required by CNO N4 Message 131755Z JAN 03 and OPNAVINST 5090.1C Series, to be applied both afloat and ashore, relies on a centralized HM issue/reuse site with HM inventory tracking performed by the Hazardous Inventory Control System (HICS). If applied properly, the CHRIMP concept works successfully on both large and small surface ships. The benefits of HM reutilization include reduced quantities of HM carried and used, less used or excess HM generated, enhanced safety and environmental compliance, and significant HM procurement cost avoidance and disposal cost savings. Fleet Type Commanders are responsible to provide implementation guidance and information on CHRIMP to assigned ships.

593-1.1.2.7 Where resources to accomplish pollution control are limited, priority of effort will be afforded according to the following order:

1. Situations constituting a direct health hazard.
2. Situations having economic implications.
3. Situations affecting the recreational and aesthetic value of natural resources.

593-1.1.2.8 All materials, including, but not limited to, solid fuels, petroleum products, and other chemical and biological agents or hazardous materials, shall be used, stored, and handled to avoid or minimize water and air pollution. Measures shall be taken to entrap the spillage or discharge of materials to prevent pollution. Each command and activity shall establish appropriate emergency plans and procedures for dealing with accidental pollution.

593-1.1.2.9 Disposal of Plastics. U.S. law prohibits the at-sea disposal of any plastic material.

593-1.1.2.10 Medical Waste. Public concern over the disposal of medical wastes increased dramatically due to several incidents of syringes and other medical wastes washing up on East coast beaches. These incidents were widely reported by the news media. Navy ships must be aware of the sensitivity of this issue and take particular precautions with medical wastes generated shipboard. The Chief of Naval Operations' Afloat Medical Waste Management Guide of June 1999 (OPNAV P-45-113-3-99) contains specific instructions regarding shipboard handling of medical waste.

593-1.1.2.11 The Afloat Environmental Protection Coordinator (AEPC) assigned for each ship shall become familiar with the policies and technical requirements provided in this manual.

593-1.1.2.12 Shipboard Environmental Information Clearinghouse (SEIC). Further information and documentation related to shipboard environmental systems is available to the Fleet on the Navy Shipboard Environmental Information Clearinghouse (SEIC) website. The website, sponsored by the Naval Sea Systems Command (NAVSEA), provides significant information related to environmental policy, ship operational requirements, and ship systems. The website contains NAVSEA environmental program information, policy reference documents, Integrated Logistics Support (ILS) documents and links, an e-mail address to obtain Life Cycle Manager and In-Service Engineer consultation support, and other data and information. The SEIC website is located at: www.navyseic.dt.navy.mil

593-1.2 TERMINOLOGY

593-1.2.1 The terms used in this chapter are defined in the following paragraphs.

593-1.2.2 AFLOAT ENVIRONMENTAL PROTECTION COORDINATOR (AEPC) A person designated by the Commanding Officers of each ship to be the Commanding Officer's advisor on the shipboard environmental protection program.

593-1.2.3 AREA COORDINATOR. The Area Coordinator is the official who initiates action to ensure that, within assigned areas, there is an effective, integrated, and coordinated shore establishment. Overseas Area Coordinators report to their appropriate Fleet Commanders-in-Chief. Within the continental United States, Area Coordinators are assigned to Naval District Commandants who report directly to the CNO.

593-1.2.4 COASTAL TERRITORIAL WATERS. The belt of the seas measured from the line of ordinary low water along a part of the coast which is in direct contact with the open sea and the line marking the seaward limit of inland waters, and extending a seaward distance of 3 NM (0 to 3 NM). Also known as ″Territorial Seas″ in OPNAVINST 5090.1C Series, Section 22.2.

593-1.2.5 CONTIGUOUS ZONE OF THE UNITED STATES. The belt of high seas, 9 NM wide, that is next to and seaward of the territorial seas of the United States and that extends from 3 to 12 NM, as measured from the coastal territorial waters baseline.

593-1.2.6 ENVIRONMENTAL PROTECTION AGENCY (EPA). A federal agency that regulates, enforces, and promotes pollution control compliance and measures to protect and preserve the natural resources.

593-1.2.7 INTERNATIONAL MARITIME ORGANIZATION (IMO). The IMO is the organization responsible for development and revision of the International Convention for the Prevention of Pollution from Ships (MARPOL).

593-1.2.8 INLAND WATERS. Inland waters are generally navigable fresh or brackish waters upstream from coastal territorial waters.

593-1.2.9 LITIGATION. Litigation is a legal contest carried on through judicial process, a lawsuit.

593-1.2.10 INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS (MARPOL). An international agreement detailing the agreed upon methods for the management of marine pollution.

593-1.2.11 MICROORGANISM. A living organism of microscopic size. Microorganisms include bacteria, molds and fungi. Microorganisms are not necessarily disease producing; A microbe.

593-1.2.12 NAVIGABLE WATERS OF THE UNITED STATES. The coastal territorial waters of the United States and waters shoreward of the territorial sea baseline, including the United States portion of the Great Lakes, the St. Lawrence Seaway, and the Panama Canal.

593-1.2.13 NEGATIVE PRESSURE. Negative pressure is a pressure less than atmospheric pressure. Gases and liquids flow from higher pressure to lower pressure areas; air is drawn into an area of negative pressure.

593-1.2.14 NAVAL SHIPS' TECHNICAL MANUAL (NSTM). The NSTM is a technical manual, subdivided into various chapters, each one providing instructions and guidelines for a general category of shipboard operations.

593-1.2.15 POLYCHLORINATED BIPHENYLS (PCBs). PCBs are toxic oils used mainly in insulating fluids. PCBs are thermally and chemically stable, and accumulate in living tissue.

593-1.2.16 pH. A measure of the acidity or alkalinity of aqueous solutions. Solutions with a pH below 7.0 are acidic. Solutions with a pH above 7.0 are alkaline. A pH of 7.0 indicates a neutral solution. For purposes of disposal, a solution is considered neutral if the pH is between 6.0 and 8.0. The pH of a solution is defined as the negative logarithm of the hydrogen-ion concentration in the solution (-log [H+]).

593-1.2.17 PROHIBITED ZONE. As prescribed by the Act to Prevent Pollution From Ships (APPS) and Annex I of MARPOL 73/78, the minimum prohibited zone is the area between a coast and 50 NM out to sea. Refer to OPNAVINST 5090.1C Series, for areas in which the zone extends more than 50 NM.

593-1.2.18 RESTRICTED WATERS. MARPOL Special Areas (see 593.1.2.10) and the territorial seas of the United States (0 to 3 NM) and the contiguous zone of the United States (3 to 12 NM). Also known as the restricted zone.

593-1.2.19 SENIOR OFFICER PRESENT AFLOAT. The abbreviation for Senior Officer Present Afloat is SOPA.

593-1.2.20 SPECIAL AREA. A sea area where, for recognized technical reasons in relation to its oceanographical and ecological condition and to particular character of its sea traffic, the adoption of special mandatory methods for the prevention of sea pollution by solid waste is required. The IMO specifies special areas. Annex I (oil) special areas designated and in effect include the Antarctic area, North West European waters (includes the North Sea, the Irish Sea, the Celtic Sea and the English Channel), Mediterranean Sea, the Baltic Sea, the Black Sea, the Red Sea, the ″Gulfs area″, the Gulf of Aden and the Oman Area. Annex II (noxious liquids) special areas designated and in effect include the Baltic Sea, Black Sea and the Antarctic area. Annex V (garbage) special areas have been designated and in effect: the Baltic Sea, the North Sea, the Antarctic (south of 60 degrees south latitude), the Mediterranean Sea, the Black Sea, the Persian Gulf, the Red Sea, the ″Gulfs area″ and the Wider Caribbean Area.

593-1.2.21 STATUS OF FORCES AGREEMENT. The abbreviation for Status of Forces Agreement is SOFA.

SECTION 2
SOLID WASTE

593-2.1 TERMS AND DEFINITIONS.

593-2.1.1 FOOD WASTE. Any spoiled or unspoiled victual wastes such as fruits, vegetables, dairy products, poultry, meat products, food scraps, and food particles.

593-2.1.2 FOREIGN SOURCE GARBAGE. Goods, food wastes, wrappers, containers, and disposable materials originating in any foreign country (excluding Canada) or Hawaii, Puerto Rico, U.S. Virgin Islands, American Samoa, Guam, and the Trust Territories of the Pacific Islands.

593-2.1.3 GARBAGE. For consistency with international law, the Navy has adopted the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex V definition of garbage: All kinds of food, domestic, and operational waste generated during normal operation of the ship. Garbage therefore encompasses all forms of shipboard solid waste, including plastics, food waste, and dry waste such as paper, cardboard, and wood. The MARPOL term ″garbage″, therefore, encompasses shipboard solid waste, including plastics, food waste and dry waste such as, paper, cardboard and wood, traditionally referred to as ″trash″.

593-2.1.4 NEGATIVE BUOYANCY. Negative buoyancy means having a density greater than water and consequently sinking when discharged overboard. In pollution control, a package that sinks within 15 minutes is considered to have negative buoyancy.

593-2.1.5 OPERATIONAL WASTE. All cargo associated waste, maintenance waste, cargo residues, and ashes and clinkers from shipboard incinerators.

593-2.1.6 PLASTIC PROCESSOR. A device that melts and compresses plastic waste into flat round disks so that it can be efficiently and safely stored aboard ship for shore disposal. The Navy installed plastic processors in most Navy surface ships (excluding those operating at the direction of COMSC) before 31 December 1998, requiring them to meet the plastics discharge prohibition following installation.

593-2.1.7 PLASTIC WASTE. Plastics wastes are Styrofoam, nylon, vinyl, and similar synthetic materials produced by polymerization that normally floats when thrown overboard. There are two designated types of plastic wastes generated on ship: Food-contaminated and non-food-contaminated.

593-2.1.8 PULPED GARBAGE. Pulped, ground, or comminuted garbage or trash capable of passing through a screen with openings of no greater than 6.35 millimeters (0.25 inches) in diameter.

593-2.1.9 SPECIAL AREA. A sea area where, for recognized technical reasons in relation to its oceanographic and ecological condition and to the particular character of its sea traffic, enhanced efforts are required to minimize pollution from ships. The International Maritime Organization (IMO) designates Annex V special areas. Their designation becomes effective internationally after IMO determines that littoral nations have sufficient capacity to manage the potential waste from ships after special area status becomes effective. Three Annex V special areas are in effect: the Baltic Sea, the North Sea and the Antarctic Area (south of 60 degrees south latitude). Other Annex V special areas are designated but not yet in effect are: Mediterranean Sea, Black Sea, Persian Gulf, Red Sea and Wider Caribbean Area. Special areas include the following:

a. The Mediterranean Sea area includes the Mediterranean Sea proper and the gulfs and seas therein, with the boundary between the Mediterranean and the Black Sea constituted by the 41° N parallel and bounded to the west by the strait of Gibraltar and the meridian of 5° 36’ W.

b. The Baltic Sea area includes the Baltic Sea proper with the Gulf of Bothnia, the Gulf of Finland, and the entrance to the Baltic Sea bounded by the parallel of The Skaw in the Skagerrak 57° 44.8’ N.

c. The Black Sea area includes the Black Sea proper with the boundary between the Mediterranean and the Black Sea constituted by the parallel 41° N.

d. The Red Sea area includes the Red Sea proper, including the Gulfs of Suez and Aqaba bounded at the south by the rhumb line between Ras si Ane (12° 8.5’ N, 43° 30.2’ E) and Husn Murad (12° 40.4’ N, 43° 30.2’ E).

e. The Persian Gulf area includes the sea area located northwest of the rhumb line between Ras al Hadd (22° 30’ N, 59° 48’ E) and Ras al Fastah (25° 04’ N, 61° 25’ E).

f. The North Sea area includes the North Sea southward of latitude 62° N and eastward of longitude 4° W; the Skagerrak, the southern limit is determined east of The Skaw by latitude 57° 44.8’ N; and the English Channel and its approaches eastward of longitude 5° W and northward of latitude 48° 30’ N.

g. The Wider Caribbean area includes the Gulf of Mexico and the Caribbean Sea proper bounded by latitude 30°.

h. The Antarctic area means the sea area south of latitude 60° S.

i. Other areas as identified and agreed upon by international treaty (MARPOL) or domestic law (USCG regulations).

593-2.1.10 TRASH AND REFUSE. Trash and refuse are terms used to define a mixture of combustible wastes such as paper, cardboard, cartons, wooden boxes, and floor sweeping.

593-2.2 INTERNATIONAL CONVENTIONS AND LEGISLATION

Navy policy for managing shipboard solid waste is derived from Annex V of the International Maritime’s Organization International Convention for the Prevention of Pollution from Ships 73/78 (MARPOL). The MARPOL Convention provides that the above Annex V requirements do not strictly apply to warships. Party states (including the U.S.) must, however, establish standards for their warships that require such vessels to conform as closely as practicable to the international standard, without compromising operational effectiveness.

NOTE

MARPOL Annex V special areas and special areas that are in effect are not necessarily the same as those specified in MARPOL Annex I.

593-2.2.1 ACT TO PREVENT POLLUTION FROM SHIPS (APPS). APPS implements MARPOL Annex V and requires that U.S. public vessels, including warships, comply with MARPOL Annex V requirements by established deadlines: Surface ships must comply with the plastic discharge prohibition and with the special area limitations. Surface ships equipped with plastic processors must comply with the plastic discharge prohibition. Submarines must comply with both the plastic discharge prohibition and the special area requirements not later than 31 December 2008. However, APPS permits U.S. Navy ships to discharge in MARPOL Annex V special areas in the following manner:

a. Ships may discharge a slurry of seawater, paper, cardboard or food waste capable of passing through a screen with openings no larger than 6.35 millimeters (0.25 inches) in diameter outside 3 NM from land.

b. Ships may discharge metal and glass that have been shredded and bagged to ensure negative buoyancy outside 12 NM from land.

593-2.2.2 OCEAN DUMPING ACT (ODA). ODA prohibits U.S. entities from transporting material from the U.S. or from any other place for the purpose of dumping it into ocean waters, unless a permit has been obtained from the U.S. Environmental Protection Agency (EPA). ODA does not apply to waste that is generated aboard ships while underway.

593-2.2.3 CLEAN WATER ACT. Prohibits the discharge of pollutants (including solid waste) from ships into waters of the U.S. within 3 NM from shore. (Discharge of solid waste pollutants beyond 3 NM from shore is regulated under APPS.)

593-2.2.4 OTHER STATUTES. Various statutes authorize the U.S. Department of Agriculture (USDA) to regulate the handling of foreign food and foreign source garbage entering the U.S. via ship and aircraft. U.S. Navy ships must comply with those regulations.

593-2.3 NAVY SOLID WASTE POLICY

OPNAVINST 5090.1C Series, Navy Environmental and Natural Resources Program Manual, Chapter 22, Environmental Compliance Afloat, defines environmental compliance policies and procedures applicable to shipboard operations. If there is any conflicting guidance between this chapter and OPNAVINST 5090.1C Series, the OPNAV instruction shall take precedence. Tables 593-2-1 and 593-2-2 summarize the Navy solid waste discharge policy.

593-2.3.1 SOLID WASTE IN PORT. Navy vessels shall offload all solid waste to shore side facilities while in port and prior to getting underway.

593-2.3.2 SOLID WASTE AT SEA. Although the at-sea disposal of some types of solid wastes by ships is permissible (as indicated below in paragraphs 593-2.3.2.1 and 593-2.3.2.2), international guidelines encourage the use of port reception facilities as the primary means of shipboard trash disposal, whenever practical. This means that surplus materials, which can reasonably and safely be stored on board, such as damaged equipment or office furniture, should be retained for shore disposal.

Table 593-2-1 Summary of Navy Solid Waste Discharge Policy for Surface Ships

Waste Type	**Discharge Permitted**			**Comments**
	U. S. Waters	Foreign Countries	MARPOL Special Areas	
Plastics - All	No Discharge.	No Discharge.	No Discharge.	
Pulped Garbage - Includes food, paper and cardboard	>3NM	>3NM	>3NM	When pulper is installed: all pulpable material shall be processed while at sea.

Table 593-2-1 Summary of Navy Solid Waste Discharge Policy for Surface Ships - Continued

Shredded Metal and Glass	>12NM	>12NM	>12NM	When Metal/Glass Shredder is installed: All metal and glass shall be processed while at sea. Shredded metal and glass must be bagged prior to disposal.
Other Unprocessed Garbage - See Note 1	>25NM provided it does not float	>25NM provided it does not float	No Discharge. Reporting requirements for emergency discharges. See paragraph 593-2.3.2.5.	Garbage discharged should be processed to eliminate floating debris. Retain surplus material for shore disposal. Includes incinerator ash.
Medical Waste - Infectious & Sharps	No Discharge. Steam, sterilize, store and transfer ashore.	No Discharge. Treat IAW SOFA or International Agreements.	No Discharge.	
Note 1: If a ship does not have pulper/shredder equipment or this equipment is inoperable, it may discharge unprocessed garbage beyond 25 NM from any coastline. Surface ships shall use available means to cause unprocessed garbage to sink as rapidly as possible. When required to make unprocessed garbage discharges to an in effect special area, the commanding officer shall note the details of such a discharge (date of discharge, special area involved, and nature and amount of discharge) in the ship's Deck Log. Ships shall report equipment casualties that either threaten or result in a discharge of unprocessed garbage to an effect special area through the CASREP system. The initial CASREP shall note the potential for discharge. Reports of such discharges will be made to CNO (N45) per paragraph 593-2.3.2.5.				

593-2.3.2.1 Plastics. No overboard discharge is allowed.

Process and retain all plastics aboard ship for transfer or shore disposal. Replace disposable plastic items with non-plastic items where possible. If appropriate, remove plastic wrapping and shipping materials from supply items before bringing on board. Minimize the amount of plastic supplies consumed.

The primary reason for the prohibition on plastics waste disposal at sea is to stop the harm that plastic waste causes marine life. Plastics pose a special problem since it neither sinks like glass and metal nor does it disintegrate like garbage, paper and cloth. The problems are physical ones of entanglement and ingestion by marine animals. This causes thousands of marine animals to die every year. The animals include seals, turtles, seabirds, and whales. Also, marine debris poses hazards to ships fouling propellers, clogging seawater intakes and evaporators, and causing engine failure. Plastics waste creates unsightly conditions at sea and on beaches. From a military standpoint, throwing shipboard trash overboard creates a potential security risk because our adversaries may obtain useful intelligence information from our trash.

593-2.3.2.2 Garbage (Non-Plastics). Garbage may be discharged overboard as indicated below. Ships equipped with solid waste processing equipment shall use such equipment to the maximum extent possible.

a. **Pulped Garbage (Includes Food Waste, Paper, and Cardboard that is Pulped, Comminuted or Ground).** All pulpable garbage shall be processed while at sea.

- U.S. Waters -discharge permitted outside 3 MN.
- Foreign Waters - discharge permitted outside 3 NM.
- MARPOL Special Areas - discharge permitted outside 3 NM.

b. **Shredded Metal and Glass Waste.** All shreddable metal and glass shall be processed while at sea.

NOTE

Shredded metal and glass must be placed in a burlap bag prior to discharge.

NOTE

All materials that naturally sink shall not be shredded prior to discharge. (Example: Heavier metal items such as tool steel, angle iron, bar stock, metal blocks or any other material that will naturally sink on its own should never be processed in the metal/glass shredder.)

- U.S. Waters - discharge permitted outside 12 NM.
- Foreign Waters - discharge permitted outside 12 NM.
- MARPOL Special Areas - discharge permitted outside 12 NM.

c. **Other Unprocessed Garbage**

- U.S. Waters - discharge permitted outside 25 NM provided it does not float.
- Foreign Waters - discharge permitted outside 25 NM provided it does not float.
- MARPOL Special Areas - no discharge permitted.

If a ship does not have pulper/shredder equipment or this equipment is inoperable, it may discharge unprocessed garbage beyond 25 NM from any coastline. Surface ships shall use available means to cause unprocessed garbage to sink as rapidly as possible. When required to make unprocessed garbage discharges to an in effect special area, the commanding officer shall note the details of such a discharge (date of discharge, special area involved, and nature and amount of discharge) in the ship's Deck Log. Ships shall report equipment casualties that either threaten or result in a discharge of unprocessed garbage to an in effect special area through the CASREP system. The initial CASREP shall note the potential for discharge. Reports of such discharges will be made to CNO (N45) per paragraph 593-2.3.2.5.

593-2.3.2.3 Submarines. Table 593-2-2 provides a summary Navy Solid Waste Policies for Submarine Solid Waste Management.

Table 593-2-2 Summary of Navy Solid Waste Discharge Policy for Submarines

Waste Type	**Discharge Permitted**			**Comments**
	U. S. Waters	Foreign Countries	MARPOL Special Areas	

Table 593-2-2 Summary of Navy Solid Waste Discharge Policy for Submarines - Continued

Plastics	-Store onboard. Make conscientious effort to minimize discharge.	-Store onboard. Make conscientious effort to minimize discharge.	-Store onboard. Make conscientious effort to minimize discharge.	Record-keeping requirements for at-sea discharge. All discharges must be non-buoyant, i.e. compacted and sinkable.
Garbage (nonplastics)	-Discharge permitted between 12NM and 25NM if water depth is >1000 fathoms. -Direct discharge permitted outside 25NM.	-Discharge permitted between 12NM and 25NM if water depth is >1000 fathoms. -Direct discharge permitted outside 25NM.	-Discharge permitted between 12NM and 25NM if water depth is >1000 fathoms. -Direct discharge permitted outside 25NM.	All discharges should be processed to eliminate floating marine debris. Retain surplus material for shore disposal.

a. **Plastics.** - Segregate plastic waste, and store onboard. If dedicated space is not available, store on station or in division spaces. Minimize plastics by replacing plastic disposable items with non-plastic items, where possible. If appropriate, remove plastic wrapping and shipping materials from supply items before bringing them on board. Minimize the amount of plastic supplies consumed. Submarines shall make a conscientious effort to minimize the discharge of plastics at sea following the guidance of the previous paragraph. Buoyant garbage discharges from submarines are prohibited.

b. **Garbage (Non-Plastics).**

- Compacted garbage that sinks may be discharged in all areas between 12 NM and 25 NM, provided that the depth of the water is greater than 1,000 fathoms.
- When greater than 25 NM from land, direct discharge is permitted.

593-2.3.2.4 Plastic Discharge Record Keeping. Surface ships or submarines shall record any discharge of plastic in the ship's deck log. The log entry shall include the date, time, and location of discharge, approximate weight and cubic volume of the discharge and nature of the material discharged.

593-2.3.2.5 Special Area Discharge Reports. Under APPS, the Secretary of Defense must report annually in the Federal Register on the amount and nature of discharges in special areas in effect in which the discharges did not meet Annex V limitations. Accordingly, upon completion of operations in special areas in effect, Navy ships shall report the following information to CNO (N45), information copies to the chain of command, regarding all discharges **other than food waste, pulped garbage and shredded and bagged metal and glass,** made into the special area in effect:

a. Date of discharge

b. Special area involved

c. Nature and amount or discharge (estimated pounds of plastic; unshredded metal and glass; unpulped wood, paper and cardboard; ceramic; or other nonfood material).

Negative reports are required.

593-2.3.3 SHIPS INSTRUCTION. To successfully comply with the requirements for shipboard solid waste management, each ship will need to issue a ship instruction to implement a ship wide solid and plastics waste management program. The program should include the following:

a. The Shipboard Solid Waste Management Equipment Guide, NSWCCD-TR-63-97/25 September 1997 by Carderock Division, Naval Surface Warfare Center, is available to assist Ships Force in developing a ship instruction. This document contains sample shipboard instruction, job qualification requirements, lessons learned, and other information needed to effectively operate and maintain the Plastic Processors, Plastics Shredders, Garbage Grinders, Compactors, Metal/Glass Shredders, and Large and Small Pulpers.

b. All personnel assigned to operate and maintain solid waste processing equipment (Plastic Waste Processors, Shredders, and Pulpers), shall complete the Plastics Waste Processor Computer-Based Training (CBT), A-690-0003, and the Pulper Shredder CBT, A-690-0004, interactive courseware, as applicable, prior to assignment.

c. Source segregation of plastics and nonplastics solid waste.

d. Onboard storage of plastics waste.

e. Training of personnel responsible for the supervision and approval of overboard disposal of solid waste on the legal requirements applicable to this waste category.

f. Performing proper maintenance and cleaning is essential for equipment operation.

593-2.3.4 EMERGENCY DISCHARGE. The standards given above do not preclude discharge of any solid waste in an emergency when failure to do so would clearly endanger the health or safety of shipboard personnel. Surface ships commanding officers shall personally approve of any garbage discharge, made in the interest of ship safety, crew health, or lifesaving, which does not conform, to Navy Policies. Various commercial and Navy developed solid waste processing equipments are available to assist Navy ships with complying with the previously discussed statutory and regulatory discharge requirements.

593-2.4 SHIPBOARD SOLID WASTE MANAGEMENT.

The following tables provide guidance to ship's force for sorting and disposing of shipboard solid waste. Table 593-2-3 provides information regarding the proper sorting of solid waste prior to disposal. Table 593-2-4 details the proper disposal methods for miscellaneous solid waste items.

Table 593-2-3 Solid Waste Sorting Chart
LEGEND: *** boxes indicate proper trash segregation for legal disposal.

Solid Waste Item	Plastics Only Container	Metal & Glass Only Container	Food / Paper Container	Other	Comments
Aerosol Cans				***Turn in to HazMinCen	
Aluminum Foil		***			
Batteries				***Turn in to HazMinCen	
Bones			***		
Cable (nonplastic coated)		***Small Quantities		***Large Quantities: Store & Retrograde	Plastic coated non-electrical cables process as electrical cables
Candy Wrappers	***				

Table 593-2-3 Solid Waste Sorting Chart

LEGEND: *** boxes indicate proper trash segregation for legal disposal. -

Continued

Solid Waste Item	Plastics Only Container	Metal & Glass Only Container	Food / Paper Container	Other	Comments
Cardboard (including waxed or Tri-walled)			***		Place plastic tape into plastics only container
Cigarette Butts			***		
Computer Disks and CDs	***Unclassified				
Durable Items (nonplastic)				***Store & Retrograde. If disposal is required, discharge unprocessed beyond 25nm and outside special areas	Examples: I-Beams, large plate, metal trash cans
Durable items (with some plastic)				***Store & Retrograde	
Electrical Cable & Wire	***Small Quantities			***Heavy & Large Quantities: Store & Retrograde	
Feminine Hygiene Products				***Incinerate or Store & Retrograde	
Foam Mattresses				***Store & Retrograde	
Food (loose)			***		
Food Containers (metal)		***			
Glass (jars/bottles)		***			
HazMat Containers				***Turn in to HazMinCen	Some HazMat containers can be disposed of with metal/plastic trash per OPNAV-P45-114-95
Light Bulb (incandescent)		***			
Light Bulbs (fluorescent)				***Turn in to HazMinCen	Contains Mercury and other Hazardous Material
Light Sticks				***Turn in to HazMinCen	

Table 593-2-3 Solid Waste Sorting Chart

LEGEND: *** boxes indicate proper trash segregation for legal disposal. -

Continued

Solid Waste Item	Plastics Only Container	Metal & Glass Only Container	Food / Paper Container	Other	Comments
Linoleum Tile	***Small Quantities			***Large Quantities Store & Retrograde :	
Magazines			***		
Medical Waste (infectious and noninfectious)				***Handled by Medical Office	
Metal (structural and large metal items)				***Discharge Directly Overboard	
Milk Bladders	***				Empty contents before processing
Music Tapes & CDs	***				
Non-plastic Hardware (nuts, bolts, etc)				***Discharge Directly Overboard	
Oily Rags, Paint Rags				***Turn in to HazMinCen	
Paper (Classified, Computer, Newspaper and loose)			***		
Pens & Pencils	***				
Plastic Bottles	***				Remove excess food contamination
Plastic Film and Wrap	***				Remove excess food contamination
Shower Shoes & Curtains	***				
Soda Cans		***If no recycling available		***If Recycling available: Compact, Store & Recycle	

Table 593-2-3 Solid Waste Sorting Chart

LEGEND: *** boxes indicate proper trash segregation for legal disposal. -

Continued

Solid Waste Item	Plastics Only Container	Metal & Glass Only Container	Food / Paper Container	Other	Comments
Steel & Aluminum		***			Only lightweight items that may float. Large items that naturally sink may not process in the shredder and should go directly into a burlap bag and then overboard
Styrofoam	***				
Telephones, Electronics, etc.	***				
Textiles				***Incinerate or Store & Retrograde	Including non-oily rags
Uniforms (clothing & shoes)				***Store & Retrograde	
Urine Bags (pilot)				***Incinerate or Store & Retrograde	
Utensils (plastic)	***				
Vegetable Oil				***Store & Retrograde or strain and place in waste oil tank	
Video Tapes	***				
Wet-strength Paper Bags			***		
Wood (crates and boxes)				***Incinerate or Store & Retrograde	
Wood (excess)				***Incinerate or Store & Retrograde	Including from pallets

Table 593-2-4 Solid Waste Processing Chart
Note: The recommended method of processing is highlighted by *** in the table. Alternate methods are indicated by the word Alternate in bold.

Solid Waste Item	Plastics Processor (PWP)	Metal/Glass Shredder	Pulper	Incinerator (if available on ship)	Other	Comments
Aerosol Cans	Not Allowed	Not Allowed	Not Allowed	Not Allowed	***Recommended Turn in to HazMinCen	
Aluminum Foil	Not Allowed	***Recommended	Not Allowed	Not Allowed	Not Allowed	
Batteries	Not Allowed	Not Allowed	Not Allowed	Not Allowed	***Recommended Turn in to HazMinCen	
Bones	Not Allowed	Alternate	***Recommended	Not Allowed	Not Allowed	Feed into pulper slowly. Mix with other pulpable items.
Butane Lighters	Not Allowed	Not Allowed	Not Allowed	Not Allowed	***Recommended Turn in to HazMinCen	
Cable & Wire (nonplastic coated)	Not Allowed	***Recommended for Small Quantities	Not Allowed	Not Allowed	***Recommended for Large Quantities: Store & Retrograde	Plastic coated non-electrical cables: Process the same as electrical cables.
Candy Wrappers	***Recommended	Not Allowed	Not Allowed	Not Allowed	Not Allowed	
Cardboard	Not Allowed	Not Allowed	***Recommended	**Alternate**	Not Allowed	Remove plastic tape and process with plastics.
Cardboard, (waxed or Triwalls)	Not Allowed	Not Allowed	***Recommended	**Alternate**	Not Allowed	Feed into pulper slowly. Mix with other pulpable items.
CDs & Computer Disks	***Recommended for Unclassified	Not Allowed	Not Allowed	Not Allowed	Not Allowed	
Cigarette Butts	Not Allowed	Not Allowed	Not Allowed	**Alternate**	Not Allowed	
Classified Paper Documents	Not Allowed	Not Allowed	***Recommended	**Alternate**	Not Allowed	
Computer Paper	Not Allowed	Not Allowed	***Recommended	**Alternate**	Not Allowed	

Table 593-2-4 Solid Waste Processing Chart

Note: The recommended method of processing is highlighted by *** in the table. Alternate methods are indicated by the word Alternate in bold. - Continued

Solid Waste Item	**Plastics Processor (PWP)**	**Metal/Glass Shredder**	**Pulper**	**Incinerator (if available on ship)**	**Other**	**Comments**
Empty HazMat Containers	***Recommended for items containing plastic (i.e., plastic handled paint brush, plastic drop cloth)	***Recommended for metal or glass items (i.e., metal paint can)	***Recommended for paper items (i.e., paper drop cloth)	Not Allowed	Not Allowed	Must be listed in OPNAV P-45-114-95 to process. Otherwise, Store & Retrograde Paint must be dry before processing. Only small cans that are one gallon or less in size. Larger cans with heavier gauge metal will not process properly in shredder and should be punctured and thrown directly into burlap bag for overboard disposal.
Durable Items (nonplastic)	Not Allowed	Not Allowed	Not Allowed	Not Allowed	***Store & Retrograde. If disposal is required discharge unprocessed beyond 25 NM and outside special areas	Examples: I-beam, large plate, metal trash cans.
Durable Items (with some plastic)	Not Allowed	Not Allowed	Not Allowed	Not Allowed	***Store & Retrograde	
Electrical Cable and Wire	***Recommended for small Quantities	Not Allowed	Not Allowed	Not Allowed	***Recommended for heavy and Large Quantities: Store & Retrograde	

Table 593-2-4 Solid Waste Processing Chart

Note: The recommended method of processing is highlighted by *** in the table. Alternate methods are indicated by the word Alternate in bold. - Continued

Solid Waste Item	**Plastics Processor (PWP)**	**Metal/Glass Shredder**	**Pulper**	**Incinerator (if available on ship)**	**Other**	**Comments**
Feminine Hygiene Products	Not Allowed	Not Allowed	Not Allowed	**Alternate**	***Store & Retrograde	
Foam Mattresses	Not Allowed	Not Allowed	Not Allowed	Not Allowed	***Store & Retrograde	
Food (loose)	Not Allowed	Not Allowed	***Recommended	Not Allowed		
Food (foreign)	Not Allowed	Not Allowed	***Recommended	**Alternate**		
Food Containers (metal)	Not Allowed	***Recommended	Not Allowed	Not Allowed		
Glass (jars / bottles)	Not Allowed	***Recommended	Not Allowed	Not Allowed		
Light Bulb (incandescent)	Not Allowed	***Recommended	Not Allowed	Not Allowed		
Light Bulb (fluorescent)	Not Allowed	Not Allowed	Not Allowed	Not Allowed	***Turn in to HazMinCen & retain for shore disposal	Contains Mercury and other Hazardous Material
Light Sticks	Not Allowed	Not Allowed	Not Allowed	Not Allowed	***Turn in to HazMinCen	
Linoleum Tile	***Recommended for small Quantities	Not Allowed	Not Allowed	Not Allowed	***Large Quantities: Store & Retrograde	
Magazines	Not Allowed	Not Allowed	***Recommended	**Alternate**		
Newspapers	Not Allowed	Not Allowed	***Recommended	**Alternate**		
Paper (loose)	Not Allowed	Not Allowed	***Recommended	**Alternate**		
Medical Waste (infectious and noninfectious)	Not Allowed	Not Allowed	Not Allowed	**Alternate**	Handled by Medical Office	
Metal (structural and large metal items)	Not Allowed	Not Allowed	Not Allowed	Not Allowed	***Discharge Overboard	Retain for shore disposal, if possible.
Milk Bladders	***Recommended	Not Allowed	Not Allowed	Not Allowed		Empty contents before processing

Table 593-2-4 Solid Waste Processing Chart

Note: The recommended method of processing is highlighted by *** in the table. Alternate methods are indicated by the word Alternate in bold. - Continued

Solid Waste Item	Plastics Processor (PWP)	Metal/Glass Shredder	Pulper	Incinerator (if available on ship)	Other	Comments
Music Tapes & CDs	***Recommended	Not Allowed	Not Allowed	Not Allowed		
Hardware, nonplastic (nuts, bolts, etc.)	Not Allowed	Not Allowed	Not Allowed	Not Allowed	***Discharge Directly Overboard	
Pencils	***Recommended for Mechanical Pencils	Not Allowed	***Recommended for Wooden Pencils	**Alternate**		
Pens	***Recommended	Not Allowed	Not Allowed	**Alternate**		
Plastic Bottles	***Recommended	Not Allowed	Not Allowed	Not Allowed		Remove excess food contamination
Plastic Film and Wrap	***Recommended	Not Allowed	Not Allowed	Not Allowed		Remove excess food contamination
Pulper Junk Box Residue	***Recommended	***Recommended	Not Allowed	Not Allowed		
Shower Shoes & Curtains	***Recommended	Not Allowed	Not Allowed	Not Allowed		
Soda Cans	Not Allowed	***Recommended	Not Allowed	Not Allowed	**Alternate: Compact, Store & Recycle**	
Styrofoam ®	Recommended	Not Allowed	Not Allowed	Not Allowed		
Telephones, Electronics, etc.	***Recommended	Not Allowed	Not Allowed	Not Allowed	**Alternate: Store & Retrograde**	
Textiles	Not Allowed	Not Allowed	Not Allowed	***Recommended	***Store & Retrograde	Including non-oily rags
Uniforms (clothing & shoes)	Not Allowed	Not Allowed	Not Allowed	**Alternate**	***Store & Retrograde	
Urine Bags (pilot)	Not Allowed	Not Allowed	Not Allowed	**Alternate**	***Store & Retrograde	
Utensils (plastic)	***Recommended	Not Allowed	Not Allowed	Not Allowed		

Table 593-2-4 Solid Waste Processing Chart

Note: The recommended method of processing is highlighted by *** in the table. Alternate methods are indicated by the word Alternate in bold. -

Continued

Solid Waste Item	**Plastics Processor (PWP)**	**Metal/Glass Shredder**	**Pulper**	**Incinerator (if available on ship)**	**Other**	**Comments**
Vegetable Oil	Not Allowed	Not Allowed	Not Allowed	Not Allowed	***Store & Retrograde or strain and place in waste oil tank	
Video Tapes	***Recommended	Not Allowed	Not Allowed	Not Allowed		
Wet-Strength Paper Bags	Not Allowed	Not Allowed	***Recommended	**Alternate**		
Wood (crates and boxes)	Not Allowed	Not Allowed	Not Allowed	***Recommended	**Alternate: Store & Retrograde**	
Wood (excess)	Not Allowed	Not Allowed	Not Allowed	***Recommended	**Alternate: Store & Retrograde**	Including pallets

General comments:

- If it looks or feels like plastic or rubber- it cannot go in the ocean- BY LAW
- Processed Metal/Glass - can only be discharged outside 12 NM from shore
- Pulped Materials can only be discharged outside 3 NM from shore

593-2.5 SHIPBOARD SOLID WASTE PROCESSING EQUIPMENT.

Various commercial and Navy developed solid waste processing equipment are installed to assist Navy ships with complying with the previously discussed statutory and regulatory discharge requirements. These equipments are discussed below.

NOTE

Proper Personal Protective Equipment (PPE) should be used during the operation of all Solid Waste Processing Equipment

593-2.5.1 PLASTICS WASTE PROCESSOR (PWP) AND MOD I PLASTICS WASTE PROCESSOR (PWP). The Navy Standard Plastics Waste Processors (PWPs) have been installed on most surface ship classes. MOD I PWPs are planned to replace the current Standard Navy PWPs on most surface ships.

The PWP consists of four components designed to process all shipboard plastics waste into a compressed block that can be sealed in odor-barrier bags and stored for periods of up to 60 days. These components are a Solid Waste or Plastics Shredder (PS), a Compress Melt Unit (CMU), either a Closed Loop Cooling Unit (CLCU)

or an Auxiliary Unit (AU) in the case of the MOD I PWP, and a heat sealer. The Plastics Processor used for most ships consists of two Compress Melt Units, a CLCU or AU, a Plastic Shredder, and a Heat Sealer.

The smaller ship classes did not receive an entire PWP installation. For these classes, the total volume of unprocessed plastics stored on board is less than the required volume for installation and operation of an entire PWP. Therefore, only a single Compress Melt Unit and Heat Sealer or only a single heat sealer is installed. Heat Sealer information can be referenced in Section 593-2.5.1.3. The larger ship classes received more than one Plastics Processor installation.

593-2.5.1.1 Navy Compress Melt Unit (CMU) and MOD I Compress Melt Unit (CMU). After shredding, the bagged plastic waste is loaded into the chamber of a Compress Melt Unit, where it is compacted by a mechanical or pneumatic extendable ram. On the standard CMU the chamber, ram, and door are heated to soften, and fuse the shredded plastics waste. The chamber, ram, and door are then cooled to stabilize the waste into a dimensionally stable disk that can be ejected from the top of the chamber by the ram. The MOD I CMU does not utilize chamber heating or cooling. The plastic disk dimensions are 20 inches in diameter and can be 1.5 to 5 inches thick. Each disk can weigh between 10 to 25 pounds. See Figure 593-2-1 for the Compress/Melt Unit (CMU), and Figure 593-2-2 for the MOD I Compress/Melt Unit (CMU). See Table 593-2-5 for ILS Support For Navy Standard Plastics Waste Processor Compress/Melt Unit with Commercial Control, Table 593-2-6 for ILS Support For Navy Standard Plastics Waste Processor Compress/Melt Unit with Military Control, and Table 593-2-7 for ILS Support for MOD I Plastics Waste Processor Compress/Melt Unit.

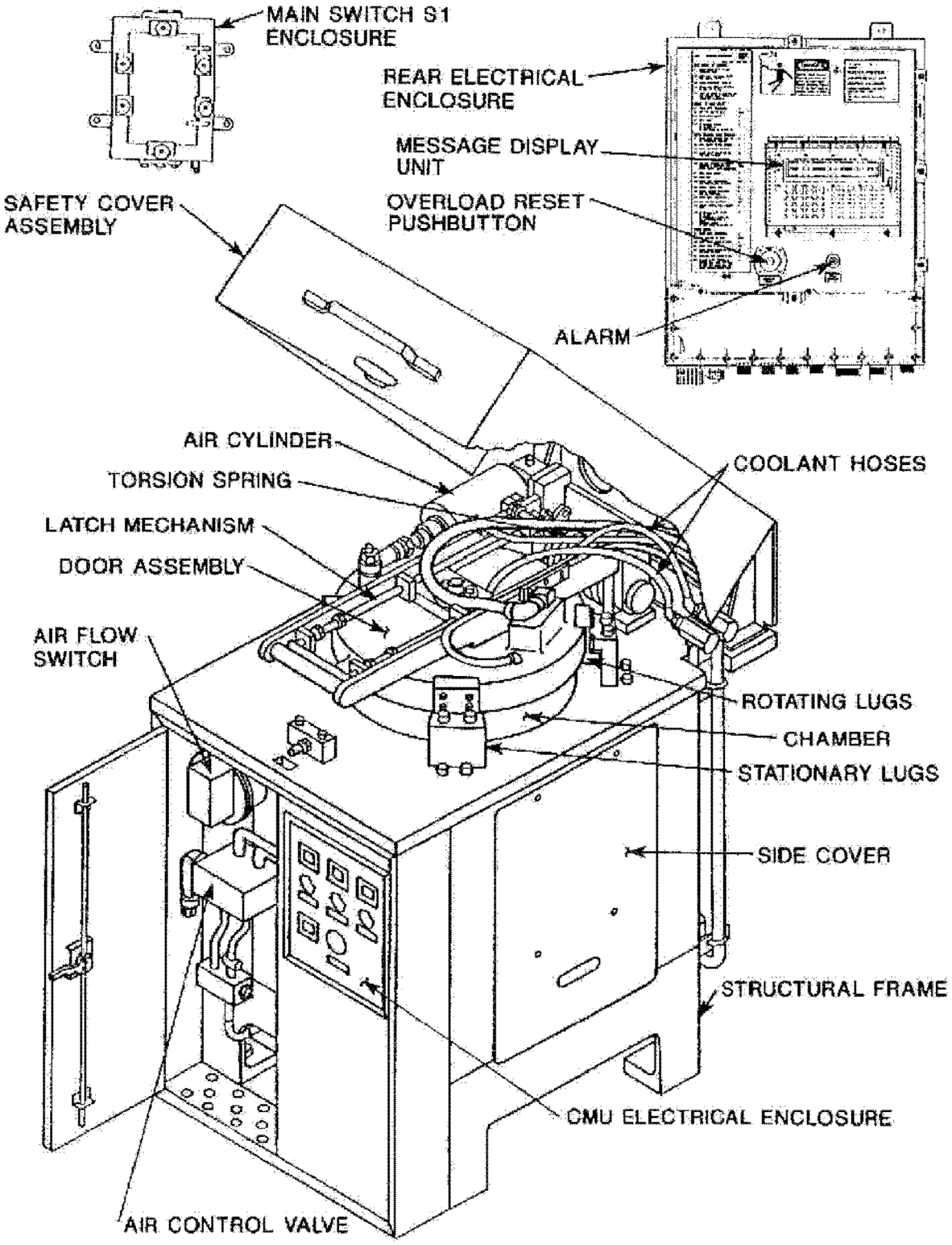


Figure 593-2-1 Compress/Melt Unit (CMU)

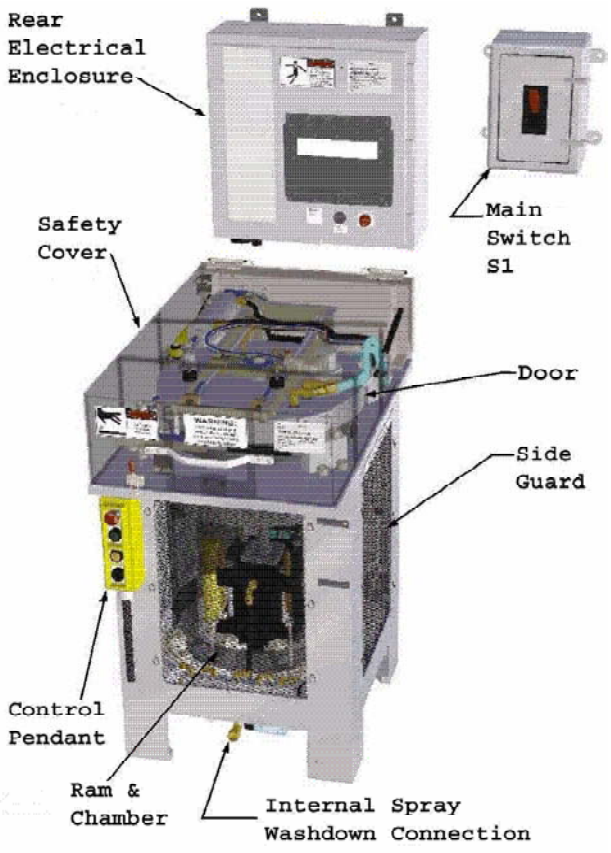


Figure 593-2-2 MOD I Compress/Melt Unit (CMU)

593-2.5.1.2 Instruction Plates. The following instruction plates are for the CMU. Instruction plates with letters 1/4-inches high shall be installed in the vicinity of the CMU control enclosure:

NOTE

The application of mold release agent (NSN: 6850-01-447-4411) to the inside of the door and chamber and the top of the ram is required. Apply generous amounts prior to processing each load of plastics to ensure proper lubrication, to minimize wear, and to simplify cleaning.

Table 593-2-5 ILS Support For Navy Standard Plastics Waste Processor Compress/Melt Unit, Commercial Control

NAVY TRAINING PLAN (NTP)/(NTSP)	NTP S-30-9508
MIP	5933/004
TECHNICAL MANUALS	S9593-C7-MMM-010 OPERATION AND MAINTENANCE PROCESSOR, PLASTICS WITH MARK II COMMERCIAL CONTROL ENCLOSURE NAVSEA DWG. 593-6961199
	S9593-CT-TRS-010 TECHNICAL REPAIR STANDARD, DEPOT PROCESSOR, PLASTICS, NAVSEA DRAWING 593-6961199
SHIPBOARD TRAINING COURSES	TBD
APL CMU	**Nomenclature**

Table 593-2-5 ILS Support For Navy Standard Plastics Waste Processor

Compress/Melt Unit, Commercial Control - Continued

439990247	Plastic Processor Melt Unit, 593-6961200
213190362	Switch, Limit, Dwg 593-6961287
509991759	Panel Front, Control, Plastics Melt Unit Dwg 593-6961270
509991760	Panel Rear, Control, Plastics Processor with Commercial Contactors Dwg 593-6961335
APL CLCU	**Nomenclature**
039990143	Closed Loop Cooling System, Dwg 593-6961310
018650003	Pump, Centrifugal, 21gpm, 3450rpm, MDL 3000D-HD1
179990341	Motor, AC, 2HP, 460VAC, 3450rpm
509991761	Panel, Control, Closed Loop Cooling System, with Commercial Contactors Dwg 593-6961338
509991553	Panel, Control, Closed Loop Cooling System, with Military Contactors Dwg 593-6961315

Table 593-2-6 ILS Support For Navy Standard Plastics Waste Processor Compress/Melt Unit, Military Control

NAVY TRAINING PLAN (NTP)/(NTSP)	NTP S-30-9508
MIP	5933/004
TECHNICAL MANUALS	S9593-C4-MMM-010 OPERATION AND MAINTENANCE PROCESSOR, PLASTICS WITH MIL-SPEC. CONTROL ENCLOSURE NAVSEA DWG. 593-6961199
	S9593-CT-TRS-010 TECHNICAL REPAIR STANDARD, DEPOT PROCESSOR, PLASTICS, NAVSEA DRAWING 593-6961199
SHIPBOARD TRAINING COURSES	TBD
APL CMU	**Nomenclature**
439990247	Plastic Processor Melt Unit, 593-6961200
213190362	Switch, Limit, Dwg 593-6961287
509991759	Panel Front, Control, Plastics Melt Unit Dwg 593-6961270
509991552	Panel Rear, Control, Plastics Processor with Military Contactors Dwg 593-6961260
APL CLCU	**Nomenclature**
039990143	Closed Loop Cooling System, Dwg 593-6961310
018650003	Pump, Centrifugal, 21gpm, 3450rpm, MDL 3000-HD1
179990341	Motor, AC, 2HP, 460VAC, 3450rpm
509991761	Panel, Control, Closed Loop Cooling System, with Commercial Contactors Dwg 593-6961338
509991553	Panel, Control, Closed Loop Cooling System, with Military Contactors Dwg 593-6961315

Table 593-2-7 ILS Support For MOD I Plastics Waste Processor Compress/ Melt Unit

NAVY TRAINING PLAN (NTP)/(NTSP)	NTP S-30-9508A
MIP	5933/012

Table 593-2-7 ILS Support For MOD I Plastics Waste Processor Compress/ Melt Unit - Continued

TECHNICAL MANUALS	S9593-BM-MMA-010 OPERATION AND MAINTENANCE MOD I Plastics Waste Processor, Compress Melt Unit 593-7556811
SHIPBOARD TRAINING COURSES	TBD
APL	**Nomenclature**
43A020018	Plastic Waste Compress Melt Unit, MOD 1, 593-7556811
50A030198	Panel, Control 440VAC 60HZ 3PH NEMA 4X Stainless Steel, Weatherproof
52A030032	Cylinder, Pneumatic Bore 8 inch, Stroke 13 inches
61A020097	Auxiliary Unit 593-7556850 ASSY 99
21A020023	Switch, Control Pendant, Dwg 593-7556841 ASSY 99

The following list provides the required tools, consumables and NSN information for the Plastic Waste Processor.

1. Scraping knives, 3-inch wide blade. Used as a scraper to clean ram face after processing a brick. NSN 5110-00-221-1538.
2. Insert Face for Mallet. NSN 5120-00-555-2086
3. Holder, Inserted Hammer. NSN 5120-00-903-8552
4. Hook Blade Replacement. NSN 5110-01-437-1141
5. Retractable Hook Blade Cutter. Used for cutting away flashing. NSN 5110-01-437-1140
6. MacLube 317 Mold Release Emulsion NSN 6850-01-447-4411
7. Scotch Brite ® pads. SPMIG: 03174 (NSN 7920-00-151-6120)
8. Plastic Trash Bags, NSN 8105-00-579-8451, 100 bags/box.
9. Water Hose (SPMIG 00652)

593-2.5.1.3 Heat Sealer. The heat sealer uses heat and compression rollers to close the odor-barrier bag with an airtight seal. See Table 593-2-8 for ILS Support for Heat Sealer

Table 593-2-8 ILS Support For Heat Sealer

NAVY TRAINING PLAN (NTP)/(NTSP)	TBD
MIP	TBD
TECHNICAL MANUALS	S9593-D3-MMC-010 OPERATION AND MAINTENANCE Sealer, Heat, Metric Model HS-B
	SG200-C2-MMC-010 OPERATION AND MAINTENANCE Sealer, Heat, Portable Model HS-B II
SHIPBOARD TRAINING COURSES	TBD
APL	**Nomenclature**
439990276	Heat Sealer, Model HS-B II / 437818
439990273	Heat Sealer, Model HS-B

593-2.5.1.3.1 For ships with a Plastics Waste Processor. Disks with food contamination must be placed in specially designed 24x27 inch odor-barrier bags (NSN 8105-01-392-6510) and sealed with a heat sealer (NSN 3540-00-819-8837 or 3540-01-456-4286) to prevent health or sanitation problems during prolonged storage.

593-2.5.1.3.2 For ships without a Plastics Waste Processor. Odor Barrier bags are used to store plastics onboard until the material can be offloaded. Contaminated plastic is placed inside the 36x50 inch Odor Barrier Bag (NSN 8105-01-392-6515) heat sealed and held until shoreside disposal.

593-2.5.1.3.3 Instruction Plates. The following instruction plates are for the heat sealer. Instruction plates with letters 1/4-inch high shall be installed in the vicinity of the heat sealer:

WARNING

HEAT SEALER IS NOT WATERTIGHT. TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK, REMOVE AND STOW HEAT SEALER PRIOR TO SPACE WASHDOWN.

NOTE

Make sure heat sealer roller spacings have been set correctly for the barrier bag thickness and the sealer mounting clamp has been installed opposite the temperature gauge prior to using the heat sealer.

593-2.5.1.4 Closed Loop Cooling Unit and Auxiliary Unit (AU). A separate Closed Loop Cooling Unit removes process heat from the Standard Compress Melt Unit. The Closed Loop Cooling Unit consists of a pump, a motor, a heat exchanger, an expansion tank, and the electrical controls necessary to operate this unit. One cooling unit can cool one or two Compress Melt Units. The cooling fluid on the closed-loop side of the heat exchanger is potable water. The MOD I CMU utilizes an Auxiliary Unit (AU), which uses direct seawater or chilled water from the ship's cooling water supply system circulated through the door and ram castings themselves to remove heat from processing at a faster rate. The AU does not contain a heat exchanger, pump, or motor. The AU has pneumatically operated inlet and outlet valves to control the flow of cooling water into the MOD I CMU as directed by the CMU's control unit. The AU also contains the LP air control valves used to operate the MOD I CMU's pneumatically operated ram and door. Either seawater or chilled water will be used to remove heat from the Closed Loop Cooling Unit.

593-2.5.1.5 Solid Waste (Plastics) Shredder and MOD I Plastics Shredder. The Plastics Shredder consists of hardened cutters on two parallel counter-rotating shafts that shred the plastics waste. Shredding produces a homogeneous mix of plastics and releases liquids that may be trapped in the plastics waste. The cutters intermesh, shredding the waste as it passes from the feed hopper, through the shredder chamber, and into a plastic collection bin lined with a bag. The Plastics Shredder and the Metal Glass Shredder are very similar pieces of equipment, except each has their own unique internal cutting comb configuration and different run times. It is essential that waste intended for either machine not be processed in the other for proper waste processing to occur. The MOD I Plastics Shredder is a modified version of the current Plastics Shredder that uses a modified cutter configuration and a larger motor in order to produce more finely shredded plastic particles. The MOD I Plastic Shredder modification is being installed in conjunction with the MOD I PWPs (See Figure 593-2-3). See Table 593-2-9 for ILS Support for Platics Waste Shredders with Commercial Control, Table 593-2-10 for ILS

Support for Platics Waste Shredders with Military Control and Table 593-2-11 for ILS Support for MOD I Platics Waste Shredders.

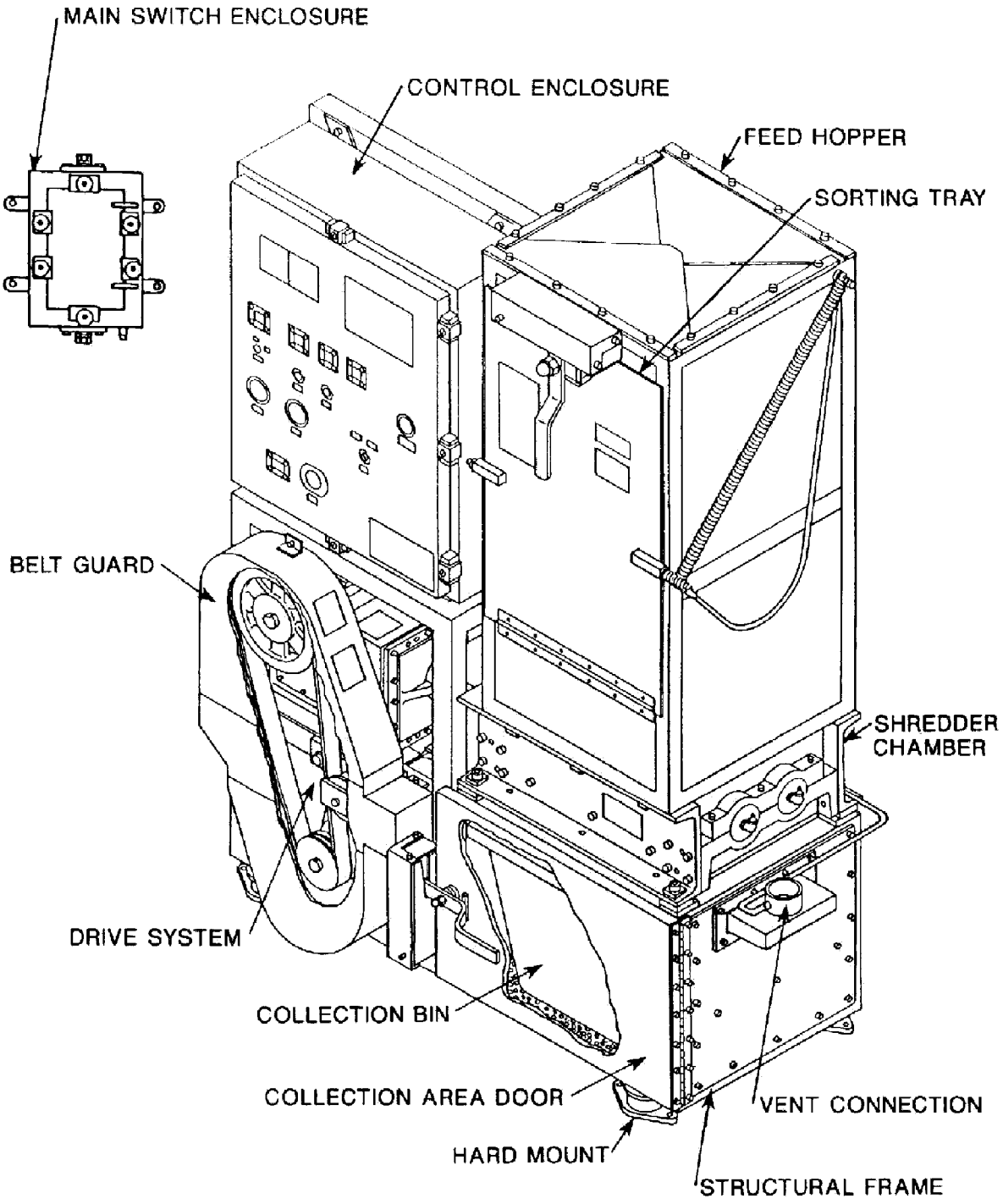


Figure 593-2-3 Plastics Shredder

NOTE

The design is very similar to the metal and glass shredder but the two units MUST NOT be used interchangeably.

Table 593-2-9 ILS Support For Plastics Waste Shredder With Commercial Control

NAVY TRAINING PLAN (NTP)/(NTSP)	NTP S-30-9508
MIP	5933/008
TECHNICAL MANUALS	S9593-C8-MMM-010 OPERATION AND MAINTENANCE SHREDDER, SOLID WASTE WITH MARK II COMMERCIAL CONTROL ENCLOSURE NAVSEA DWG. 593-6960881
	S9593-CU-TRS-010 TECHNICAL REPAIR STANDARD, DEPOT SHREDDER, SOLID WASTE, NAVSEA DRAWING 593-6960881
SHIPBOARD TRAINING COURSES	TBD
APL	**Nomenclature**
439990250	Shredder, Solid Waste/Plastics
174081084	Motor, AC, 460V, 5HP, 1725RPM
213190361	Switch, Limit, Model LS2D4K
509991762	Control Panel with Commercial Contactors Dwg 593-6960954
698880367	Gear Assembly, Speed Reducer Dwg 593-6960891 ASSY 99

Table 593-2-10 ILS Support For Plastics Waste Shredder With Military Control

NAVY TRAINING PLAN (NTP)/(NTSP)	NTP S-30-9508
MIP	5933/008
TECHNICAL MANUALS	S9593-C5-MMM-010 OPERATION AND MAINTENANCE SHREDDER, SOLID WASTE WITH MIL-SPEC CONTROL ENCLOSURE 593-6960881
	S9593-CU-TRS-010 TECHNICAL REPAIR STANDARD, DEPOT SHREDDER, SOLID WASTE, NAVSEA DRAWING 593-6960881
SHIPBOARD TRAINING COURSES	TBD
APL	**Nomenclature**
439990250	Shredder, Solid Waste/Plastics
174081084	Motor, AC, 460V, 5HP, 1725RPM
213190361	Switch, Limit, Model LS2D4K
509991550	Control Panel with Military Contactors Dwg 593-6960902
698880367	Gear Assembly, Speed Reducer Dwg 593-6960891 ASSY 99

Table 593-2-11 ILS Support For MOD I Plastics Waste Shredder

NAVY TRAINING PLAN (NTP)/(NTSP)	TBD
MIP	5933/008

Table 593-2-11 ILS Support For MOD I Plastics Waste Shredder - Continued

TECHNICAL MANUALS	S9593-DP-MMM-010 OPERATION AND MAINTENANCE MOD I Plastics Shredder, 593-7556873
SHIPBOARD TRAINING COURSES	TBD
APL	**Nomenclature**
43A030060	Plastic Shredder, Dwg 593-7556873
50A030406	Military Panel, Control, Solid Waste Dwg 593-6960902
50A030407	Commercial Panel, Control, Solid Waste 593-7556872
698880367	Gear Assembly, Speed Reducer Dwg 593-6960891 ASSY 99
213190361	Switch, Limit, Model LS2D4K
17A030082	Motor, AC 460V 7.5HP, WDM3710T

593-2.5.2 LARGE AND SMALL PULPERS. Large and small pulper installations have been installed on most surface ship classes. The large and small pulpers process paper, food and cardboard waste into non-floating slurry that is then pumped overboard. The pulpers are designed to resist damage if non-pulpable trash is mistakenly placed in the pulper. Non-pulpable trash includes metal and glass. The pulpers shunt the metal and glass debris to a ″ junk box″ that collects the debris for manual removal. The pulpers are designed to partially shred and, to some degree, retain plastic waste accidentally placed in the pulper. The retained plastic waste is then manually removed from the pulping chamber.

593-2.5.2.1 Large Pulpers. The large pulper is capable of processing 1000 lbs/hr of food waste, 500 lbs/hr of paper and cardboard waste, and 680 lbs/hr of mixed waste. The large pulper is also capable of processing large items, like large cardboard boxes. Figure 593-2-4 shows the large pulper and Table 593-2-12 represents ILS Support for Large Pulpers.

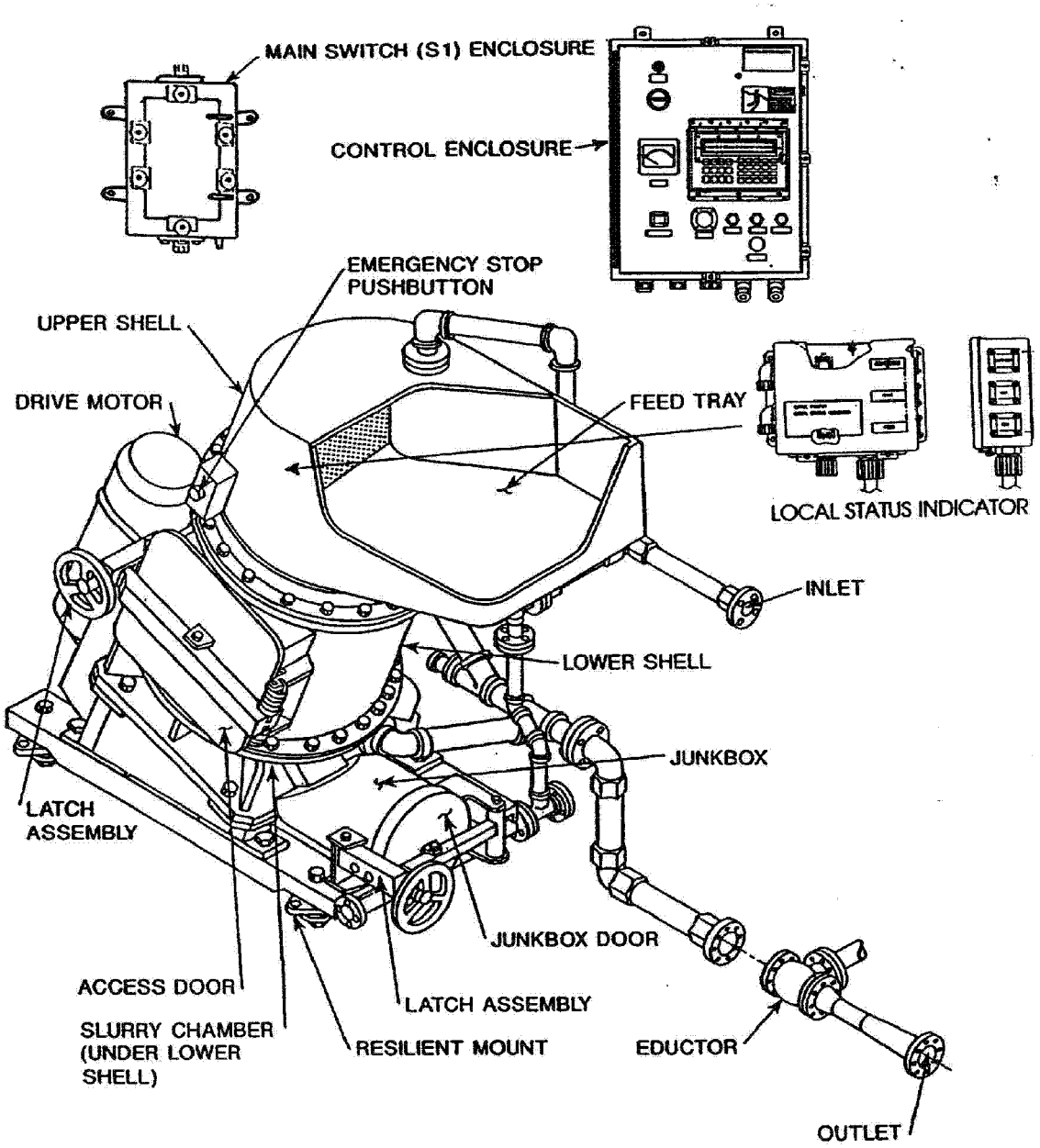


Figure 593-2-4 Large Pulper

NOTE

Navy policy requires that all pulpable waste be processed at sea.

592-2.5.2.1.1 Instruction Plates. The following instruction plates are for the Large Pulper. Instruction plates with letters 1/4-inch high shall be installed in the vicinity of the pulper control enclosure:

WARNING

FOOD, PAPER, OR CARDBOARD SHALL NOT BE PROCESSED WHEN THE SHIP IS INSIDE 3 NAUTICAL MILES OF THE U.S. OR FOREIGN COASTLINES.

Table 593-2-12 ILS Support For Large Pulper

NAVY TRAINING PLAN (NTP)/(NTSP)	NTP S-30-9603
MIP	5933/010
TECHNICAL MANUALS	S9593-C2-MMM-010 OPERATION AND MAINTENANCE PULPER, LARGE, NAVSEA DWG 593-6960300
SHIPBOARD TRAINING COURSES	TBD
APL	**Nomenclature**
439990265	Large Pulper Dwg 593-6960300
509991752	Panel, Control, Large Pulper, Dwg 593-6960500 ASSY 99
618880157	Valve/Actuator Assy, Model 593-6960345 ASSY 99
618880158	Actuator, Pneumatic, Model 593-6960358
882306066	Valve, Globe, 2.00ips, 700psi
882303585	Valve, Globe, 1.50ips, 700psi
17A040000	Motor, AC, 460V, 20HP, 1760RPM

593-2.5.2.2 Small Pulper. The small pulper is a smaller version of the large pulper. The small pulper was developed for smaller ships that cannot easily accommodate a large pulper. The small pulper can process 100 lbs/hr of food waste, 200 lbs/hr of paper and cardboard waste, and 140 lbs/hr of mixed waste. The small pulper can process large items if they are first cut or torn in smaller pieces that can fit in the small pulper's chute. The small pulper is shown in Figure 593-2-5 and Table 593-2-13 represents ILS Support for Small Pulpers.

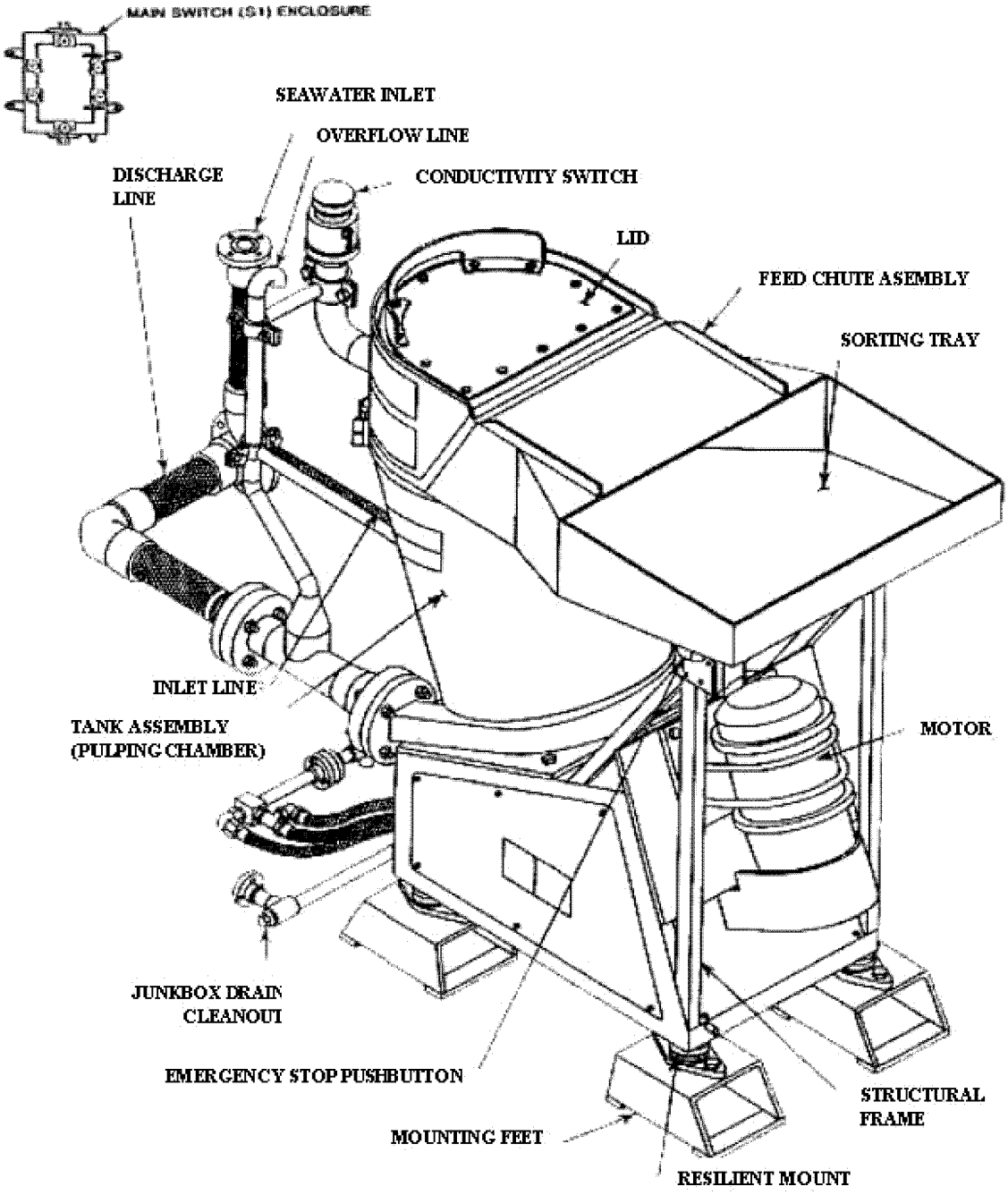


Figure 593-2-5 Small Pulper

NOTE

Navy policy requires that all pulpable waste be processed at sea.

593-2.5.2.2.1 Instruction Plates. The following instruction plates are for the small pulper. Instruction plates with letters 1/4-inch high shall be installed in the vicinity of the pulper control enclosure:

WARNING

FOOD, PAPER, OR CARDBOARD SHALL NOT BE PROCESSED WHEN THE SHIP IS INSIDE 3 NAUTICAL MILES OF THE U.S. OR FOREIGN COASTLINES.

Table 593-2-13 ILS Support For Small Pulper

NAVY TRAINING PLAN (NTP)/(NTSP)	**NTP S-30-9603**
MIP	5933/007
TECHNICAL MANUALS	S9593-C3-MMM-010 OPERATION AND MAINTENANCE PULPER, SMALL, NAVSEA DWG 593-6960581
SHIPBOARD TRAINING COURSES	TBD
APL	**Nomenclature**
439990264	Small Pulper 593-6960581
509991793	Panel, Control, Small Pulper, Dwg 593-6960500
618880157	Valve/Actuator Assy, Model 593-6960345 Assy 99
618880158	Actuator, Pneumatic, Model 593-6960358
882306097	Valve, Ball, 0.75ips, 700psi
509991714	Panel, Control, Small Pulper, Dwg 593-6960653
618880156	Valve/Actuator Assy, Model 593-6960782 Assy 99
74A990001	Eductor, 2IN inlet, 2.5IN Outlet

593-2.5.3 METAL/GLASS SHREDDER Metal/Glass Shredder installations have been installed on most surface ship classes. The Metal/Glass Shredder shredder consists of hardened cutters on two parallel counter-rotating shafts that shred the metal and glass waste. Shredding reduces the volume of metal and glass waste by one third. The cutters intermesh, shredding the waste as it passes from the feed hopper, through the shredder chamber, and into a plastic, bag lined collection bin. The Plastics Shredder and the Metal Glass Shredder are very similar pieces of equipment, except each has their own unique internal cutting comb configuration and different run times. It is essential that waste intended for either machine not be processed in the other for proper waste processing to occur. See Figure 593-2-6 and Table 593-2-14 for ILS Support information.

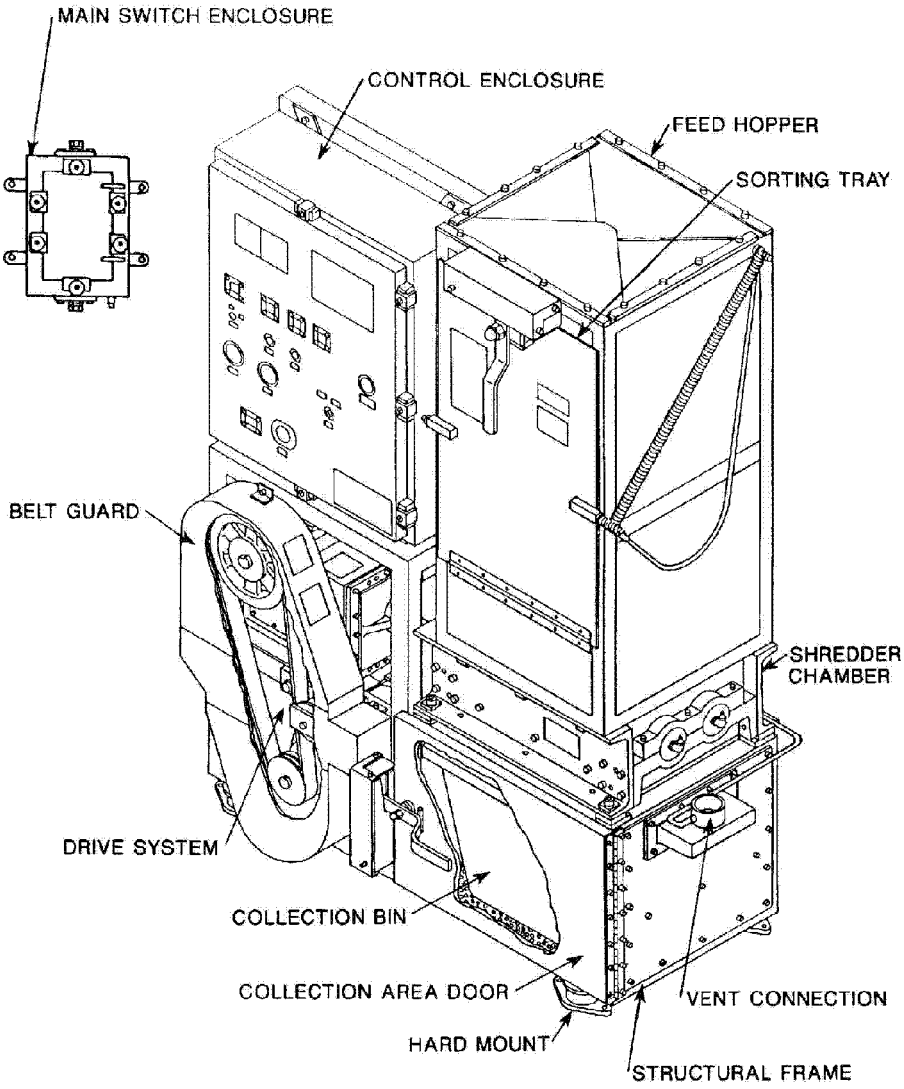


Figure 593-2-6 Metal/Glass Shredder

593-2.5.3.1 Instruction Plates The following instruction plates are for the Metal/Glass Shredder. Instruction plates with letters ¼-inch high shall be installed in the vicinity of the shredder control enclosure:

WARNING

PROCESSED METAL/GLASS FROM THE SHREDDER SHALL NOT BE DISPOSED OF OVERBOARD WHEN THE SHIP IS INSIDE 12 NAUTICAL MILES OF THE U.S. OR FOREIGN COASTLINES.

Table 593-2-14 ILS Support For Metal/Glass Shredder

NAVY TRAINING PLAN (NTP)/(NTSP)	**NTP S-30-9603**
MIP	5933/008

Table 593-2-14 ILS Support For Metal/Glass Shredder - Continued

NAVY TRAINING PLAN (NTP)/(NTSP)	**NTP S-30-9603**
TECHNICAL MANUALS	S9593-C8-MMM-010 OPERATION AND MAINTENANCE SHREDDER, SOLID WASTE WITH MARK II COMMERCIAL CONTROL ENCLOSURE NAVSEA DWG. 593-6960881
	S9593-CU-TRS-010 TECHNICAL REPAIR STANDARD, DEPOT SHREDDER, SOLID WASTE, NAVSEA DRAWING 593-6960881
SHIPBOARD TRAINING COURSES	TBD
APL	**Nomenclature**
439990278	Solid Waste Shredder, Metal And Glass
174081084	Motor AC, 460V, 5 HP, 1725 rpm
213190361	Switch, Limit, Model LS2D4K
509991762	Panel, Control, Solid Waste Shredder Dwg 593-6960954
698880367	Gear Assy, Speed Reducer, Dwg 593-6960891 Assy 99

593-2.5.4 INCINERATORS Because of the installation of pulpers and shredders, incinerators should be used as a secondary means of disposal for items listed in Table 593-2-4. Ventomatic Incinerators conforming to MIL-I-15650 (CANCELLED) were installed on larger ships for the disposal of combustible trash such as paper, cardboard, wooden boxes and crates, cartons, magazines, and uncontaminated rags prior to the development and installation of pulpers and shredders. Incinerators equipped with auxiliary burners can also dispose of food wastes in the incinerators. See Figure 593-2-7 for Ventomatic Incinerator and Table 593-2-15 for ILS Support information. On the Aircraft Carriers, the Ventomatic incinerators are being replaced with TeamTec (Golar) incinerators. See Figure 593-2-8 for Golar Incinerators and Table 593-2-16 for ILS Support information.

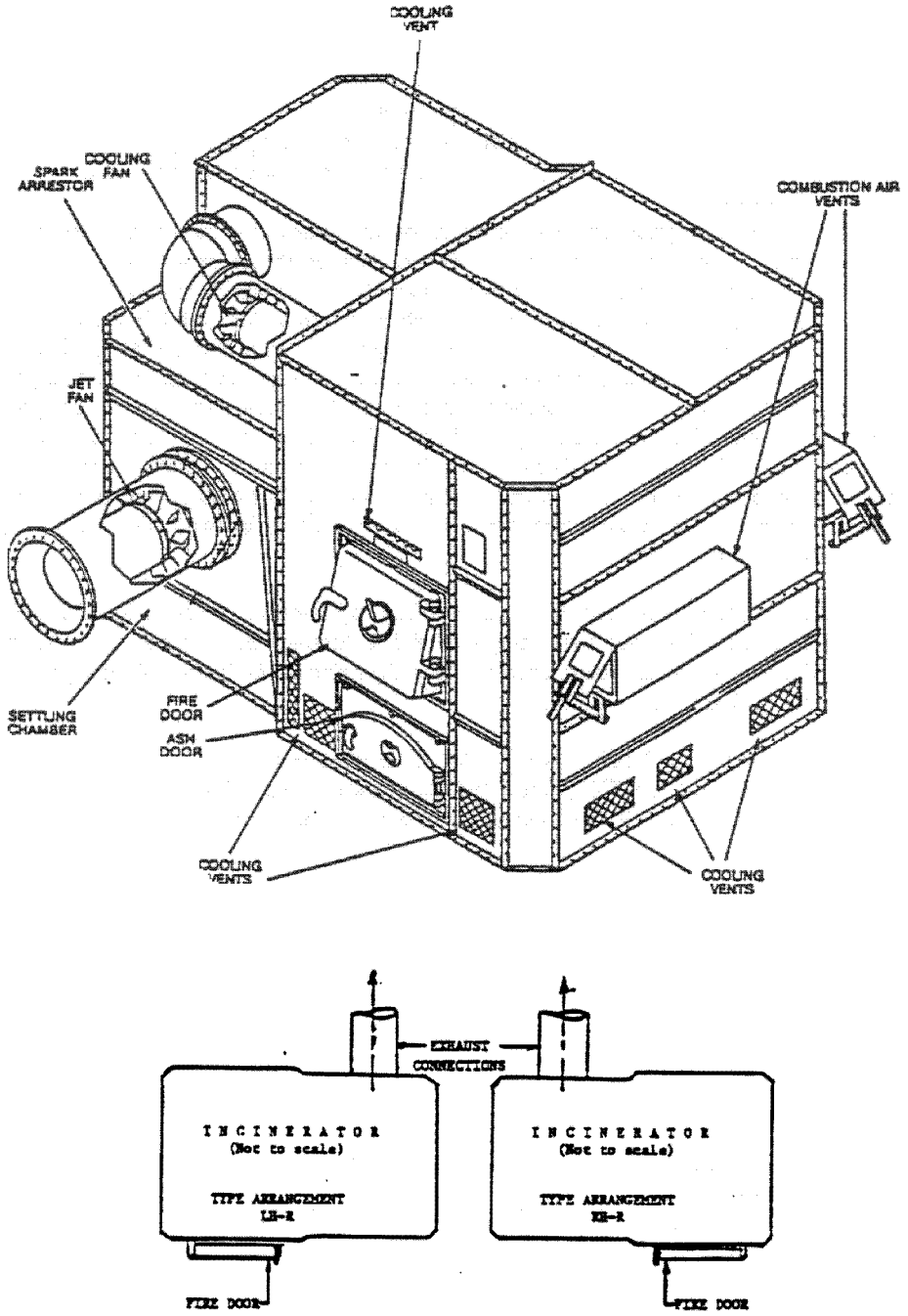


Figure 593-2-7 Ventomatic Incinerator

Table 593-2-15 ILS Support For Ventomatic Incinerator

NAVY TRAINING PLAN (NTP)/(NTSP)	**NONE**
MIP	5933/003 5933/001

Table 593-2-15 ILS Support For Ventomatic Incinerator - Continued

NAVY TRAINING PLAN (NTP)/(NTSP)	**NONE**
TECHNICAL MANUALS	NAVSEA S9593-CN-MMA-010 (0910-LP-104-7411) Trash-Burner, Vent-O-Matic, Model 3AC/5R; Maintenance Manual
SHIPBOARD TRAINING COURSES	TBD
APL	**Nomenclature**
302010006	Incinerator Cap 500 lb/hr Induced Draft
30201A001	Approved Machinery Alteration ECP 410 0006
30201A002	Approved Machinery Alteration ECP 410 0012
302010012	Incinerator Cap 500 lb/hr Induced Draft
AEL	**Nomenclature**
2-920015039	Incinerator, Personal Protective Equipment

Figure 593-2-8 Golar GS-500 Incinerator

Table 593-2-16 ILS Support For Golar Incinerator

NAVY TRAINING PLAN (NTP)/(NTSP)	**NONE**
MIP	5933/011
TECHNICAL MANUALS	S9593-DC-MMM-010 (0910-LP-028-7520) Incinerators, TEAMTEC (Golar) Type GSA500C; Description, Operation and Maintenance
SHIPBOARD TRAINING COURSES	TBD

Table 593-2-16 ILS Support For Golar Incinerator - Continued

NAVY TRAINING PLAN (NTP)/(NTSP)	**NONE**
EOSS	MI/CVN-68/0301 and MI/CVN-76/1102
APL	**Nomenclature**
30A990001 for CVN-68 and CVN-73	Incinerator Unit, Sanitation Model GSA500CSW (Small Casing)
30A020003 for CV-63, CVN-65, CVN-74, CVN-75, and CVN-76	Incinerator Unit (Large Casing)

593-2.5.5 FOOD WASTE DISPOSERS A variety of food waste disposer units are used in the fleet. See Appendix E for guidelines on the selection of food waste disposal units. All units are subject to serious damage when foreign objects such as knives and forks are introduced into a unit. Consequently, care should be exercised in controlling material fed into a unit. A food waste disposer shall be used solely for the disposal of food waste. Good practice is to remove all items such as steel, glass, china, and large bones to prevent accelerated wear and decreased life of the disposer and motor. Operators must study the manufacturer's technical manual before operating the disposer. The manual includes a description of the equipment and instructions for operation and maintenance. Pulped food waste shall be discharged as far from any U.S. coastline as practicable, but not within three nautical miles of any U.S. coastline. Pulped food waste may be discharged into gray water collection system piping only when a ship is docked and the sewage pumps are discharging to pier facilities. In order to maximize necessary sewage holding capacity and to preclude inadvertent overboard discharges of sewage, garbage pulpers shall not be used within 3 NM of any U.S. coastline. No pulped food waste shall be discharged within 3 NM of any foreign coastline. In order to maximize necessary sewage holding capacity and to preclude inadvertent overboard discharges of sewage, food waste pulpers that are connected to the ship's collection and holding tank (CHT system) shall not be used within 3 NM of any foreign coastline. See Figure 593-2-9 for SOMAT Models 3 & 3S and Table 593-2-17 for ILS Support information. See Figure 593-2-10 for SOMAT Model 5S and Table 593-2-18 for ILS Support information.

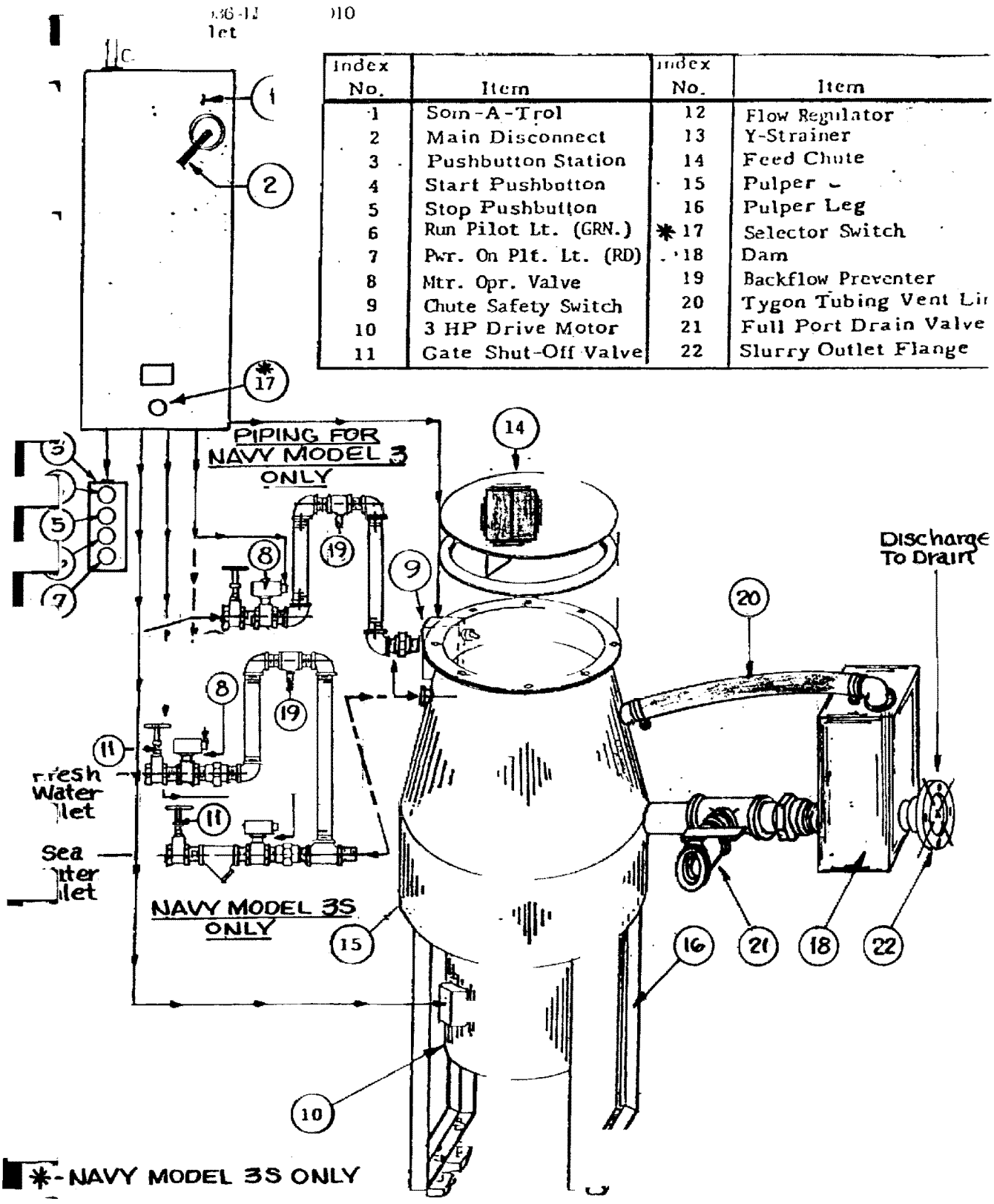


Figure 593-2-9 SOMAT Model 3 and 3S

Table 593-2-17 ILS Support For SOMAT Model 3 and 3S

NAVY TRAINING PLAN (NTP)/(NTSP)	**NONE**
MIP	6517/006
TECHNICAL MANUALS	NAVSEA S6161-UK-FSE-010 Disposal System, Waste, Models 3 and 3S; Description, Operation and Maintenance
SHIPBOARD TRAINING COURSES	TBD
APL	**Nomenclature**
432270008	Garbage Disposal Machine Commercial

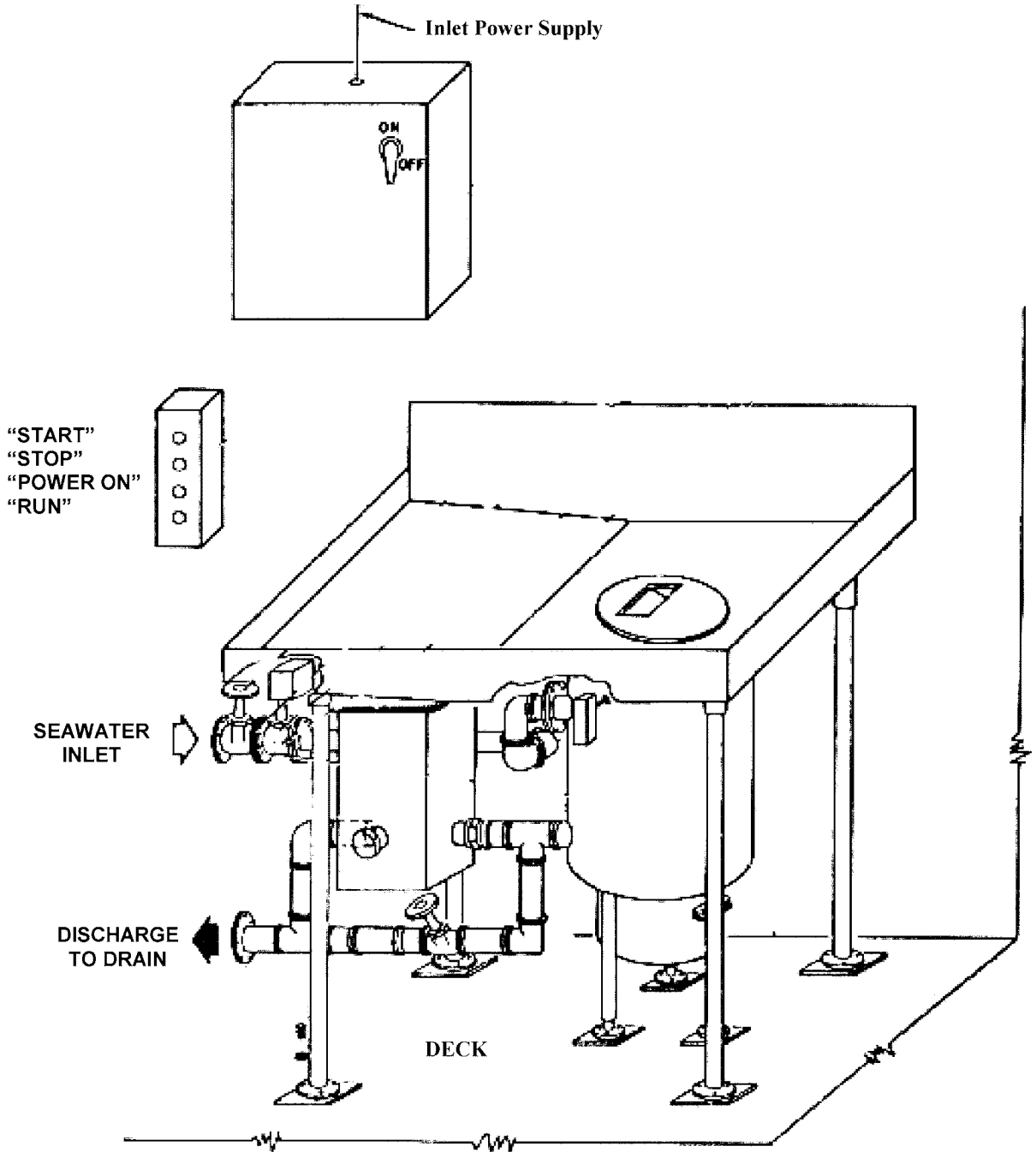


Figure 593-2-10 SOMAT Model 5S

Table 593-2-18 ILS Support For SOMAT Model 5S

NAVY TRAINING PLAN (NTP)/(NTSP)	**NONE**
MIP	6517/004
TECHNICAL MANUALS	NAVSEA 0936-LP-039-7010 Waste Disposal System, Navy Model 5; Installation, Operation, Maintenance and Inspection Instructions
SHIPBOARD TRAINING COURSES	TBD

Table 593-2-18 ILS Support For SOMAT Model 5S - Continued

NAVY TRAINING PLAN (NTP)/(NTSP)	**NONE**
APL	**Nomenclature**
432270007	Garbage Disposal/Kitchen Pulper/Waste Management System Model SN-5

593-2.5.5.1 Instruction Plates The following instruction plates are for SOMAT Model 3S, SOMAT Model 5S or any food waste disposer/pulper using seawater as the flushing/pulping medium. An instruction plate with letters 1/4-inch high shall be installed in the vicinity of the pulpers describing the two modes, conditions for operation of each mode, and the valve settings for each mode. The instruction plate shall include:

WARNING

THIS MACHINE SHALL NOT BE OPERATED WHEN THE SHIP IS OPERATING WITHIN 3 NM OF THE U.S. COAST OR FOREIGN COASTS. CLEAN DISHWATER AND UTENSILS SHALL NOT BE STORED IN COMPARTMENTS WHERE SEAWATER PULPING AND FLUSHING IS USED.

An additional instruction plate shall be installed in the vicinity of the pulper in sculleries with a seawater connection to the food waste disposer. This plate shall include:

WARNING

SEAWATER SHALL BE USED IN THE PULPER ONLY WHEN THE SHIP IS AT SEA. IN PORT, ONLY FRESH WATER SHALL BE USED.

593-2.5.6 FOOD WASTE DISPOSERS ON SUBMARINES If required, the submarine galley and scullery shall be fitted with an American Delphi, Model 75AD, food waste disposer. This is the only food waste disposer approved for submarine use. The disposers shall be resiliently mounted under a sink. Fresh water shall be used for grinding and flushing operation for gravity drain to a hard tank. See Figure 593-2-11 and Table 593-2-19 for ILS Support information.

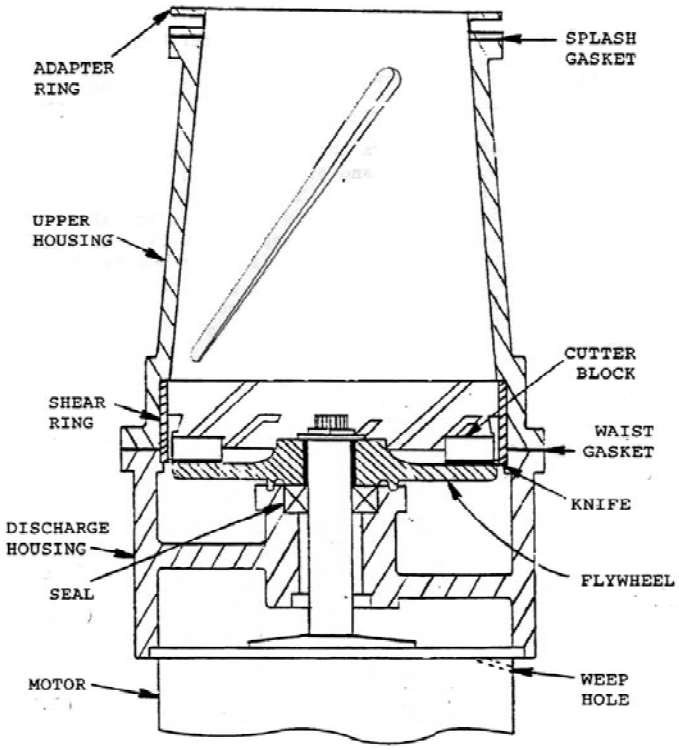


Figure 593-2-11 American Delphi Model 75AD

Table 593-2-19 ILS Support For American Delphi Model 75AD

NAVY TRAINING PLAN (NTP)/(NTSP)	**NONE**
MIP	6517/003 (as of 94) 6517/026 (as of 91)
TECHNICAL MANUALS	NAVSEA 0936-LP-040-5010 Garbage Grinder, Model 33AD, 75AD, (756AD), and 100AD; Description, Operation, Installation and Maintenance Instructions W/CHGS 1-7
	S6161-YZ-FSE-010 GARBAGE GRINDER MODEL 75AD; USERS MANUAL
SHIPBOARD TRAINING COURSES	TBD
APL	**Nomenclature**
439050003	Garbage Disposal, Model 75AD
501420002	Panel, Control

SECTION 3
OIL POLLUTION ABATEMENT

593-3.1 TERMINOLOGY

593-3.1.1 BILGE WATER A mix consisting primarily of water, with some oil (normally less than 5 percent) and other unspecified substances, resulting from the normal operation of a vessel. Bilge water is considered an oily waste. Under normal circumstances, bilge water does not contain hazardous materials (HM) or other constituents that would classify it as a hazardous waste.

593-3.1.2 DETERGENT A detergent is a degreaser and emulsifying substance for cleaning purposes. In a broad sense, it includes soaps, but commonly refers only to modern synthetic, non-soap detergents.

593-3.1.3 OIL For the purposes of compliance with MARPOL and the Act to Prevent Pollution from Ships, the term ″oil″ refers to any petroleum-based fluid or semisolid, including crude oil, liquid fuels (like gasoline, kerosene, diesel), lubricating oil, waste oil, oil sludge and oil refuse. Oil also includes synthetic-based lubricating and transmission products. MARPOL, Annex II classifies non-petroleum based oils, such as vegetable oils, as noxious liquid substances.

In compliance with the Clean Water Act, the term ″oil″ refers to oil of any kind or in any form, including petroleum, fuel oil, sludge, oil refuse, vegetable oil, and oil mixed with waste other than dredge soils.

593-3.1.4 OIL CONTENT MONITOR (OCM) An oil content monitor is a device, which automatically analyzes the water discharge from an oil/water separator (OWS) or a secondary treatment system (i.e., polisher or ultra-filtration ceramic membrane system). The OCM prevents overboard discharge of water with an oil content greater than the unit's alarm set points via an automatic diverter valve.

593-3.1.5 OIL POLLUTION ABATEMENT (OPA) SYSTEM An oil pollution abatement system consists of all equipment used to collect, temporarily store, and prevent overboard discharge of oily wastewater greater than legal limits. This equipment consists primarily of oily waste transfer systems, oil water separators, oil content monitors, and secondary treatment systems.

593-3.1.6 OIL/WATER SEPARATOR (OWS) An oil/water separator is a piece of equipment that separates oil from oily waste drawn primarily from the oily waste holding tank or directly from the bilges. Processed effluent water, if suitable, is discharged directly overboard, while the separated oil is retained for pierside disposal to a shore facility.

593-3.1.7 OILY RAGS Oily rags are cleaning cloths or other sorbents contaminated with the types of oils as defined previously above. This does not include sorbents contaminated with vegetable oils, liquid or solid shortening or animal fat/lard used in food preparation.

593-3.1.8 OILY WASTE Oil is mixed with water or other fluids such that the state of the mixture generated is no longer useful without further treatment, such as oil reclamation.

593-3.1.9 OILY WASTE HOLDING TANK (OWHT) An oily waste holding tank is a tank specifically designated for the collection of bilge water, tank draining, tank washings, and other oily mixtures generated from normal shipboard operation prior to processing by an OWS.

593-3.1.10 OILY WASTE TRANSFER (OWT) SYSTEM An oily waste transfer system consists of the pumps, tanks and related piping used to transfer oily waste from bilges to holding tanks, to deck connections for offloading to a shore facility, or to discharge overboard in the event of an emergency.

593-3.1.11 OLEOPHILIC Oleophilic is having a tendency or inclination of attracting oil.

593-3.1.12 PARTS PER MILLION (ppm) Number of parts per one million parts of a mixture on a volume basis.

593-3.1.13 POLISHER A polisher is a piece of equipment which helps further remove oil from the OWS effluent, thereby promoting better discharge water quality.

593-3.1.14 RECLAMATION The action employed to process used oil for the purposes of recovering usable oil products.

593-3.1.15 SHEEN An iridescent appearance on the surface of the water.

593-3.1.16 USED OIL Oil whose characteristics have changed since being originally refined but which may still be suitable for future use and is economically reclaimable. Used oil excludes synthetic-based lubricating and transmission products.

593-3.1.17 WASTE OIL Waste oil is oil whose characteristics have changed markedly since being originally refined and has become unsuitable for further shipboard use, and is not considered economically shipboard recyclable.

593-3.2 GENERAL

593-3.2.1 MAJOR GOAL For shipboard oil pollution abatement (OPA), the Navy has established as a major goal the discontinuation of all oily waste discharges into streams, harbors, and oceans by Naval ships. This goal is set forth in OPNAVINST 5090.1C Series, The Environmental and Natural Resources Program Manual. This manual executes Department of Defense (DOD) Directive 6050.15 which implements the provisions of Public Law 96-478, Act to Prevent Pollution From Ships, by providing standards for the prevention of oil pollution from U.S. Navy ships. These standards are upheld via NAVSEA Instruction 9593.2, The Inspection and Certification Process for OPA Systems in US Navy Surface Ships and Craft. This document ensures that OPA systems onboard Navy Ships are in compliance with OPNAVINST 5090.1C Series and DOD Directive 6050.15, and enforces these requirements through mandatory initial and periodic system certification inspections.

593-3.2.2 Oil or oily wastes shall not be discharged to the sea or other waters from any Navy activity or ship.

593-3.2.3 SPECIAL AREAS. When operating in foreign waters, engineering department personnel shall familiarize themselves with any unique requirements for those waters. Special areas where the no-discharge rule (for oil or oily waste) applies are defined by DOD Directive 6050.15 and are consistent with paragraph 593-1.2.20.

593-3.2.4 EMERGENCY SITUATIONS Emergency situations may occur involving the safety of a ship or its personnel, saving a life at sea, or damage to a ship or its equipment. When an emergency or hazardous situation occurs or when the potential for such a situation exists, oil pollution control measures may be relaxed to the extent necessary to reduce or eliminate the emergency condition. In the event that an emergency or potential hazard exists, all reasonable precautions shall be taken to prevent or minimize the discharge of oil and oily waste. In such cases, the incident shall be recorded using paragraph 593-3.6 guidelines.

593-3.2.5 Whenever possible and before any action is taken concerning the relaxation of oil pollution control measures, a trade-off evaluation of the emergency situation hazard versus the oil pollution hazard shall be made. Priority considerations in such an evaluation are:

a. Personnel safety.

b. Ship safety or damage.

c. Equipment safety or damage.

593-3.2.6 OILY WASTE SOURCES Oily wastes generated by a particular ship usually are derived from the sources indicated in paragraphs 593-3.2.7 to 593-3.2.11.

593-3.2.7 LUBRICATING OIL Oily wastes derived from lubricating oils are caused by:

a. Leakage and drainage from equipment and systems.

b. Contaminated oil from centrifugal purifiers.

c. Used oil from equipment during maintenance and repair.

593-3.2.8 FUEL OIL Oily wastes derived from fuel are caused by:

a. Spillages during fueling or defueling, and internal transfer operations.

b. Leakage through hull structure into bilges.

c. Stripping from the contaminated fuel-settling tank.

d. Ballast water from fuel tanks of non-compensated fuel systems or bulk carriers.

e. Ballast water from compensated fuel tank systems during fueling or defueling, and internal transfer operations.

f. Tank cleaning operations.

g. Fuel separator and purifier discharges.

h. Leakage and drainage of fuel system equipment.

593-3.2.9 HYDRAULIC FLUIDS Oily wastes derived from hydraulic fluids are caused by:

a. Leakage of hydraulic fluid from glands and seals.

b. Spillage during system filling or replenishment.

c. Spillage resulting from hydraulic system casualty.

d. Spillage during system maintenance and repair.

593-3.2.10 SYNTHETIC FLUIDS Oily wastes derived from synthetic fluids are caused by:

a. Leakage and drainage from equipment and systems.

b. Used oil from equipment during maintenance and repair.

c. Leakage of fluid from glands and seals into pump room bilges.

d. Spillage during system filling or replenishment.

e. Spillage resulting from system casualty.

593-3.2.11 REFERENCES For a detailed description of the types of petroleum products or systems that contribute to oily wastes, refer to:

a. NSTM Chapter 262, Lubricating Oils, Greases, and Hydraulic Fluids and Lubricating Systems.

b. NSTM Chapter 541, Ship Fuel and Fuel Systems.

c. NSTM Chapter 542, Gasoline and JP-5 Fuel System.

593-3.3 OIL POLLUTION ABATEMENT SYSTEM

593-3.3.1 OBJECTIVES The following are objectives of the ship's Oil Pollution Abatement (OPA) System, which manages non-synthetic waste oil and oily waste.

a. Reduce oily waste generation (i.e., via system segregation of oily wastes from non-oily waste sources, synthetics from non-synthetic oils, and proper bilge management).

b. Provide for storage of waste oil and oily waste.

c. Monitor oil content in the overboard discharge of an OWS or a secondary treatment device (i.e. polisher or ultrafiltration ceramic membrane system).

d. Transfer or offload waste oil and oily waste to designated shipboard storage tanks or shore facilities.

e. Process oily waste.

593-3.3.1.1 Typical Shipboard OPA System. Schematic diagrams of the OPA system interfaces and the typical shipboard OPA system are shown in Figures 593-3-1 and 593-3-2. The features pertaining to oil pollution abatement are discussed in detail from paragraphs 593-3.3.1.2 to 593-3.3.1.15.

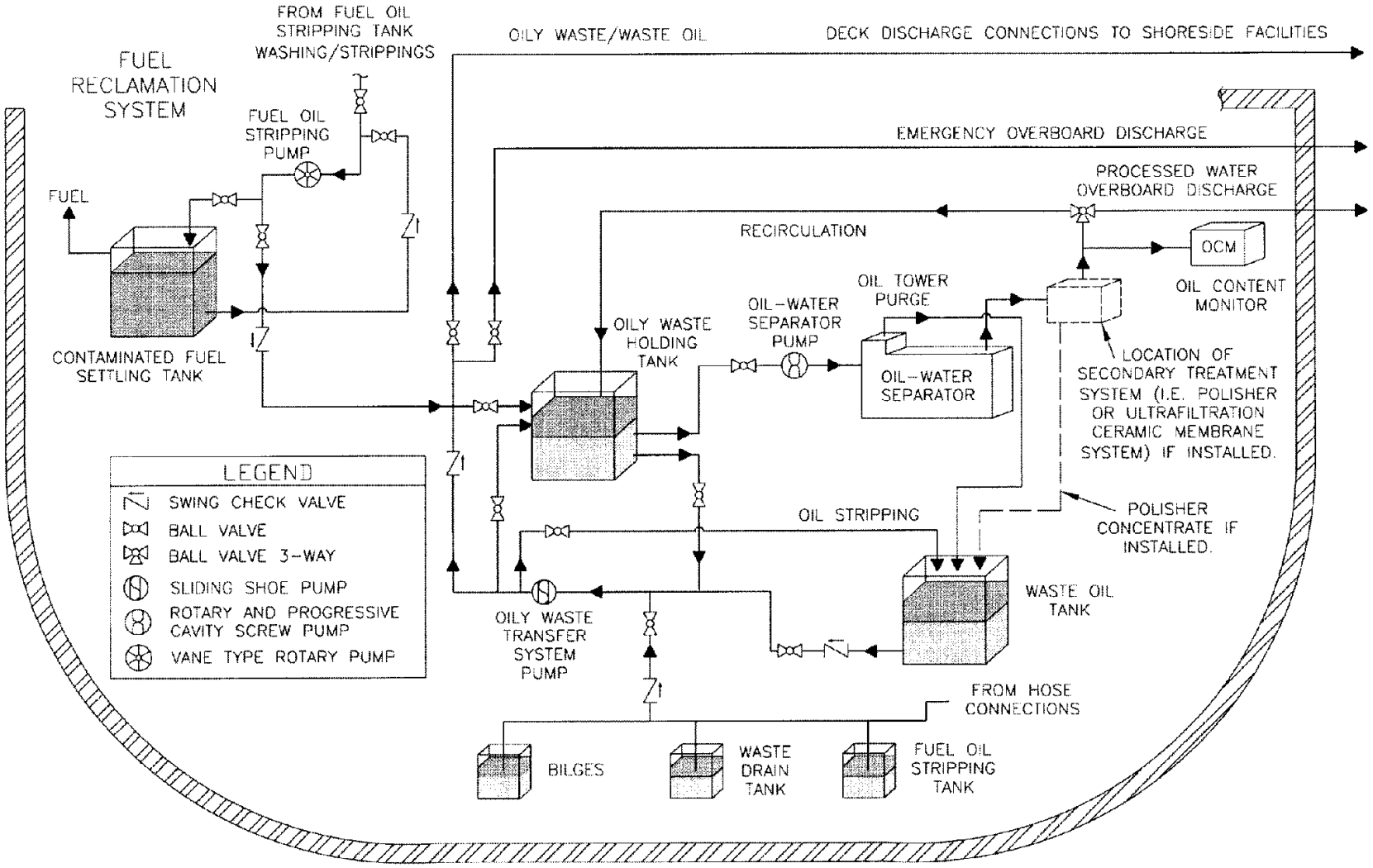


Figure 593-3-1 Oil Pollution Abatement System Interfaces.

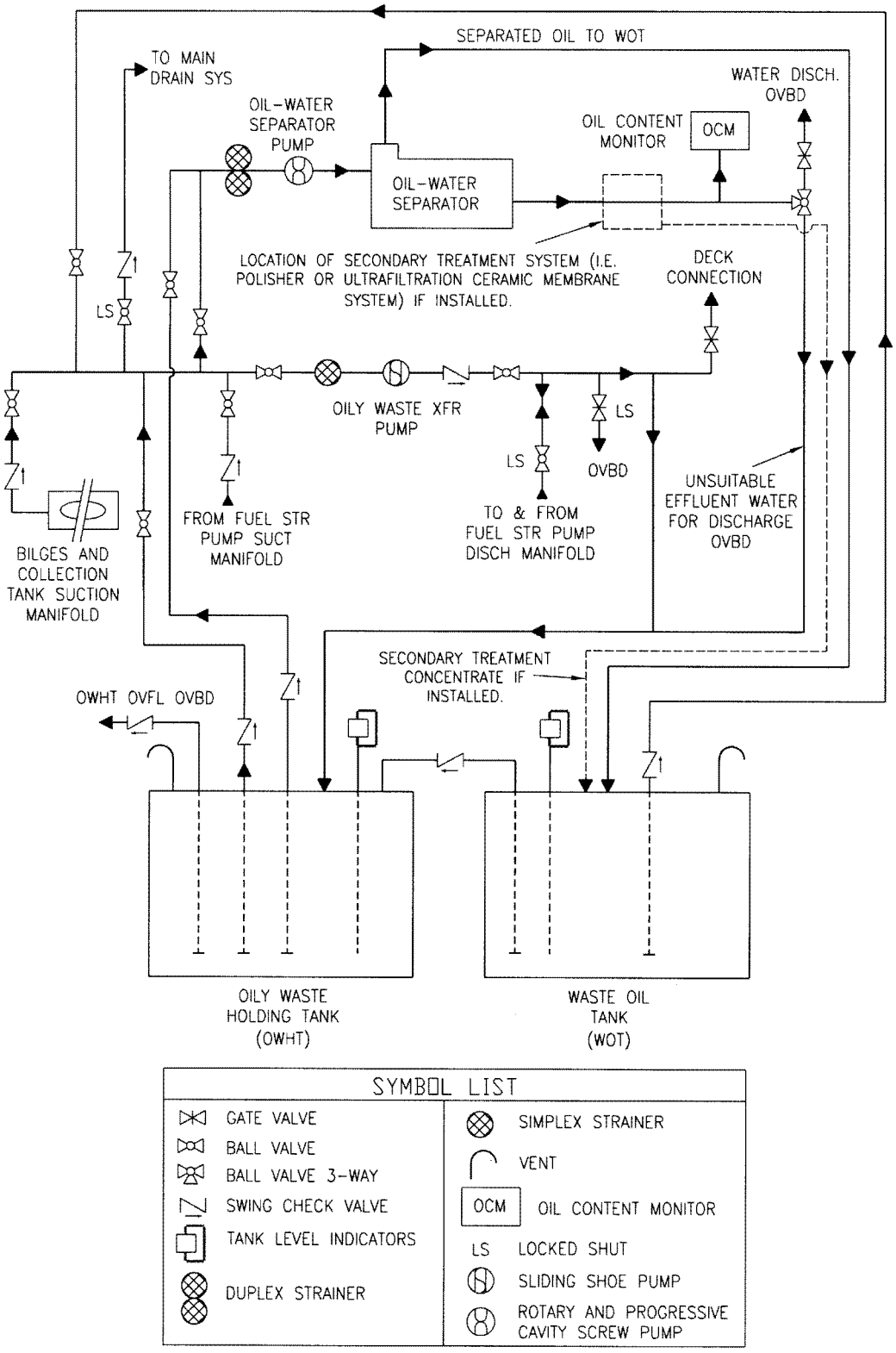


Figure 593-3-2 Typical Oil Pollution Abatement System

593-3.3.1.2 Oil/Water Separator (OWS) The Oil/Water Separator (OWS) is used to process oily waste by sepa-

rating the oil and water, discharging the oil to the Waste Oil Tank (WOT), and discharging acceptable processed water overboard via an Oil Content Monitor (OCM) system. The OWS is designed to process all oily wastes with the exception of fuel ballast, gas turbine water wash, and synthetic oily waste generated by the ship, both in port and at sea. In addition, AFFF, solvents, and long-lived detergents are not compatible with the OWS. Caution should be taken in the appropriate use and segregation of these chemicals from the OWS since OWS performance and efficiency will be significantly compromised once introduced into the system. The following types of OWS and OCM systems are installed onboard Navy ships:

a. NAVSEA Technical Manual S9550-AN-MMO-010/MOD VGS-10 (0910-LP-039-6400); **Oil Water Separator, 10 GPM, MOD VGS-10; Operations and Installation**

b. NAVSEA Technical Manual S9550-B2-MMA-010/25204 (0910-LP-434-9700); **10 GPM Oil/Water Seperator,Model 690231, Description, Operation and Maintenance ; W/CHGS A-B.**

c. NAVSEA Technical Manual S9550-BD-MMO-010/60699 (0910-LP-326-8400); **Oil/Water Separator, Model CPS-3B15; Installation, Operation and Maintenance, W/CHGS A and B**

d. NAVSEA Technical Manual S9550-BE-MMA-010/53918; **5-GPM Oil Water Seperator, Model VGS-10, Operation, Maintenance and Installation.**

e. NAVSEA Technical Manual S9593-AY-MMM-010 (0910-LP-103-6286); **10 GPM Bilge Oil/Water Seperator, AAE Model 740581, Fram Model OPB-10N/P; Installation, Operation, Maintenance and Repair Instructions with Parts List.**

f. NAVSEA Technical Manual S9593-CD-MMO-010/25204 (0910-LP-405-4400); **Monitor, Oil Content, Type ET-35N, MOD ST40000, Description, Operation and Maintenance.**

g. NAVSEA Technical Manual S9593-CL-MMO-010 (0910-LP-584-9900); **Seperator, Oil/Water, Navy Model 3F, For Small Boats; Installation, Operation and Maintenance**

h. NAVSEA Technical Manual S9593-CY-MMO-010 (0910-LP-102-2034); **Variable Speed, Model VS-50, Oil-Water Seperator, Integrated Oil Pollution Abatement System; Installation, Operation Maintenance, and Repair Instructions with Parts List.**

i. NAVSEA Technical Manual S9593-DA-MMO-010 (0910-LP-101-7008); **Oil/Water Seperator, 100 GPM Model C50//RF01; Installation, Operation Maintenance, and Repair.**

j. NAVSEA Technical Manual S9593-DK-MMO-010; **Oil/Water Seperator 50 Gal/Min, Model C50; Installation, Operation, Maintenance and Repair, W/CHG A.**

593-3.3.1.2.1 The OWS is provided with a dedicated suction from the Oily Waste Holding Tank (OWHT). The primary mode of operation is for all oily wastewaters to be transferred to the OWHT prior to being processed by the OWS. This procedure allows the bulk oil to be separated from the oily waste; the OWHTs act as a pre-settling tank. The OWS discharges the processed water overboard, within 3 feet above the waterline, and the separated oil to the WOT for eventual pierside disposal.

593-3.3.1.3 Principle of OWS Operation The OWS works on the principle of gravity separation and coalescence. Generally, oil and water are insoluble. With the exception of synthetic oils (paragraph 593-3.3.1.8), a mixture of oil and water in a confined space (such as a tank) will tend to separate into two phases with the oil layer on top since oil generally has a lower specific gravity (less dense) than water. The rate at which these liquids separate depends upon many variables, such as the size of the oil droplets, ship's motion, tank heights, contaminants, etc. Under proper conditions, small oil droplets join together (coalesce) to form larger droplets, which rise to form an oil layer. If the droplets are too small, the molecular action of the water is sufficient to prevent them from coalescing and a mechanical emulsion is formed. These mechanical emulsions can be broken by providing an oleophilic (oil attracting) surface where the oil can coalesce into larger droplets and be removed from the water phase. An OWS uses its uniquely designed medium and media to enhance the normally occurring gravity separation and coalescing process. The medium and surface media collaborate to formulate a system flow pattern and rate at which the oily waste contacts an oleophilic surface, thereby promoting faster separation into distinct oil and water layers. Once accomplished, the oil layer is stripped from the water and complete separation is achieved.

593-3.3.1.3.1 Certain materials such as polypropylene (a type of plastic) are oleophilic; that is, the oil tends to adhere to their surfaces thereby promoting separation of oil from water. When an oil and water mixture passes over an oleophilic surface, oil droplets collect and coalesce into larger droplets. Subsequently, the droplets become so large that buoyancy, or the flow of the water, causes them to break free and rise to the top of the water phase. As more oil droplets float to the top, an oil layer is formed.

593-3.3.1.4 Oily Waste Transfer Pump (OWTP) The Oily Waste Transfer Pump (OWTP) is used to collect, transfer, and temporarily store waste oil and oily waste within a ship. For example, the OWTP will transfer oily waste from machinery room bilges to an OWHT. An OWTP is also used to discharge oily waste and waste oil to shore facilities through pipe risers and standard deck connections (paragraph 593-3.3.1.14). These pumps normally have the capacity to completely off load waste oil and oily wastewater from the WOT and the OWHT in approximately 1 to 2 hours, except on aircraft carriers where an off loading time of 4 hours is acceptable.

593-3.3.1.5 Oil Content Monitors (OCM) An Oil Content Monitor (OCM) is a device installed downstream of an OWS or a secondary treatment system (see paragraph 593-3.3.1.15) to monitor the effluent water quality before discharging overboard. The monitor will measure the oil content of the water being discharged by the OWS or secondary treatment system and ensure federal compliance with oil discharge regulations. These federal discharge regulations allow the maximum oil concentration of 15 ppm when operating both, in-port within 12 NM from the nearest land and at-sea beyond 12 NM. During at sea conditions, if 15 ppm cannot be achieved, then the ship must limit its discharges to less than 100 ppm. The OCM is provided with both, 15 and 100 ppm alarm set points, to ensure that these discharge limits are not exceeded.

NOTE

The oil discharge concentration limits cited in this section are subject to change as warranted by Federal Legislation.

When the oil content in the OWS or secondary treatment system effluent exceeds the OCM alarm limit, a signal is generated and sent to a diverter valve, which redirects the effluent flow back to the OWHT to be reprocessed. The OCM shall operate whenever the OWS is in operation.

593-3.3.1.6 Oily Waste Holding Tank (OWHT) The OWHT provides the capability of storing oily waste prior to processing by an OWS or before discharge to shore facilities. On ships without an OWS, all oily waste shall be held in the OWHT. On ships equipped with an OWS, all oily waste water shall be processed by the OWS. Under conditions of reported OWS failure, the contents of the OWHT may be off loaded to shore facilities (see paragraph 593-3.4.2 for other cases). Whenever possible, only the water phase should be processed by the OWS to reduce maintenance and to ensure best OWS performance. Thus, the accumulated oil phase in the OWHT can be transferred directly to the WOT using the OWTP.

593-3.3.1.7 Waste Oil Tank (WOT) The WOT receives separated oil from the OWS for later discharge to shore receiving facilities. Synthetic oils shall not be collected or held in the WOT (paragraph 593-3.3.1.8). In addition, oily wastewater shall not be collected in the WOT. For ships with the capability of discharging into the WOT via the OWTP, only the oil phase of the OWHT shall be transferred to the WOT.

593-3.3.1.8 Synthetic Waste Oil Tank A synthetic waste oil tank is normally installed on aircraft carriers and ships with gas turbine engines. The synthetic waste oil tank receives synthetic oils from spills or machinery sumps. Synthetic oil is stored in the synthetic waste oil tank or other approved containers until it can be discharged or transferred to shore receiving facilities. Synthetic oils have a density approximately equal to that of water. Since the OWS bases its operation on the difference in density/specific gravity between oil and water

for separation, the OWS cannot remove synthetic oils from water. Therefore, synthetic oils shall not be collected in the WOT or OWHT and shall not be processed by the OWS. In addition, synthetic oils shall be segregated from the oily waste transfer (OWT) system.

593-3.3.1.9 Contaminated Fuel Settling Tank (CFST) The Contaminated Fuel Settling Tank (CFST) is one of the most important shipboard pollution control system components because it can be used to reclaim contaminated fuel. The CFST receives bottom sediment, water, and fuels stripped from fuel storage and service tanks during normal fuel stripping operations. In the CFST, water and sediment are allowed to separate from the fuel. Water and sediment are stripped to the OWHT and usable fuel is returned to the fuel storage tanks. For the OPA system to be effective, strict adherence to this procedure for using the CFST shall be maintained. Any use of the CFST, other than for fuel reclamation, may preclude significant fuel (energy) savings and will result in excessive oily waste generation. Non-fuel type oily waste shall not be pumped to the CFST, except during an emergency. Oily waste generated in the CFST can be transferred to the OWHT via the OWT pumps.

593-3.3.1.10 Oily Water Drain Collecting Tank (OWDCT) An Oily Water Drain Collecting Tank (OWDCT) receives oily waste from equipment funnel drains. Oily waste collected in the OWDCT shall be transferred to the OWHT via OWTP to be processed by the OWS.

593-3.3.1.11 Oily Water Bilge Sump Tank (OWBST) The Oily Water Bilge Sump Tank (OWBST) is an inner bottom drainage tank, which collects bilge fluids through a grating.

593-3.3.1.12 Tank (Liquid) Level Indicator (TLI) Many oil spills have been attributed to the lack of accurate Tank Level Indicators (TLI) in tanks that contain petroleum products (of any amount) which can overflow directly overboard, to other tanks, or into the bilges. The TLI system consists of magnetic float type liquid level indicators and receivers with audible high level alarms. TLIs are also installed in feedwater and potable water tanks to preclude overflowing to the bilges, thereby reducing both the oily waste generation and the OWS operating time. Primary and secondary receivers shall be located near its respective pump (e.g., oily waste transfer, fuel oil stripping, etc.) and the OWS. TLIs shall be installed in accordance with NAVSEA Dwg. 803-2145532.

593-3.3.1.12.1 CFSTs are provided with two TLIs; one to indicate the fuel-water interface and the other for the total tank level. Primary receivers are marked to indicate fuel-water and total/fuel-air interfaces. Primary receivers with high-level alarms are installed in protected areas to prevent accidental damage. The high-level alarm for the CFST is preset to activate at a designated tank level.

593-3.3.1.12.2 WOTs and OWHTs are provided with two TLIs, one to indicate the oil-water interface, and the second to indicate the total fluid level (oil-air interface). Primary receivers and high level alarms for WOTs and OWHTs are located in a continuously manned space in a protected area to prevent damage. Secondary receivers for WOTs and OWHTs shall be located near the OWS and OWT pump(s) controller(s), respectively. Additional OWHT receivers and high-level alarms are provided at each pump that is capable of discharging to the OWHT. The WOTs and OWHTs shall also have primary receivers and high-level alarms located at the boiler/engine control station or console or in the enclosed operating station, when provided, and in a space that is manned continuously while on cold iron watch.

593-3.3.1.13 Bilge Level Alarms Bilge level alarms are provided to prevent and warn of flooding in the bilges to avoid equipment damage and to ensure personnel safety.

593-3.3.1.14 Deck Discharge Connections/OWTP Piping Risers OWTP piping risers with deck discharge connections provide the ship with the capability of discharging oily waste and waste oil to shore facilities while in port. At least one deck connection shall be installed on each side of the ship. The deck discharge connection is a 2-½ inch flanged cam-lock type fitting (Figures 593-3-3 and 593-3-4) and can be easily adapted to an International Maritime Organization (IMO) oil discharge flange (Figure 593-3-5). The standard deck discharge connection has been assigned the National Stock Number (NSN) 4730-00-602-3160. Figure 593-3-6 shows a typical US-based ship-to-shore connection.

593-3.3.1.15 Secondary Treatment Systems (Polisher). A polisher is a piece of equipment installed downstream of an OWS, as secondary treatment, to further enhance its effluent water quality. The discharge water from polishers is also monitored by an OCM, which ascertains whether it is acceptable for overboard discharge. Polishers help OWSs to achieve satisfactory compliance with regulatory oil discharge requirements. If installed, the system is employed whenever the OWS is unable to attain adequate water discharge purity. Not all ships are equipped with polishers. Polisher installations have been determined on a case by case, or ship class basis. The two types of polisher systems that have been installed in the fleet to date are described below:

a. Polymeric Media Polisher System. This polisher uses polymeric media to absorb oil droplets, while allowing oil-free water to pass through the system. Some manufacturers use a combination of various polymers and activated carbon to increase its performance. Typically these polishers contain no moving parts. Once the media is saturated, it must be replaced and the used media properly disposed.

b. Ultrafiltration Ceramic Membrane System. A ceramic membrane system uses ultrafiltration as a form of secondary treatment. The membranes are made of very porous ceramic material. These pores are so small (an average of 50 Angstroms in diameter) that oil molecules and droplets cannot filter through, but water molecules can. Once the membranes are fouled, they are replaced with spares. The spent membranes can be regenerated and reused. The discharge of the ceramic membrane may also be monitored by an OCM. Several prototypes of the ceramic membrane system have been installed in the fleet.

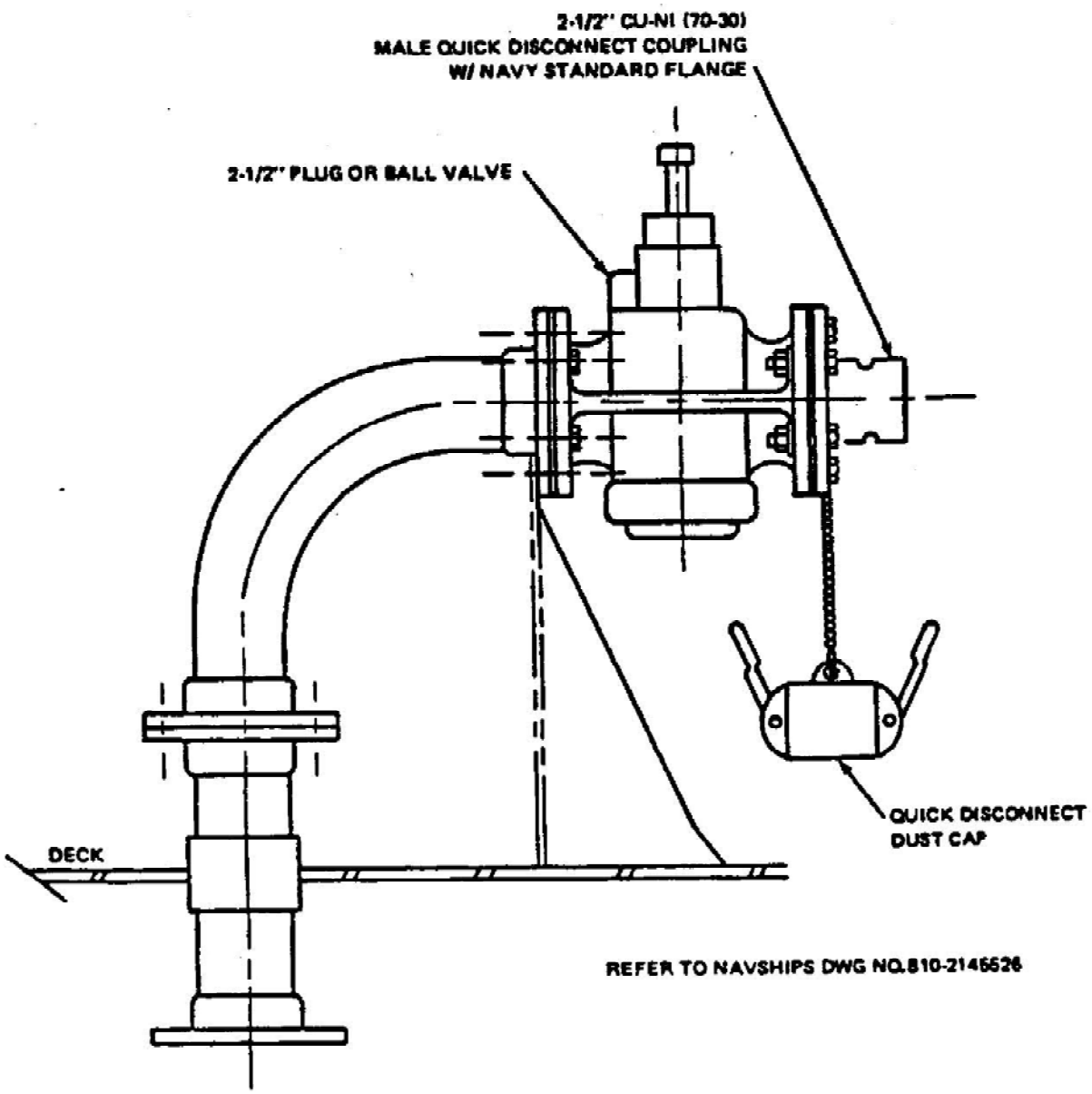


Figure 593-3-3 Surface Ship Oily Waste Discharge Connection

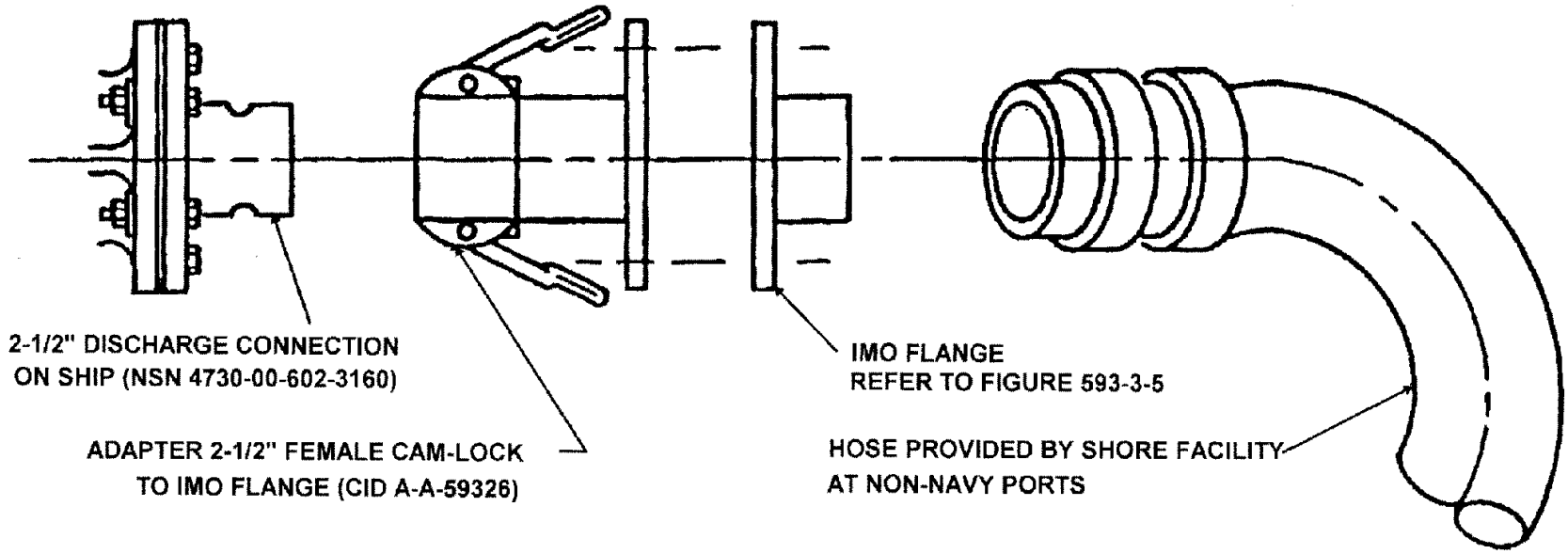


Figure 593-3-4 Adapter 2-1/2 Inch Female Cam-Lock to IMO Oily Waste Flange

TO ENABLE PIPES OF RECEPTION FACILITIES TO BE CONNECTED WITH THE SHIP'S DISCHARGE PIPE LINES FOR THE RESIDUES FROM MACHINERY BILGES, LINES SHALL BE FITTED WITH A STANDARD DISCHARGE CONNECTION IN ACCORDANCE WITH THE FOLLOWING TABLE:

STANDARD DIMENSIONS OF FLANGES FOR DISCHARGE CONNECTION

DESCRIPTION	OIL
OUTSIDE DIAMETER	215mm
INNER DIAMETER	ACCORDING TO PIPE OUTSIDE DIAMETER
BOLT CIRCLE DIAMETER	183mm
SLOTS IN FLANGE	6 HOLES 22mm IN DIAMETER EQUIDISTANTLY PLACED ON BOLT CIRCLES OF THE ABOVE DIAMETER, SLOTTED TO THE FLANGE PERIPHERY. THE SLOT WIDTH TO BE 22mm.
FLANGE THICKNESS	20mm
BOLTS AND NUTS	6, EACH 20mm IN DIAMETER AND OF SUITABLE LENGTH
OPERATING PRESSURE	6 kg/cm²

Figure 593-3-5 IMO Flange

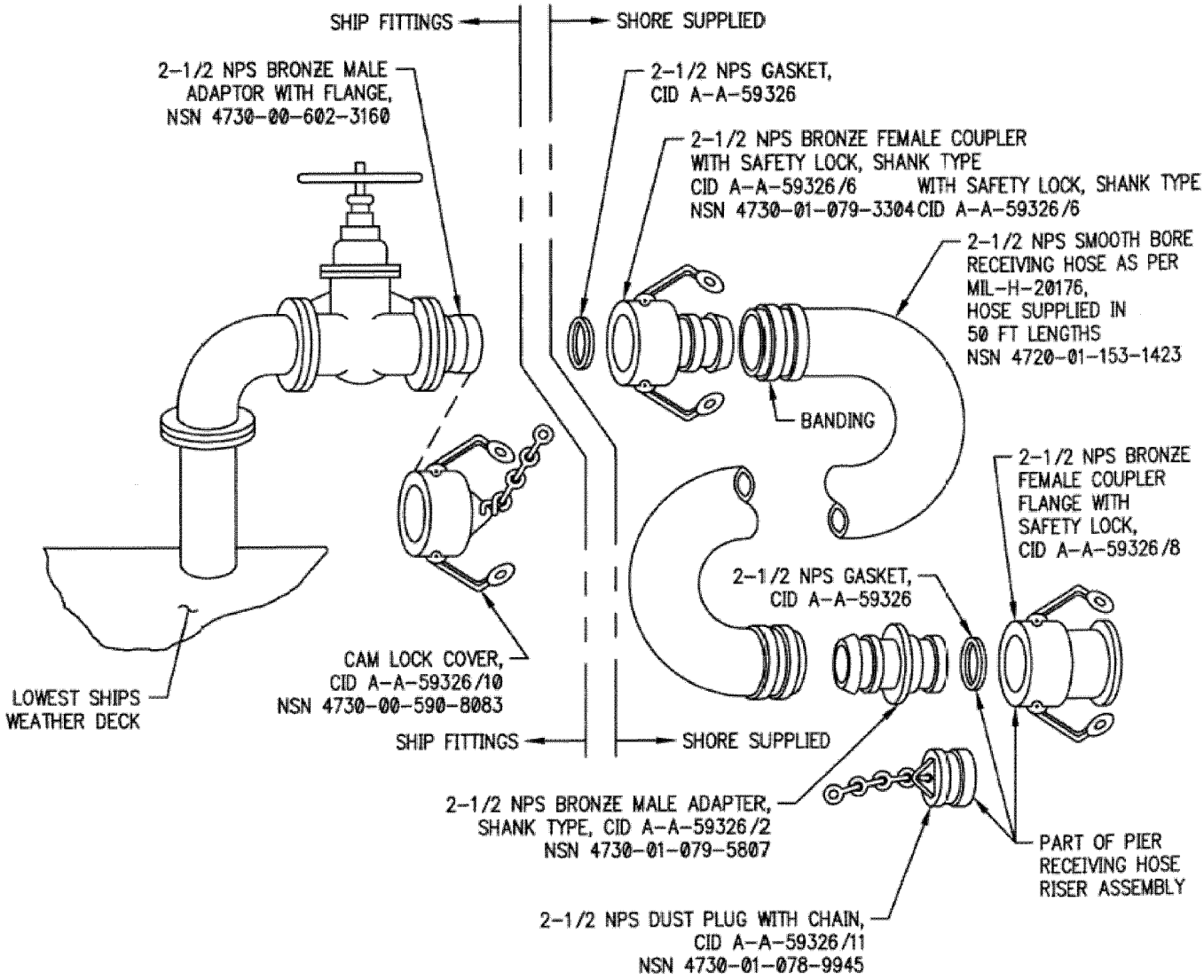


Figure 593-3-6 Ship-to-Shore Oily Waste Hose Connection

593-3.4 OIL POLLUTION ABATEMENT (OPA) OPERATION

593-3.4.1 GENERAL All OPA system piping and valves shall be properly stenciled and painted for flow direction and system identification. The color-code designation for the oily waste system is black. All oily waste system valve handles shall be painted black. All OPA system piping in the bilge area shall be painted terra cotta red; all other piping shall be properly painted. OPA system valves shall be labeled. Operating and warning placards, valve alignment charts and system schematic diagrams shall be conspicuously posted adjacent to OPA equipment. OPA technical personnel shall be equipped with appropriate integrated logistic support (ILS), such as, equipment technical manuals, Engineering Operating Sequencing System (EOSS), and Planned Maintenance System (PMS).

593-3.4.2 AT-SEA OPERATIONS At sea, oily waste may be generated from one or all of the sources discussed in paragraphs 593-3.2.6 to 593-3.2.11. Lubricating oil, hydraulic fluids, and fuel that spill or leak into machinery space bilges shall be collected with the bilge water and other particles found in the bilges, and transferred using the OWTP to the OWHT. Additional OWTPs shall also be used to transfer oily waste to the OWHT from all remote locations where oily waste is generated. Separated water and sediment from the CFST shall also be

transferred to the OWHT. The oily waste that has been collected in the OWHT shall be processed by the OWS (paragraph 593-3.3.1.2) and, if warranted, a secondary treatment system. The OCM shall operate whenever the OWS alone, or with a secondary treatment system is processing oily waste. For at-sea operations, the OCM shall be set at the 15-ppm alarm set point limit. If equipment-operating conditions prevent achieving less than 15-ppm, overboard oil discharge concentrations shall be limited to less than 100-ppm, using the 70-ppm OCM alarm set point. The OCM technical manual shall be referred to, as necessary, to ensure proper system operation. Eductors shall not be used to dewater bilges containing oily waste except in emergency situations or when:

a. OWS system has been casualty reported (CASREP),

b. No OWSs installed onboard ship,

c. Insufficient capacity of the OWHT to handle immediate flow requirements.

All efforts shall be made to process the oily waste contained in the OWHT at-sea, since port restrictions may limit or prohibit the use of an OWS (and secondary treatment system), or even offloading oily waste when an operational OWS exists. If eductors must be used, every effort shall be made to discharge beyond 50 NM from land and while the ship is underway. An engineering log entry shall be made concerning such discharges. In all events, all reasonable precautions shall be taken to minimize the discharge of oil. Synthetic oily waste is collected and stored in the synthetic oily waste tank for later transfer to shore facilities (paragraph 593-3.3.1.8).

593-3.4.3 IN-PORT OPERATIONS OPA system operations shall be conducted according to paragraph 593-3.4.2. However, for in-port operations, the OCM shall always be set at the designated alarm limit for the in-port mode, which is 15ppm. The OCM technical manual shall be referred to, as necessary, to ensure proper system operation. In addition, all synthetic and non-synthetic waste oil and oily waste shall be off loaded to a barge or shore facility using the appropriate transfer pump via the deck riser and deck discharge connections. For example, the OWTP can be used to off-load oily waste from the OWHT, bilges, and other oily waste collection points using the deck riser and deck connections. While in port, the personnel in charge of OPA operations shall ensure that the system is operating properly and that any water discharged into the harbors has an oil content of less than 15ppm, as determined by the OCM, or does not produce a visible sheen. Prior to system start-up, OPA operators must check with the On-Site Environmental Coordinator/Representative for local oil discharge limits and restrictions, since more stringent requirements may exist. In cases where local oil discharge limits are less than 15-ppm, a determination must be made between the On-Site Environmental Coordinator/Representative and the ship regarding the use of the OWS (and secondary treatment system) in-port. If the OWS (and secondary treatment system) cannot be operated in-port, oily waste must be retained in the OWHT until arrangements for offloading via deck connections to shore facilities can be made. Otherwise, the ship must wait until it is underway at sea beyond 12 NM to operate its OWS (and secondary treatment system) to process the oily waste. IF THE OCM SYSTEM IS INOPERABLE at least one crewmember shall be stationed on deck above the OWS overboard discharge. The appearance of an oil slick or oil sheen shall be reported immediately and all OWS operations shall cease until the problem is corrected (see paragraph 593-3.6 for reporting oil spills).

NOTE

The oil discharge concentration limits cited in this section are subject to change as warranted by Federal Legislation.

593-3.4.4 FUELING, DEFUELING, AND INTERNAL FUEL TRANSFER. As required by OPNAVINST 5090.1C Series (or its latest version if not current), in-port fuel transfers shall be accomplished during normal daylight working hours by established fueling detail. The Fueling Bill shall require that the following conditions be met:

1. Topside watches are to be posted at all locations of possible fuel spills. Direct communication to all fuel transfer stations will be established before commencing the process.
2. Check off lists of allocations and procedures necessary for fuel system line-up and operation shall be established and maintained to reflect the installed system. All fuel system valves shall be checked for proper valve alignment.
3. Each member of the fueling detail is to be formally qualified in fueling procedures, emergency procedures, and communication requirements.
4. Continuous tank sounding and indicator monitoring at remote TLI's of all tanks being filled will be maintained and reported to the fueling control console operator.
5. Precautionary measures shall be taken to minimize the danger of a fuel spill by blocking the scuppers, assuring the availability of adequate manpower, and having sufficient containment and cleanup equipment, such as the Navy oil spill control kit.
6. Certification shall be given to the Commanding Officer, Command Duty Officer, Officer-of-the-Deck, and to the fuel supplier that the ship is totally ready to commence fueling operations. Before receiving fuel, the ship shall receive notification from the fuel supplier that the fueling equipment (i.e., fittings and hoses) has been tested and are in proper working condition. This shall be according to appropriate NAVSEA, NAVSUP, or Marine Terminal instructions.

593-3.4.4.1 Great care shall be taken to avoid spills on decks or elsewhere when handling fueling hoses. This requires the use of drip pans, oil absorbent materials, and hose caps or plugs.

593-3.4.4.2 Instructions for fueling at sea are provided in NSTM Chapter 541, Ship Fuel and Fuel Systems. All equipment used in these operations shall be kept clean and in good working condition, and shall be inspected frequently according to current directives. Necessary repairs shall be made promptly and before the equipment is used in any fueling or defueling process.

593-3.4.5 CLEAN BALLAST A clean ballast system is used to eliminate the necessity of ballasting fuel tanks. On those ships equipped with clean ballast tanks, fuel tanks shall be ballasted only when required by the liquid loading instructions. On ships not having clean ballast tanks, liquid-loading instructions shall be followed and the resultant oily ballast water shall be discharged to the OWHT using the fuel stripping pump(s).

593-3.4.6 JP-5 RECLAMATION SYSTEMS Jet propulsion fuel (JP-5) reclamation systems reduce oily waste generation by providing a method of purifying contaminated JP-5 from fuel, aircraft fuel hose flushing, and stripping operations. The JP-5 purification system consists of filter separator(s), prefilters, valves, and piping used in conjunction with existing transfer or stripping pumps and contaminated JP-5 tanks. Flushing connections are installed at fueling or defueling stations to route fuel to a contaminated JP-5 settling tank. The system provides the means to rapidly purify contaminated JP-5 fuel, flushed from hoses or stripped from storage and cargo tanks. The piping instruction books for each ship describe the installed system. The filter/separator is according to MIL-PRF-15618.

593-3.4.6.1 JP-5 fuel, which is considered unsuitable for reclamation for aviation use, shall be directed to a suitable contaminated holding tank (if installed). The water phase shall be transferred to the OWHT via the OWTP for eventual processing by an OWS, or placed in other approved containers (50-gallon drums used for hazardous waste) until it can be discharged or transferred to shore receiving facilities.

593-3.5 REDUCTION OF OILY WASTE

593-3.5.1 GENERAL Proper segregation of oily waste fluids and maintenance of systems and equipment contribute to the reduction of oily waste generation. Oily waste is reduced by:

a. Maintaining mechanical seals on pumps so they are essentially leak-free.

b. Ensuring that tank level indicators are accurate and in good working condition.

c. Minimizing fuel tank overflows by careful monitoring of tank levels during fueling operations.

d. Disposing used oil lab samples directly into the WOT via sounding tube or drain funnel.

e. Repairing leaking valves.

593-3.5.1.1 Oily and Non-Oily Drains Discharge from machinery oil and water drains contributes significantly to the volume of oily waste bilge water generated. When ship-piping configuration permits, drains for non-oily sources shall be separated from drains for oily sources. Drains from ice cube makers, drinking fountains, evaporators, air-conditioners, condensers, and cooling coils are examples of non-oily water drains. Where possible, non-oily water drains shall be directed to a wastewater drain tank or wastewater bilge sump tank. The wastewater can then be pumped directly overboard. Out-of-specification fresh water from evaporators (distillate dump) shall also be discharged overboard, either directly or through a wastewater drain tank and pump. Drains containing both oil and water (oily waste) are drained to an OWHT, OWDCT, or to an OWBST. The contents of these tanks can be processed by an OWS, when installed, or discharged to shore receiving facilities in port. Drains, which contain primarily oil, such as those from fuel or lube oil filter enclosures, are drained to a waste oil tank, lube oil purifier slop tank, or some other tank designated to receive waste oil. Upon return to port, this oil shall be discharged to a shore facility for reclamation or disposal. Synthetic oily waste drainage, such as lubricating oil for gas turbines, and the gas turbine water wash shall be collected in separate tanks or containers and held for off loading to shore facilities. Synthetic oily waste and gas turbine water wash shall not be evacuated through the ship's OWT system or processed by the OWS.

WARNING

ONLY WATER, NON-SYNTHETIC LUBE-OIL OR FUEL MAY BE DISCHARGED INTO THE OILY WASTE COLLECTION SYSTEM. PROPER USE WILL PREVENT SYSTEM MALFUNCTION AND/OR DAMAGE. DISCARDING OTHER MATERIALS INTO THIS SYSTEM IS PROHIBITED. SUCH MATERIALS INCLUDING NON-APPROVED DETERGENTS, AFFF, PAINTS AND/OR THINNERS CAN CAUSE BLOCKAGE, FOULING, AND REDUCE THE PERFORMANCE EFFICIENCY OF THE OWS. IF DRAINAGE PIPING IS BLOCKED, OVERFLOW CAN OCCUR THROUGH OTHER FUNNEL DRAINS. OVERFLfiOWS CAN RESULT IN MAJOR FIRES. IF CLOGGING OCCURS, DO NOT PRESSURIZE SYSTEM. PIPE OBSTRUCTION MUST BE REMOVED PRIOR TO SYSTEM OPERATION.

593-3.6 COMMANDING OFFICERS' RESPONSIBILITIES

Commanding Officers are responsible for:

a. Appointing an officer or petty officer to ensure that oil and oily waste collection and treatment systems are operated and maintained properly, and that ship-to-shore transfers of the waste are handled in a safe and effective manner.

b. Ensuring that shipboard personnel working with oil pollution abatement systems are trained properly, attended the appropriate training course, and are fully aware of applicable Navy technical manuals, documentation, discharge regulations, and Navy oil and hazardous substance spill contingency plans.

c. Reporting to the fleet commanders of any condition or system/equipment malfunction that would necessitate oily waste discharge upon restricted waters.

d. Ensuring that the engineering log or equivalent oil record book be used to record any oily waste discharge that caused a visible sheen or any discharge not processed by the OWS. In the event of such discharges, the cause should be determined. Record keeping shall consist of the date, time of occurrence, ship location at the beginning and end of the incident, substance discharged, quantity discharged, and the cause of the discharge. Commanding Officers are accountable for discharges of oily waste, which do not fall within the guidelines of an emergency situation or of unrecorded and unjustifiable oil discharge incidents.

e. Taking immediate action to contain, control and mitigate all spills caused by the ship.

593-3.6.1 PERSONNEL RESPONSIBILITIES Effective use of the oil pollution abatement systems depend upon:

a. Knowledge of the installed pollution abatement systems by operating personnel.

b. Comprehensive training.

c. Maximum foresight and planning to ensure that oil and oily waste handling evolutions are executed properly.

d. Adequate monitoring of equipment and system performance to ensure proper operation.

e. Monitoring of bilge spaces to ensure that bilges are kept dry and free of oil.

f. Proper attention to preventive maintenance requirements.

g. Use of solvents or detergents of a non-emulsifying or short-lived nature for cleaning machinery spaces and general housekeeping. For a list of recommended detergents, see paragraph 593-3.8.2.1.

593-3.6.2 SHIPBOARD PERSONNEL TRAINING The training officer shall ensure that formal training, at appropriate schools, is provided to key personnel responsible for maintaining and operating pollution control equipment. It is the responsibility of the training officer to maintain an acceptable level of shipboard expertise.

593-3.7 SAFETY PRECAUTIONS

593-3.7.1 HAZARDS AND SAFETY PRECAUTIONS The hazards associated with oil pollution abatement shall receive the full attention of operating personnel to eliminate potential oil pollution and ensure safe operation and maintenance of system and equipment, including personnel safety. Appropriate sources of safety and precaution information are cited in paragraphs 593-3.7.2 through 593-3.7.5.

593-3.7.2 FIRE AND EXPLOSIVE HAZARDS Oily waste can contain an appreciable amount of volatile petroleum or fuel products. These wastes, which may have been confined in spaces such as tanks and bilge compartments, are combustible and potentially hazardous to personnel, equipment, and the ship. The presence of

some surface accumulations is difficult to detect because Navy fuels, such as JP-5 and Diesel Fuel Marine (DFM), are nearly colorless. All of the safety precautions cited in NSTM Chapter 262, Lubricating Oils, Greases, Specialty Lubricants and Lubrication Systems, and NSTM Chapter 541, Ship Fuel and Fuel Systems, relative to the stowage, use, and testing of petroleum fuels are invoked as applicable to the handling, storage, and processing of oily waste.

593-3.7.3 SHOCK HAZARDS Oil pollution abatement equipment or systems are powered from 115 -440 VAC sources. Strict adherence to the safety precautions cited in NSTM Chapter 300, Electric Plant - General, NSTM Chapter 302, Electric Motors and Controllers, and NSTM Chapter 400, Electronics, is necessary.

593-3.7.4 HYDRAULIC FLUIDS AND TOXICITY Precautions regarding the toxicity of hydraulic fluids are outlined in NAVSEAINST 5100.13, Synthetic Fire Resistant Hydraulic Fluids. The provisions of this instruction shall be adhered to in order to maintain the health and safety requirements established by OPNAVINST 5100.19 Series, Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat.

593-3.7.5 OIL POLLUTION WARNING PLACARDS Oil Pollution Placards stating overboard restrictions of oily waste shall be conspicuously posted adjacent to each overboard discharge valve, deck riser, and pump capable of discharging oily waste. The placard shall meet the intent with the Federal Water Pollution Control Act, Public Law 107-303 (U.S. Code 33). The Oil Pollution Act (OPA) discharge warning placard shall read as follows:

WARNING

OVERBOARD DISCHARGE OF OILY WASTE OR WASTE OIL IS PROHIBITED.

ALL NAVAL VESSELS EQUIPPED WITH AN OIL POLLUTION ABATEMENT SYSTEM SHALL UTILIZE THE SYSTEM TO PROCESS OILY WASTEWATER PRIOR TO OVERBOARD DISCHARGE.

WITHIN 12 NAUTICAL MILES OF THE U.S. COASTLINE, NO OIL OR OILY WASTE WATER THAT WILL CAUSE A SHEEN OR SURFACE FILM ON THE WATER, OR DISCOLORATION BENEATH THE SURFACE OF THE WATER SHALL BE PERMITTED. WITHIN THIS ZONE, NO OILY WASTE WATER THAT EXCEEDS 15 PPM OIL-IN-WATER SHALL BE DISCHARGED. ANY UNACCEPTABLE DISCHARGES SHALL BE REPORTED IMMEDIATELY IN ACCORDANCE WITH OPNAVINST 5090.1C.

OUTSIDE 12 NAUTICAL MILES, DISCHARGES SHALL BE LIMITED TO 15 PPM, BUT IF OPERATING CONDITIONS PREVENT THE OIL-WATER SEPARATOR (OWS) SYSTEM FROM MEETING THE 15 PPM DISCHARGE LIMIT, TREATED OILY WASTE WATER CONTAINING LESS THAN 100 PPM OIL-IN-WATER MAY BE DISCHARGED.

WITHIN 12 NAUTICAL MILES OF FOREIGN COUNTRIES AND FOR OTHER SPECIAL REQUIREMENTS, U.S. NAVAL VESSELS SHALL

Warning - *precedes*

ABIDE BY REGULATIONS SPECIFIED IN THE STATUS OF FORCES AGREEMENT (SOFA), OPNAVINST 5090.1C, AND DOD DIRECTIVE 6050.15.

593-3.8 OPA MAINTENANCE

593-3.8.1 OWS CLEANING PROCEDURES. Shipboard OWS systems periodically require cleaning. It involves the removal and disposal of accumulated sludge from the OWS due to normal use. OWS sludge has been classified by the Navy Bureau of Medicine and Surgery (BUMED) as a hazardous waste and should be handled and disposed of accordingly. It should be assumed that hydrogen sulfide (H_2S) has accumulated in the OWS system. For detailed cleaning procedures, follow the OWSs technical manual and Maintenance Index Page (MIP) /Maintenance Requirement Card (MRC). The following general procedures shall be followed when draining and cleaning an OWS:

1. De-energize the OWS according to the OWS technical manual.
2. Assure adequate ventilation in machinery space where OWS is located.
3. Follow procedures outlined in NSTM Chapter 074, Volume 3, Gas Free Engineering.
4. Assure bilge is dry.
5. Drain the OWS to the WOT when the OWS drains are piped to the WOT. When the OWS drains are not piped to the WOT, transfer the contents of the OWS to the WOT by use of a portable pump following the procedures outlined in the respective OWS technical manual and MIP/MRC.
6. Remove the OWS tank cover.
7. Line the liquid containment portion of a wet vacuum machine with a heavy-duty plastic bag.
8. Vacuum sludge from underside of tank cover.
9. Vacuum sludge from top of coalescing plates.
10. Remove the coalescing plates and flush with water the remaining sludge from the plates into the OWS tank.
11. Vacuum OWS tank interior for remaining sludge.
12. Reinstall plates and tank cover.
13. Follow the OWS technical manual for system energizing, priming and start-up.

593-3.8.1.1 Sludge that has accumulated in the wet vacuum shall be disposed of according to Section 5, Shipboard Hazardous Waste, of this NSTM Chapter.

593-3.8.2 EMULSIFIERS Emulsifiers, such as detergents, Aqueous Film Forming Foam (AFFF) and some degreasers, tend to chemically prevent small oil droplets from attaching to the coalescent material used in the OWS or to otherwise form larger oil droplets. This chemically formed emulsion is more difficult to break down than a mechanical emulsion. Consequently, some oil droplets will pass through the OWS, thus reducing its performance capability. Therefore, it is imperative that only solvents or detergents of a short-lived or non-emulsifying nature be used for housekeeping in machinery rooms or spaces serviced by an OWS.

593-3.8.2.1 Short-Lived Non-Emulsifying Detergents MIL-D-16791 Series and Allied P-98 (made by Allied Enterprises, Norfolk, VA) are acceptable short-lived non-emulsifying detergents for shipboard use. The MIL-D-16791 Series cleaning solution can be prepared by mixing 1-1/2 ounces of detergent to 3 gallons of freshwater (approximately a 400:1 mixture). The Allied P-98 cleaning solution can be prepared by mixing 1/2 gallon of detergent to 10 gallons of freshwater (approximately a 20:1 mixture). For use with heavily soiled surfaces, refer to the directions on the detergent container for required dosage. Other detergents and cleaning techniques are being evaluated to determine shipboard compatibility. Information on these results will be provided periodically as it becomes available.

Cleaning Solution/Qty	NSNs
MIL-D-16791 Series	
1 Gallon	7930-00-282-9699
5 Gallons	7930-00-985-6911
55 Gallons	7930-00-282-9700
Allied P-98	
5 Gallons	6850-01-278-4421
30 Gallons	6850-01-278-3858
55 Gallons	6850-01-278-9700

SECTION 4
SEWAGE AND GRAY WATER

593-4.1 TERMINOLOGY

593-4.1.1 COLLECTION, HOLDING, AND TRANSFER SYSTEM (CHT) The Collecting, Holding, and Transfer System is a Type III Marine Sanitation Device (MSD) used for handling sewage and gray water. Sewage and gray water are collected using gravity in a CHT system.

593-4.1.2 COMMINUTOR A comminutor is a motor-driven grinder used to pulp or liquefy sewage solids before they enter a CHT tank.

593-4.1.3 GRAY WATER Discarded water from deck drains, lavatories, showers, dishwashers, laundries, and garbage grinders (food waste disposers) as well as discarded water from shipboard medical facilities. Does not include industrial wastes, infectious wastes, and human body wastes. Also known in some cases as ″wastewater,″ ″plumbing waste″ or ″waste.″

593-4.1.4 GRAY WATER COLLECTION AND TRANSFER SYSTEM An independent, auxiliary gray water collection and transfer system designed to collect and pump gray water to shore facilities in port or direct the gray water overboard at sea. Gray water collection and transfer systems are typically installed on ships with segregated Type III-A Marine Sanitation Devices (MSDs) that may lack the capability to collect and transfer gray water.

593-4.1.5 INDUSTRIAL WASTEWATER Wastewater or semi-solid material generated in shipboard processes such as manufacturing, production and maintenance (e.g. metal plating, acid cleaning, photo processing, solvent cleaning and painting materials).

593-4.1.6 MARINE SANITATION DEVICE (MSD) Any equipment on board a ship or craft designed to receive and treat sewage to a level acceptable for overboard discharge, or which receives or retains sewage on board for later discharge ashore or in waters where discharge is permissible. Within the generic term MSD, the Navy uses the following terms to identify general types:

a. Type I: ″Flow-through″ and ″discharge″ device designed to receive and treat sewage aboard ship and produce an overboard effluent with a fecal coliform count of not more than 1,000 per 100 milliliters and no visible floating solids.

b. Type II: ″Flow-through″ and ″discharge″ device that produces an overboard effluent with a fecal coliform count of not more than 200 per 100 milliliters and total suspended solids of not more than 150 milligrams per liter.

c. Type III-A: ″Non-flow-through″ device designed to collect shipboard sewage by means of vacuum or other reduced-flush systems and to hold the sewage while transiting navigable waters (0 to 3 NM). This type may include equipment for shipboard evaporation or incineration of collected sewage.

d. Type III-B: Collection, Holding and Transfer (CHT) system designed to collect both sewage and gray water while in port; to offload sewage and gray water to suitable shore receiving facilities; to hold sewage while transiting within 0 to 3 NM; and to discharge both sewage and gray water overboard while operating beyond 3 NM.

593-4.1.7 SEWAGE Sewage is defined as wastes of human origin from water closets and urinals and transported by the ship soil drain system. Also known as ″soil″ or ″blackwater.″

593-4.2 GENERAL

593-4.2.1 BACKGROUND Sewage and gray water discharges into rivers, harbors, and coastal waters by naval ships, and the environmental effects that result, are of great concern to the Navy. The Navy is required to control sewage and gray water discharges under regulations promulgated by the Secretary of Defense. Navy policies and responsibilities are defined in OPNAVINST 5090.1C Series, The Environmental and Natural Resources Program Manual.

In the past, shipboard sewage and gray water was discharged directly overboard as a matter of routine design and operation. Studies have shown that concentrations of the constituents of sewage and gray water in inland waters, ports, harbors, and coastal waters of the United States can have detrimental effects on the environment.

In 1972 the Chief of Naval Operations (CNO) directed that Marine Sanitation Devices (MSDs) be installed aboard naval ships. All Navy ships are now equipped with Marine Sanitation Devices (MSDs) and gray water systems. These systems enable ships to comply with sewage and gray water discharge policies without compromising the ship mission capability.

593-4.2.2 SYSTEM OVERVIEW The various sewage and gray water systems installed on Navy ships are designed to collect, hold, transfer, and, in some cases, process/treat sewage and gray water. The design goal of these systems is to provide the ships the capability of making a 12-hour transit in restricted waters. In most ships this goal is achieved using a gravity-drain Collection, Holding and Transfer (CHT) system or a Vacuum Collection, Holding and Transfer (VCHT) to collect and hold sewage only for the duration of the transit. Gray water is not currently required to be held while transiting restricted waters. Gray water is required to be collected in port only, so Navy ships are currently only equipped to collect and transfer gray water to shore. These systems will all be discussed in later paragraphs.

593-4.2.3 NAVY SEWAGE AND GRAY WATER POLICY OPNAVINST 5090.1C Series, The Environmental and Natural Resources Program Manual, Chapter 22, Environmental Compliance Afloat, defines environmental compliance policies and procedures applicable to shipboard operations. If there is any conflicting guidance between this chapter and OPNAVINST 5090.1C Series, the OPNAV instruction shall take precedence.

593-4.2.3.1 Marine Sanitation Device (MSD) Certification. All MSDs shall be certified in accordance with the requirements of DOD 4715.6-R1 and NAVSEAINST 9593.1.

593-4.2.3.2 Urinal Removals from Active Ships Some ships have removed urinals from sanitary spaces without prior NAVSEA approval and without documenting the change through SHIPMAIN / FMP or other appropriate means. Currently, removal of urinals from active ships, with commensurate replacement with waterclosets in accordance with fixture ratios prescribed in Habitability Design Criteria Manual, T9640-AB-DDT-010/HAB, is approved by NAVSEA only for sanitary spaces modified in conjunction with women-at-sea alterations. OPNAVINST 9640.1A does delegate authority to Commander Fleet Forces Command and Commander Pacific Fleet for deviations from the habitability criteria invoked therein and contained in the Habitability Design Criteria Manual. Therefore, the extent to which urinals are removed from ships is at the discretion of those commands. Urinal removals related to women-at-sea and the exclusion of urinals on new construction ships is managed to reduce habitability impacts by installing additional waterclosets and, in the case of new construction ships, including additional capacity in the sewage holding tanks. Aside from these situations, removal of urinals is not recommended due to the adverse impact on shipboard habitability, the potentially significant impact on sewage

holding capacities, the associated environmental compliance risks, and the increased operating costs. The only instance where selected removal of urinals is acceptable from the habitability perspective is on ships built to more stringent standards invoked prior to 1979 when the absolute minimum ratio of personnel per urinal was 20 for officers, 30 for CPOs, and 40 for crew. The 1979 and current standard relaxed that ratio to 20-25 for officers, 30-35 for CPOs, and 40-45 for crew. Although replacement of urinals with waterclosets to the maximum extent practical would minimize the habitability impact, the following environmental compliance and environmental system considerations limit or preclude this approach:

a. Most ships were designed with 12 hours of sewage holding capacity, though holding times on some ship classes are more restrictive (DDG-51 Class has only 8 hours of holding capacity). This holding capacity is considered adequate to transit restricted waters (3 NM) and most ships can make all but the longest transits. Some locations such as Puget Sound and canal transits will present problems.

b. Ships with gravity flush sewage drain systems use 3 to 5 gallons per flush for water closets and 0.75 to 1.5 gallons per flush for urinals. Vacuum freshwater sewage drain systems use 3 pints per flush for water closets and 1 pint per flush for urinals. The 12-hour holding capacities were calculated based on these flush rates and the required mix of urinals and water closets on each ship. Since the removal of urinals will require the expanded use of waterclosets, there will be a significant negative impact on sewage holding time. Removal of urinals can reduce a ship's holding capacity by as much as 50 percent.

c. In foreign ports, Navy ships are required to pay for sewage disposal on a per-gallon basis. As discussed above, using water closets in place of urinals will decrease holding time by as much as 50 percent. This 50 percent figure also represents the increase in sewage disposal costs the Fleet should expect to see from ships where urinals are removed.

593-4.2.4 RESPONSIBILITIES

593-4.2.4.1 Navigator Responsibilities While the ship is transiting from sea to port, or port to sea, it is the Navigator's responsibility to determine when the ship will be crossing the three (3) nautical mile restricted zone. The Navigator shall inform the Officer of the Day (OOD) of the time of crossing.

593-4.2.4.2 ODD Responsibilities Upon receipt of word from the Navigator that the ship is about to cross the three (3) nautical mile restricted zone, the OOD shall initiate the appropriate mode change of the sewage and gray water systems in accordance with prescribed procedures. For ships with limited sewage holding capacity, the OOD shall begin holding sewage at a point that allows the ship to reach port and hook up the sewage system to the pier sewer without overflowing the sewage holding tank. For example, a destroyer with four (4) hours holding capacity should begin holding sewage about three (3) hours from the pier. All ships equipped with holding systems should begin holding sewage immediately before disconnecting sewage hoses from pier connections and divert sewage drains overboard after the sewage holding tank is filled or upon exiting restricted waters. Ships desiring to hold gray water in the sewage tank during transit through the restricted zone shall do so only when the ODD and AEPC determine there is adequate holding capacity to hold both sewage and gray water for the entire transit (including the time required to connect to pier facilities). The holding of gray water shall not be allowed to result in the overboard discharge of sewage during transit. Ships equipped with other type of MSDs should refer to system operating instructions to determine how the MSD should be operated to prevent discharge of untreated sewage in restricted waters.

593-4.2.5 DISCHARGE WAIVER Sewage and gray water discharge regulations do not preclude overboard discharge in restricted waters when an emergency situation exists and failure to discharge would endanger the health and safety of personnel. A waiver from discharge restrictions is provided for ships, where at certain times

and under certain circumstances, compliance would unduly and unreasonably detract from their military characteristics, effectiveness and safety to such an extent as to be not in the interest of national security. These circumstances and times are identified in OPNAVINST 5090.1C Series, DOD 4715.6-R1 and in applicable type commander maintenance instructions Joint Fleet Maintenance Manual (COMFLTFORCOMINST 4790.3 Series).

593-4.2.6 SHIPS IN DRYDOCK Sewage and gray water discharge procedures for ships in drydock are discussed in NSTM Chapter 997, Docking Instructions and Routine Work in Dock.

593-4.2.7 TRAINING

593-4.2.7.1 Environmental Laws and Regulations Training Ship's force training on environmental laws and regulations are required by OPNAVINST 5090.1C Series, Sections 28-6.6. Specific training programs and their locations are provided in the instruction.

593-4.2.7.2 Operation and Maintenance Training The Naval Education and Training Command (NETC) is responsible for all formal training. For general CHT system training, CANTRAC (Catalog of Navy Training Courses) A-652-2141 ″SHIPBOARD SEWAGE COLLECTION HOLDING AND TRANSFER (CHT) SYSTEM (SHIPBOARD TRAINING ENHANCEMENT PROGRAM)″ CD-ROMs (no classroom) are available from the Navy Knowledge Online (NKO) Website (https://wwwa.nko.navy.mil). For USS ARLEIGH BURKE (DDG-51), Computer-Based Training (CBT) NKO Catalog Code NAVSEA-VCHT51-1.0 was developed for the VCHT systems installed on DDG-51 only. For USS BARRY (DDG-52) and follow ships, CBT NKO Catalog Code NAVSEA-VCHT-01 was developed for the VCHT systems on these hulls. Both CBTs are listed under the Department of the Navy (DON)/ General Engineering training category of Navy e-Learning in NKO.

593-4.3 SAFETY AND HEALTH

593-4.3.1 SAFETY REQUIREMENTS Numerous potential health and safety hazards are associated with sewage and gray water systems. However, these systems may be operated safely by following prescribed operational procedures, performing the required planned maintenance, and most importantly, by carefully adhering to the safety precautions and procedures outlined throughout this chapter.

593-4.3.1.1 A serious potential hazard associated with sewage and gray water systems is the release of toxic gases in confined spaces. Hydrogen sulfide has been identified as the most likely gas hazard associated with decomposition of sewage and gray water in holding tanks. It is toxic and can be explosive. When the available dissolved oxygen in sewage or gray water is depleted by the bacteria naturally present, certain types of bacteria will then produce hydrogen sulfide. Such sewage or gray water is often referred to as septic. Hydrogen sulfide will not only be present in the air above septic sewage or gray water, but can also be dissolved in large quantities in the sewage or gray water itself. Often, hydrogen sulfide will be produced in the lower levels of sludge layers, which may accumulate in holding tanks, since oxygen cannot reach these lower sludge layers. As a result, sewage and gray water holding tanks and all sewage system piping are designated as Immediately Dangerous to Life or Health (IDLH) spaces in accordance with NSTM Chapter 074, Volume 3 (Gas Free Engineering). Entry into IDLH spaces by ship's force is authorized only under emergency conditions. Only the Commanding Officer can authorize opening and entry into IDLH spaces. In order to minimize the potential hazards resulting from the release of toxic gases from sewage and gray water systems, the following precautions shall be observed:

a. For holding tanks larger than 2,000 gallons, always ensure that the installed holding tank aeration system is operated as required by the Sewage Disposal Operational Sequencing System (SDOSS). The aeration system

shall be operated while transiting inside the three (3) nautical mile restricted zone, while in-port as sewage and gray water are being collected, or any time sewage or gray water is being collected in the holding tank (e.g. when a CHT system must be used as an collection and transfer system at sea). This will maintain dissolved oxygen levels sufficient to prevent the formation of significant levels of hydrogen sulfide, and will keep solids in suspension so that sludge layers, which form hydrogen sulfide, do not accumulate in the holding tank. By reducing the potential for hydrogen sulfide production, the potential for any release of toxic/explosive gas is similarly reduced. Systems with holding tanks less than 2,000 gallons have no installed aeration system, but use strainers, which remove a large portion of the sewage solids before the sewage enters the holding tank. This reduces the risk of hydrogen sulfide generation. Typically, hydrogen sulfide will begin to form when sewage or gray water has been without aeration for approximately 12 hours.

b. Always assume that any sewage or gray water holding tank contains sewage or gray water and toxic gases. Any maintenance requiring the removal or disassembly of valves, pumps, flanges, or similar equipment inside the sewage or gray water system pump room or below the holding tank overflow, shall be conducted strictly in accordance with paragraph 593-4.3.4 of this manual. Ship's force shall never enter the holding tank or open the holding tank manhole access at any time unless at a suitable industrial facility and unless all requirements cited in paragraph 593-4.3.4 have been met. It shall be stressed that corrective maintenance not requiring immediate attention shall be deferred until the ship is in port and industrial facilities are available. In a situation where holding sewage and gray water would present a health or safety hazard (such as all pumps becoming inoperable), the system should be CASREPed and secured. OPNAVINST 5090.1C Series, provides the authority to divert sewage and gray water overboard while in restricted waters without violating federal, state or local pollution control laws if retention would interfere with operational effectiveness or pose a hazard.

c. Always ensure that the sewage or gray water pump room installed Hydrogen Sulfide Alarm System (see paragraph 593-4.4.2) is operating properly. Where permanently installed hydrogen sulfide detectors are not installed, the use of a portable hydrogen sulfide detector meeting the criteria below is recommended during maintenance.

   1. Minimum hydrogen sulfide detection range of 0 to 50 parts per million (ppm).
   2. Alarm set at ten (10) ppm with an audible or audible and visual alarm.
   3. Battery operated.
   4. Rechargeable power source or low power indicator.
   5. Response time less than 60 seconds to 90 percent of actual value.
   6. Capable of onboard calibration or provided with replaceable sensor. Contact information for several companies that can provide portable hydrogen sulfide detectors are as follows:

Enmet Corporation

680 Fairfield Court
P.O. Box 979
Ann Arbor, Michigan 48106-0979
Phone Number 734-761-1270
Web: www.enmet.com

CEA Instruments, Incorporated
16 Chestnut Street
Emerson, NJ 07630-8450
Phone Number: 888-893-9640
Models: Gasman II, Tetra
Web: www.ceainstr.com

RKI Instruments, Incorporated
33248 Central Ave.
Union City, CA 94587
Phone Number: 800-754-5165
Models: GasWatch, GasWatch 2
Web: www.rkiinstruments.com

AFC International, Incorporated
715 SW Almond St, Ste C
P.O. Box 894
DeMotte, IN 46310
Phone Number: 800-952-3293
Model: MicroPac (disposable after 2 years)
Web: www.afcintl.com

Industrial Scientific Corporation
1001 Oakdale Road
Oakdale, PA 15071-1500
Phone Number: 800-338-3287
Models: M40, T40 Rattler, T82
Web: www.indsci.com

Mine Safety Appliance Company
P.O. Box 426
Pittsburgh, PA 15230
Phone Number: 800-672-2222
Model: Sirius, Solaris
Web: www.msanet.com

d. If hydrogen sulfide is detected by smell or by a hydrogen sulfide detector, when working in a sewage or gray water related space (pump room, comminutor space or any space containing sewage or gray water drain piping), the space shall be evacuated immediately. At a level of less than 0.2 parts per million, (ppm) hydrogen sulfide may be detected by its rotten egg smell. Concentrations greater than the OSHA established maximum exposure limit of 20 ppm, can usually be tolerated as a very strong smell but are physiologically damaging. At concentrations slightly higher or after long periods of moderate exposure, the sense of smell will be affected so the odor of hydrogen sulfide is not even detected. Under these situations a false sense of security develops because the odor apparently disappears and yet hydrogen sulfide is still present in dangerous concentrations. A space in which hydrogen sulfide has been detected either by odor or by a hydrogen sulfide detector, shall be re-entered only by personnel wearing respirators as described in paragraph 593-4.3.4.1.1, step c. The ship's Gas Free Engineer shall be contacted immediately to determine the concentrations of gas in the space. Efforts to identify the source of gas should be directed toward pipe fittings, system component leaks, and contents in the sump or containment coaming, existing drain openings or ventilation system openings. Gas can originate in a compartment from leakage or spilled sewage, or can enter a compartment from drains with inadequate or dry traps, or from adjacent or interconnected compartments. If the source cannot be detected, and concentrations greater than ten (10) ppm are confirmed, the space shall be gas freed in accordance with NSTM Chapter 074, Volume 3 (Gas Free Engineering), secured and all drains to that space diverted overboard. Further investigations into the cause of gas in that space should be deferred until industrial facilities are available. Two Emergency Escape Breathing Devices (EEBD) shall be placed in each main sewage related space (pump room, comminutor space, MSD space, etc.).

593-4.3.1.2 Additional information concerning potential hazards associated with hydrogen sulfide from sewage or gray water systems is provided as follows:

a. Although a space or holding tank may be certified gas free and hydrogen sulfide levels are below safe levels (10ppm), some danger may still exist if any sewage, gray water or sewage solids remain in the space or holding tank. The sewage, gray water and sewage solids can continue to release dissolved hydrogen sulfide or produce new hydrogen sulfide, causing levels in the atmosphere to increase above safe levels. To minimize this hazard always flush holding tanks and pump out completely as described in paragraph 593-4.3.4.1.1, step a. if components are to be removed from the holding tank, or from the piping below the highest point of the holding tank overflow. Always recheck gas levels in the holding tank before reopening the holding tank or piping to replace repaired components if more than two (2) hours have elapsed since the holding tank was last certified GAS FREE (or one (1) hour if the ambient temperature is above 32.2 ° C (90 ° F)). If levels of gases have climbed above acceptable limits, repeat the applicable flushing procedure. Wear respirators as described in paragraph 593-4.3.4.1.1, step c., when replacing components. In addition, always flush out sumps and space coamings completely before conducting any maintenance, even if hydrogen sulfide levels in a space are below safe levels (10 ppm). Similarly, in any space where a sewage or gray water spill has occurred, do not conduct any work or maintenance other than work required to clean up the spill, until gas levels are below acceptable limits described in paragraph 593-4.3.4.1.1, step b. and all sewage and gray water materials, including solids, have been removed from the space and the space washed down according to paragraph 593-4.3.3, step f. Even if a space has been certified GAS FREE, until such time as all sewage and gray water can be removed from the space, re-certification of the space as gas free shall be repeated at least every two (2) hours (or every hour where ambient temperature is above 32.2° C (90° F)) or more frequently if deemed necessary by the ship's Gas Free Engineer.

b. In some cases, sewage or gray water piping, especially pump discharge piping, passes through voids or compartments, which are rarely opened. Because this piping cannot be easily inspected, leaks may go undetected for long periods allowing sewage or gray water to collect in these voids or compartments. This sewage or gray water may become septic and produce hydrogen sulfide. It is critical that before opening any unventilated void or compartment which contains sewage or gray water piping and which has not been inspected or opened for an extended period, that the compartment be opened using respirators as described in paragraph 593-4.3.4.1.1, step c., an SAR/SCBA, or air-line mask, and that the atmosphere be tested to ensure it meets the safety criteria stated in paragraph 593-4.3.4.1.1, step b. A spare respirator, SAR/SCBA, or airline mask shall be available at the compartment access before commencing work and a safety watch shall be posted. The same precautions shall be taken before entering a sewage or gray water related space where the installed ventilation system is inoperable.

c. Although hydrogen sulfide poisoning occurs mainly through inhalation, some hydrogen sulfide can be absorbed through the skin if the personnel are working in areas with high concentrations of hydrogen sulfide at high temperatures. Therefore, work in spaces with hydrogen sulfide levels greater than ten (10) ppm shall be limited to that required to clean up a spill and to gas free the space only, even if personnel are using respiratory protection. If levels below ten (10) ppm cannot be obtained and maintained, the space shall be secured until industrial facilities are available.

593-4.3.1.3 Another potential sewage system hazard is fire or explosion. Although fire fighting is a basic component of damage control training, preventative measures shall also be strictly observed. The sewage holding tank and system piping shall be considered to contain some type of combustible, which is one of the three requirements for a fire. Combustible gases may be formed inside the holding tank or piping due to biological decomposition of organics. Under normal operating conditions, most other gases that are potentially flammable do not form in concentrations high enough to approach the explosive limit. Fuels may also be inadvertently collected in holding tanks from deck drains or through common bulkheads, and decks between fuel oil tanks and holding tanks, which have failed. The second component required to start a fire is ignition or a source of heat. Conducting hot work, smoking and electrical failures are typical sources of ignition. The final component in order for fire to occur is the presence of oxygen. In order to minimize the potential for a fire or explosion hazard the following precautions shall be followed:

a. Ensure the aeration system is operated according to the applicable SDOSS to reduce the amount of hydrogen sulfide produced as described in paragraph 593-4.3.4.1.1. Aeration of the holding tank contents does not necessarily provide available oxygen as a gas in the holding tank. The intention of aeration is to provide dissolved oxygen to the fluid inside the holding tank. Aerating the holding tank does not pressurize the holding tank.

b. Always follow the precautions and procedures in this chapter as well as NSTM Chapter 074, Volume 3 (Gas Free Engineering), before conducting hot work on any part of a sewage or gray water system.

c. Use only approved intrinsically safe, spark-proof or explosion-proof equipment when flammable or explosive vapors, gases, or materials are present. Control all other potential ignition sources and provide adequate fire protection measures for the specific exposure.

d. Smoking, eating, or drinking is never permitted inside the sewage or gray water system spaces (pump rooms, comminutor spaces, MSD spaces, etc.) or when working on any sewage or gray water system component.

e. Always exercise caution when cleaning up fuel or flammable liquid spills. These fluids shall be containerized and sealed for shore disposal by the base public works department. The disposal of flammable or toxic liquids to the holding tank by way of the sewage or gray water drains is strictly prohibited.

593-4.3.1.4 Health and sanitation hazards may develop as a result of sewage or gray water spills in system related spaces, leaking fittings throughout the ship, improper clean-up procedures used after clearing blocked lines, swing check valves not properly seating, or other similar conditions. Infectious microorganisms in sewage and gray water may cause diseases such as typhoid fever, dysentery, cholera, hepatitis and others. In order to minimize the risks of health and sanitation hazards resulting from these systems, always follow the sanitary and hygienic practices described in paragraph 593-4.3.3.

593-4.3.1.5 Flooding and electrical hazards in sewage and gray water system related spaces and other spaces containing sewage and gray water equipment or piping should also be minimized. Flooding of the pump room may result in a severe electrical hazard if flooding progresses above the sump or coaming containment. In order to prevent flooding or electrical hazards the following precautions should be followed:

1. The SDOSS should be strictly followed to ensure holding tanks are pumped out after exiting restricted waters. The SDOSS procedures also ensure that all diverter valves for both sewage and gray water drains are diverted overboard.

2. Always assume holding tanks contain fluid and toxic gas. Before conducting any maintenance requiring removal or disassembly of valves or components outside the holding tank or below the highest point of the holding tank overflow, the holding tank shall be flushed and pumped out twice in accordance with paragraph 593-4.3.4.1.1, step a. If both pumps are inoperable, no maintenance, including pump maintenance, should be conducted until suitable industrial facilities and personnel are available.

3. Proper level sensor and pump controller operation shall be routinely verified in accordance with applicable PMS.

4. Ensure proper operation of space and containment coaming flooding alarms quarterly or in accordance with applicable PMS.

5. Ensure that the sewage or gray water holding tank overflow is clear of obstructions and that any valves in the overflow are locked open.

6. Be aware that if a ship is nested, other ships may be pumping sewage or gray water through your pump discharge piping (see Figure 593-4-1). If a component or piping section is removed from the discharge piping without first properly isolating the component or section from the rest of the piping system, flooding could occur from sewage or gray water being pumped by other nested ships. The same is true on a few ship classes

in which sewage or gray water pumps from various pump rooms discharge to a common discharge header. Prior to conducting maintenance on any section or component of the pump discharge piping, consult your SDOSS and ensure the piping is properly isolated to prevent flooding from adjacent pump rooms or other nested ships.

7. Ensure that all swing check valves in sewage and gray water drainage piping are operating properly. The detection of sewage odors in spaces may indicate a check valve is not properly seated. These valves shall be periodically cleaned or replaced as required. Proper precautions shall be observed when conducting valve maintenance.

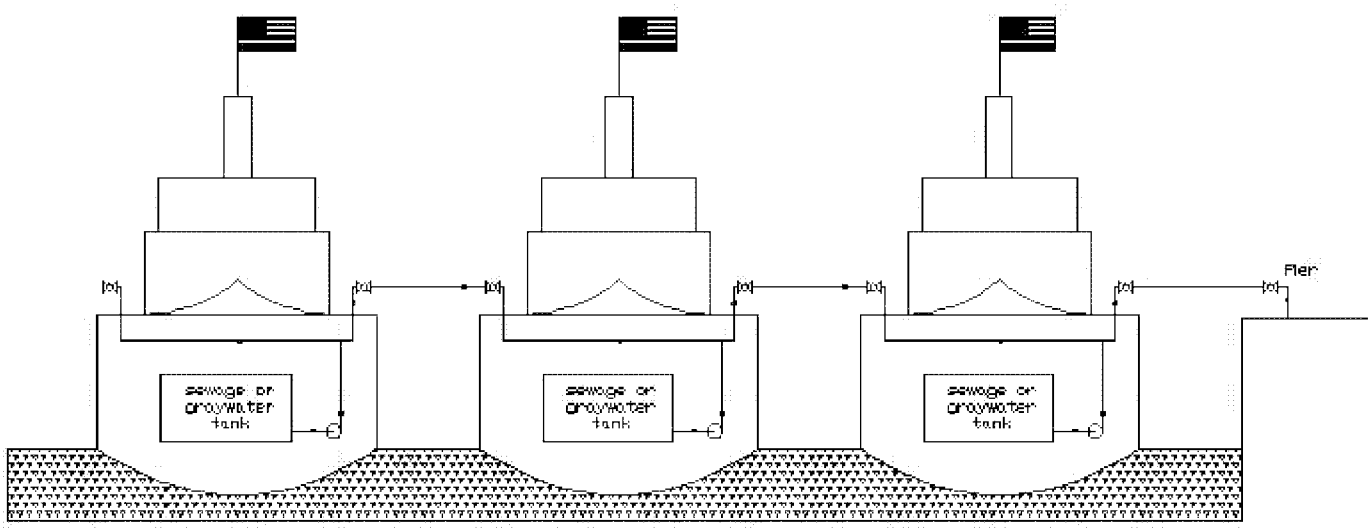


Figure 593-4-1 Nested Ship Sewage Transfer

593-4.3.1.6 The hazards discussed in this manual are real. However, other hazards may exist or develop if proper sewage or gray water system preventative maintenance is not followed. Always use available software such as SDOSS, MRCs, installation drawings, technical manuals, and DC diagrams to operate and maintain the sewage or gray water system. The activities responsible for the maintenance of these software items depend on fleet feedbacks to correct errors or make changes resulting from system or component alterations. These facilities can be contacted through your Type Commander or the SEIC website (www.navyseic.dt.navy.mil) and should be used to provide guidance, training and technical assistance. Although it is important to maintain a clean environment, crew health and safety come first. Don't take chances.

593-4.3.2 SANITARY AND HYGIENIC PROVISIONS The provisions and equipment described in this paragraph are typically incorporated in shipboard sewage and gray water systems, or are provided onboard to ensure that sanitary and hygienic conditions are maintained:

a. Sewage and gray water pumps incorporate seals designed to minimize the possibility of leakage.

b. Dedicated sewage and gray water system pump room spaces have a sump to collect any spillage or leakage, which might occur due to equipment malfunction or maintenance. This sump has an eductor or sump pump installed to evacuate contents.

c. Where sewage and gray water system equipment is not located in a dedicated space, a minimum 6-inch coaming surrounds the equipment and contains a sump as described above. The coaming and the sump prevent the spread of any leakage to spaces traversed by the crew.

d. Individual sewage and gray water pump sets in dedicated pump rooms are surrounded by two (2) to four (4) inch local coamings. Where possible these coamings direct leakage to the pump room space sump. This aids in maintaining sanitary conditions in the pump room area during operation and maintenance. On some ships, gratings are installed in place of coamings, to prevent contact with sewage or gray water. Equipment such as comminutors, mounted on decks, have similar coamings.

e. Removable drip pans are installed beneath equipment mounted off the deck, which are not located above an enclosed coaming area. The drip pans aid in the detection of possible leakage and prevent any leakage from creating an unsanitary condition.

f. Removable drip pans or coamings are provided to catch, contain, and detect possible leakage from valves or takedown joints in health sensitive areas such as:
   1. Food storerooms.
   2. Food preparation or messing areas.
   3. Spaces where utensils are stored or washed.
   4. Medical and dental spaces.
   5. Spaces where leakage can reach bilges contacting potable water tank boundaries.
   6. In berthing spaces when valves are located above or immediately adjacent to bunks.

g. Wash-up facilities, including a sink with potable water, soap, and hand drying facilities, are located in or near the system pump rooms and other dedicated spaces. In some cases, where hot water is impractical, only cold potable water may be present. Cold water is adequate to provide the necessary sanitation when used with soap.

h. A firemain hose connection is provided in the system pump rooms for wash down of the space in the event of leakage, a spill, or general clean up.

i. Health warning placards are posted in appropriate locations (deck connections, system pump rooms, etc.) identifying procedures to be followed in those areas.

j. A locker stocked in accordance with the requirements of Allowance Equipage Lists (AELs) 2-360044010 (Sewage CHT System Personnel Protective Gear) and 2-360044011 (Sewage System CHT Operations Accessories) is located at the entrance to MSD system pump rooms. Typical items in the spill locker include (but are not limited to) the following:
   1. Coveralls, Disposal Type I (Commercial Item Description (CID) A-A-55196A) - select appropriate size(s)
      Small, NSN 8415-01-092-7529
      Medium, NSN 8415-01-092-7530
      Large, NSN 8415-01-092-7531
      X-large, NSN 8415-01-092-7532
      XX-large, NSN 8415-01-092-7533
   2. Goggles, Industrial
      NSN 4240-00-203-3804
   3. Face shield, Industrial
      NSN 4240-00-764-5152
   4. Boots, Rubber (CID A-A-50371) - select appropriate size(s)
      Size 6, NSN 8430-00-147-1032

Size 7, NSN 8430-00-147-1033
Size 8, NSN 8430-00-147-1034
Size 9, NSN 8430-00-147-1035
Size 10, NSN 8430-00-147-1036
Size 11, NSN 8430-00-299-0342
Size 12, NSN 8430-00-147-1038
Size 13, NSN 8430-00-882-5490

5. Laundry Bags, Canvas
6. Impermeable Rubber Gloves (MIL-G-12223) - select appropriate size(s)
   X-Small, NSN 8415-00-753-6550
   Small, NSN 8415-00-753-6551
   Medium, NSN 8415-00-753-6552
   Large, NSN 8415-00-753-6553
   X-large, NSN 8415-00-753-6554
7. Trash Bags, Plastic, Laundry Size
   NSN 8105-00-070-9496
8. Detergent, Liquid Stock, Type I (MIL-D-16791)
   NSN 7930-00-282-9699
9. Mop, Cellulose Sponge
   NSN 7920-00-728-1167
10. Bucket, Steel, 16 quart
    NSN 7920-00-926-5243
11. Paper Towels, Disposable
12. Disinfectants
    Betadine Surgical Soap, NSN 6505-00-994-7224
    Wescodyne (CID A-A-1440), NSN 6840-00-782-2691
    Povidone-Iodine Solution, NSN 6505-00-914-3593

Stock numbers are subject to change. Check other sources such as the AFLOAT SHOPPING GUIDE for the latest NSN information. The following label plate information shall be attached to the front of the locker:

WARNING

This locker is for storage of cleaning gear and protective clothing only. Do not store soiled protective clothing or gear. Wash cleaning gear (mops, buckets, etc.) thoroughly before returning to locker.

593-4.3.3 SANITARY AND HYGIENIC PROCEDURES The sanitary and hygienic practices described in the following paragraphs shall be adhered to.

a. Personnel who connect or disconnect sewage and gray water transfer hoses shall not subsequently handle potable water hoses.

b. Personnel who connect or disconnect sewage and gray water hoses shall wear rubber gloves, rubber boots, and coveralls.

c. When performing maintenance, which requires disassembly of sewage or gray water equipment or when contact with sewage or gray water is possible, rubber gloves, rubber boots, eye/face shields and coveralls shall be worn. Before beginning maintenance, several plastic laundry-size bags shall be brought to the maintenance area. Upon completion of maintenance, the area and components shall be washed down with hot potable water and stock detergent and rinsed with seawater or fresh water. Personnel shall then move from the immediate

maintenance area and remove protective clothing. Protective clothing shall then be placed in the plastic bags, with rubber boots and gloves going in one bag, and with fabric clothing going in another bag. Rubber boots and gloves shall be washed in hot potable water and stock detergent, and shall be rinsed with an approved disinfectant solution listed in the following paragraph. Fabric protective clothing may receive normal laundering. In no case shall maintenance personnel walk through living, eating, working, or any manned spaces still wearing protective clothing, boots, or gloves. Before leaving the maintenance area, personnel shall thoroughly wash hands, lower arms, and face, in that order, with hot water and soap using the wash-up facilities provided in the area.

d. Personnel working in sewage or gray water spaces or on sewage and gray water system equipment shall not smoke, eat, or drink before a thorough wash up with hot water and soap.

e. Personnel exposed to sewage and gray water or those who work in sewage or gray water spaces, or with MSDs, shall keep basic immunizations current in accordance with NAVMED P-5010-7 Manual of Naval Preventive Medicine, Chapter 7, Wastewater Treatment and Disposal Ashore and Afloat and NAVMED P-117 Manual of the Medical Department

f. In the event spaces become contaminated with sewage or gray water as a result of leaks, spills, or system backflow, the space shall be evacuated immediately and the medical department notified of the spill. The spill area shall be secured from traffic, and the ship's Gas Free Engineer shall test the area to ensure that the atmosphere is within acceptable gas limits as described in paragraph 593-4.3.4.1.1, step b. A safety watch with respiratory protection (preferably that specified in paragraph 593-4.3.4.1.1, step c, or if unavailable, a Supplied Air Respirator/Self-Contained Breathing Apparatus (SAR/SCBA) or air-line mask) shall be posted at the compartment access during cleanup. The spill shall then be removed or washed down. Respiratory protection shall be used if the atmosphere is not within acceptable limits. If the atmosphere is within acceptable limits, cleanup may be accomplished without respiratory protection; however, respiratory protection shall be kept on hand during the cleanup. The area shall be recertified as gas free at least every two (2) hours and every hour for ambient temperatures above 32.2° C (90° F) or more frequently if deemed necessary by the Gas Free Engineer. The ship's Gas Free Engineer shall determine the need for temporary ventilation. A final washdown shall be accomplished with hot, potable water and stock detergent. In addition, food service spaces, berthing areas, and medical spaces shall be treated with an approved disinfectant such as NSN 6840-00-753-4797, Disinfectant, Germicidal and Fungicidal Concentrate (Phenolic Type); or NSN 6840-00-526-1129, Disinfectant, Germicidal and Fungicidal Concentrate (Iodine Type). To be effective, these agents shall be used according to the instructions printed on the labels.

g. Each time sewage or gray water transfer operations are terminated and the hose is disconnected, the deck discharge connection, components, and immediate area shall be washed with hot potable water and stock detergent, and rinsed with seawater or potable water.

h. The deck discharge connection shall be periodically checked during sewage and gray water transfer operations to ensure that the connection is intact and that an unsanitary condition is not developing.

i. All sewage and gray water system components (such as valves, pumps, comminutors, and fitted flanges) shall be checked periodically for leakage. Sewage and gray water pump mechanical seals have a zero leakage requirement past the secondary seal. Replace the mechanical seal, if any leakage is detected past the secondary seal into the pump room per paragraph 593-4.5.6. Where drip pans are installed, the pans shall be checked periodically for sewage or gray water accumulations. Sewage and gray water system inspection requirements, including frequency, shall be according to NAVMED P-5010-7 Manual of Naval Preventive Medicine, Chapter 7, Wastewater Treatment and Diposal Ashore and Afloat, and the applicable MRC.

j. In cases where sewage or gray water pumps are located in main or auxiliary machinery spaces, or above bilges contacting potable water tanks, the pump area will incorporate a small sump with a sump pump or eductor within the pump coaming. The sump will also have a sump high-level alarm. The sump and the alarm system

shall be checked periodically for proper operation in accordance with the applicable MRC. The sounding of the high level alarm indicates that one or a combination of problems has occurred:

1. Excessive leaage within the coaming.
2. Failure of the sump pump or eductor to operate. Immediate action shall be taken to identify and correct the problem.

k. Bilges contaminated with sewage or gray water should be pumped out, washed down with a fire hose, and pumped out again. If potable water tanks form the floor of the bilge, daily bacteriological monitoring of the water from those tanks shall be promptly initiated and continued until it is assured that contamination of the tanks has not occurred. Furthermore, if the potable water system is suspected of being contaminated, the appropriate tanks should be secured until the water is determined to be safe for consumption.

l. Planned Maintenance System (PMS) for Sewage or Gray water Systems. The regular accomplishment of planned maintenance on the any sewage or gray water system is essential to ensure that the system remains in proper working order and that no health or safety hazards develop. MRCs are available which completely describe all the required planned maintenance actions for sewage and gray water systems. When performing planned maintenance, it is essential that all safety precautions and procedures described on the MRCs be strictly followed. In addition, personnel shall become familiar with, and follow, all precautions described in paragraphs 593-4.3.1 and 593-4.3.2 before conducting any sewage or gray water system maintenance. If these procedures cannot be followed due to some equipment malfunction, do not attempt the maintenance. This maintenance shall be deferred until suitable industrial facilities are available. If necessary, divert drains overboard and deactivate the system until such facilities are available.

593-4.3.4 HOLDING TANK OR COMPONENTS ENTRY Sewage and gray water system holding tanks and the associated piping systems (drain and transfer pipes) are considered Immediately Dangerous to Life or Health (IDLH) spaces. As a result, approval from the Commanding Officer is required prior to opening any sewage or gray water system holding tank or pipe. In addition, the procedures provided in the following paragraphs must be followed to open or enter sewage or gray water system holding tanks or piping system for maintenance or repair.

593-4.3.4.1 Large Holding Tank Entry Procedures for inspection and maintenance of sewage or gray water systems requiring large holding tank (CHT systems on all ships, VCHT systems on large ships, treatment type MSDs) entry or the removal of components are discussed in the following paragraphs. No personnel shall attempt this maintenance unless they have thoroughly read these procedures and the safety precautions outlined in paragraph 593-4.3.1. Inspection and maintenance requiring entry into smaller sewage or gray water holding tanks (submarines, VCHT systems on combatants or smaller ships, receiving tanks) shall follow procedures in paragraph 593–4.3.4.1.3.

WARNING

PERMANENT METAL INTERNAL HOLDING TANK ACCESS LADDERS IN HOLDING TANKS SHALL NOT BE USED. TEMPORARY LADDERS AND SAFETY HARNESSES SECURED TO A POINT EXTERNAL TO THE HOLDING TANK SHALL BE USED BY ALL PERSONNEL ACCESSING HOLDING TANKS, EXCEPT AS NOTED BELOW. IF PERMANENT METAL INTERNAL HOLDING TANK ACCESS LADDERS MUST BE USED DUE TO THE NATURE OF WORK OR DESIGN OF

Warning - *precedes*

THE HOLD TANK, THE ENTIRE PERMANENT METAL INTERNAL ACCESS LADDER ASSEMBLY SHALL BE INSPECTED, WHILE USING A SAFETY HARNESS SECURED TO A POINT EXTERNAL TO THE HOLDING TANK, TO VERIFY STRUCTURAL INTEGRITY PRIOR TO USE, AND ALL PERSONNEL USING THE PERMANENT METAL INTERNAL ACCESS LADDER AFTER INSPECTION SHALL USE A SAFETY HARNESS SECURED TO A POINT EXTERNAL TO THE HOLDING TANK.

593-4.3.4.1.1 Inspection and Maintenance Requiring Holding Tank Entry Sewage and gray water system holding tanks shall be cleaned and inspected in accordance with the current maintenance cycle or when the holding tanks must be entered for other required repairs. Cleaning of the holding tank shall be accomplished as outlined in the following paragraphs, or by using dry bacteria cultures as outlined in Uniform Industrial Process Instruction (UIPI) 5931-453, Sewage System (CHT) Tank Cleaning; Dry Bacteria Culture Cleaner. UIPI 5931-453 is an industrial process not authorized for ship's force accomplishment. The holding tank inspection shall be conducted only at a suitable facility where proper industrial assistance is available. Arrangements shall be made in advance with the Facility Production Engineering, Gas Free Engineering, and Industrial Hygiene Departments, or their equivalents, for the services of a qualified Gas Free Engineer and for design and installation of the necessary temporary ventilation. Re-coating of holding tanks or repair of coatings, where required, shall be accomplished in accordance with the requirements of NSTM Chapter 631V1, Preservation of Ships in Service - General. Installed zinc anodes shall be renewed in accordance with the requirements of NSTM Chapter 633.

WARNING

SHIP FORCE SHALL NOT ENTER THE SEWAGE OR GRAY WATER HOLDING TANK OR OPEN THE MANHOLE ACCESS AT ANY TIME UNLESS THIS IS DONE AT A SUITABLE INDUSTRIAL FACILITY AND UNLESS ALL REQUIREMENTS CITED IN PARAGRAPHS 593-4.3.4 HAVE BEEN MET OR THE HOLDING TANK HAS BEEN CLEANED AND CERTIFIED GAS FREE BY THE GAS FREE ENGINEER IN ACCORDANCE WITH NSTM CHAPTER 074, VOLUME 3 (GAS FREE ENGINEERING). IF PROBLEMS DEVELOP THAT PREVENT SEWAGE OR GRAY WATER SYSTEM OPERATION AND REQUIRE HOLDING TANK ACCESS FOR CORRECTION, DIVERT ALL SEWAGE AND GRAY WATER DRAINS OVERBOARD AND SECURE THE SEWAGE OR GRAY WATER SYSTEM UNTIL PROPER FACILITIES ARE AVAILABLE. REPAIR THE SEWAGE OR GRAY WATER SYSTEM AT THE EARLIEST OPPORTUNITY.

a. Before proceeding, the Production Engineering and Industrial Hygiene Departments, or their equivalents, shall ensure that the exhaust ventilation, approved by the ship's Gas Free Engineer and discharging to the weather, is installed as close as possible to the holding tank access or the intended holding tank opening. The wash down and Gas Free procedures in this paragraph and paragraph 593-4.3.4.1.2, shall be observed as follows:

1. Secure all sanitary spaces draining to affected tank if in port. Divert all sewage and gray water drains overboard if at-sea. Provide safety tags for valves as required.
2. Secure or isolate all heads, fountains, or drains as required.
3. Ensure valve in the holding tank overflow discharge line is open.
4. Operate aeration system if available.
5. Pump out the holding tank completely. When pump suction is lost, turn off pump.
6. Open holding tank wash down valve and fill holding tank until water is observed coming from overflow overboard discharge. Secure wash down system.
7. Repeat steps 5 and 6.
8. Repeat step 5.
9. Secure air supply.
10. Secure sewage and gray water pump isolation valves.

WARNING

TOXIC GASES MAY EXIST IN HOLDING TANK. DO NOT OPEN UNTIL CERTIFIED GAS FREE. OBSERVE NO-SMOKING REGULATION. DO NOT ALLOW OPEN FLAME, ORDINARY ELECTRIC LIGHTS, FLASHLIGHTS, REGULAR TOOLS, OR SPARKING ELECTRICAL APPARATUS IN OR NEAR OPEN HOLDING TANK UNTIL SAFETY IS CERTIFIED BY GAS FREE ENGINEER.

b. The holding tank shall be immediately inspected by the Gas Free Engineer, while observing the precautions outlined in the following paragraph. A GAS FREE certificate shall be issued as required by NSTM Chapter 074, Volume 3. Particular attention shall be paid to hydrogen sulfide, explosive gases, carbon dioxide, and oxygen levels. If the holding tank is not gas free, close the holding tank and repeat the wash down procedure outlined in paragraph 593-4.3.4.1.1, step a. until the holding tank can be certified GAS FREE and safe. Acceptable gas limits are:

1. Hydrogen sulfide --less than 10 parts per million
2. Carbon dioxide --less than 5,000 parts per million
3. Oxygen --shall be at least 20 percent
4. Explosive gases --below 10 percent of lower explosive limit

c. Holding tanks shall be opened immediately after first acceptable GAS FREE measurements are made, observing the precautions outlined in this paragraph. Spectacle flanges should be used (if installed) in the sewage and gray water inlet lines to the holding tank to prevent inadvertent collection of sewage and gray water. If spectacle flanges are not available, blank flanges should be installed in place of all sewage and gray water inlet line isolation valves upstream of the holding tank. Recertification of holding tanks shall be performed at least every four (4) hours until sludge has been removed at which time the interval may be extended to eight (8) hours. It shall be recognized that even though a holding tank may be certified GAS FREE, toxic gases may remain in the sludge blanket and could be released when the blanket is disturbed. Before opening the holding tank in any manner (e.g. by removal of manhole access covers or liquid level sensor flanges), or removing any valves or components below the highest level of the holding tank overflow, all personnel in the area at the time the opening is made shall wear either of the following:

1. A full-face piece, Supplied Air Respirator/Self-Contained Breathing Apparatus (SAR/SCBA) operated in the pressure-demand mode.

2. A full-face piece airline respirator operated in the pressure demand mode and equipped with an auxiliary self-contained air supply that contains sufficient air to ensure escape. If the ship is underway and if required by an emergency, a SAR/SCBA may be used if approved by the Commanding Officer.
   A second person shall be on hand to lend assistance as required. All personnel required to wear respiratory protection shall be medically qualified and trained in accordance with local requirements prior to using the protection equipment. Personnel shall also ensure that exhaust ventilation approved by the ship's Gas Free Engineer is installed and operating before opening the holding tank in any way.

d. The Gas Free Engineer shall establish and ensure ventilation requirements are maintained in accordance with NSTM Chapter 074, Volume 3, Section 21.

e. Once forced ventilation of the holding tank has been established for 30 minutes, the Gas Free Engineer shall re-test the space outside the holding tank to determine whether respiratory protection is still required outside the holding tank.

f. Before the holding tank is entered, clean (remove sludge blanket, if required) as thoroughly as possible, using a fire hose or manually-controlled high-pressure water-cleaning nozzle. Care must be taken not to damage internal holding tank equipment such as level sensors. Open the pump isolation valves and pump out holding tank as necessary during the cleaning procedure. Close the pump isolation valves and secure the pumps after completion of this procedure.

g. Measurements shall be repeated by the Gas Free Engineer after the accomplishment of paragraph 593-4.3.4.1.1, step f. When the holding tank is certified GAS FREE and safe, personnel may enter, using respiratory protection as specified in paragraph 593-4.3.4.1.1, step c and the internal metal holding tank access ladder precautions as specified in paragraphs 593-4.3.4.1.1, step h and 593-4.3.4.1.1, step i. Personnel entering the holding tank shall wear coveralls, boots, gloves, and head covering. If the holding tank is found to be unsafe, continue ventilation until it can be certified GAS FREE and safe. A safety harness and tending line shall be used if only a single person enters the holding tank. If more than one person enters the holding tank, the tending line shall not be used, but personnel shall keep in constant sight or touch of one another. Station a safety watch with a spare respirator outside the holding tank to lend assistance if required.

h. A temporary ladder and a safety harness secured to a point external to the holding tank shall be used to access holding tanks when the permanently installed access ladders are metallic in construction. If the temporary ladder is sufficient to perform all required tasks, the permanent metal access ladder shall not be used. If use of the permanent metal access ladder is required, the temporary ladder and safety harness shall be used to gain access to and verify the condition of the permanent metal access ladder in accordance with paragraph 593-4.3.4.1.1, step i. If the design of the holding tank prevents use of temporary ladders, the existing permanent metal access ladder can be used with the following precautions: an approved safety harness secured to a point external to the holding tank shall be used, appropriate safety procedures shall be followed by all personnel, and the permanent metal access ladder assembly shall be inspected in accordance with paragraph 593-4.3.4.1.1, step i prior to continued use.

i. Inspection/testing of permanent metal access ladder assemblies shall include visual inspection of each ladder section, all fasteners and supports, and load testing, if required, of the ladder assembly as described below. This inspection and testing shall take place from temporary ladders using a safety harness secured to a point external to the holding tank or from the permanent metal access ladder, section by section, top to bottom, using an approved safety harness secured to a point external to the holding tank.
   1. Visual inspection - Visually inspect all ladder component (stringers, treads, fasteners, welds) for deterioration or corrosion. Any components found to have significant areas of corrosion or deterioration shall cause the ladder to be taken out of service until the problem component is repaired or replaced.
   2. Dissimilar metal component inspection - Inspect ladders and fasteners to identify any dissimilar metals. Carbon steel fasteners should not be used with stainless steel ladders and vice versa. Although new or replacement stainless steel installations should use identical alloys for both ladders and fasteners, use of

304 or 316 stainless steel fasteners with any existing 304 or 316 stainless steel ladder is acceptable. This inspection can be accomplished using a magnet. Annealed or condition a 304 and 316 stainless are non-magnetic or weakly magnetic. Both may appear black after exposure to the environment. Any dissimilar material components shall be replaced immediately or scheduled for replacement at next industrial period requiring holding tank repairs.

3. Load test - A load test can be performed if deemed necessary. For reference, treads on newly manufactured ladders shall be load tested to 250 pounds.

j. Upon entering holding tank, personnel shall accomplish the following:

1. Inspect tank for sludge deposits. If minor sludge deposits are present, physically remove the deposits and exit the tank. Then proceed to paragraph 593-4.3.4.1.1, step l.
2. If major deposits remain, exit tank and accomplish the cleaning procedure specified in paragraph 593-4.3.4.1.1, step f. Repeat the cleaning procedure and re-certify tank GAS FREE (paragraph 593-4.3.4.1.1, step k.) until deposits can be physically removed. Then proceed to paragraph 593-4.3.4.1.1, step l.

k. Holding tank shall then be rechecked by the Gas Free Engineer. If the holding tank is found unsafe, continue ventilation until holding tank can be recertified GAS FREE and safe.

l. Once all sludge has been removed and the holding tank has been recertified GAS FREE, work can continue in the holding tank without air-line masks or SAR/SCBAs provided ventilation is continued and the Gas Free Engineer approves.

m. Inspect holding tank internal structure and piping, tank coating, level sensors, aeration and washdown systems, and anodes (where installed). If re-coating is necessary, it shall be done with coating conforming to NSTM Chapter 631. Where the cement filler used to fill pockets or areas where sewage or gray water can collect, has broken away, cement shall be replaced with deck covering latex cement conforming to MIL-D-21631. This cement is not intended to be a covering for the holding tank bottom, but only to fill pockets or areas which would not drain properly as the holding tank is pumped down. Coating shall be applied according to NSTM Chapter 631. Where a cathodic protection system is installed, replace anodes if more than one half the original anode thickness has been lost since the last holding tank inspection.

n. No welding or hot work shall be performed on the holding tank, inside or outside, without a Gas Free Engineer first determining that the holding tank is safe for hot work. After welding is complete, the coating shall be inspected for heat damage and repaired as necessary.

WARNING

SEWAGE AND GRAY WATER HOLDING TANKS MAY CONTAIN TOXIC OR EXPLOSIVE GASES. NO PERSONNEL SHALL ATTEMPT SYSTEM MAINTENANCE UNLESS THEY HAVE THOROUGHLY READ AND BECOME FAMILIAR WITH THE SAFETY REQUIREMENTS AND PRECAUTIONS OUTLINED IN PARAGRAPH 593-4.3.4 AND UNLESS THEY FOLLOW THE SPECIFIC PROCEDURES FOR THIS MAINTENANCE OUTLINED IN THIS MANUAL AND THE APPLICABLE MRCS. IF THESE PROCEDURES CANNOT BE FOLLOWED DUE TO SOME EQUIPMENT MALFUNCTION, THIS MAINTENANCE SHALL BE DEFERRED UNTIL A SUITABLE INDUSTRIAL

Warning - *precedes*
FACILITY BECOMES AVAILABLE. IF NECESSARY, DEACTIVATE THE SYSTEM AND DIVERT DRAINS OVERBOARD UNTIL SUCH FACILITIES ARE AVAILABLE.

593-4.3.4.1.2 Maintenance Not Requiring Holding Tank Entry If maintenance not requiring sewage or gray water holding tank entry, calls for equipment to be removed which will leave an opening in the holding tank (e.g. removal of level sensors or washdown nozzles), or calls for the removal or disassembly of any valve or piping component in the pump room, or anywhere below the highest point of the holding tank overflow piping, the following safety precautions shall be observed. Personnel shall use respiratory protection equipment when performing maintenance described above. Respirators shall be selected from existing shipboard assets using the following order of priority:

1. A full face piece, Supplied Air Respirator/Self-Contained Breathing Apparatus (SAR/SCBA) operated in the pressure-demand mode.
2. A full face piece airline respirator operated in the pressure demand mode and equipped with an auxiliary self-contained air supply that contains sufficient air to ensure escape.
3. A Supplied Air Respirator/Self-Contained Breathing Apparatus (SAR/SCBA). A safety watch equipped with a suitable respirator shall be posted at the access to the pump room while maintenance is being performed.

The procedure for accessing the holding tank, but not entering the holding tank, is provided below:

1. Ensure that the compartment ventilation system is operating properly (both mechanical supply and mechanical exhaust are functioning) and that the compartment access is open. The ship's Gas Free Engineer shall determine if any additional temporary ventilation is required.
2. Ensure that the pump room coaming sump or space eductor is operational and that all valves are properly aligned to evacuate the space. All valves in the eductor discharge line, either to the deck connection station (in-port) or to the overboard discharge (at-sea), shall be open. If a valve or piping is being disassembled or removed, ensure that the valve alignment will not permit the eductor to discharge into the space through the opening in the piping created by the maintenance.
3. Evacuate any contents in the pump room coaming sump.
4. Flush the holding tank and piping by observing steps 1 through 10 of paragraph 593-4.3.4.1.1, step a. This will remove any septic sewage or gray water from the holding tank and discharge piping, and force any hydrogen sulfide at the fluid surface out the holding tank overflow.
5. While using a respirator, the ship Gas Free Engineer shall immediately test the atmosphere in the holding tank to ensure it is within acceptable limits as described in paragraph 593-4.3.4.1.1, step b. If the holding tank atmosphere is not within acceptable limits, repeat step 4 until acceptable gas levels are achieved. Equipment may then be removed with personnel while using a respirator.
6. Equipment should be removed immediately after first acceptable GAS FREE measurements are made. If any evidence of pressurized fluid is found during removal of components, immediately retighten the bolts and identify and secure the source of fluid in the holding tank. Pump out the holding tank and repeat the GAS FREE measurements.
7. Immediately seal openings using either blank flanges or a suitable sealing device.

8. Respirators may then be removed and work continued on the equipment

9. If more than two (2) hours have elapsed since the holding tank was last certified GAS FREE (one (1) hour if the temperature within the tank is above 32.2° C (90° F), the Gas Free Engineer shall recheck the holding tank atmosphere, while using a respirator, before personnel replace failed components. If levels have climbed above acceptable limits repeat step 4 until acceptable levels are obtained. Equipment or components may then be replaced while using respirators.

10. Wash down area with hot potable water and stock detergent.

WARNING

NEVER ASSUME A HOLDING TANK IS EMPTY OR IS NOT DANGEROUS BECAUSE THE HOLDING TANK HAS NOT BEEN IN USE OR BECAUSE DRAINS HAVE BEEN DIVERTED OVERBOARD. SEWAGE OR GRAY WATER CAN UNINTENTIONALLY COLLECT IN THE HOLDING TANK DUE TO FAULTY OR MISALIGNED VALVES. THIS IS A POTENTIALLY LETHAL SITUATION SINCE THE SEWAGE OR GRAY WATER WILL HAVE BEEN PRESENT FOR LONG PERIODS OF TIME WITHOUT AERATION AND CAN CONTAIN LARGE AMOUNTS OF DISSOLVED HYDROGEN SULFIDE. THE SAME IS TRUE OF SEWAGE OR GRAY WATER, WHICH MAY HAVE REMAINED IN THE DISCHARGE PIPING FOR EXTENDED PERIODS. SPILLAGE OF THIS SEWAGE OR GRAY WATER INTO THE SPACE CAN CAUSE INSTANT RELEASE OF LARGE AMOUNTS OF HYDROGEN SULFIDE GAS AND RESULT IN SERIOUS INJURY OR DEATH. DON'T TAKE CHANCES. ALWAYS FOLLOW THE FLUSHING AND GAS FREEING PROCEDURES SPECIFIED IN THIS SECTION BEFORE CONDUCTING THIS TYPE OF MAINTENANCE. IN ADDITION, NEVER ATTEMPT TO DISASSEMBLE ANY VALVE OR COMPONENT IN PLACE IN THE PUMP ROOM OR BELOW THE HIGHEST LEVEL OF THE HOLDING TANK OVERFLOW UNLESS ALL FLUSHING AND GAS FREEING PROCEDURES DESCRIBED HEREIN HAVE BEEN ACCOMPLISHED. THIS MAY RESULT IN SPILLAGE OF SEPTIC SEWAGE OR GRAY WATER IN THE SPACE AND RELEASE OF HYDROGEN SULFIDE GAS.

593-4.3.4.1.3 Inspection and Maintenance Requiring Entry into Small Sewage or Gray Water Holding Tanks Procedures for inspection and maintenance requiring holding tank entry on surface ships are discussed in paragraph 593-4.3.4.1.1. No personnel shall attempt this maintenance unless they have thoroughly read these procedures and the safety precautions outlined in paragraph 593-4.3.1. The requirements for breathing apparatus do not apply to the person entering the holding tank once the holding tank is certified GAS FREE, as outlined by paragraph 593-4.3.4.1.1. However, as a precaution, a second person wearing breathing apparatus should be posted at the holding tank access to lend assistance to the individual entering the holding tank, if required. Procedures for inspection and maintenance requiring tank entry on submarines are provided in paragraph 593-4.3.4.1.4.

a. Inspection and Maintenance Requiring Holding Tank Entry. Sewage and gray water system holding tanks shall be cleaned and inspected in accordance with the current maintenance cycle or when the holding tanks must be entered for other required repairs. Cleaning of the holding tank shall be accomplished as outlined in the

following paragraphs, or by using dry bacteria cultures as outlined in Uniform Industrial Process Instruction (UIPI) 5931-453, Sewage System (CHT) Tank Cleaning; Dry Bacteria Culture Cleaner. This inspection shall be conducted only at a suitable facility where proper industrial assistance is available. Arrangements shall then be made in advance with the Facility Production Engineering, Gas Free Engineering, and Industrial Hygiene Departments, or their equivalents, for the services of a qualified Gas Free Engineer and for design and installation of the necessary temporary ventilation. Re-coating, where required, shall be accomplished in accordance with the requirements of NSTM Chapter 631. Installed anodes shall be renewed in accordance with the requirements of NSTM Chapter 633.

b. Before proceeding, the Production Engineering and Industrial Hygiene Departments, or their equivalents, shall ensure that the exhaust ventilation, discharging to the weather, is installed as close as possible to the holding tank access or the intended holding tank opening. The washdown and GAS FREE procedures in this paragraph, NSTM Chapter 074, Volume 3 (Gas Free Engineering), and applicable system operating instructions shall be observed as follows:

   1. Secure all sanitary spaces and other sources draining to affected tank if in port. Divert all sewage and gray water drains overboard if at-sea. Provide safety tags for valves as required.
   2. Pump out holding tank completely. When pump suction is lost, turn off pump(s).
   3. Open holding tank wash down valve or fill holding tank as necessary until water is observed coming from overflow overboard discharge.
   4. Repeat steps 2 and 3.
   5. Repeat step 2.
   6. Secure pumps and pump isolation valves.
   7. Inspect holding tank in accordance with paragraph 593-4.3.4.1.1, step j. If the holding tank is not gas free and a sludge blanket remains, close the holding tank. Repeat the wash down and cleaning procedures until acceptable gas limits have been met and the sludge blanket is removed.

c. Holding tanks shall be opened immediately after first acceptable GAS FREE measurements are made, observing all safety and health precautions included in this chapter and in NSTM Chapter 074, Volume 3 (Gas Free Engineering). Spectacle flanges should be used (if installed) in the sewage and gray water inlet lines to the holding tank to prevent inadvertent collection of sewage and gray water. If spectacle flanges are not available, blank flanges should be installed in place of all sewage and gray water inlet line isolation valves upstream of the holding tank. Recertification of holding tanks shall be performed as required by NSTM Chapter 074, Volume 3 (Gas Free Engineering).

d. After opening the holding tank, the holding tank shall be force-ventilated continuously as determined by the Production Engineering and Industrial Hygiene Departments or their equivalents. Avoid contamination of the air compressor or ventilation intakes. Once forced exhaust ventilation inside the holding tank is established, ventilation at the holding tank access (or opening) may be discontinued if approved by the Production Engineering and Industrial Hygiene Departments or their equivalents.

e. Upon entering the holding tank, personnel shall physically wash down the holding tank and pump out, as necessary. Maintenance may now be performed in accordance with paragraphs 593-4.3.4.1.1, step m and 593-4.3.4.1.1, step n.

593-4.3.4.1.4 Inspection and Maintenance Requiring Entry into Submarine Sanitary Tanks Inspection and maintenance requiring entry into submarine tanks shall be performed in accordance with UIPI 0593-901, Submarine Sewage System Sanitary Tank, Cleaning Of, and NSTM Chapter 074, Volume 3 (Gas Free Engineering).

593-4.3.5 COMPONENT LABELING AND INFORMATION LABEL PLATES

593-4.3.5.1 Components All sewage and gray water system components are labeled and marked in accordance with NAVSEA Design Criteria Manual for Sewage Collection, Holding and Transfer (CHT) Systems, Chapter 593, December (NAVSEA T9500-AA-PR0-100). Specific requirements are provided below.

a. Piping - Piping which passes through unmanned spaces such as tanks, voids, and cofferdams is marked at least once in each space. Piping in machinery spaces is marked at least twice: at point of entry and point of exit. Drains are marked to show the type of service; that is, sewage drains, gray water drains, garbage grinder drains, and so forth. Outlet piping from diverter valves should be marked ″TO TANK″, ″TO OVBD″, ″TO DECK CONN″, etc. as required.

b. Valves and Remote Operating Gear - Valves and remote operating gear are labeled by service and position for system operating modes and damage control.

   1. Valves that are only operable locally should be labeled as shown (a soil cutout (isolation) valve label example is shown below):

SOIL COV

2-234-2

SOIL - This identifies valve service. Terms to designate service used include SOIL (blackwater, sewage), WASTE (gray water, wastewater), etc.
COV - This identifies valve type. Terms used to designate valve type include COV (isolation), DIV (diverter), or SCUP (scupper)
2-234-2 - Valve location number
Z – Designated damage control classification (as required)

   2. Valves that can be operated locally and remotely should be labeled at the valve and at the remote operator station. Labels should contain the valve type, valve service, valve number, location of the valve, remote operator number, location of the remote operator, and DC classification (as required). At the valve, the label should read as follows (a 3rd deck soil isolation valve example is shown):

SOIL COV

3-234-2
Remote 2-233-2 in 2-225-2-L
Z

SOIL - Valve service
COV - Valve type
3-234-2 - Valve location number
2-233-2 - Remote operator number
2-225-2-L - Remote operator location
Z - Damage control classification (as required)

At the remote operator for a valve that can be operated locally and remotely, a label should be affixed to a bulkhead in close proximity to the deck box should read as follows (a 3rd deck soil isolation valve example is shown):

Remote 2-233-2 for

SOIL COV 3-234-2 in 3-230-2-L
Z

2-233-2 - Remote operator number
SOIL - Valve service

COV - Valve type
3-234-2 - Valve location number
3-285-2-L - Valve location
Z - Damage control classification (as required)

In addition, for valve remote operators equipped with a numbered scale position indicator, the label plate should also include valve position information (scale readings for valve open and close positions). An example of a 3rd deck soil scupper valve that has a valve open position reading of ″0″ and closed position reading of ″15″ is as follows:

Remote 2-231-2 for

SOIL SCUP 3-234-2 in 3-285-2-L
0 - OPEN 15 - CLOSE
Z

2-231-2 - Remote operator number
SOIL - Valve service
SCUP - Valve type
3-234-2 - Valve location number
3-285-2-L - Valve location
0 - Reading on remote operator graduated scale that indicates valve is OPEN.
15 - Reading on remote operator graduated scale that indicates valve is CLOSED.
Z - Damage control classification (as required)

Note: For diverter valves, the terms OVB (overboard), TANK (tank) and DECK CONN (deck discharge station) should be used as required in place of OPEN and CLOSED.

c. Major System Components - Major system components such as pumps and comminutors are provided with separate labels clearly identifying each component by the equipment room number. For example, two pumps set within an equipment room are labeled ″Pump 1A″ and ″Pump 1B″. Corresponding label plates are on the motor controller switches.

593-4.3.5.2 Information Placards. Placards providing specific system operating instructions for all modes of system operation are provided in each pump room space, deck discharge connection station and other dedicated equipment space. NAVSEA T9500-AA-PR0-100 provides details on their fabrication.

The following placard is provided on or in the vicinity of each diaphragm seal-type gage:

WARNING

DO NOT DISASSEMBLE GAGE ASSEMBLY AS THIS WILL RESULT IN LOSS OF SEALED GAGE FLUID AND GAGE FAILURE. IF MAINTENANCE ACTIONS REQUIRE DISCONNECTING THE GAGE ASSEMBLY, DISCONNECT ASSEMBLY AT THE PIPE CONNECTION TO THE DIAPHRAGM SEAL WITH THE GAGE CUTOUT VALVE BETWEEN THE DIAPHRAGM SEAL HOUSING AND THE PUMP PIPING SECURED. AFTER REMOVING THE ASSEMBLY FROM THE PUMP PIPING CONNECTION, INSTALL A THREADED PIPE CAP ON THE OPEN END OF THE PUMP PIPING CONNECTION. IF A GAGE CUTOUT VALVE IS NOT OPERATIONAL OR NOT PROVIDED, DO NOT

Warning-*continued*

Warning - *precedes*

REMOVE THE GAGE ASSEMBLY. WHERE REPAIR REQUIRED, THE COMPLETE GAGE ASSEMBLY SHOULD BE RETURNED TO THE MANUFACTURER OR AUTHORIZED MANUFACTURER REPAIR SERVICE COMPANY.
PUBLICATION NAVSEA S9086–CH-STM-030, CHAPTER 074, VOLUME 3.

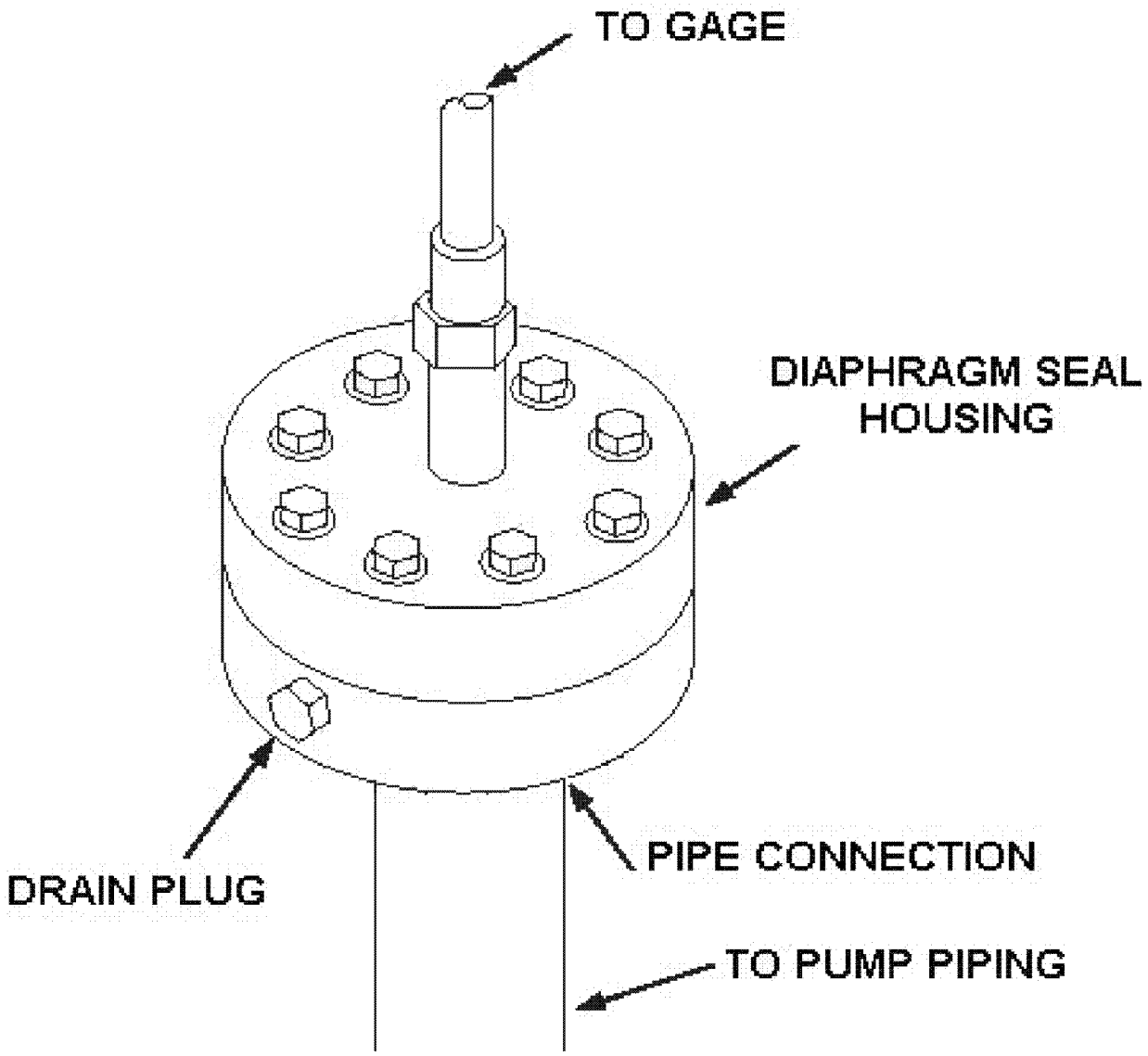


Figure 593-4-2 Diaphragm Seal

The following placard is provided on or in the vicinity of each ring gage isolator or at the ring gauge isolator panel:

WARNING

DO NOT REMOVE RING GAGE ISOLATOR FROM THE PIPING SYSTEM.

TO REPLACE GAGE, CLOSE GAGE CUTOUT VALVE BETWEEN THE RING GAGE ISOLATOR BODY AND GAGE, REMOVE EXISTING GAGE, FILL ISOLATOR BODY WITH 50/50 MIXTURE OF ETHYLENE GLYCOL AND WATER (OR 100% DISTILLED WATER IF ETHYLENE GLYCOL NOT AVAILABLE) UNTIL CONNECTION OVERFLOWS, AND INSTALL NEW GAGE.

IF A GAGE CUTOUT VALVE IS NOT OPERATIONAL OR NOT PROVIDED, GAGE REPLACEMENT SHOULD NOT BE ACCOMPLISHED.

FOR ALL OTHER REPAIRS, OVERHAUL THE ASSEMBLY AFTER IT HAS BEEN SAFELY REMOVED FROM THE PIPING SYSTEM.

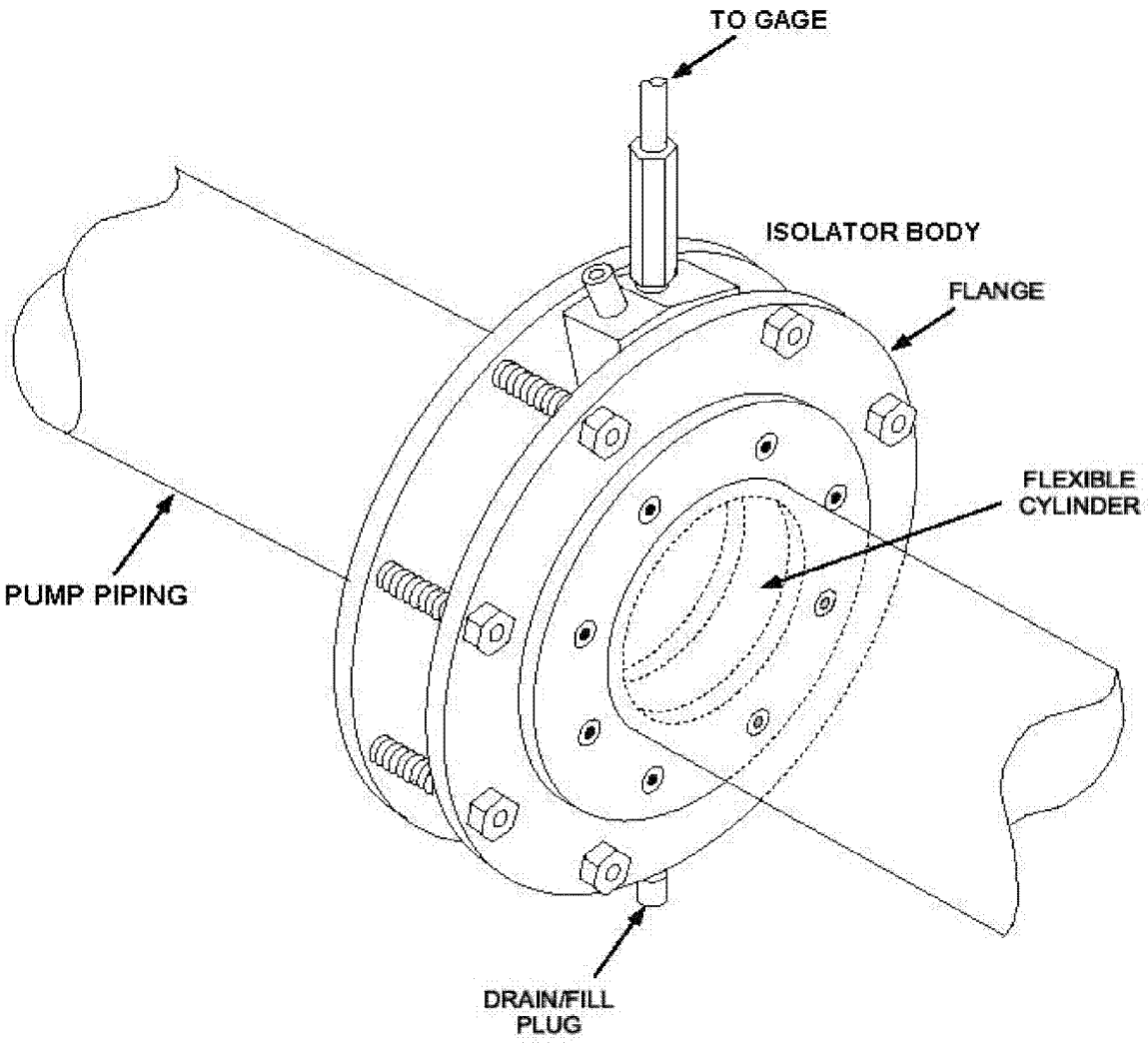


Figure 593-4-3 Ring Gage Isolator

The following placard is posted in a conspicuous place in each sewage equipment space and at each deck discharge connection:

WARNING

PERSONNEL SHALL NOT EAT, DRINK, OR SMOKE WHILE IN THE SEWAGE EQUIPMENT SPACE.

The following placard is placed at the access to each sewage equipment room:

WARNING

1. SEWAGE SPILLS CAN PRODUCE HAZARDOUS GASES.

2. USE EEBD MOUNTED IN PUMP ROOM FOR EMERGENCY ESCAPE IN EVENT OF SEWAGE SPILL.

3. FOLLOW SAFETY PROCEDURES IN NAVAL SHIPS TECHNICAL MANUAL, ENTITLED ″POLLUTION CONTROL,″ PUBLICATION NAVSEA S9086–T8–STM-010/CH-593 DURING MAINTENANCE OR CLEAN UP.

4. USE SAR/SCBA ONLY FOR EMERGENCY RESCUE AND DAMAGE CONTROL (SECURING OF FLOODING).

The following placard is provided in the vicinity of each sewage pump controller for those sewage systems where gravity sewage and waste gray water overboards exist below the holding tank overflow (below the waterline):

CAUTION

When high-level alarm sounds divert upper deck drains overboard and close isolation valves on drains below overboard discharge.

The following placard is provided on or in the vicinity of each sewage holding tank access and receiving tank access:

WARNING

TOXIC OR EXPLOSIVE GASES MAY EXIST IN THE TANK. DO NOT OPEN UNLESS AT A SUITABLE INDUSTRIAL ACTIVITY AND TANK HAS BEEN CERTIFIED GAS FREE IN ACCORDANCE WITH THE REQUIREMENTS OF NAVAL SHIPS TECHNICAL MANUAL, ENTITLED ″GAS FREE ENGINEERING,″ PUBLICATION NAVSEA S9086–T8–STM-010 Chapter 074.

The following placard is provided in each sewage equipment (pump room, comminutor, etc.) space:

WARNING

HEALTH AND SANITARY PRECAUTIONS TO BE OBSERVED PRIOR TO, DURING, AND AFTER SEWAGE PLANT MAINTENANCE:

1. Prior to working on the sewage plant or cleaning a spill, personnel shall:
   a. Obtain stock detergent, buckets, mop and plastic laundry sized bags. These should be placed in the compartment wash up area.
   b. Put on rubber boots, rubber gloves and coveralls.
2. ″ WARNING″ -Personnel shall not eat, drink or smoke while in the sewage equipment space.

3. When maintenance is complete, the area should be rinsed with sea or freshwater, washed down with hot potable water and stock detergent, and rinsed with sea or freshwater.

4. Non-fabric items such as boots, rubber gloves, etc. should be washed in the compartment sink with warm (if available) water and detergent, allowed to dry, and placed in a plastic bag for storage.

5. Coveralls should be removed and placed in plastic bags for normal laundering.

6. Wash hands, lower arms, and face, in that order, with hot potable water and soap.

7. All of the above items should be accomplished prior to leaving the compartment. Personnel engaged in sewage plant maintenance shall not leave the compartment wearing boots, coveralls, or rubber gloves worn during maintenance.

8. After leaving the compartment, personnel should shower with hot water and soap.

9. Should any person during the course of maintenance, become contaminated with sewage such that clothing becomes saturated and wet to the skin, he should follow the procedures cited above, leave the compartment, and shower with hot water and soap.

The following placards are provided at each deck discharge connection:

CAUTION

Do not disconnect sewage hose while it is pressurized. Depressurize hose and secure discharge cut-off valve prior to disconnecting hose.

HOSE HOOK-UP PROCEDURES

1. Rig and connect transfer hose. Ensure camlock hose fitting is in the locked position.
2. Line up sewage pumps for transfer.
3. Open sewage discharge hose connection cut-off valve.

HOSE DISCONNECT PROCEDURES

1. Secure sewage transfer pumps.
2. Flush sewage discharge piping and hoses using fire main flushing connection. Secure fire main flushing valve.
3. Jack open check valves in sewage discharge piping (just downstream of the discharge pumps) to drain lines back to holding tank.
4. Secure pump discharge cut-off valves and reset check valves.
5. Close deck connection cut-off valves.
6. Hook up ship service low-pressure airline to fitting on deck discharge connection (if provided).
7. Open small air valve and blow out hose for 30 seconds.
8. Disconnect sewage hose.

SANITARY AND HEALTH PRECAUTIONS

1. Prior to disconnecting sewage hoses, personnel shall put on coveralls, rubber boots, and rubber gloves.
2. Personnel who connect or disconnect sewage hoses shall not subsequently handle potable water hoses.
3. Personnel shall not eat, smoke, or drink during sewage hose connect or disconnect procedures.
4. After disconnecting sewage hoses, rinse deck discharge connection area and fitting with fresh water or seawater, wash same with hot potable water and stock detergent, and finally rinse with seawater or fresh water.
5. Place boots and rubber gloves in plastic bags for washing in warm water and detergent.
6. Place coveralls in plastic bags for normal laundering.
7. Upon completion of hose connect or disconnect procedures, personnel shall wash hands, lower arms, and face in that order with hot potable water and soap.

Sewage and gray water system diverter valves, in addition to the normal required valve markings, are also labeled as follows with the appropriate service and direction of flow indicated at the diverter valve outlets: Gravity drainage valves -″ **TO TANK** ″ and ″ **TO OVBD** ″

The following placard is placed over all service sinks in sewage equipment serviced by an eductor or sump pump:

WARNING

ACTIVATE SPACE EDUCTOR OR SUMP PUMP PRIOR TO USING SERVICE SINK. SECURE EDUCTOR OR SUMP PUMP BEFORE LEAVING SPACE.

The following placard is placed over photographic and x-ray chemical drainage sinks:

WARNING

PHOTOGRAPHIC WASTES ARE HIGHLY CORROSIVE AND CAN DAMAGE PLUMBING DRAINS. DILUTE PHOTOGRAPHIC WASTES BEFORE DISPOSAL AND FLUSH WITH LARGE QUANTITIES OF WATER.

The following placard is placed over battery acid sinks:

WARNING

BATTERY ACID WASTES ARE HIGHLY CORROSIVE AND CAN DAMAGE PLUMBING DRAINS. NEUTRALIZE BATTERY ACID WASTES BEFORE DISPOSAL AND FLUSH WITH LARGE QUANTITIES OF WATER.

593-4.4 SEWAGE AND GRAY WATER SUBSYSTEMS

593-4.4.1 FLOODING ALARM SYSTEM. This system is installed to indicate flooding resulting from improper operation, malfunction or failure of pumps, valves or fittings. For a dedicated sewage or gray water pump room, equipment space or containment coaming, a minimum of one liquid level switch, type IC/R-1-U is installed at the lowest point, approximately two (2) inches from the deck. All switches installed in one compartment are connected in parallel to activate a single alarm sensor line. Some installations, CG-47 Class for example, have a terminal box in the monitored space provided with a visual indicator (red light), audible indicator (buzzer) and buzzer cutout switch. Most installations are only provided with a type IC/SM alarm switchboard installed in a normally manned location. For surface ships, the switchboard is installed in a space such as damage control central or propulsion control, and for submarines, the maneuvering control station. Summary audible and visual extension alarms are provided as required (such as in the Pilot House and at each OOD Station).

593-4.4.2 HYDROGEN SULFIDE ALARM SYSTEM. A hydrogen sulfide (H_2S) alarm system (see Figure 593-4-4) is installed for each sewage system pump room on all ship classes except DDG-51 and MCM-1 Classes (efforts to backfit H_2S alarm systems to DDG-51 and MCM-1 Classes are ongoing). The H_2S alarm system is designed to continuously monitor for the presence of hydrogen sulfide, and provide immediate notification of that presence. The fixed H_2S alarm system consists of detector heads installed at various locations in the sewage system pump room, local visual and audible alarms within the sewage pump room and outside the sewage pump room near the sewage pump room access, an H_2S system control unit near the sewage pump room access, and remote visual and audible alarms located in Damage Control Central or another continuously manned space. Where permanently installed hydrogen sulfide alarm systems are not installed, refer to Section C of paragraph 593-4.3.4.1.1.

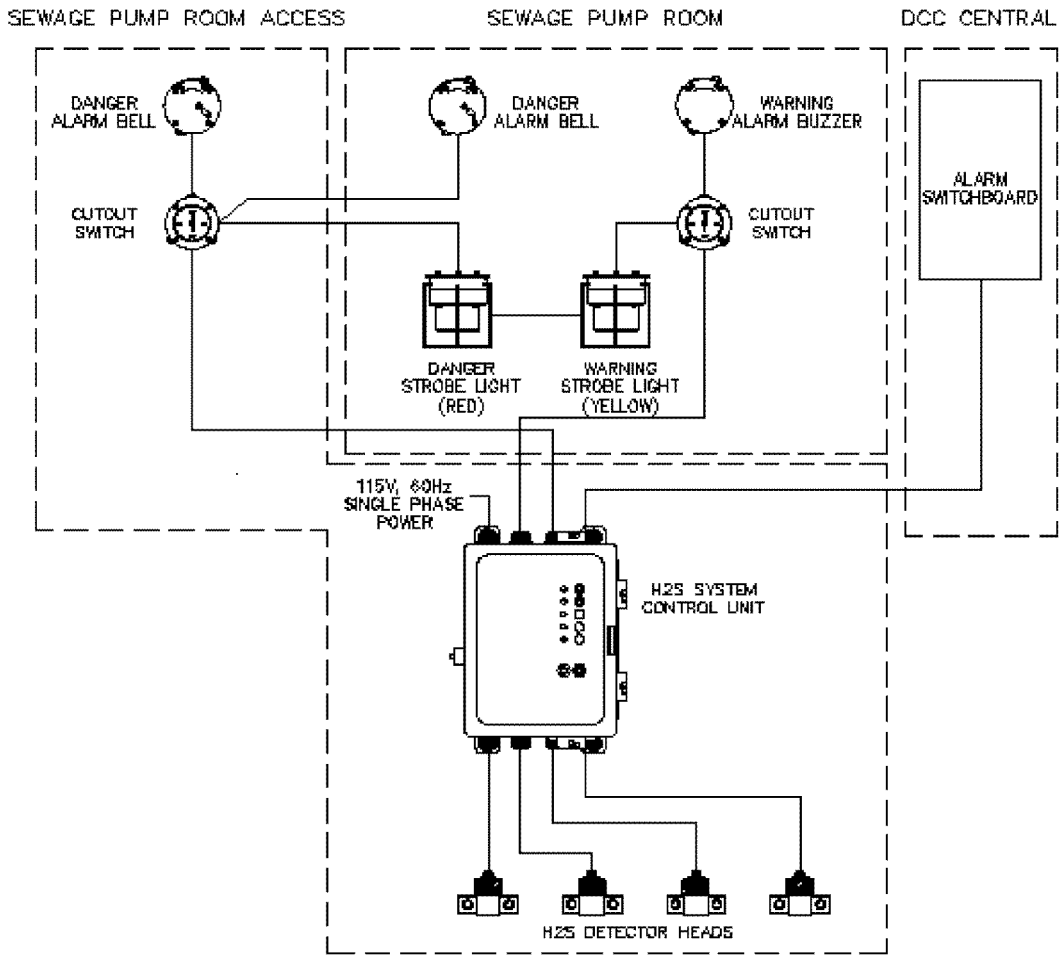


Figure 593-4-4 Hydrogen Sulfide Alarm System

593-4.4.2.1 System Detectors. Detectors are installed as follows:

1. Above the recessed sump, inside the transfer pump containment coaming.
2. At the forced ventilation exhaust duct terminal inside the pump room.
3. Two detectors are installed near valves and other possible sources of H_2S gas leakage located outside the containment coaming.

593-4.4.2.2 Alarm Set Points. The H_2S gas detector system control unit activates visual and audible alarms when the H_2S concentration reaches the following set points:

10 ppm - WARNING alarm set point

50 ppm - DANGER alarm set point

If the WARNING alarm is activated, personnel should report this condition to the DCA immediately. If the DANGER alarm is activated, personnel should leave the monitored space IMMEDIATELY. The space can only be re-entered if wearing respiratory protection or after it has been certified gas-free by the Gas Free Engineer.

593-4.4.2.3 Local Alarms. Local visual and audible alarms are activated within the pump room, and outside the pump room near the pump room access. Visual alarm indicators are yellow lights for WARNING and red lights for DANGER. Visual lights in the pump room are flashing strobe lights. Indicator lights on the H_2S gas detector control unit glow during alarm set point conditions. The local audible alarms are a buzzer that is activated during a WARNING condition and, a bell and buzzer that are activated during a DANGER condition. A bell and buzzer are installed in the pump room with a cutout switch to silence the buzzer. A bell and cutout switch are installed outside the pump room, near the pump room access. The cutout switch outside the pump room silences the bell in the pump room and the bell near the pump room access. All local DANGER and WARNING strobe lights and indicator lights remain illuminated until the DANGER or WARNING condition is cleared.

593-4.4.2.4 Remote Alarms. Some ship classes are equipped with remote visual and audible alarms located in Damage Control Central or another continuously manned space.

593-4.4.2.5 Warning Placards. A warning placard is installed in a highly visible location in each pump room inscribed as follows:

WARNING

FLASHING RED LIGHT AND BELL ALARM. LEAVE THIS SPACE IMMEDIATELY. TOXIC H_2S GAS DANGER. USE EEBD (EMERGENCY ESCAPE BREATHING DEVICE) WHERE ESCAPE IS DELAYED. FLASHING YELLOW LIGHTS AND BUZZER. LOW LEVELS OF TOXIC H_2S GAS PRESENT. LEAVE THIS SPACE. REPORT TO DCA.

A warning placard is installed at the access to each pump room near the H_2S alarm control unit indicator lights, inscribed as follows:

WARNING

RED LIGHT AND BELL ALARM OR YELLOW LIGHT INDICATES TOXIC H_2S GAS LEAKAGE. DO NOT ENTER WITHOUT RESPIRATORY PROTECTION OR UNTIL COMPARTMENT HAS BEEN CERTIFIED GAS FREE BY THE GAS FREE ENGINEER.

593-4.4.2.6 System Maintenance. The system is maintained and calibrated in accordance with the system's Planned Maintenance System (PMS) and technical manual.

593-4.4.3 AIRFLOW ALARM SYSTEM. The airflow alarm system (typical system shown in Figure 593-4-5) is installed to provide a means of activating audible and visual alarms when the rate of air flow decreases below a selected level for sewage pump rooms or equipment spaces where hazardous substances (hydrogen sulfide) could present an explosive fire or toxic hazard.

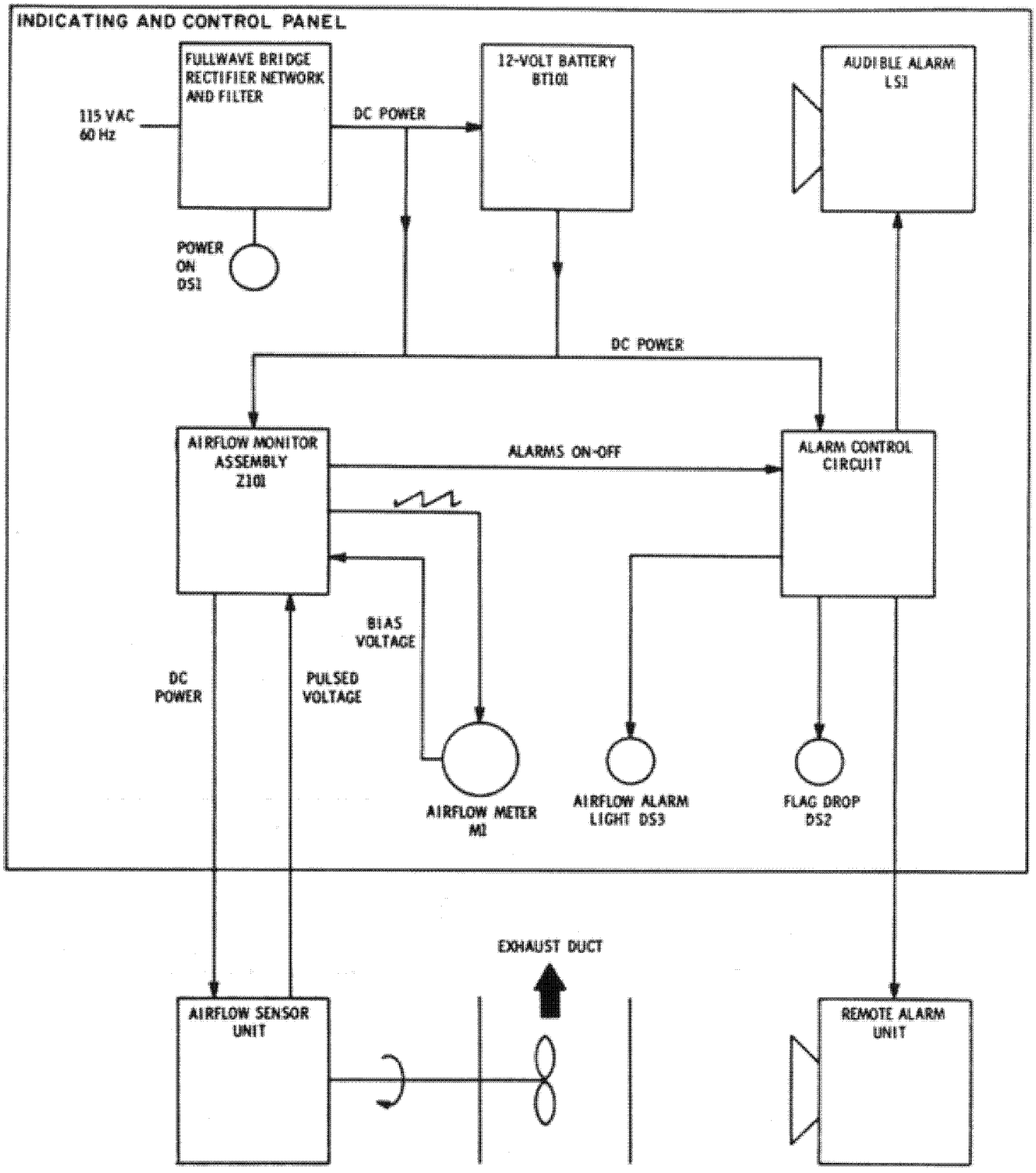


Figure 593-4-5 Airflow Alarm System

The installation for each compartment consists of an airflow sensor (for systems using airflow sensors) and an indication and control panel. The airflow sensor is in the exhaust duct of each compartment and connected to the indication and control panel located external to the compartment and adjacent to the access. An extension

audible and visual alarm capability is provided in Central Control Station, or in the EOS for ships not having a Central Control Station. Airflow remote alarm units (Figure 593-4-6) are typically installed in pump rooms to provide an audible indication of a low airflow condition.

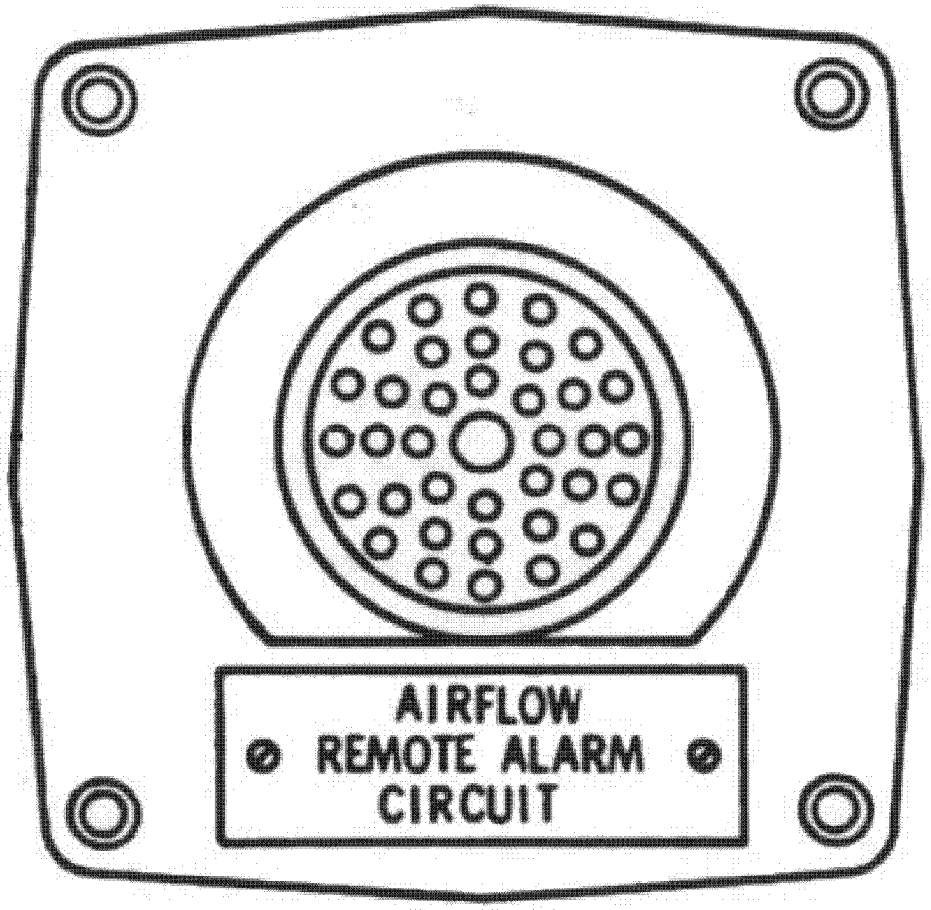


Figure 593-4-6 Airflow Remote Alarm Unit

For airflow alarm systems using airflow sensors, the airflow rate setting for actuating the alarm should be set to 50 percent of the protected compartment's design airflow. Design airflow information should be documented in the ship's drawings and can be obtained from the ship's planning yard.

There are three kinds of airflow alarm systems used in the fleet. The first type of airflow alarm systems uses a pinwheel-type airflow sensor (Figure 593-4-7) mounted in the exhaust duct of the sewage pump room ventilation system. As the rotor (pinwheel) of the sensor rotates due to airflow in the exhaust duct, a pulsed voltage is developed that is proportional to the rpm of the rotor. This pulsed voltage is sent to the indication and control panel (Figure 593-4-8) where it is monitored and converted to an analog signal for use by the indication and control panel in monitoring airflow.

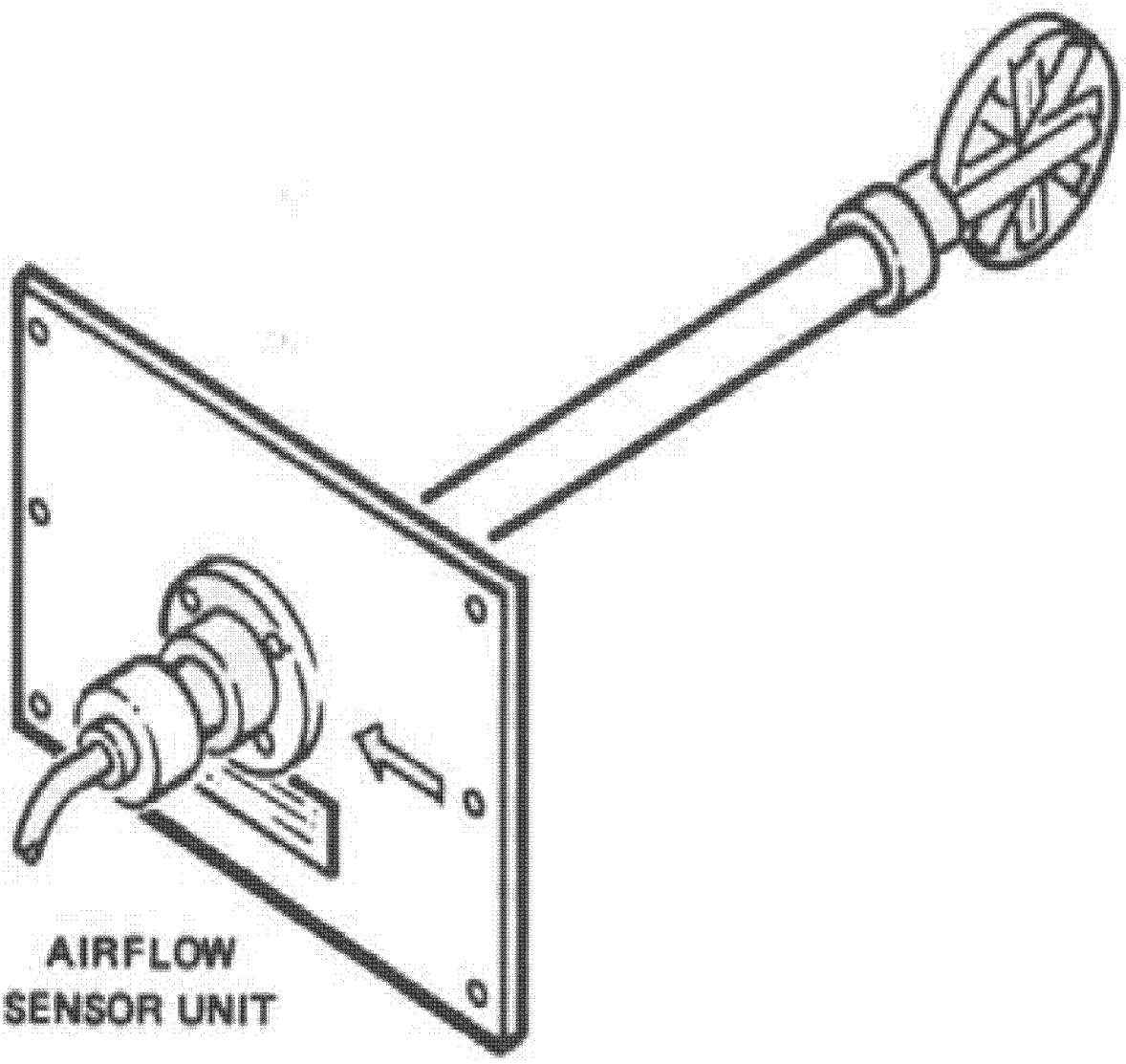


Figure 593-4-7 Pinwheel-type Airflow Sensor

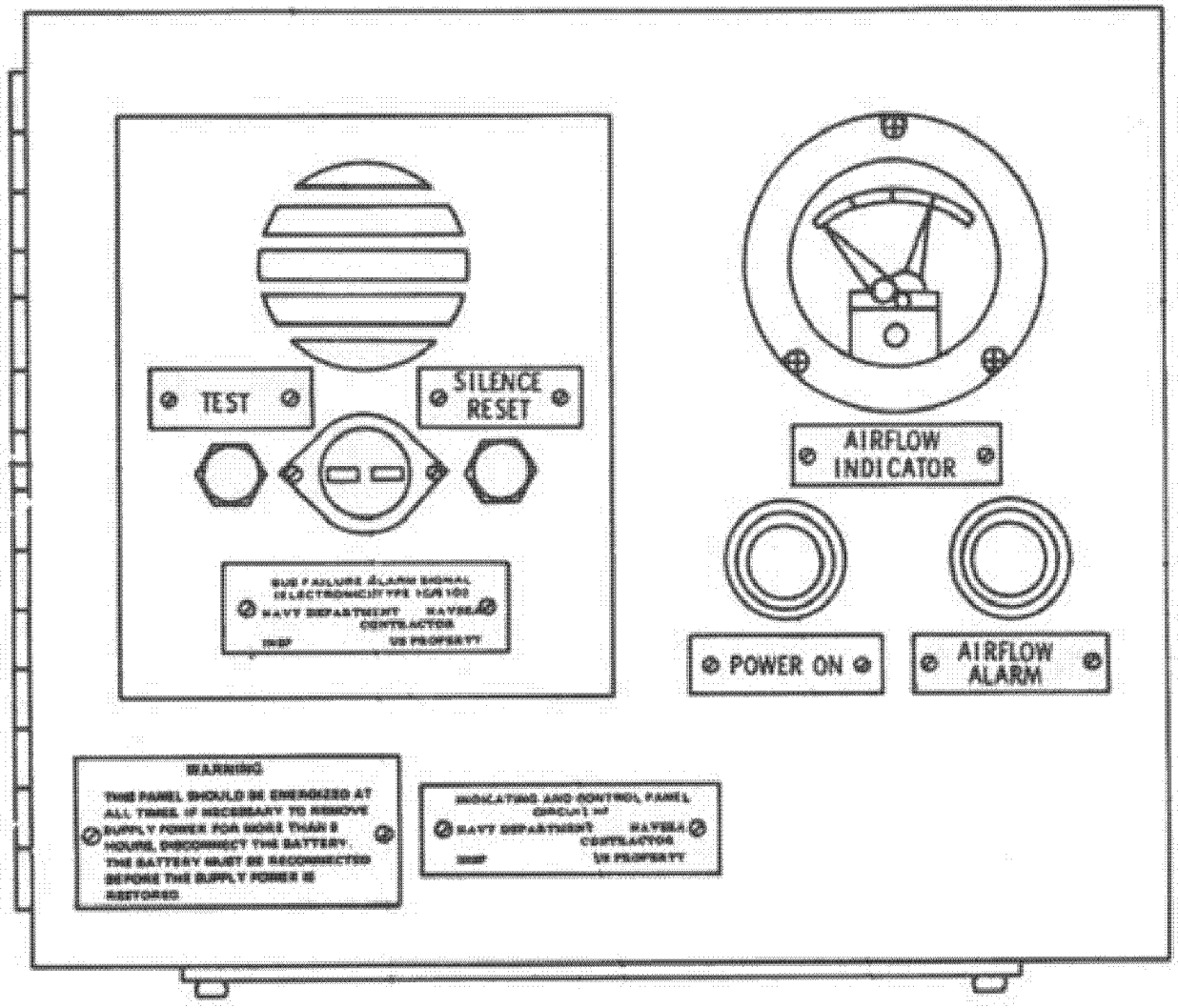


Figure 593-4-8 Airflow Indication and Control Panel

This type of airflow indication and control panel contains an airflow indicator (meter), power and alarm lights, pushbuttons for testing the panel and silencing audible alarms as well as output connections for remote alarm units.

The second type of airflow alarm systems uses a resistive thermal device (RTD)- type airflow sensor (Figure 593-4-9). The RTD sensor measures the temperature changes in the exhaust duct due to changes in airflow. This data is then processed by the airflow indication and control panel's (Figure 593-4-10) microprocessors for use in monitoring the airflow.

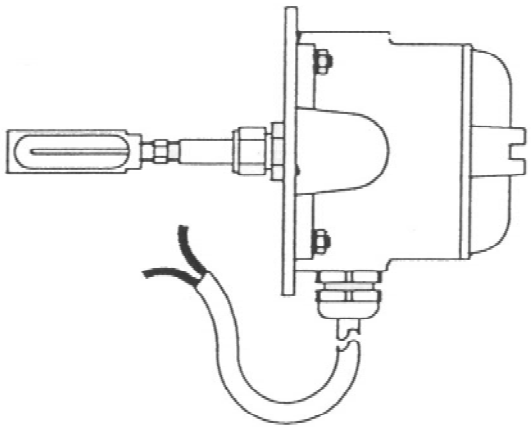


Figure 593-4-9 RTD-type Airflow Sensor

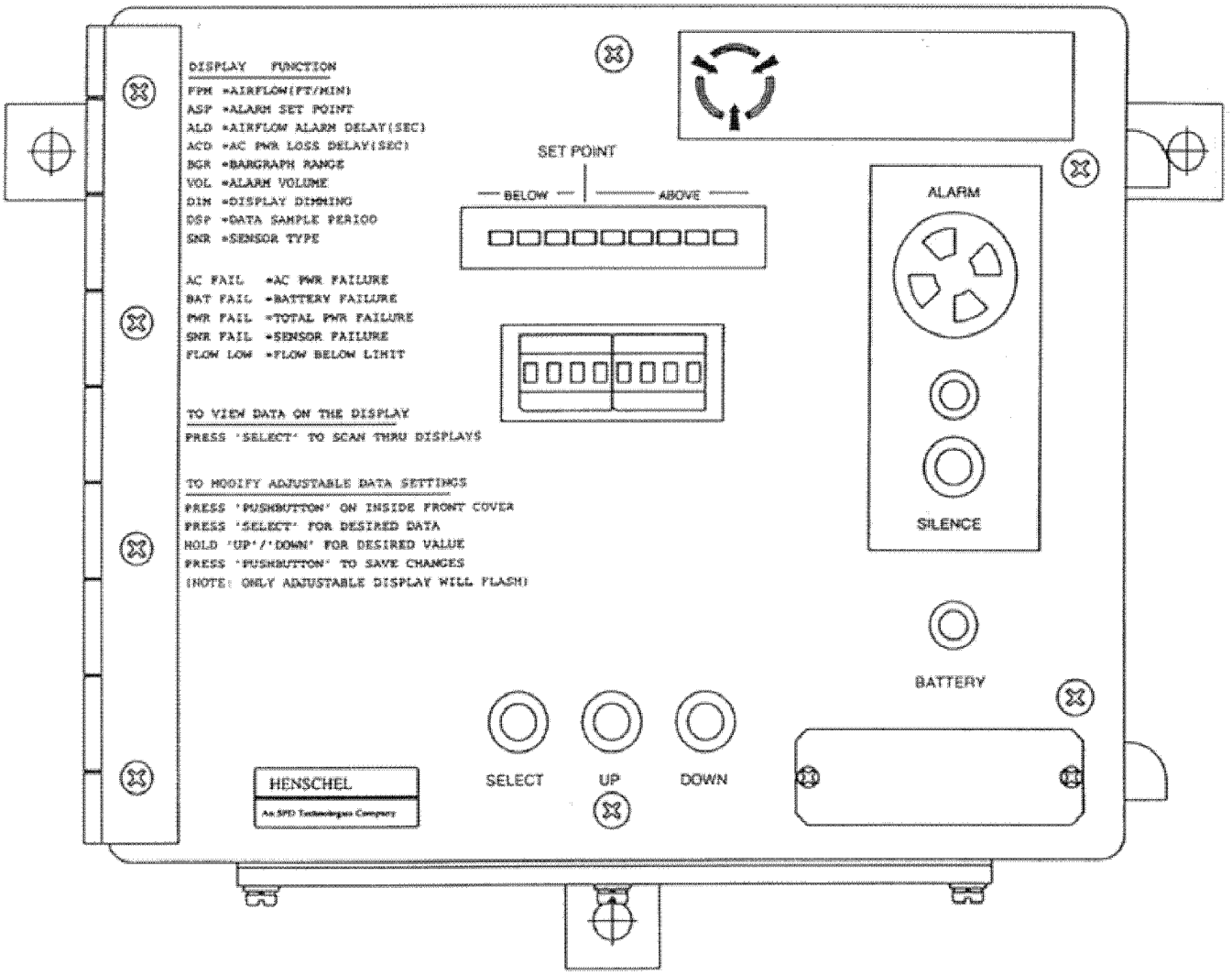


Figure 593-4-10 Airflow Indication and Control Panel

This type of airflow indication and control panel contains LEDs for displaying airflow set point, battery status, alarm conditions, and various pushbuttons for programming, testing, silencing audible alarms, as well as output connections for remote alarm units.

The third type of airflow alarm system is based on operation of the ventilation supply and exhaust system blower motors not actual airflow. When either motor is not energized, visual and audible alarms are energized on an indicating panel located at the access to the sewage pump room. This system is installed on DDG-51 Class ships.

For all three types of airflow alarm systems, a label placard is installed in a conspicuous location on the exterior of the access door to the monitored compartment. The placard is to be inscribed as follows:

WARNING

ALARM INDICATES LOW AIR FLOW IN VENTILATION SYSTEM SERVING THIS COMPARTMENT. TAKE IMMEDIATE ACTION TO

Warning - *precedes*

RESTORE VENTILATION. DO NOT ENTER WITHOUT RESPIRATORY PROTECTION OR UNTIL COMPARTMENT VENTILATION HAS BEEN RESTORED FOR AT LEAST 15 MINUTES. EVACUATE THE COMPARTMENT IMMEDIATELY UPON SOUNDING OF ALARM.

593-4.4.4 FIREFIGHTING. Fire fighting equipment (15 pound CO2 bottle, fire main station) is provided in or near sewage and gray water system spaces. Personnel are reminded that the sewage and gray water holding tanks may contain toxic or combustible gases that can present an added hazard in an emergency situation (see NSTM Chapter 074, Volume 3, Gas Free Engineering).

593-4.4.5 COMMUNICATIONS. A telephone connection to the ship internal communication system is provided in the pump room, at the continuously manned remote location where the high level alarm is located, and at deck discharge connection. This system allows each station to communicate with the remaining stations.

593-4.5 MAINTENANCE AND REPAIR

593-4.5.1 SYSTEM PIPING BLOCKAGES. The character of human waste and seawater used for flushing (in some cases) combined with various sewage system characteristics (reduced flow volumes, small diameter piping, reduced flow velocities) tend to accelerate scale build-up in the drain piping. This scale consists mostly of calcium carbonate ($CaCO_3$), which crystallizes on the pipe walls as a result of the reaction between chemicals in seawater and human waste. This calcium carbonate scale is extremely hard and cannot be completely removed by conventional mechanical cleaning procedures. Foreign objects, garbage, or grease can also block drains. Practices and procedures for limiting blockages from sources other than calcium carbonate are provided in NSTM Chapter 505, Piping Systems.

593-4.5.2 PIPE SYSTEM CLEANING. There are three NAVSEA approved methods for cleaning scale from sanitary system piping. These three methods are hydroblasting (see 593-4.5.2.1), system acid/chemical cleaning (see 593-4.5.2.2), and component acid cleaning (see 593-4.5.2.3 and 505-4.1.2.11). Hydroblasting uses high-pressure water to pulverize scale. System acid/chemical cleaning removes scale by circulating an approved chemical thru the system piping until the piping is scale free. Component acid cleaning removes scale by soaking a section of piping in an acid solution to dissolve the scale.

593-4.5.2.1 Hydroblast Cleaning. Procedures for hydroblasting ship class and specific ship sanitary systems are included in various Hydroblast Planning Documents. These documents provide detailed hydroblasting procedures, specific to a class or specific ship's individual sanitary system piping configuration. The procedures in the applicable Hydroblast Planning Documents must be strictly followed. Hydroblast Planning Documents can be obtained through the Shipboard Environmental Information Clearinghouse (SEIC) at www.navyseic.dt.navy.mil.

593-4.5.2.1.1 Hydroblast Equipment. Hydroblasting involves the use of a high-pressure waterjet machine, which provides flow pressures of up to 10,000 pounds per-square inch gauge (psig) at the source. Operational and maintenance procedures for the waterjet machine are included in NAVSEA technical manual 0910-LP-074-7800, Cleaning CHT Piping Systems with High Pressure Water Jet Equipment Model WBD-150N. Repair and overhaul procedures for the waterjet machine are included in NAVSEA technical manual 0951-LP-037-6010.

593-4.5.2.1.2 Hydroblasting Procedure. High-velocity water jets from the waterjet machine are introduced into the piping through a flexible lance and nozzle. The impact of the water against the pipe interior pulverizes any scale or debris. During this operation, the piping itself is not pressurized. By limiting the lance feed rate to a maximum of one foot-per-minute (ft/min) the scale is pulverized and removed from the pipe walls. A prolonged, up to 12 hour, seawater flush of the piping after hydroblasting flushes the pulverized scale from the system. The hydroblast process requires clean-out fittings at 50-foot intervals in the piping for hydroblast lance access, to minimize hydroblast pressure losses, and to maintain maximum cleaning effectiveness. Custom hydroblast fittings (spectacle flanges, hydroblast suction and discharge assemblies) are also required in the comminutor/pump rooms. See Figure 593-4-11. These fittings can be also be used for chemical cleaning (see 593-4.5.2.2).

WARNING

THE SPECTACLE FLANGE AND HYDROBLAST SUCTION AND DISCHARGE ASSEMBLIES ARE FOR INDUSTRIAL WORK ONLY. THE SPECTACLE FLANGE SHOULD NEVER BE TOUCHED BY THE SYSTEM OPERATORS/SHIP'S FORCE. THE SPECTACLE FLANGE SHOULD BE INSTALLED WITH THE OPEN END IN LINE WITH THE PIPING DURING NORMAL OPERATIONS. IF THE SPECTACLE FLANGE IS INSTALLED WITH THE CLOSED END IN LINE WITH THE PIPING DURING NORMAL OPERATIONS, DO NOT ATTEMPT TO ROTATE THE SPECTACLE FLANGE TO THE OPEN POSITION. OBTAIN INDUSTRIAL ASSISTANCE TO RESTORE THE SPECTACLE FLANGE TO THE OPEN POSITION. HYDROBLAST SUCTION AND DISCHARGE ASSEMBLIES SHOULD BE REMOVED AND PERMANENT PIPE CAPS INSTALLED ON THE CLEANOUTS DURING NORMAL OPERATIONS. OTHER SYSTEM PIPING CLEANOUTS SHOULD ALSO HAVE PERMANENT PIPE CAPS INSTALLED DURING NORMAL OPERATIONS.

The design and location of these fittings are specified in the applicable Hydroblast Planning Document and are installed on most ships. Intermediate maintenance activities, tenders, shipyards, and other industrial activities, including some private contractors, have the capability to conduct hydroblast pipe cleaning. In order to schedule system hydroblasting, an OPNAV 4790/2K should be submitted to the appropriate Regional Maintenance Center (RMC). This will ensure that hydroblast cleaning is properly scheduled and that the appropriate Hydroblast Planning Document is made available.

593-4.5.2.1.3 Quality Assurance for Hydroblasting. It is important to perform quality assurance procedures to inspect the cleaned piping after hydroblasting and flushing. Perform a visual inspection by opening cleanouts and looking inside horizontal piping runs with a flashlight. Use a mirror and flashlight to inspect vertical piping runs. Piping should be clear of all scale deposits and no pulverized scale should remain in the pipe. An electro-optic remote visual inspection (RVI) video probe (borescope) can also be used to inspect the interior of the piping. Prior to approval of the hydroblasting job, a 48-hour operational test should be performed, under normal operating conditions, to ensure there are no back-ups throughout the system. The piping inspection and operational testing should be witnessed by the cleaning activity or contractor, the applicable SUPSHIP, and ship's force Repair Officer.

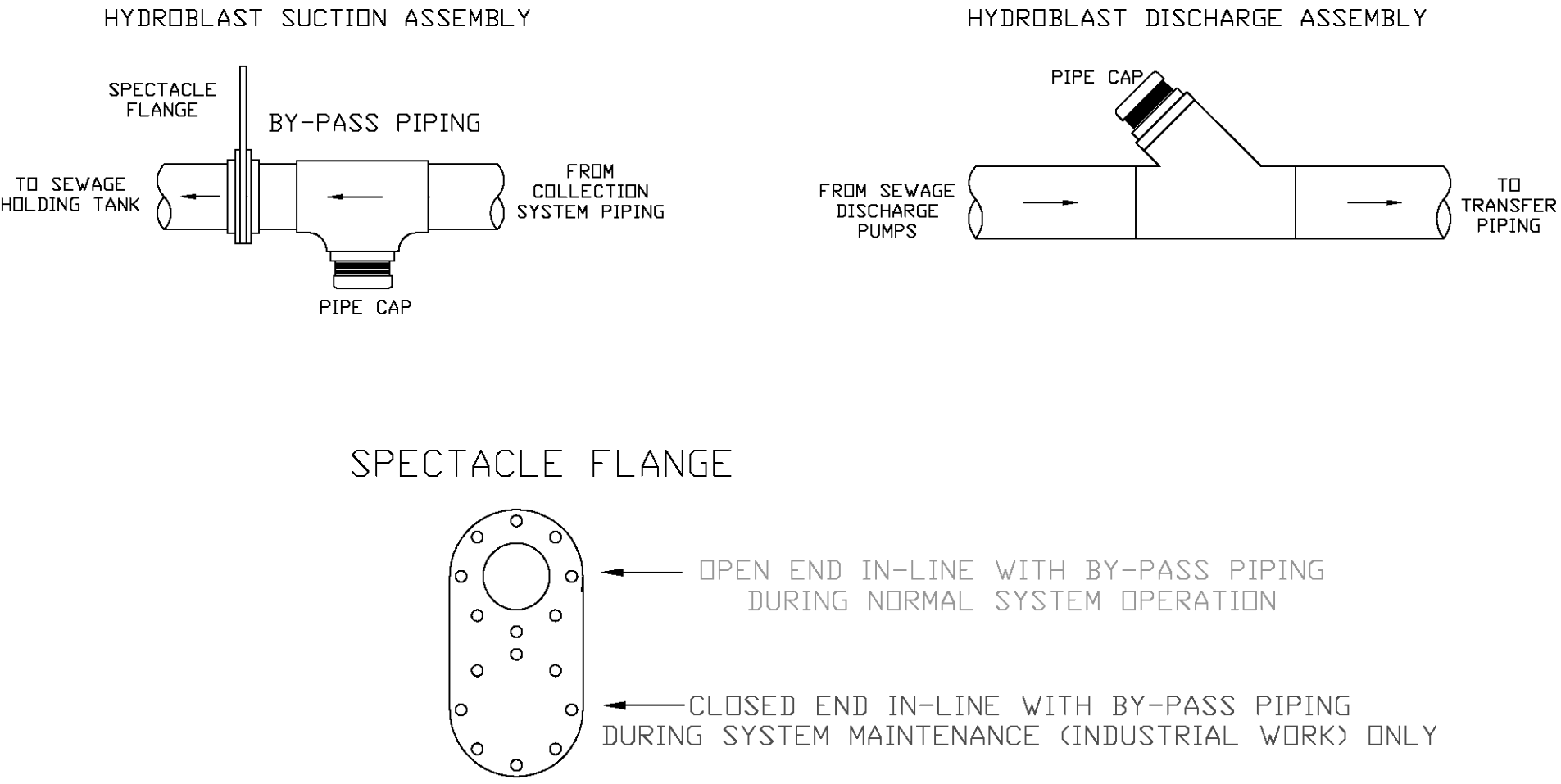


Figure 593-4-11 Custom Hydroblast Fittings

593-4.5.2.2 Acid/Chemical Cleaning. Sanitary system piping acid/chemical cleaning can only be performed by NAVSEA-approved contractors or qualified Navy shipyards. NAVSEA-approved standard procedures or NAVSEA approved contractor proprietary procedures must be used for all acid/chemical cleaning evolutions. All chemicals used for cleaning hard scale deposits from collection piping on U.S. Navy surface vessels must meet the requirements established in Uniform Industrial Process Instruction (UIPI) 5281-450 - Chemical Cleaning of Hard Scale Deposits on Soil Collection System Piping on U.S. Navy Surface Ships. In addition, contractor performing chemical cleanings on U.S. Navy surface ships must comply with the requirements established in CDN-SWC-TM-63-00/117, NSWCCD LTR Ser 631/131 of 10 April 2000: Performance Requirements for the Chemical Cleaning of Sanitary Waste System Piping on Navy Surface Ships by Contractor or Industrial Activity Resources.

WARNING

THE SPECTACLE FLANGE AND HYDROBLAST SUCTION AND DISCHARGE ASSEMBLIES ORIGINALLY INSTALLED FOR HYDROBLAST CLEANING CAN BE USED FOR CHEMICAL CLEANING. THESE FITTINGS ARE FOR INDUSTRIAL WORK ONLY. THE SPECTACLE FLANGE SHOULD NEVER BE TOUCHED BY THE SYSTEM OPERATORS/SHIP'S FORCE. THE SPECTACLE FLANGE SHOULD BE INSTALLED WITH THE OPEN END IN LINE WITH THE PIPING DURING NORMAL OPERATIONS. IF THE SPECTACLE FLANGE IS INSTALLED WITH THE CLOSED END IN LINE WITH THE PIPING DURING NORMAL OPERATIONS, DO NOT ATTEMPT TO ROTATE THE SPECTACLE FLANGE TO THE OPEN POSITION. OBTAIN INDUSTRIAL ASSISTANCE TO RESTORE THE SPECTACLE FLANGE TO THE OPEN POSITION. HYDROBLAST SUCTION AND DISCHARGE ASSEMBLIES SHOULD BE REMOVED AND PERMANENT PIPE CAPS INSTALLED ON THE CLEANOUTS DURING NORMAL OPERATIONS. OTHER SYSTEM PIPING CLEANOUTS SHOULD ALSO HAVE PERMANENT PIPE CAPS INSTALLED DURING NORMAL OPERATIONS.

593-4.5.2.2.1 Acid/Chemical Cleaning Waste Disposal. All acid/chemical-cleaning evolutions must include complete and proper disposal of all cleaning procedure wastes by the contractor or shipyard performing the cleaning. If the cleaning procedure includes use of the ship's holding tanks to hold and/or neutralize acid/chemical cleaning waste, the ship should ensure that the holding tank is completely emptied, flushed of all waste, all removed equipment re-installed, and the tank restored to its original operating condition prior to the contractor or shipyard leaving the ship.

593-4.5.2.2.2 Acid/Chemical Cleaning Quality Assurance. It is important to perform quality assurance procedures to inspect the cleaned piping after acid/chemical cleaning. Perform a visual inspection by opening cleanouts and looking inside horizontal piping runs with a flashlight. Use a mirror and flashlight to inspect vertical piping runs. Ensure all piping from individual fixtures to the holding tank is completely clear of all scale deposits. Use an electro-optic remote visual inspection (RVI) video probe (borescope) to inspect the interior of the piping. The borescope should show at least fifteen (15) feet of piping beyond the entry point. Prior to approval of the acid/chemical cleaning job, a 48-hour operational test should be performed under normal operating conditions to ensure there are no problems with the system. The piping inspection and operational test should be witnessed by the cleaning contractor or shipyard, the applicable SUPSHIP, and ship's force Repair Officer.

593-4.5.2.3 Component Acid Cleaning. This procedure shall only be used to clean scale from pipe sections that can be removed from the system and acid-soaked separate from the system.

WARNING

PERSONNEL ENGAGED IN CHEMICAL ACID CLEANING TREATMENT SHALL OBSERVE SAFETY PRECAUTIONS. RUBBER GLOVES AND A FULL FACE PIECE AIR-PURIFYING RESPIRATOR EQUIPPED WITH FILTER (DUST, FUME, AND MIST) SHALL BE WORN DURING HANDLING OF DRY ACID OR DRY NEUTRALIZING COMPOUNDS AND MIXED SOLUTIONS. IF CLEANING SOLUTION COMES IN CONTACT WITH THE SKIN, THE AFFECTED AREA SHALL BE THOROUGHLY WASHED WITH SOAP AND WATER. IF CLEANING SOLUTION COMES IN CONTACT WITH EYES; THE EYES SHALL BE RINSED THOROUGHLY WITH CLEAN WATER AND MEDICAL ATTENTION IMMEDIATELY OBTAINED. HANDS AND ALL EXPOSED SKIN SHALL BE THOROUGHLY WASHED WITH SOAP AND WATER AT THE CONCLUSION OF THE ACID CLEANING PROCEDURE.

593-4.5.2.3.1 Cleaning Procedure. In the acid cleaning process, cleaning is done by soaking the pipe section in an acid solution as follows:

1. Remove pipe section that is to be cleaned.
2. Fill a bucket or suitable container with the acid solution described below.
3. Submerge pipe section that is to be cleaned in the acid solution.
4. Before mixing acid, estimate the volume of acid needed. In a drum, slowly add dry sulfamic acid scale removing compound (NSN 6850-00-637-6142) to hot fresh water in the ratio of eight (8) pounds (about 14 cups) of acid for each four (4) gallons of water. Stir until acid is completely in solution. To reduce foaming, add 3/4 ounces of anti-foam solution similar to Dow Corning Anti-Foam B or G.E. Anti-Foam 60 to each five (5) gallons of solution.
5. Soak the component until all visible reaction has stopped, or for four (4) hours, whichever occurs first.

WARNING

The scale-removing compound contains a chemical indicator, which imparts a light red color to the fresh solution. As the acid reacts with scale, the color changes to orange and finally to yellow, at which time 95 percent of the acid has been consumed.

6. When the soaking period is completed, neutralize the waste solution (with pipe section still submerged) by adding the same number of cups of dry neutralizing compound, anhydrous soda ash, CID A-A-59563, NSN 6810-00-262-8567 as dry sulfamic acid originally used. Let stand 15 minutes and then properly dispose of neutralized solution
7. Flush the pipe section thoroughly with seawater and inspect. Inspect the pipe section. If scale remains, the acid treatment should be repeated as necessary.

593-4.5.3 SCALE PREVENTION. Pipe scale forms inside shipboard sanitary piping when calcium and other minerals present in human waste and flushing water precipitate and bond to the pipe wall. The formulation of hard scale (calcium carbonate) eventually blocks sanitary drains. Drain piping which experiences severe scale blockage should be hydroblasted or acid/chemically cleaned according to paragraph 593–4.5.2. Several maintenance procedures and preventive methods are available for scale prevention.

593-4.5.3.1 Urinal Citric Acid Tablets. The primary product used for scale prevention is the urinal citric acid tablet. The citric acid tablet should be placed alone in each urinal (no dispenser required). These actions are outlined in the applicable MRCs. The citric acid tablet national stock number is NSN 6810-01-362-0042. The citric acid tablet will dissolve slowly as the urinal flushing water flows over the tablet. The chemical action of the acid should retard the formation of calcium carbonate scale on the wall of soil piping. Urinal bowls shall have one non-depleted citric acid tablet in the urinal at all times in order to gain full benefit from the procedures. Only when a tablet has dissolved approximately 90% should a new tablet be added. It should be noted that although residual acid may dissolve existing scale, the use of acid is not considered to be a corrective maintenance procedure. Scale prevention product usage is most effective when it follows a system hydroblast or acid/ chemical cleaning. Citric acid tablets should not be used on ships equipped with biological treatment systems as the tablets could upset the biological colonies.

593-4.5.3.2 Polyolefin Piping. Use of the citric acid tablets, while successful in reducing scale development, accelerates deterioration of brass urinal tailpieces and p-traps. As a result, polyolefin piping components (in accordance with ASTM F412) are approved for limited use on ships using citric acid tablets. Only urinal tailpieces and p-traps are allowed to be changed from brass to polyolefin.

WARNING

Under no circumstances should polyolefin piping be installed outside sanitary spaces. Under no circumstances should other plastic materials (such as PVC or GRP) be used in place of polyolefin.

593-4.5.3.2.1 Polyolefin Parts Information. Allowance Parts List (APL) 679990237 provides NSNs for all polyolefin components required to replace brass tailpieces and p-traps.

593-4.5.3.3 Flushometer Maintenance. Proper dilution of human waste assists in scale prevention. Routine maintenance of urinal and water closet flushometers in accordance with applicable MRCs will ensure proper dilution of human waste. It will also ensure that sewage-holding times are not adversely effected.

593-4.5.3.4 Urinal Removal. Removal of urinals from sanitary spaces can alleviate some problems associated with scale development. However, removal of urinals without prior approval and without documenting the change through SHIPMAIN or other appropriate means is not authorized or recommended by NAVSEA. Further guidance is provided in section 593-4.2.3.2.

593-4.5.3.5 Other Scale Prevention Products. MIL-PRF-32217 is the performance specification for scale prevention in sewage collection, holding, and transfer (CHT) and vacuum CHT (VCHT) piping systems for use on NAVAL surface ships. Products that have met the qualification requirements of this specification are approved for use in scale prevention on surface ships and listed under the Qualified Products List (QPL-32217) for MIL-PRF-32217. This list of approved products can be reviewed at http://assist.daps.dla.mil/quicksearch/ .

593-4.5.4 CLEANING PRODUCTS. Cleaning products used on sanitary fixtures (urinals and water closets) and other fixtures/drains served by sewage and gray water systems (sinks, showers, sanitary space deck drains) can have a detrimental effect on sewage and gray water system piping. The use of deodorant cakes (in urinals), and silica-based scouring powders and pine oil type cleaning products on any fixture served by a sewage or gray water system accelerates the formation of pipe scale. These products should not be used in or on shipboard fixtures served by sewage or gray water systems.

593-4.5.4.1 The recommended cleaning products (cleaners/disinfectants) for these fixtures can be found in the Authorized Chemical Cleaning Products and Dispensing Systems Catalog, U.S. Navy Surface Ship (Non-Submarine) (see paragraph 593-9.7). The recommended cleaner for use on submarines can be ordered under the following NSNs:

Description	NSN
55 gallons	7930-01-346-4290
5 gallons	7930-01-347-0490
Gal Containers (6)	7930-01-346-4289
This cleaner is intended for use in various dilutions for varying cleaning purposes:	
Cleaning Purpose	Dilution
Urinals/Water Closets	One to 10
Decks	One to 24
Sinks/Showers	One to 48

(Dilution based on product to water ratio.)

593-4.5.4.2 Sulfamic Acid. Sulfamic acid described in paragraph 593-4.5.2.3.1. or the cleaning products described in paragraph 593-4.5.4.1. may be used for removing scale deposits and stains from porcelain fixtures.

593-4.5.4.3 The use of commercial chemicals or any chemicals other than those described in paragraphs 593-4.5.2.2, 593-4.5.2.3.1., 593-4.5.3.1 and 593-4.5.4.2 in any portion of the drainage system is prohibited.

593-4.5.5 PIPING INSPECTION AND REPAIR Early detection and correction of piping system problems is very important. Personnel safety and the operational reliability of the sewage and gray water systems requires that piping be in proper condition. Inspections of sewage and gray water system piping shall be conducted in accordance with Planned Maintenance System (PMS) requirements and NSTM Chapter 505. Procedures and criteria for inspecting, repairing and replacing sewage and gray water system piping are provided in the following paragraphs. Epoxy coated discharge piping (see paragraph 593-4.5.5.3) does not require inspections as described herein (due to the significantly extended life associated with epoxy coated discharge piping, and the fact that currently used methods of piping inspection (ultrasonic testing) will not detect the failure mode (pinhole leaks) associated with the epoxy coating).

593-4.5.5.1 Discharge Piping Replacement. This section provides guidance for determining when sewage or gray water pump discharge piping should be replaced due to corrosion-induced wall thickness reductions. NSTM Chapter 505 defines the allowable pipe wall thickness. NSTM Chapter 505 paragraph 505–1.5.1.3 provides an equation for determining minimum allowable wall thickness accounting for pipe size, service, operating pressure, and strength of material and normal operating temperature. Inspection of the piping is accomplished according to NSTM Chapter 505, paragraph 505–1.3.4 through 505-1.4.1.

593-4.5.5.1.1 Replacement Criteria. For purposes of sewage and gray water discharge piping replacement, the operating pressure is considered to be 125 psi, which is the maximum allowable fire main pressure for discharge pipe/hose washdown connections. The strength of materials (or maximum allowable stresses) is provided by Table 505-1-2 (for ferrous pipe) and Table 505-1-3 (for non-ferrous pipe) in NSTM Chapter 505 and is based on a temperature of 150° F. For sewage system discharge piping 150° F is used because it is the maximum allowable temperature for sewage and gray water system piping and components per Military Standard MIL-STD-777 (SH). A typical sewage or gray water discharge system uses Class 200, 90-10 Cu-Ni, four (4) inch nominal pipe in accordance with MIL-T-16420 (SH). For this pipe, the values, calculation and criteria are as follows:

Tm = Minimum wall thickness in inches. This is piping which should be replaced immediately.

p = 125 psi. System design pressure based on discharge piping wash down system maximum allowable fire-main pressure.

S = 9,000 psi. Stress value at design temperature (in this application, 150° F) of the installed material (based on Table 505–1-4 in NSTM Chapter 505 for 90–10 Copper-Nickel {Cu-Ni}) Type II piping. Class 200 Cu-Ni pipes with outside diameters 3.5 inches and higher can be manufactured as Type I (seamless) or Type II (welded). 90–10 Cu-Ni piping with outside diameters 0.125 inch through 2.875 inches are available in Type I only.
D = 4.5 inches Outside diameter for Class 200, 90–10 Cu-Ni, 4 inch nominal pipe (Table III of MIL-T-16420 (SH)).
Y = 0.4 A coefficient based on Table 505–1-2 in NSTM Chapter 505

$$T_m = \frac{PD}{2(S + YP)} = \frac{125 * 4.5}{2(9{,}000 + 0.4 * 125)}$$

= 0.032 inches for 90–10 CU-Ni Piping, Type II
Piping below 0.032 inches should be replaced immediately. If other pipe is used (i.e., material, size, etc.) calculate Tm to identify which piping should be replaced immediately. However, pipe that should be replaced during the next ship availability would be any pipe with wall thickness of between one half the original wall thickness and value Tm.

593-4.5.5.2 Glass Reinforced Plastic (GRP) Piping. Unless specifically waived by NAVSEA, or specified in the ship specifications, Glass Reinforced Plastic (GRP) piping is not approved for use in sewage and gray water system piping except for piping inside sewage and gray water tanks. The installation of GRP piping and components (including ladders) is approved inside tanks and is described in NAVSEA Drawing 505-7036295. Limited amounts of polyolefin piping are approved for use in sewage collection piping in section 593-4.5.3.2.1.

593-4.5.5.3 Epoxy-Lined Pipe. To eliminate corrosion and subsequent piping failures, internal epoxy pipe coatings are installed in sewage system discharge piping on certain ships. The coatings have been designed to prevent accelerated pipe wall thickness reduction, particularly on the discharge piping of sewage systems. A Naval Research Laboratory (NRL) developed coating, NRL-4B, is the only coating approved for use in Navy ships sewage discharge piping.

593-4.5.5.3.1 Hot Work Restrictions. Hot work performed on coated piping will damage the coating. Epoxy lined piping should be labeled on the outside every 20 feet, ″Epoxy Lined Pipe, Hot Work Restrictions″, in block letters one (1) inch high. Markings shall appear at least once in every appropriate compartment.

593-4.5.5.3.2 Repair Procedure. Repair of leaks in epoxy-lined sewage system discharge piping not located in tanks or voids and no greater than 1/2 inch in diameter, and with the coating surrounding the hole still intact, may be repaired in accordance with paragraph 593-4.5.5.3.3. For other types of failed epoxy-lined sewage system discharge piping, follow the procedure provided in paragraph 593-4.5.5.3.4.

593-4.5.5.3.3 Minor Repair. Repair of pinhole size leaks in epoxy-lined sewage discharge piping not located in tanks or voids may be accomplished in accordance with procedures specified in NSTM Chapter 079, Volume 2, Section 079-42 using glass reinforced plastic (GRP) soft patch repair kits in accordance with MIL-R-17882.

The area around the pinhole leak shall be surveyed to insure the interior pipe coating around the leak is still intact, and the corroded area of the pipe is no greater than 1/2 inch in diameter. The external pipe coating shall be removed from the area to be covered by the patch to ensure proper adhesion. This repair will be considered

as semi-permanent (superceding the semi-permanent criteria provided in NSTM Chapter 079 and NSTM Chapter 505) until the next scheduled replacement and recoating of failed sewage system discharge piping.

593-4.5.5.3.4 Extensive Repair. Since excessive heat will damage the epoxy coating, repair to damaged epoxy-lined discharge piping shall be performed as follows:

1. Cut out the damaged section of piping.
2. Wearing protective eye and respiratory gear, chip, sandblast or grind the lining three (3) inches back from the ends.
3. Install flanges on both ends and re-coat piping with fresh NRL-4B epoxy using a brush.
4. Fabricate a spool piece and coat the spool piece.
5. Install the spool piece.
6. If the piping and spool piece is not relined with NRL-4B epoxy, mark the repaired piping section as follows: ″ Piping Section of X inches repaired on XX/XX/XX. Pipe Section NOT Epoxy Lined. ″

593-4.5.6 SEWAGE AND GRAY WATER PUMP MECHANICAL SEALS. Procedures and criteria for inspecting, maintaining and replacing sewage and gray water pump mechanical seals are provided in the following paragraphs.

593-4.5.6.1 Mechanical Seal Inspection and Maintenance. Using the applicable Maintenance Requirement Card (MRC), inspect the condition of the mechanical seal lubricant (TEP 2190, MIL-PRF-17331, for John Crane Type 8-1 mechanical seals or 50/50 propylene glycol mixture for cartridge seals). If water is detected in the seal oil cavity or reservoir sight glass (cartridge seals), but the seal is not leaking into the pump room, do not replace the seal. Testing has shown that small amounts of water can migrate into the seal oil cavity or coolant reservoir (cartridge seals) during normal operation; however, this does not necessarily indicate seal failure. A small amount of water will not adversely affect seal performance provided seal lubricant is inspected and seal oil is changed in accordance with the applicable MRC.

593-4.5.6.2 Lip Seal Inspection, Maintenance, and Replacement. The type of shaft sealing system used on the vortex (EDDY) pumps requires a constant supply of adjusted compressed air to keep contaminants out of the pump bearings. The seals are designed to permit a certain amount of air to pass between the seal and the pump shaft in order to create the desired positive flow of air. Over a period of time, due to friction, heat, abrasion and other normal factors, the contact face of the seal will wear a radial groove in the surface of the shaft sleeve at the same time losing some of the material from the seal. This process will gradually increase the clearance between the seal and the surface of the shaft sleeve, allowing more and more air to pass the seal. This increase in flow will become evident at the airflow gauge on the front of the pump control system box. The flow of air will gradually increase until a point is reached where the amount of air introduced into the volute will affect the normal pumping process. To compensate for the wear the air pressure entering the pump can be decreased reducing the rate of air flow (CFM). Eventually the wear will reach a point where, in order to drop the airflow, air pressure has to be reduced until it reaches the shutoff point (1.5 psig) of the pump control system. At this point the seal cartridge should be replaced. Vortex (EDDY) pump lip seals are lubricated by hand using the applicable MRC, or are provided with an automatic greasing unit.

593-4.5.6.3 Mechanical Seal Replacement. Sewage and gray water pumps have a zero leakage requirement. Seal replacement is recommended if any seal leakage is detected into the pump room or when pump disassem-

bly is required. For lip seals, the seals must be replaced when the air pressure shutoff point (1.5 psig) is reached. Replacement of mechanical seals or lip seals is accomplished in accordance with the applicable MRCs and pump technical manuals.

593-4.6 GENERAL DESIGN CRITERIA

593-4.6.1 FOOD WASTE DISPOSER DRAINS. Food waste disposer (or garbage grinder) gravity drains connected to the gray water drains are generally installed with a minimum slope of three (3) in/ft. Food waste disposer drains are also provided with a check valve to preclude back-flow from the gray water drain, and a dedicated diverter valve to permit drainage to either the holding tank or directly overboard. When the food waste disposer employs seawater for flushing, the gray water piping downstream of the food waste disposer must be copper-nickel alloy.

593-4.6.2 DAMAGE CONTROL. Sewage and gray water drains may penetrate watertight bulkheads. Usually, each bulkhead penetration below the Flooding Water Level (FWL-1) is provided with a bulkhead stop valve to prevent progressive flooding. The stop valve is a full-port plug or ball valve. The stop valve is operable locally at the valve and remotely at the damage control deck through the use of remote operating gear (ROG). In some installations, diverter valves (three way valves) required to divert plumbing drains either overboard or to the holding tank are used in place of bulkhead stop valves to prevent progressive flooding.

593-4.6.2.1 Where system valves are designated as damage control closures, the damage control valve bonnet and hand wheel is labeled SET X-RAY, SET YOKE, or SET ZEBRA, with the direction to be turned marked with an arrow. Similar labeling is required at the damage control valve ROG deck box. The damage control labeling is in addition to the required sewage or gray water system classification and label placard.

593-4.7 SYSTEM DESCRIPTIONS

593-4.7.1 COLLECTION, HOLDING AND TRANSFER (CHT) SYSTEM. The majority of fleet ships surface combatant size and larger are equipped with CHT systems. The CHT system is designed to accept sewage discharge from water closets and urinals, and gray water discharge from showers, laundries, and galleys. As the name –″collection, holding, and transfer″– implies, three functional elements constitute the CHT system.

a. Collection Element. The collection element consists of sewage and gray water drains with diverter valves. Depending on the position of the diverter valves, the sewage or gray water can be diverted overboard independently, or into the CHT holding tank.

b. Holding Element. The holding element consists of a holding tank equipped with various support subsystems.

c. Transfer Element. The transfer element includes pumps, overboard and deck discharge piping and valves, and deck discharge fittings.

NOTE

All CHT systems incorporate the applicable sanitary and hygienic provisions as discussed in paragraph 593-4.3.2. All sewage and gray water system sanitary and hygienic procedures as described in paragraph 593-4.3.3 should be followed, as they apply to the CHT system.

593-4.7.1.1 Modes of Operation. The CHT system can be used in any of three distinct modes of operation depending on the situation.

593-4.7.1.1.1 Transiting Restricted Waters. When transiting restricted waters, the CHT system will be configured to collect and hold the discharges from sewage drains only. Gray water drains will typically be diverted directly overboard.

593-4.7.1.1.2 In-Port. During in-port periods, the CHT system will collect and transfer to a shore receiving facility or a barge all discharges from sewage and gray water drains.

593-4.7.1.1.3. At-Sea. When operating at sea, outside restricted waters, the CHT system will be set up to divert discharges from both sewage and gray water drains directly overboard.

593-4.7.1.2 System Types. Three types of CHT systems are installed. The type selected for a particular ship depends on the required holding tank capacity. Systems with holding tanks with a capacity of more than 2,000 gallons use a comminutor and aeration system or a vortex pump and aeration system. Smaller systems with holding tanks having a capacity of less than 2,000 gallons use a strainer type CHT system.

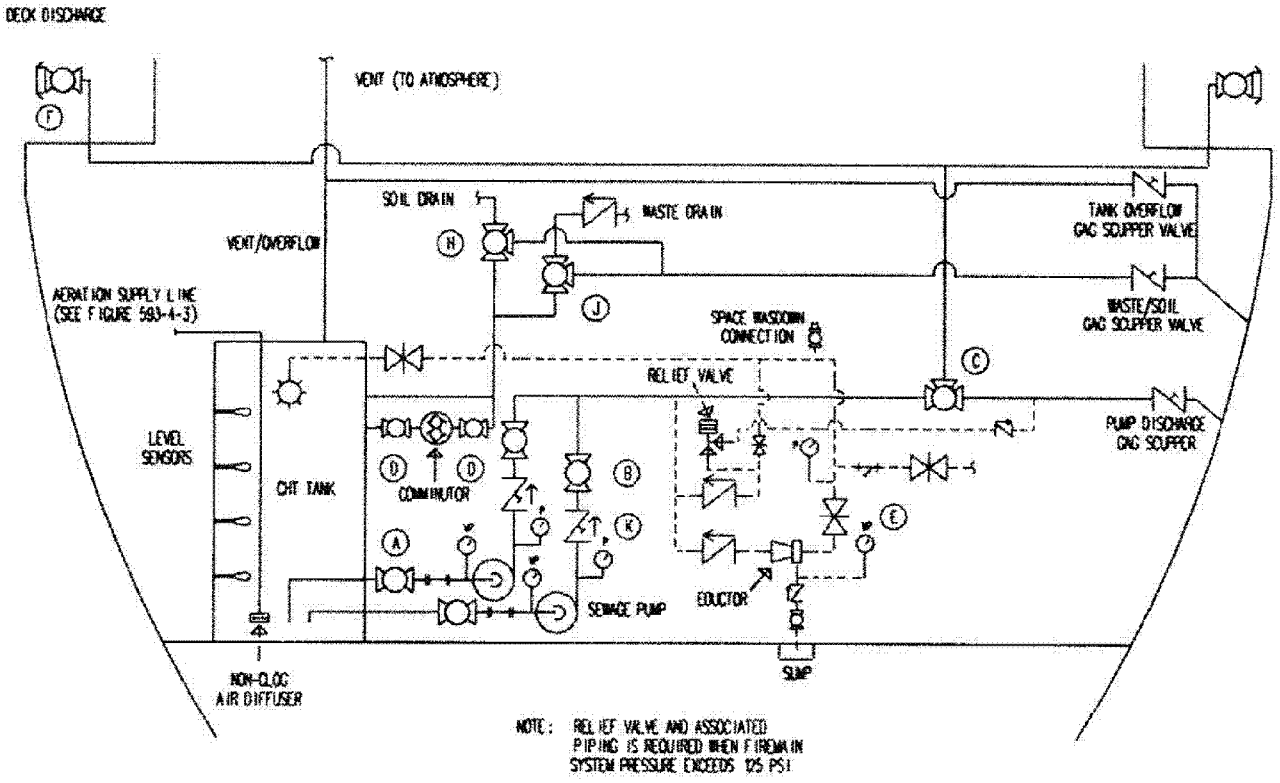
593-4.7.1.2.1 Comminutor Type CHT System. In a comminutor type CHT system the comminutor, located in the sewage drain main or the combined sewage and gray water drain main, serves to macerate solids passing into the CHT holding tank. A bypass of the comminutor is also included. If the comminutor jams or plugs, the bypass provides drainage around the comminutor and into the holding tank. If a valve is included in the bypass, it shall always remain open. Isolation valves are installed directly before and after the comminutor to allow for maintenance. Most installations include an access port, or cleanout, to permit removal of foreign objects, which may jam or plug the comminutor. Some installations include a comminutor-reversing switch, which can also be used to clear jams. The components of the comminutor type CHT system (Figure 593-4-12) include:

a. The CHT Holding Tank. The capacity of each holding tank is usually more than 2,000 gallons. The holding tank includes an aeration system and a wash down system. The aeration system is typically one of two types: diffused air aeration or aspiration. The wash down system consists of nozzles supplied by the ship's fire main.

b. The CHT Pump Set (one pump set per holding tank). A pump set consists of two motor-driven pumps, two suction plug or ball valves, two discharge plug or ball valves, two discharge check valves (with hold-open device), a pump controller, a high level alarm, and an appropriate number of liquid level sensors.

c. The Comminutor. One comminutor is located in each sewage drain main or combined sewage and gray water drain main entering each holding tank.

d. The Gravity Collection System. The collection system consists of piping, valves, and fittings necessary to transfer sewage (and gray water) from fixtures to the holding tank or overboard.



VALVE SERVICE LEGEND		
(A) PUMP SUCTION VALVE	(D) COMMINUTOR ISOLATION VALVE	(H) SOIL DRAIN DIVERTER VALVE
(B) PUMP DISCHARGE VALVE	(E) EDUCTOR SUPPLY VALVE	(J) WASTE DRAIN DIVERTER VALVE
(C) PUMP DISCHARGE DIVERTER VALVE	(F) DECK DISCHARGE VALVE	(K) PUMP DISCHARGE CHECK VALVE

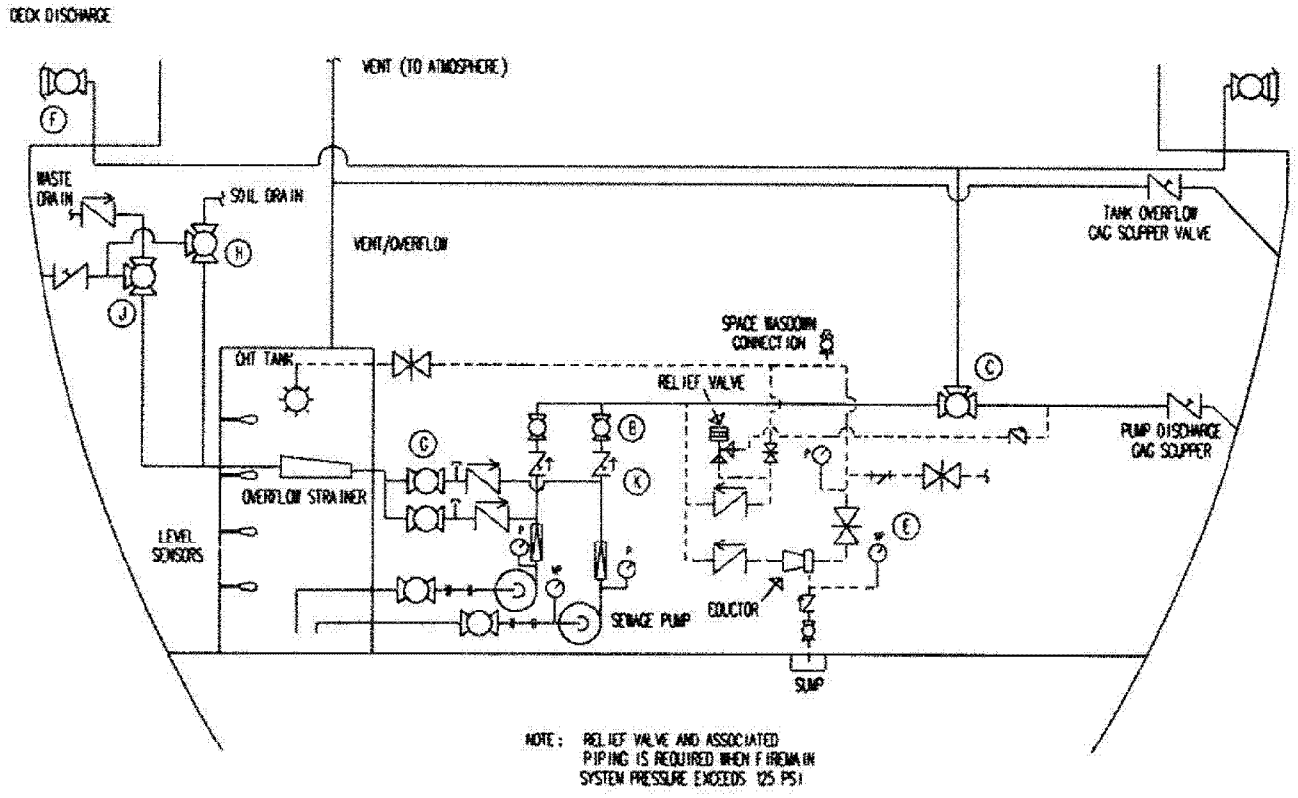
SYMBOLS LEGEND																			
BALL/ PLUG VALVE	GATE VALVE	SWING CHECK VALVE	EDUC-TOR	PUMP CHECK VALVE	GAG SCUP. VALVE	PUMP	CAGE	SPRAY NOZZLE	3 WAY DIV. VALVE	RELIEF VALVE	FLUSH CONNECT	STRAIN-ER	HOSE CONN.	CAM-LOCK	COMM-INUTOR	AIR DIFF.	SPOOL PIECE	DIFLW STRAIN	INFL. STRAIN	LEVEL SENSOR

Figure 593-4-12 Comminutor Type CHT System

593-4.7.1.2.2 Vortex Pump Type CHT System. The vortex pump and aeration type CHT system is similar to the comminutor type CHT system. The significant difference between the two systems is that the vortex pump

system is equipped with vortex discharge pumps as opposed to the centrifugal pumps normally provided with a comminutor type CHT system. The use of the vortex pump and its ability to pump large solids negates the need for a comminutor and its associated equipment. All other components of the vortex pump type system are the same as the comminutor type CHT system.

593-4.7.1.2.3 Strainer Type CHT System. The strainer type system incorporates an overflow strainer within the CHT holding tank and an inflow strainer mounted on the discharge side of each pump. Under normal conditions, solids and liquids flow through the overflow strainer, the inflow stop, and check valves until they reach the discharge piping of the pumps. At this point, the sewage flows through the inflow strainers where large solids are collected, then through the pumps, and into the CHT holding tank. The inflow strainer limits the flow of solids, but liquids are allowed to pass through the pump into the holding tank. Each time the pump operates, its inflow strainer is cleaned by the reverse flow of liquid being pumped from the holding tank. If the inflow strainers or pumps become plugged, sewage will back up and enter the tank through the overflow strainer. The strainer type CHT system components (Figure 593-4-13) include:



VALVE SERVICE LEGEND		
(A) PUMP SUCTION VALVE	(E) EDUCTOR SUPPLY VALVE	(H) SOIL DRAIN DIVERTER VALVE
(B) PUMP DISCHARGE VALVE	(F) DECK DISCHARGE VALVE	(J) WASTE DRAIN DIVERTER VALVE
(C) PUMP DISCHARGE DIVERTER VALVE	(G) INFLOW STOP VALVE	(K) PUMP DISCHARGE CHECK VALVE

SYMBOLS LEGEND																			
BALL/ PLUG VALVE	GATE VALVE	SWING CHECK VALVE	EDUC-TOR	PUMP CHECK VALVE	C&G SCUP. VALVE	PUMP	GAGE	SPRAY NOZZLE	3 WAY DIV. VALVE	RELIEF VALVE	FLUSH CONNCT	STRAIN-ER	HOSE CONN.	CAM-LOCK	COMM-UNITOR	AIR. DIFF.	SPOOL PIECE	OVFLW STRAIN	INFL. STRAIN	LEVEL SENSOR

Figure 593-4-13 Strainer Type CHT System

a. The CHT Holding Tank. The capacity of each holding tank is usually less than 2,000 gallons. The holding tank includes a wash down system consisting of nozzles supplied by the ship's fire main.

b. The CHT Pump Set (one pump set per holding tank). A pump set consists of two motor-driven pumps, an overflow strainer, two inflow strainers, two suction plug or ball valves, two discharge plug or ball valves, two discharge check valves (with hold-open device), a pump controller, a high level alarm, and an appropriate number of liquid level sensors.

c. The Gravity Collection System. The collection system consists of piping, valves, and fittings necessary to transfer sewage (and gray water) from fixtures to the holding tank or overboard.

593-4.7.1.3 Element Installation Descriptions. Detailed descriptions of the installation of CHT system components are provided in the following paragraphs.

593-4.7.1.3.1 Collection Element. The basic CHT system concept requires that gravity gray water drains be kept separate from gravity sewage drains wherever practical until they reach their respective overboard diverter valves. Downstream of the overboard diverter valves, both gray water drains and sewage drains may be combined into a single gravity drain line leading to the CHT holding tank. All sewage and gray water drains above the waterline may be diverted either to the CHT holding tank or directly overboard by gravity. Sewage and gray water drains located below the waterline cannot be diverted directly overboard and are piped directly to the CHT holding tank. When there are drain lines below the water line piped to the holding tank, the CHT system is used as an ejection system and is operated continuously in all modes.

593-4.7.1.3.1.1 All gravity drain piping is pitched to ensure rapid and complete drainage. Pitch is 1/2-in/ft whenever possible, but not less than 1/8-in/ft relative to the operating trim.

593-4.7.1.3.1.2 Food waste disposer (garbage grinder) drains connected to the gray water drains are generally installed with a minimum slope of three (3) in/ft. Food waste disposer drains are also provided with a check valve to preclude back-flow from the gray water drain, and a dedicated diverter valve to permit drainage to either the CHT holding tank or directly overboard. When the food waste disposer employs seawater for flushing, the gray water piping downstream of the food waste disposer must be copper-nickel alloy.

593-4.7.1.3.1.3 Plumbing (sewage and gray water) drains may penetrate watertight bulkheads. Usually, each bulkhead penetration below Flooding Water Level (FWL-1) is provided with a bulkhead stop valve to prevent progressive flooding. The stop valve is a full-port plug or ball valve. The stop valve is operable locally at the valve and remotely at the damage control deck through the use of remote operating gear (ROG). In some installations, diverter valves (3-way valves) required to divert plumbing drains either overboard or to the holding tank are used in place of bulkhead stop valves to prevent progressive flooding.

593-4.7.1.3.1.4 Where CHT system valves are designated as damage control closures, the damage control valve bonnet and hand wheel is labeled SET X-RAY, SET YOKE, or SET ZEBRA, with the direction to be turned marked with an arrow. Similar labeling is required at the damage control valve ROG deck box. The damage control labeling is in addition to the required CHT system classification and placard.

593-4.7.1.3.2 Holding Element. The CHT holding tank is usually sized for a 12-hour holding period of sewage only during a transit of restricted waters. Individual ship constraints may affect this design objective. Where possible, holding tank inside surfaces are free of structural members such as stiffeners, headers, and brackets. Very large holding tanks may require swash bulkheads to dampen movement of the holding tank contents. The holding tank bottom is formed so it slopes approximately 1.5-in/ft toward the pump suction. All internal surfaces of the holding tank are coated in accordance with procedures given in NSTM Chapter 631V2, Preservation of Ships in Service (Surface Preparation and Painting), for protecting sanitary holding tanks and preventing corrosion. In addition, for ships using Sigma Edgeguard phenolic epoxy tank coating, additional procedures are provided in NAVSEA Drawing 505-7036295. Each holding tank is fitted with a vent to the atmosphere and an overflow to overboard. Vents should be positioned to avoid intake of tank gases into the air compressor or ventilation intakes. In addition, a manhole is provided for internal maintenance. The manhole includes a gas-sampling valve to sample holding tank contents during GAS FREE procedures.

593-4.7.1.3.2.1 A fire main connection is provided for flushing and cleaning the holding tank. Seawater is delivered to the holding tank through wash down nozzles, which spray the inside of the holding tank. In addition, provision is made to use the fire main for flushing the pump discharge piping and the sewage hose when the ship is preparing to leave port. A threaded firemain hose connection also is provided in the pump room to permit attachment of a hose for rinsing the adjacent area.

593-4.7.1.3.3 Transfer Element. Each holding tank is equipped with two non-clog marine sewage (centrifugal or vortex) pumps connected in parallel. An explanation of pump characteristics and curves for centrifugal pumps is given in NSTM Chapter 503, Pumps. Each pump is equipped with full-port plug or ball suction and discharge valves, and a discharge swing check valve with a hold-open device

The pumps may discharge sewage to a tender, barge, shore receiving facility, or directly overboard, depending on the position of the discharge diverter valve and deck discharge diverter/stop valves.

593-4.7.1.3.3.1 Level Sensors. Each holding tank is equipped with level sensing devices that provide control of the transfer pumps and various alarms. These devices are located at various levels in the holding tank or at the top of the holding tank. There are various types of level sensing devices. The following devices are the most common in the Fleet:

a. Mercury Float Switch - The mercury float switch (see Figure 593-4-14) employs internal mercury switches encased in a polyurethane float body and connected to a water resistant cable. As the fluid level in the holding tank increases, the polyurethane float body floats. When the required degree of tilt is attained, mercury in the switches moves to the other side of the switches and closes the circuit between sets of contacts. When the fluid level in the holding tank decreases, the attitude of the float body again changes and when the required degree of tilt is reached, the mercury moves to the opposite side of the switches, opening the sets of contacts. Mercury float switches are provided with both normally open (N.O.) and normally closed (N.C.) contacts to suit various electrical configurations.

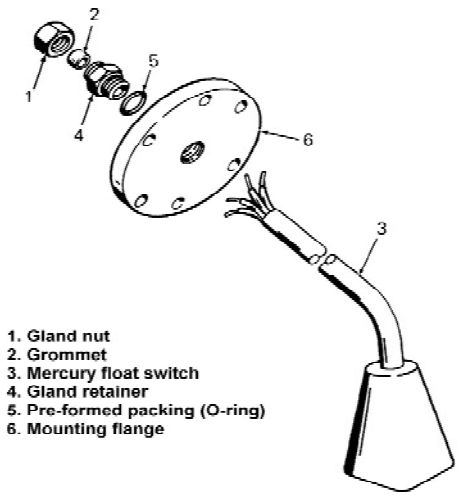
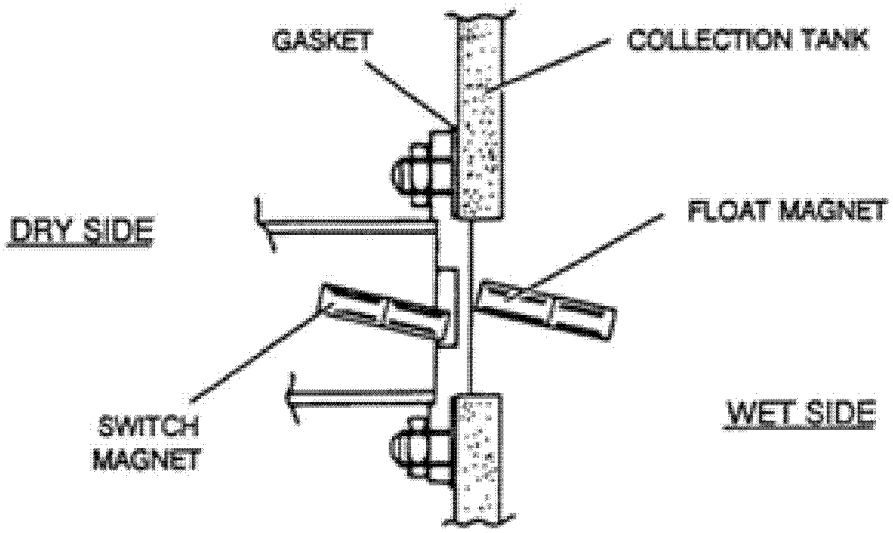


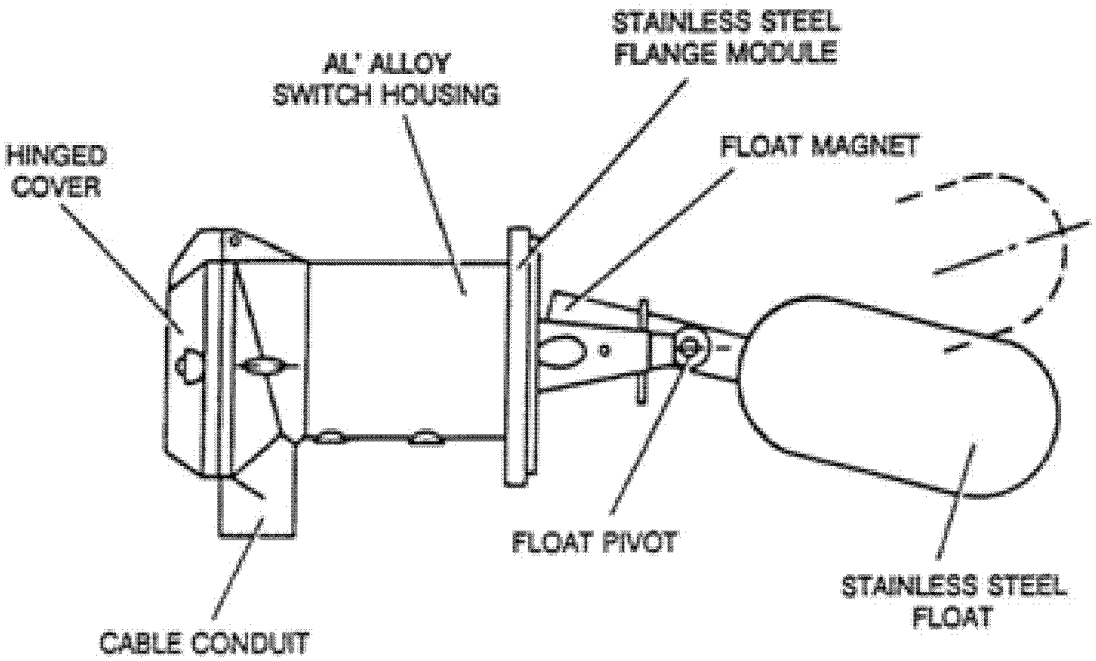
Figure 593-4-14 Mercury Float Switch

b. Magnetic Float Switches - Magnetic float switches (see Figures 593-4-15 and 593-4-16) employ opposing magnets to activate electric switches. The magnets for the float and the switches are oriented to have like poles facing each other in order to employ the ″repulsion of like poles″ principle. When the level in the tank rises and lifts the float, its magnet repulses the switch magnet through the mounting flange's non-magnetic barrier. The switch magnet in turn operates the electrical switches used to control pump operation. Magnetic float switches are provided with both normally open (N.O.) and normally closed (N.C.) contacts to suit various

electrical configurations.

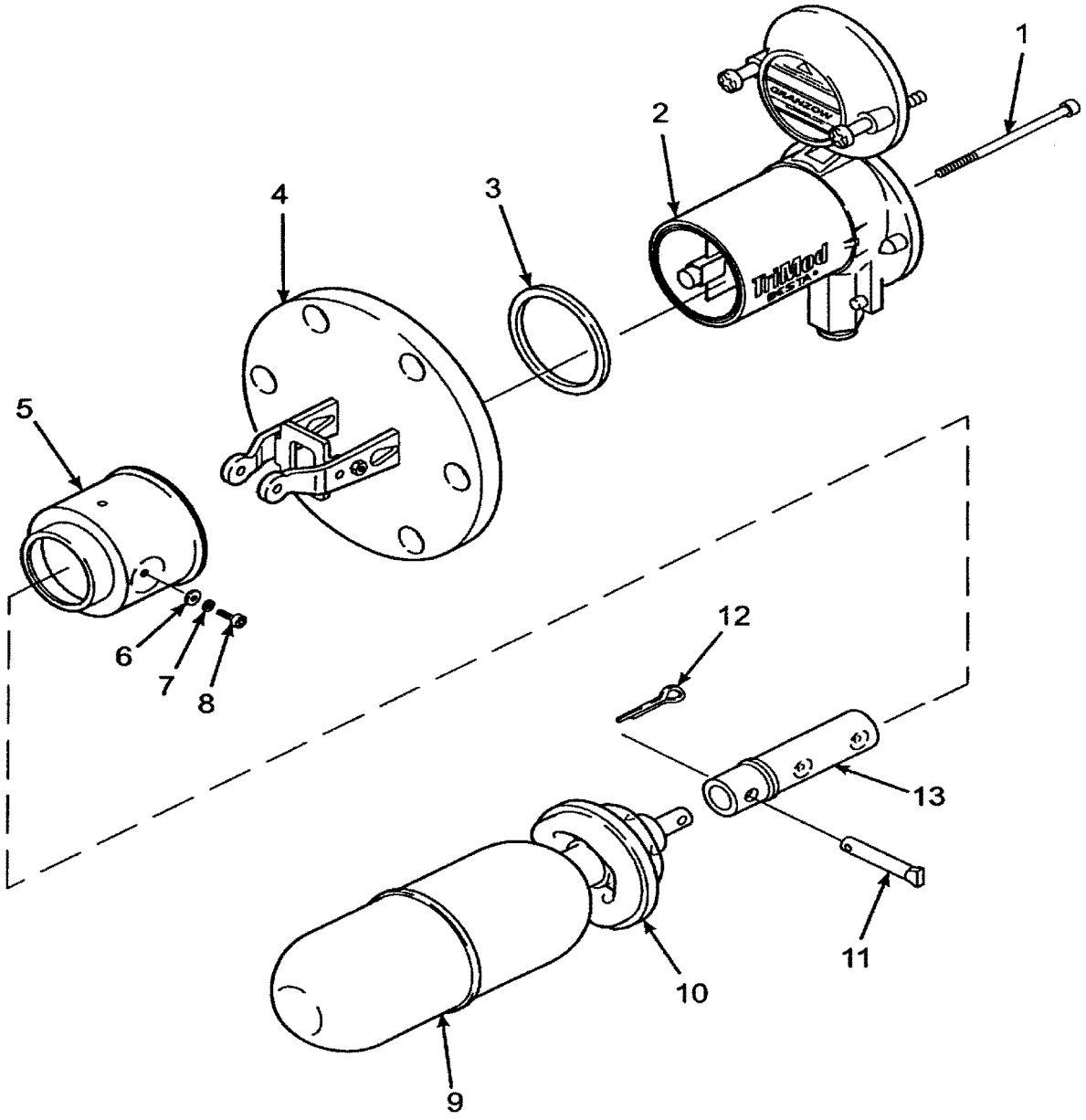


SWITCH/TANK INTERFACE



NOTE: Silicone boot removed to show detail.

Figure 593-4-15 Magnetic Float Switch Operating Principle



1. Socket head cap screw
2. Switch module
3. Gasket
4. Flange module
5. Cover
6. Flat washer
7. Lockwasher
8. Socket head cap screw
9. Float
10. Rubber boot
11. Pin
12. Cotter pin
13. Magnet

Figure 593-4-16 Magnetic Float Switch (Exploded View)

c. Radar Tank Level Indicating System - The radar tank level indicating system uses radar waves to determine

holding tank levels. The radar sensor unit (see Figure 593-4-17) is mounted to the top of the holding tank. This unit produces an outgoing radar pulse that reflects off the surface of the tank's contents. The unit's antenna picks up the return pulse and converts it to an electrical signal. Internal electronics determine the time of flight between the outgoing pulse and its return. The internal software mathematically converts this value to a level measurement, based on tank dimensions entered when the radar system is calibrated. The radar head outputs a 4 to 20 mA analog signal proportional to the level in the tank. The 4 to 20 mA analog signal is processed by an external controller (typically a programmable logic controller or PLC) to activate switches or relays for use by the pump controller. In addition, an LED display on the radar sensor unit provides visual readout of the holding tank level.

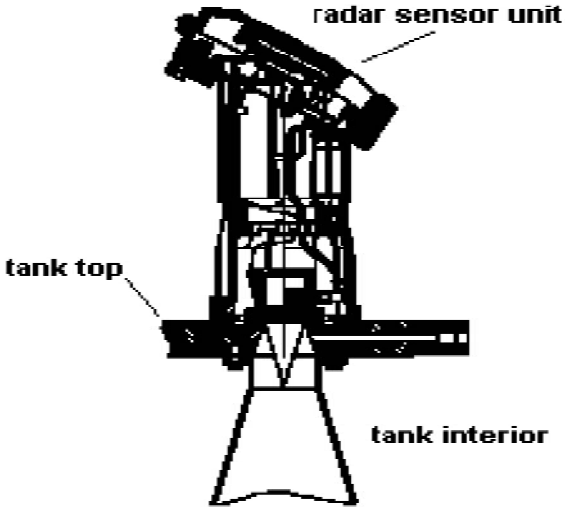


Figure 593-4-17 Radar Sensor Unit

593-4.7.1.4 Controls and Alarms.

593-4.7.1.4.1 Pump Control. The CHT system pump controller provides for both manual and automatic modes of operation. There are several types of pump control configurations based on numbers of level sensors and type of pumps (centrifugal or vortex) in the Fleet. The following configurations are the most common in the Fleet:

a. Type 1 - Centrifugal pump controller with four liquid levels sensed (most surface combatants except CG-47 and FFG-7 Classes). The four sensor levels are: High Level Alarm, Standby Pump Start, Duty Pump Start and Pump Stop.
   1. Manual 1 Mode (MAN 1) - When the pump controller selector switches are set to MAN1, either or both pumps may be actuated by the operator independent of the liquid level sensors located in the holding tank.
   2. Manual 2 Mode (MAN 2) - When the selector switches are set to MAN2, either or both pumps may be actuated by the operator, but the pump(s) will be automatically stopped at the Pump Stop level sensor.
   3. Automatic Mode (AUTO) - When the selector switches are set to AUTO, the pump controller performs five functions as a result of signals generated by the level sensors in the CHT holding tank. The five functions are described below.
      a. Duty pump alternation ensures a single pump does not accumulate significantly more running time than the other by alternating the duty pump each pumping cycle.
      b. The Pump Stop level sensor signals the controller to stop the pump(s) when the liquid level in the holding tank reduces to a pre-determined level (generally about 15 percent of holding tank capacity)
      c. The Duty Pump Start level sensor signals the controller to start the duty pump when the liquid rises to a predetermined level (generally about 30 percent of holding tank capacity).

d. If the liquid in the holding tank continues to rise after the duty pump has been activated, the Standby Pump Start level sensor will activate the standby (second) pump (generally at about 60 percent of holding tank capacity).

e. The High Level Alarm level sensor (generally about 85 percent of holding tank capacity) signals the controller to provide a visual and audible high level alarm signal in the pump space and in a continuously manned, remote location.

b. Type 2 - Centrifugal pump controller with five liquid level sensors (CG-47 Class and LHD-1 Class). The five sensor levels are: High Level Alarm, Standby Pump Start, Duty Pump Start, Pump Stop and Low Level Alarm.

1. Manual 1 Mode (MAN 1) - When the pump controller selector switches are set to MAN1, either or both pumps may be actuated by the operator independent of the liquid level sensors located in the holding tank.
2. Manual 2 Mode (MAN 2) - When the selector switches are set to MAN2, either or both pumps may be actuated by the operator, but the pump(s) will be automatically stopped at the Pump Stop level sensor.
3. Automatic Mode (AUTO) - When the selector switches are set to AUTO, the pump controller performs five functions as a result of signals generated by the level sensors in the CHT holding tank. The six functions are described below.

a. Duty pump alternation ensures a single pump does not accumulate significantly more running time than the other by alternating the duty pump each pumping cycle.

b. The Low Level Alarm sensor signals the controller before the liquid level in the holding tank is pumped below the pump suction inlets (generally about 10 percent of holding tank capacity)

c. The Pump Stop level sensor signals the controller to stop the pump(s) when the liquid level in the holding tank reduces to a pre-determined level (generally about 15 percent of holding tank capacity). This level sensor may also be used to shut off the air aspirator pumps (LHD-1 Class).

d. The Duty Pump Start level sensor signals the controller to start the duty pump when the liquid rises to a predetermined level (generally about 30 percent of holding tank capacity).

e. If the liquid in the holding tank continues to rise after the duty pump has been activated, the Standby Pump Start level sensor will activate the standby (second) pump (generally at about 60 percent of holding tank capacity).

f. The High Level Alarm level sensor (generally about 85 percent of holding tank capacity) signals the controller to provide a visual and audible high level alarm signal in the pump space and in a continuously manned, remote location.

c. Type 3 - Centrifugal pump controller with five liquid level sensors (FFG-7 Class). The five sensor levels are: High Level Alarm, Standby Pump Start, Duty Pump Start and Low Level (two switches).

1. Manual Start-Stop Mode - When a pump selector switch is set to MANUAL and the MAN RUN pushbutton is pushed on the pump controller, the pump may be actuated by the operator independent of the liquid level sensors located in the holding tank.
2. Manual Start-Auto Stop Mode - When a pump selector switch is set to MANUAL and the AUTO RUN pushbutton is pushed on the pump controller the pump will be automatically stopped at the Pump Stop level sensor.
3. Automatic Mode - When the MAN-AUTO selector switch is set to AUTO, the pump controller performs five functions as a result of signals generated by the level sensors in the holding tank. The five functions are described below.

a. Duty pump alternation ensures a single pump does not accumulate significantly more running time than the other by alternating the duty pump each pumping cycle.

b. Two Low Level level sensors (one for each pump) signal the controller to secure the pump(s) before the liquid level in the holding tank is pumped below the pump suction inlets (generally about 10 percent of holding tank capacity)

c. The Duty Pump Start level sensor signals the controller to start the duty pump when the liquid rises to a predetermined level (generally about 30 percent of holding tank capacity)

d. If the liquid in the holding tank continues to rise after the duty pump has been activated, the Standby Pump Start level sensor will activate the standby (second) pump (generally at about 70 percent of holding tank capacity).

e. The High Level Alarm level sensor (generally about 85 percent of holding tank capacity) signals the

controller to provide a visual and audible high level alarm signal in the pump space and in a continuously manned, remote location. On some FFG-7 Class ships, this feature is controlled by a separate tank level indicating system.

d. Type 4 - Vortex pump controller with four liquid level sensors (CV/CVN Classes). The four sensor levels are: High Level Alarm, Standby Pump Start, Duty Pump Start and Pump Stop.
   1. Emergency Run Mode (EMER) - When a pump selector switch is set to EMER on the pump controller, the pump may be actuated by the operator independent of the liquid level sensors located in the holding tank. However, undercurrent trip, high bearing temperature and air pressure protective circuits are still active. Only one pump at a time can be operated in EMER mode.
   2. Automatic mode (AUTO) - When both pump selector switches are set to AUTO, the pump controller performs five functions as a result of signals generated by the level sensors in the CHT holding tank. The five functions are described below.
      a. Duty pump alternation ensures a single pump does not accumulate significantly more running time than the other by alternating the duty pump each pumping cycle.
      b. The Pump Stop level sensor signals the controller to stop the pump(s) when the liquid level in the holding tank reduces to a pre-determined level (generally about 15 percent of holding tank capacity)
      c. The Duty Pump Start level sensor signals the controller to start the duty pump when the liquid rises to a predetermined level (generally about 30 percent of holding tank capacity)
      d. If the liquid in the holding tank continues to rise after the duty pump has been activated, the Standby Pump Start level sensor will activate the standby (second) pump (generally at about 60 percent of holding tank capacity).
      e. The High Level Alarm level sensor (generally about 85 percent of holding tank capacity) signals the controller to provide a visual and audible high level alarm signal in the pump space and in a continuously manned, remote location.

The sensors described previously this section are presented in relative order to their distance from the holding tank bottom. Other variations of the pump control systems exist in the Fleet as new designs are implemented. Consult applicable pump technical manuals for details on these configurations. In systems equipped with radar tank level indicating systems the accompanying PLC is programmed to operate the pumps similarly to the above descriptions.

593-4.7.1.5 Aeration Subsystem. In the ships with large (more than 2,000 gallons) sewage holding tanks, air is supplied to the holding tank to prevent the contents from becoming anaerobic (devoid of oxygen), and to keep the solids in suspension. A typical aeration subsystem is illustrated in Figure 593-4-18. Aeration subsystems may vary somewhat from ship to ship.

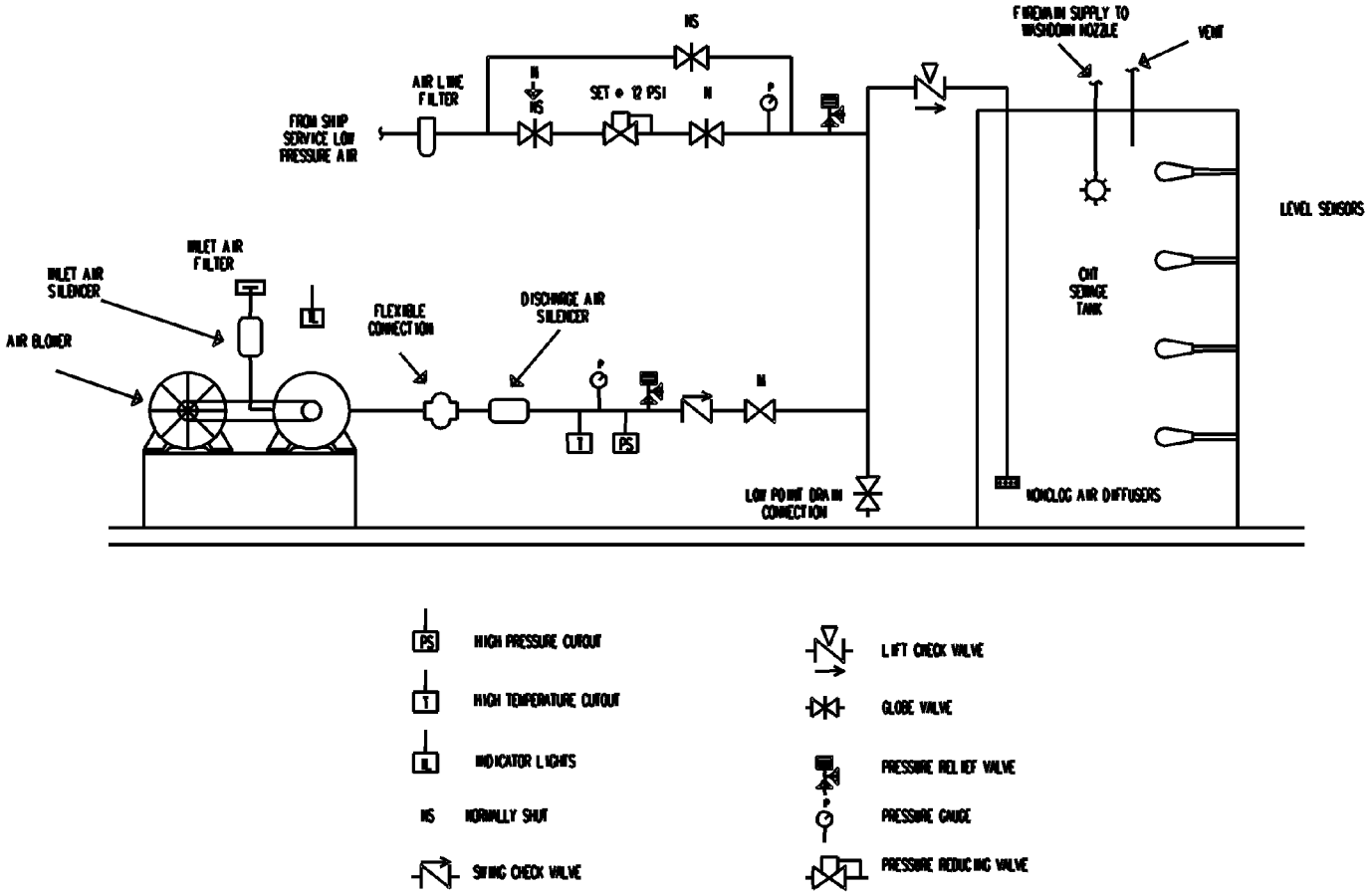


Figure 593-4-18 Aeration Subsystem

593-4.7.1.5.1 An air source enters the holding tank at or near the top and is piped to non-clog air diffusers located on the holding tank bottom. Air pressure at the diffusers must be sufficient to overcome the maximum hydrostatic head of the overlying liquid. A motor-driven blower supplies air.

593-4.7.1.5.2 In some systems, ship service air is provided as a secondary source. Systems onboard some aircraft carriers have no blowers for aeration and use ship service air as the primary source.

593-4.7.1.5.3 Where certain conditions dictate, some systems may use an air aspiration system instead of the conventional diffused air aeration system. The air aspiration system incorporates a circulating pump, which pumps sewage through an aspiration nozzle. At this nozzle, air is drawn into the fluid stream through a vent pipe. The high velocity fluid and air mixture is then injected into the holding tank to keep solids in suspension and keep the contents oxygenated. Suction and discharge for the circulating pump are at the bottom of the holding tank.

593-4.7.1.5.4 Where an aeration or aspiration system is installed, it shall be operated whenever sewage or gray water is in the holding tank. Where an air blower or ship service air is used (Figure 593-4-18), the blower/discharge valve M and the ship service low-pressure air supply valves N shall be closed any time the system is not in use.

593-4.7.1.6 CHT Operational Mode Descriptions. As discussed in paragraph 593-4.7.1.1, the CHT system is designed for three modes of operation: Transit Mode, In-Port Mode, and At-Sea Mode (see Figure 593-4-12 and Figure 593-4-13 for location of drains, valves, and other components). Detailed descriptions of the CHT opera-

tional modes are provided below. Specific CHT system operating instructions tailored for each ship are provided in the ship's Sewage Disposal Operational Sequencing System (SDOSS) instructions. If a particular ship's SDOSS cannot be located, contact Naval Surface Warfare Center, Carderock Division, Ship Systems Engineering Station (NSWCCD-SSES), Philadelphia, PA for assistance or refer to the SEIC website at www.navyseic.dt-.navy.mil for assistance.

593-4.7.1.6.1 Transit Mode. While transiting a restricted zone, sewage drains are routed to the holding tanks and gray water drains are diverted overboard. Both pump controller switches are in the OFF position. Pump suction valves A and inflow stop valves G (for strainer system only) are open (Figure 593-4-13). Pump discharge valves B and the holding tank wash down supply valve are closed. Sewage drain diverter valves H are in the TO TANK position. Gray water drain diverter valves J are in the OVERBOARD position, discharging overboard through the gag scupper valves.

593-4.7.1.6.1.1 For systems equipped with a comminutor (Figure 593-4-12) and an aeration system (Figure 593-4-18), the comminutor isolation valves D are open and the comminutor is operated. The holding tank contents are aerated continuously. The air blower is operated and discharge valve M is open, or the ship service air supply valve N is open (Figure 593-4-18). If an aspirator system is employed, the aspirator pump is operated.

WARNING

WHENEVER A HIGH LEVEL ALARM SOUNDS WHILE OPERATING THE CHT SYSTEM IN THE TRANSIT MODE, IMMEDIATE ACTION MUST BE TAKEN TO CLOSE THE ISOLATION VALVES ON DRAINS BELOW OVERBOARD DISCHARGE, AND TO DIVERT UPPER LEVEL DRAINS OVERBOARD, TO PRECLUDE FLOODING OF SPACES. IF IN PORT, SEWAGE PUMPS MUST BE MANUALLY ACTIVATED IMMEDIATELY.

593-4.7.1.6.2 In-Port Mode. While in port the transfer deck connections are connected to the receiving facility (or barge) using sewage hoses. Both sewage and gray water drains are routed to the holding tank and then discharged to a shore receiving facility, nested ship, or barge receiving station using the transfer pumps.

NOTE

When connecting the sewage hose, proper chafing gear and supporting lines should be fitted, where required, to protect the hose. Snagging the hose between the ship and the pier should be avoided.

a. Procedure for Arrival In Port. When in the Transit Mode and not entering a nested situation, the procedures described in the following paragraphs shall be followed to prepare the CHT system for the in-port mode (see paragraph 593-4.7.1.7 for nesting operations).
   1. The sewage hoses should be connected between the deck connection and the receiving facility using posted instructions.
   2. Valves A, B, and C are lined up and set for discharge to the appropriate deck discharge at valve F. The receiving station sewer valve is then opened, followed by valve F at the deck connection. With a man stationed at deck connection F, word should be passed to the pump room that hose connections have been made (Figure 593-4-12 and Figure 593-4-13).
   3. Both pump controller selector switches should be set to the MAN2 position to pump out the holding tank.

NOTE

If sewage pumps become air-bound and fail to pump (this occasionally occurs when the holding tank has been completely emptied using the pumps in the MAN1 mode, and then refilled), the pump should be stopped. Pump discharge valve B should be opened, the pump started, and the manual hold-open device on pump discharge check valve K screwed in. The procedure should be repeated for the second pump. The manual hold-open devices on pump discharge check valves K should be returned to their original position (out).

4. After the holding tank is pumped down and the pumps automatically stop, the holding tank wash down supply valve should be opened to wash the holding tank for 30 minutes. After completion of flushing, the holding tank wash down supply valve should be closed.
5. Place the pump selectors in the AUTO position.
6. Gray water drain diverter valves J should be set to the TO TANK position.
7. The comminutor and aeration (or aspiration) system should be operated continuously in the in-port mode. During extended in-port transfer operations, the holding tank shall be manually emptied and washed down a minimum of 30 minutes once each week.
8. While discharging through sewage hoses, the hoses should be checked periodically for leakage, kinking, and snagging.

b. High Level Alarm In Port. In the event of a high level alarm, the operator should recognize that a problem exists with the pumps, the discharge piping, the level sensors, or the pump controls. If the holding tank completely fills while the system malfunction is being investigated, the sewage will overflow overboard and any heads or fixtures located below the overflow discharge lines (below the waterline) will back up. Drain lines from fixtures located below the waterline incorporate both a check valve and an isolation, or cutoff valve. These valves will prevent the holding tank from overflowing into the sanitary spaces, but will not prevent the fixtures from backing up if used. The fixtures located below the waterline, and their corresponding isolation valves, should be identified before initial system use. Whenever a high level alarm sounds, immediately close the isolation valves on drains located below the waterline discharge and secure all sanitary spaces with drain lines located below the waterline. Divert upper deck drains overboard to preclude flooding of spaces. Operation of pumps and pump controls should be checked. The holding tank should be pumped out using the MAN2 mode, if necessary, until problem can be corrected. If the problem cannot be immediately corrected sanitary spaces should be secured to prevent an overboard discharge of sewage and gray water in port.

c. Sewage Leak or Hose Snag In Port. In the event of leakage or snagging of the sewage hoses, only deck discharge valve F (Figure 593-4-12 and Figure 593-4-13) at the deck connection should be closed (closing the pier sewer valve may cause the hose to rupture). Immediate action must be taken to close the isolation valves on drains below the waterline and secure the sewage pumps until the problems with the sewage hoses have been corrected

d. Procedure for Getting Underway. When in the In-Port Mode and not in a nested situation, the procedures described in the following paragraphs shall be followed to prepare the CHT system for getting underway (see paragraph 593-4.7.1.7 for nesting operations).

1. Gray water drain diverter valve J (Figure 593-4-12 and Figure 593-4-13) should be set to the OVERBOARD position.
2. Sewage discharge pump controller selector switches should be set to MAN1 to empty the holding tank.
3. Aeration should remain in operation.
4. When the discharge pumps lose pump suction, the pump controller selector switches should be set in the OFF position. Pump discharge valves B should be closed.

NOTE

Before opening discharge piping flushing supply valve, the pump discharge gag scupper valve should be opened to allow the flushing system to relieve overboard, if required.

5. The discharge piping flushing supply valve should be opened to flush the discharge piping and hose for ten (10) minutes.
6. Discharge piping flushing valve should be closed and pump discharge valves B should be opened. The manual hold-open device on the pump discharge check valves K should be operated by screwing in the hold-open device to drain the discharge lines back into the holding tank.
7. If possible, the sewage hose should be raised to remove fluid from the drooping portion. Deck discharge valve F should be closed.
8. Where a feature exists on the deck discharge connection for air blow down of the hose, the connection should be hooked up to a ship service low-pressure air connection, and the hose blown down for 30 seconds. The air blow down system should be secured and the isolation valve on the pier sewer connection should be closed.
9. The deck discharge valve F should be momentarily opened and closed to ensure hose is not pressurized.
10. The highest hose connection should be disconnected first to ensure drainage of the hose. The cap on CHT deck connection should be replaced.

NOTE

Personnel engaged in sewage hose operations shall observe all applicable safety precautions described in paragraph 593-4.3.1 and sanitary and hygienic procedures described in paragraph 593-4.3.3.

11. The pump discharge check valves K should be reset (closed) by screwing out the hold-open device.
12. Deck connection components and area should be washed down with stock detergents and hosed down with seawater or fresh water.
13. Pump discharge valves B should be closed. The ship should now be prepared for transit.

593-4.7.1.6.3 At-Sea Mode. While at sea, the sewage and gray water drains are diverted overboard. The transfer pumps and the holding tank aeration system are secured. If the ship has sewage or gray water drain lines located below the waterline, they will continue to drain to the holding tank while at sea. In this case, the system will be operated as an ejection system with the transfer pumps in automatic and the aeration system in operation.

a. Procedure for changing to At-Sea Mode. For systems not required to be operated as an ejection system (see paragraph 593-4.7.1.3.1), the following procedure should be used to change from the Transit Mode (restricted waters) to the At-Sea Mode (non-restricted waters).
   1. All sewage and gray water drain diverter valves H and J should be set to the OVERBOARD position (Figure 593-4-12 and Figure 593-4-13).
   2. For CHT systems outfitted with comminutors, the comminutor should be secured. Pump discharge valves B should be opened.
   3. Pump discharge diverter valve C should be set to the OVERBOARD position. Check to ensure gag scupper valve at the hull in the pump discharge line is open.
   4. Discharge pump controller selector switches should be set to the MAN1 position.
   5. After the pumps lose suction, turn both controller selector switches to AUTO position.

6. Holding tank wash down supply valve should be opened to wash holding tank for 30 minutes. Holding tank wash down supply valve should be closed when holding tank washing is complete.
7. Controller selector switches should be set to MAN1 position. After loss of pump suction, controller switches should be set in OFF position. Pump suction valves A, discharge valves B, and, in the strainer system only, the inflow stop valves G should be closed.

NOTE

If pumps become airbound and fail to pump sewage, see corrective action outlined in note at paragraph 593-4.7.1.6.2, step a.

8. For comminutor type CHT systems, air blower discharge valve M should be closed and air blower secured, or ship service air supply valve N should be closed after holding tank washdown procedures have been completed and pump has lost suction (Figure 593-4-18). If an air aspirator system is installed, the system should be shut down and the aspiration pump secured.

b. When the CHT system must be used as an ejection system (paragraph 593-4.7.1.3.1) the following system operational changes from paragraph 593-4.7.1.6.3, step a. should be made:
   1. Valves A, B, and C shall be lined up and set to discharge overboard. The pump controller selector switches should be set to AUTO position. Sewage drain diverter valve H should be set to TO TANK position for drainage to the holding tank.
   2. For comminutor type CHT systems, the comminutor and the aeration systems should be used continuously.
   3. The holding tank should be manually emptied and washed down 30 minutes each week using the holding tank cleaning nozzles and wash down supply system.

c. Procedure for changing from At-Sea Mode to Transit Mode. The following procedure should be used to change from the At-Sea Mode (non-restricted waters) to the Transit Mode (restricted waters).

NOTE

All procedures below should be accomplished prior to the ship entering restricted waters.

1. Pump discharge valves B should be opened. Pump discharge diverter valve C should be set to the OVERBOARD position. Check to ensure gag scupper valve at the hull in the pump discharge line is open.
2. Discharge pump controller selector switches should be set to the MAN1 position.
3. After the pumps lose suction, turn both controller selector switches to AUTO position.
4. Holding tank wash down supply valve should be opened to wash holding tank for 30 minutes. Holding tank wash down supply valve should be closed when holding tank washing is complete.
5. Controller selector switches should be set to MAN2 position. After the pump shuts off automatically, controller switches should be set in AUTO position.

NOTE

If pumps become airbound and fail to pump sewage, see corrective action outlined in note at paragraph 593-4.7.1.6.2, step a.

6. All sewage and gray water drain diverter valves H and J should be set to the TO TANK position (Figure 593-4-12 and Figure 593-4-13).
7. For comminutor type CHT systems, the comminutor should be operating at all times.

8. For comminutor type CHT systems, air blower discharge valve M should be opened and air blower operated at all times, or ship service air supply valve N should be opened (see Figure 593-4-18). If an air aspirator system is installed, the system should be operated at all times.

NOTE

Whenever a high level alarm sounds, immediate action shall be taken to close the isolation valves on drains below the CHT holding tank overflow discharge (the waterline) and to divert upper level drains overboard to preclude flooding of spaces. If in port, sewage pumps should be immediately activated.

d. While at sea, the CHT holding tank shall be flushed and aerated once a week. The holding tank shall be flushed for 30 minutes using the holding tank wash down system followed by 30 minutes of aeration (for comminutor systems only). This procedure should be accomplished in accordance with applicable operational documentation (SDOSS). This wash down and aeration should be accomplished regardless of whether the CHT system is used as an ejection system while at sea.

593-4.7.1.7 Nesting Operations. To transfer holding tank contents from two or more nested ships to a receiving facility, hoses should be interconnected between inboard and outboard deck discharge valves F. After connections are made, deck discharge valves F should be opened.

CAUTION

Interconnecting deck discharge valves F shall not be opened until all hose connections have been made.

593-4.7.1.7.1 Hose Connections. When hoses are secured and deck discharge valves F are opened, the outboard ship shall be notified that transfer operations may begin. The outboard ship should then pump sewage through the inboard ship(s) to the sewage receiving station, using procedures described in paragraph 593-4.7.1.6.2. A schematic representation of the nested ship sewage transfer flow path is shown in Figure 593-4-1. In systems using aeration, valves N or M (Figure 593-4-18) shall be open while pumping out sewage, and aeration shall be operating.

593-4.7.1.7.2 Unnesting. The procedures listed in the following paragraphs shall be followed by all ships in a nest when any single ship must leave the nest.

WARNING

After completion of seawater flushing and air blow down (if applicable), it should be verified that the hose is depressurized. Depressurization should be done by opening the port and starboard deck discharge valves F. These valves shall be closed before any sewage hose is disconnected.

a. The ship leaving the nest shall:

1. Notify all ships of the intended action.
2. Set gray water drain diverter valve J to discharge overboard.
3. Set sewage discharge pump controller selector switches to MAN1 for emptying the holding tank.
4. When the discharge pumps lose pump suction, place the pump controller selector switches in the OFF position.
5. Close pump discharge valves B.
6. Request all other nested ships to deactivate their sewage pumps. Await confirmation from all ships. Ensure pump discharge gag scupper valve is open to allow piping flushing system relief valve to function, if required.
7. After confirmation has been received, open the discharge piping flushing supply valve and flush discharge piping for ten (10) minutes. Also, request ship immediately outboard to flush discharge piping for ten (10) minutes.
8. Close discharge piping flushing supply valve and pump discharge gag scupper valve. Also, confirm that outboard ship has completed flushing.
9. Open pump discharge valves B and open the manual hold-open device on the pump discharge check valves K, by screwing the hold-open device in, to drain discharge lines back to the holding tank.
10. Raise hose(s) and try to remove fluid from the drooping portion of the hose(s).
11. Close deck discharge valves F.
12. Where an air blow down connection is provided on the deck discharge connection, hook up to a source of ship low pressure air, open the 1/4-inch air supply valve on the deck discharge connection, and blow down the sewage hose(s) for 30 seconds. The blow down will help clear the hose(s) of sewage or flush water. Close the 1/4-inch air supply valve.
13. Close port and starboard deck discharge valves F.
14. Request ships immediately outboard and inboard to close their deck discharge valves F. Await confirmation.
15. Break the highest hose connection first since some flushing water may remain in the hose.
16. Notify all ships that unnesting is completed.
17. Close both pump discharge valves B.
18. Reset (close) the pump discharge check valves K by screwing out the hold-open device.
19. Wash down deck connection components and area with stock detergent and hose down with seawater or fresh water. The ship should now be prepared for transit.

b. Each remaining nested ship shall:

1. Await request from unnesting ship to deactivate sewage pumps.
2. Inform unnesting ship that sewage pumps have been deactivated.
3. Place sewage pump controller selector switches in the OFF position.
4. Await confirmation from the reconnecting ships that unnesting is complete.
5. Upon confirmation from reconnecting ships that the appropriate connections have been made and they are ready to transfer sewage, place sewage pump controller switches in the AUTO position and begin transfer operations.

c. In addition to the procedures described, the ships immediately inboard and outboard of the unnesting ship shall perform the procedures listed in this paragraph:

1. Upon request of the adjacent unnesting ship, flush sewage discharge piping for ten (10) minutes (outboard ship only).

2. Upon request of the adjacent unnesting ship close deck discharge valves F.
3. Notify unnesting ship that both deck discharge valves F are closed.
4. If the unnesting ship hose connection is lower than the adjacent ship hose connection, break the higher hose connection first. Some flushing water may be remaining in the hose.
5. Upon departure of the unnesting ship, the two adjacent ships should reconnect according to instructions given in paragraph 593–4.7.1.7. Unused hoses shall be returned to the Public Works Center, appropriate shore facility, or tender. Ensure that all deck discharge valves F connected to a hose are opened after re-connection.
6. Notify all other ships in the nest that re-connection is complete and that sewage transfer may begin.
7. Place sewage pump controller selector switches in the AUTO position and commence transfer operations.

d. Personnel engaged in sewage transfer operations shall observe all applicable sanitary and hygienic practices as described in the following paragraph.

e. The sanitary and hygienic practices listed in this paragraph shall be observed when transferring sewage (see paragraph 593–4.2.3 for additional precautions).
   1. Personnel engaged in sewage transfer hose operations shall not connect or disconnect hoses used for potable water.
   2. Personnel engaged in handling sewage hose shall wear protective rubber gloves, rubber boots, and coveralls.
   3. The sewage hose connection and the hose exterior shall be washed down with hot potable water, containing a stock detergent, and hosed down with seawater or fresh water any time the sewage hose is disconnected after transfer operations, and any time a sewage spill occurs.
   4. If a spill occurs, the area shall be secured from traffic until cleanup has been completed.

593-4.7.1.7.3 Surface Ship Tender and Submarine Tender Operations. During most tending operations, the ships being serviced transfer sewage and graywater to tender receiving tanks through tender receiving stations. Typical surface ship tender and submarine tender receiving stations are shown schematically in Figure 593-4-19 and Figure 593-4-20. Sewage and graywater transferred to tender receiving tanks from the serviced ship is subsequently transferred by the tender to the receiving facility. A few tenders have the capability to bypass the receiving tank through a diverter valve which can direct sewage and graywater from the receiving tank inlet line directly to the receiving tank pump discharge line.

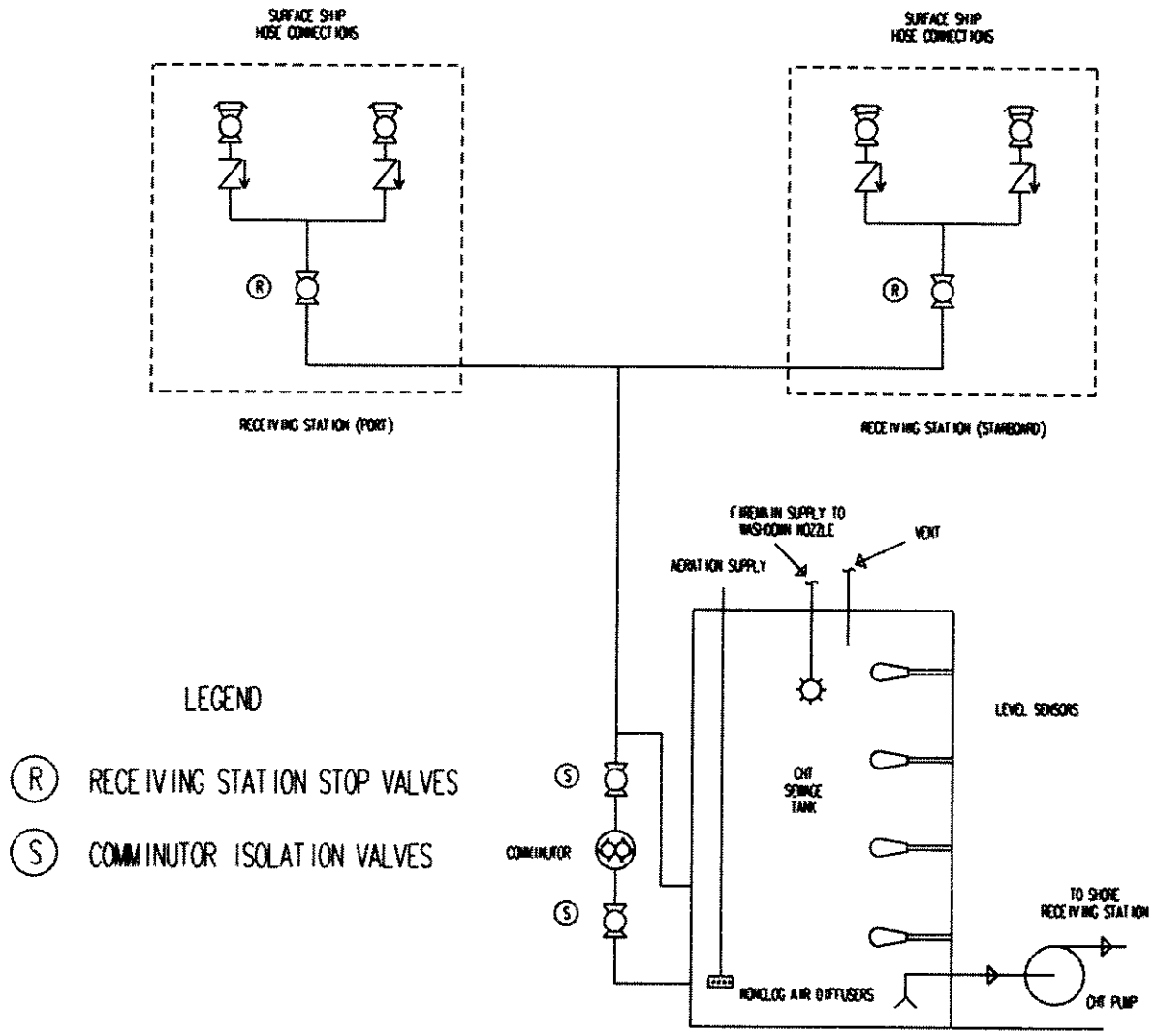


Figure 593-4-19 Surface Ship Tender Receiving Station

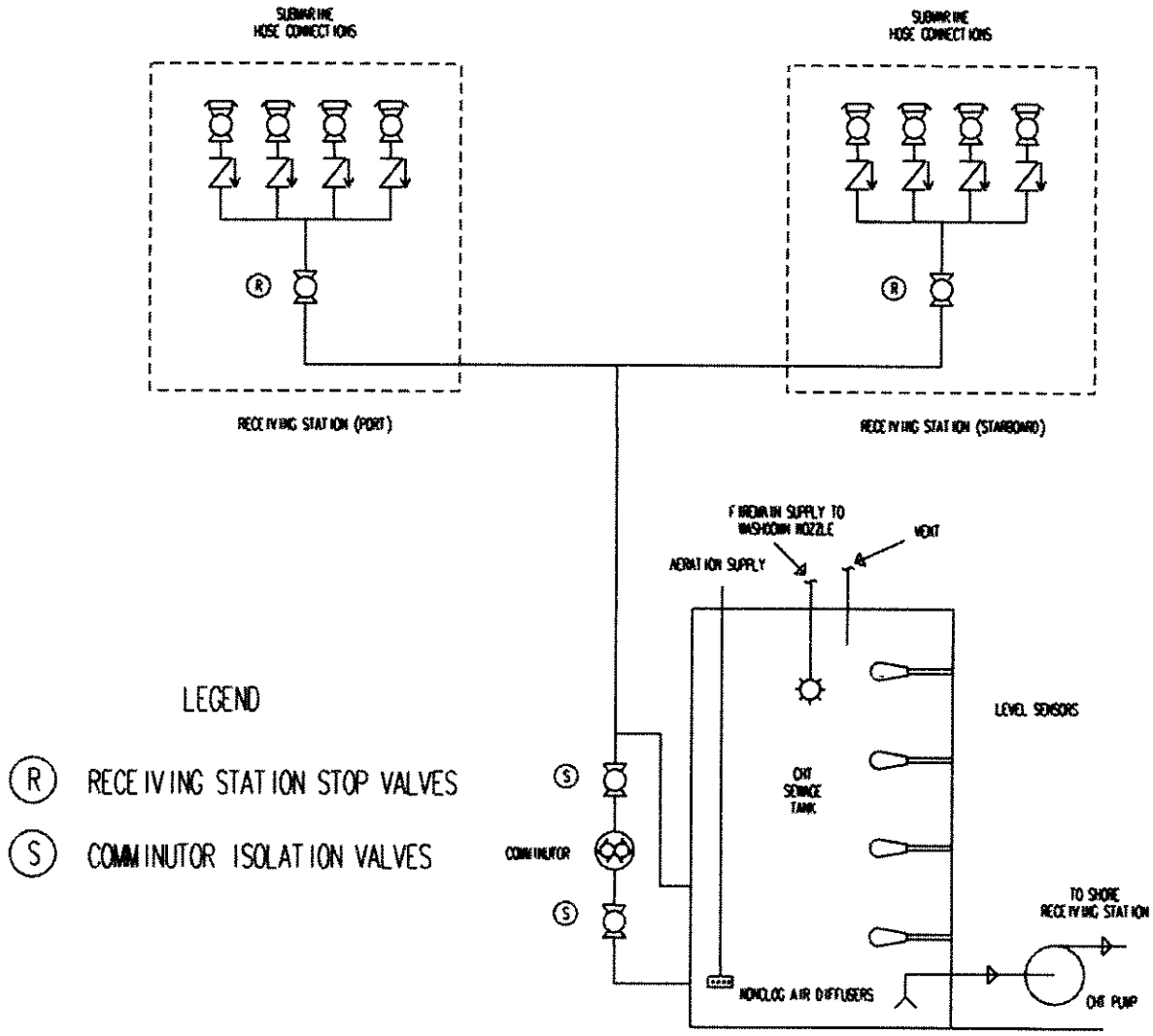


Figure 593-4-20 Submarine Tender Receiving Station

593-4.7.1.7.3.1 Submarine sewage transfer hose configurations are different from those of surface ships in that each submarine uses its own independent hoses for direct transfer to a tender or receiving facility. That is, when nested, submarines do not discharge sewage through inboard ships to the receiving facility as is the case with nested surface ships.

593-4.7.1.7.3.2 Tenders will obtain and furnish the sewage transfer hose for tended ships in a four (4) inch size with quick-disconnect fittings for surface ships, and 2-1/2-inch size with quick-disconnect fittings for submarines. The sewage hose will be obtained from the Public Works Center or appropriate shore facility. The following paragraphs identify shipboard sewage transfer procedures unique to tender operations.

593-4.7.1.7.3.3 Before receiving sewage from tended surface ships, sewage hoses must be connected to the tender sewage receiving station in accordance with procedures contained in paragraphs 593–4.7.1.7 and 593–4.7.1.7.1. Then, as illustrated in Figure 593-4-19 and Figure 593-4-20, tender receiving station stop valves R and comminutor isolation valves S shall be opened. The surface ship shall then be advised that transfer operations may begin. Where conditions permit, and where provisions exist on those few ships to bypass the receiving tank through a diverter and bypass line to the receiving tank pump discharge, the tender shall bypass the receiving tank. The pumping system shall remain activated and in the AUTO mode.

CAUTION

When connecting hoses during nesting operations, no valves are to be opened until after all connections are made. If the high level alarm on the tender sounds while emptying a tended ship holding tank, notify the tended ship to immediately stop transferring, and then close receiving station stop valves. Investigate and take corrective action before resuming further transfer operations.

593-4.7.1.7.3.4 When the tended ship has to disconnect from the tender (getting underway, moving to another pier, etc.), the tended ship shall follow procedures described in paragraphs 593–4.7.1.7.2 through 593–4.7.1.7.2, step e.

CAUTION

Before disconnecting any hose, make sure the line is depressurized by opening all valves in the lines to the CHT holding tanks on the tended ships. Also, all pump selector switches on the tended ships should be in the OFF position. All applicable sanitary and hygienic procedures outlined in paragraphs 593–4.2.3 shall be followed.

593-4.7.1.7.3.5 Submarine transfer procedures are similar to surface ship transfer procedures except that the receiving station stop valves R are opened and remain open only during receiving operations, and a submarine shall obtain permission from the tender before discharging sewage. When securing receiving operations a complete air blow of the hose and piping will minimize hose spillage during disconnect.

WARNING

If the high level alarm on the tender sounds while receiving sewage from the submarine, notify the submarine immediately to stop transfer operations. The alarm should be immediately investigated, and corrective actions taken before resuming transfer operations. Actions should be taken to ensure that sewage transfer hoses are not pressurized before disconnecting.

593-4.7.1.8 Changing CHT System Modes of Operation. CHT system operators should consult the specific technical manual and Sewage Operational Sequencing System (SDOSS) documentation for detailed mode change instructions.

NOTE

During maintenance and operation of the system, all sanitary and hygienic provisions and procedures outlined in paragraphs 593-4.3.2 and 593-4.3.3 shall be followed where they are applicable to the CHT System.

593-4.7.1.9 CHT System Maintenance and Repair. Maintenance procedures for the CHT system are covered in detail in the manufacturer's technical manual for the specific shipboard system or equipment. Maintenance personnel should refer to the technical manual for specific troubleshooting and repair procedures.

593-4.7.1.9.1 Preventive maintenance for the CHT system shall be performed according to applicable MRCs. It should be noted that the use of commercial chemical pipe cleaners in the CHT system is prohibited.

593-4.7.2 VACUUM COLLECTION, HOLDING AND TRANSFER (VCHT) SYSTEM. The vacuum collection, holding and transfer (VCHT) system, as indicated by the system name, has the same basic elements as the collection, holding and transfer (CHT) system. The major differences are that sewage collection is assisted by vacuum, and low flow sanitary fixtures are used. These differences allow fixture (water closet and urinal) drainage independent of slope (vertical lifts are allowed), lower water usage, smaller diameter piping, and smaller holding tanks. VCHT systems typically include holding tanks and transfer systems similar to CHT systems.

NOTE

All VCHT systems incorporate the applicable sanitary and hygienic provisions as discussed in paragraph 593–4.2.2. All sewage and gray water system sanitary and hygienic procedures as described in paragraph 593–4.2.3 should be followed, as they apply to the VCHT system.

593-4.7.2.1 Operation. There are two major types of VCHT systems used on operational fleet ships, the fire-main powered eductor type (DD-963 Class, DDG-51), and the sewage powered ejector type (DDG-52 and follow, MHC-51 Class). Both systems include a holding tank and transfer system very similar to those of CHT systems. The difference between the two VCHT system types is related to the method of vacuum collection.

a. The fire main powered eductor system generates vacuum in the holding tank and collection piping using a fire-main powered eductor connected to the top of the VCHT holding tank.
b. The sewage powered ejector system generates vacuum only in the collection piping by pumping sewage from the bottom of the holding tank through an ejector, back into the top of the tank. The collection piping is connected to the suction side of the ejector allowing a vacuum to be formed in the collection piping.

593-4.7.2.2 Modes of Operation. The VCHT system is designed to operate in several different modes of operation.

NOTE

Ship's force should refer to the applicable VCHT system technical manuals and Sewage Disposal Operational Sequencing System (SDOSS) documentation for detailed explanations of operational scenarios and procedures for switching from one mode of operations to another.

a. While in port (In-Port Mode), the vacuum collection system is in operation collecting all sewage from water closets and urinals. The sewage is collected in the holding tank and pumped periodically to shoreside facilities or a barge using a transfer system similar to the CHT system.

b. While in restricted waters (Transit Mode), the vacuum collection system is in operation collecting all sewage from water closets and urinals. The sewage is stored in the holding tank until the ship arrives in port or in non-restricted waters at which time the holding tank is pumped out using the transfer system. .

c. While in non-restricted waters (At-Sea Mode), the vacuum collection sys-

tem is in operation collecting all sewage from water closets and urinals. The sewage is collected in the holding tank and pumped overboard periodically using the transfer system

593-4.7.2.3 Components. Components included in the VCHT system are described in the following paragraphs.

593-4.7.2.3.1 Vacuum Collection Piping. The vacuum collection piping design and operation is the same for both types of vacuum systems. The sewage from vacuum water closets (see paragraph 593-4.7.2.3.2) and urinals through Vacuum Interface Valves (VIVs) (see paragraph 593–4.7.2.3.3) is transported to the holding tank in the form of a slug. The sewage slug is formed when atmospheric air is admitted into the piping system by flushing a vacuum water closet or by actuation of a urinal VIV. The slug forms a seal as it conforms to the circumference of the piping. The slug is moved through the piping due to the pressure difference between the atmospheric air entering the piping (through the water closets and VIVs) and the system vacuum at the holding tank end of the piping system. As the slug moves down the piping, it begins to break up as the pressure difference within the piping system is equalized. In long piping runs one flush does not provide enough atmospheric air to transport the entire slug to the holding tank. Traps, referred to as a reformer pockets, are required to collect the portion of the slug that remains in the piping between flushes. After the slug reforms in the reformer pocket it will be transported further down the piping system upon the next water closet of VIV actuation. Normal piping system vacuum levels range between 12 to 18 inches of mercury (Hg) with optimal levels from 14 to 16 inches of mercury (Hg). Vacuum main piping can range from two (2) to 2-1/2 inches nominal pipe diameter, while 1-1/2 inches is the basic size for branch lines from water closets and urinal VIVs. To guarantee efficient and proper operation, vacuum collection, mains and branch lines are designed to ensure all air admitted into the system is used to propel sewage by maintaining the sewage slug seal as long as possible. The vacuum collection piping design also keeps static vacuum losses to a minimum to ensure there is enough vacuum pressure to flush the plumbing fixtures farthest from the vacuum source. Some specific design requirements to meet these requirements are:

1. All pipe bends are made using long turn 90° elbows or two 45° elbows.
2. Lift piping is vertical and straight without any changes of direction.
3. Lift piping is connected to the horizontal main piping with a Y-branch fitting at or above the centerline of the main.
4. Horizontal piping is installed with no pitch or with a slight pitch of 1/4 inch per foot toward the direction of flow. Vertical lifts are permissible in vacuum collection piping when designed and installed in accordance with specific requirements.

593-4.7.2.3.2 Vacuum Water Closet. The vacuum water closet is made of white vitreous china, and is either deck or bulkhead mounted. Flushing water is supplied by the ship's potable water system, with some older ships classes (DD-963, DDG-993) using water from a reduced pressure seawater fire main system as a back-up. Approximately three pints of water is dispensed per flush. A cavity behind the bowl houses the operating components. The three major components consist of a control valve, a flushing water valve, and a discharge valve. When the flush cycle is initiated, the control valve directs a vacuum-mechanical-hydraulic circuit (first and second generation vacuum water closets) or a pneumatic circuit (third generation vacuum water closets), which opens the flushing water and discharge valves. The flushing water valve dispenses water to rinse the bowl as atmospheric air is allowed to enter the piping system propelling the bowl contents into the collection piping through the open discharge valve. The discharge valve closes as it is vented, and additional flushing water is directed into the bowl to form a pool of water for the next use. If the vacuum water closet flush cycle is initiated when the system vacuum is below the minimum required for operation, the water closet will not operate but will automatically flush when the minimum operating vacuum level is restored.

593-4.7.2.3.3 Urinal and Vacuum Interface Valve (VIV). A standard shipboard gravity drain urinal is typically used with the flushing water supplied by the ship's potable water (with some older ships classes (DD-963, DDG-993) using water from a reduced pressure seawater fire main system as a back-up). The urinal flushometer is adjusted to dispense one pint of water per flush. The urinal drain is connected to the vacuum collection piping through a Vacuum Interface Valve (VIV). In some installations, a single VIV handles flow from more than one urinal. The major components of the VIV are a level sensing activator and a discharge valve. The activator is connected to the vacuum collection piping with tubing. First generation VIVs use a vacuum-mechanical control circuit and second generation VIVs use a pneumatic control circuit.

In the first generation VIV, a hydrostatic pressure is created when waste and flushing water from the urinal are collected by the gravity drain in the buffer area of the VIV. When that pressure reaches 8 inches of water, a control spool in the activator forces a trip lever to open a plunger. The plunger then directs the vacuum from a vacuum port to a valve port. It is then directed to a port on the outlet of the discharge valve. This vacuum opens the discharge valve rubber sleeve, allowing the stored waste and water to flow through the discharge valve and into the collection piping. The discharge valve remains open for approximately 3 seconds and then closes, completing the urinal / VIV flush cycle.

In the second generation VIV, a hydrostatic pressure is created as waste and flushing water from the urinal are collected by the gravity drain in the buffer area of the VIV. When that pressure reaches 2 inches of water and is sensed by the activator's sensing port, the activator is triggered to transfer the system vacuum to a port on the outlet of the discharge valve. This vacuum opens the discharge valve rubber sleeve, allowing the stored waste and water to flow through the discharge valve and into the collection piping. The discharge valve remains open for approximately 3 seconds and then closes, completing the urinal / VIV flush cycle.

593-4.7.2.3.4 Firemain Powered Eductor. The firemain powered eductor system uses a firemain powered eductor connected to the top of the VCHT holding tank via a suction line. A differential pressure is created as sea water flows through the eductor nozzle. This differential pressure allows the eductor to evacuate the air in the holding tank and collection piping connected to the holding tank, producing system vacuum. Since the eductor runs continuously, a vacuum regulating valve is provided to regulate vacuum pressure. The valve regulates the flow of atmospheric air into the system to maintain vacuum within operating requirements.

593-4.7.2.3.5 Sewage Powered Ejector. The sewage powered ejector system generates vacuum by pumping sewage from the bottom of the holding tank through an ejector, back into the top of the tank. The collection piping is connected to the suction side of the ejector via a suction distribution manifold and a non-return valve at the ejector suction inlet. The ejector operating principles are the same as an eductor. The sewage flows through a nozzle within the ejector creating a differential pressure which allows the ejector to remove air from the collection piping (the holding tank is not under vacuum). When the ejector system is not running, the non-return valve isolates the vacuum collection piping from the holding tank, which is at atmospheric pressure. The ejector system is controlled by three vacuum switches, which automatically start and stop the ejector pumps at preset levels to maintain the system vacuum within operating requirements.

593-4.7.2.3.6 Holding Tank. The VCHT system includes a holding tank to hold sewage until pumped overboard or to a shoreside facility. In the fire main powered eductor system the holding tank is under vacuum. In the sewage powered ejector system the tank is not under vacuum. On most ships a fire main connection is provided for flushing and cleaning the VCHT holding tank. Seawater can be delivered to the holding tank through wash down nozzles, which spray the inside of the holding tank.

593-4.7.2.3.7 Transfer System. Most ships equipped with VCHT systems are typically equipped with a transfer system similar in design and operation to the transfer element of a CHT system.

On some ships (MHC-51 Class, figure 593-4-21), the sewage pumps serve a dual function of generating system collection piping vacuum via the sewage powered ejectors and discharging sewage holding tank contents via the pump discharge piping. Each pump is provided with discharge piping between the pump outlet and the respective sewage ejector inlet. Since sewage flow is split between the discharge piping path and the sewage ejector inlet path, vacuum is maintained at a reduced rate while the system is transferring sewage. The discharge piping for each pump is equipped with a non-clogging swing check valve (with manual lift mechanism) and a motorized isolation valve, in that order, before connecting to the combined sewage transfer piping. The motorized isolation valves can be controlled manually or automatically by the liquid level switches in the holding tank.

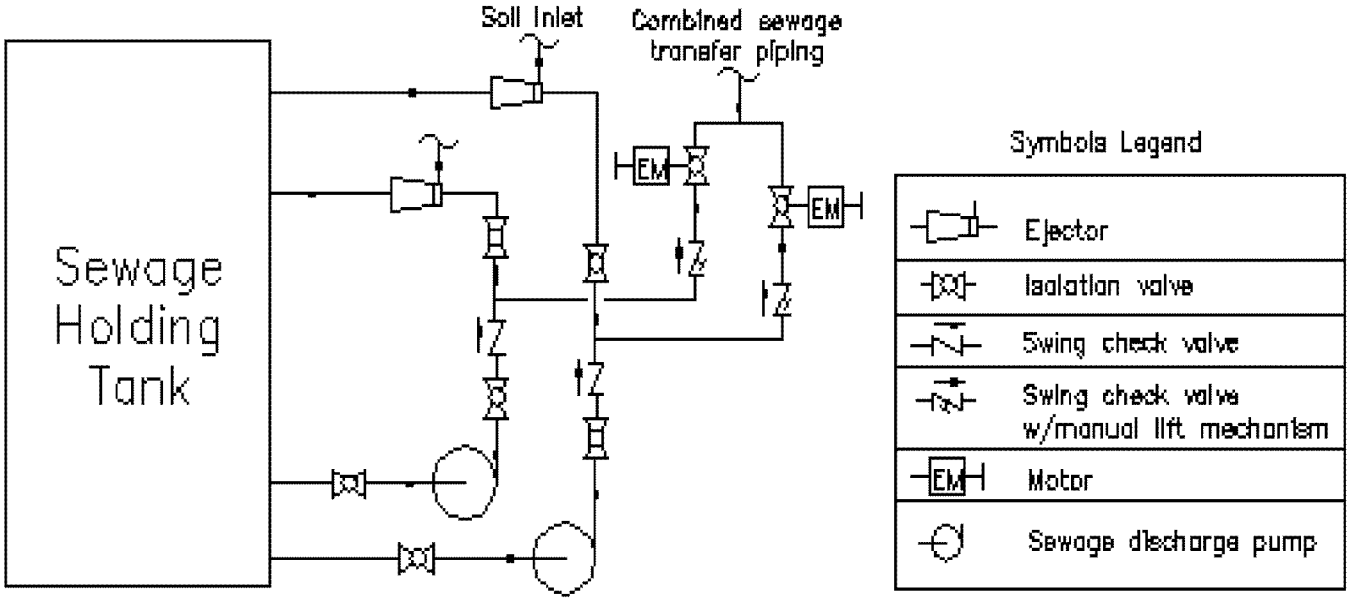


Figure 593-4-21 MHC-51 Class Ejector-Transfer Piping Network

For DD-963 Class, the transfer system is described in the Modes of Operation section (593-4.7.3.2) for the JERED Vacu-Burn Sewage Treatment System.

593-4.7.2.4 Changing VCHT System Modes of Operation. Detailed procedures for modes of operation for VCHT systems vary by ship class and are therefore not described in this manual. VCHT system operators should consult the specific technical manual and Sewage Operational Sequencing System (SDOSS) documentation for detailed mode change instructions.

NOTE

During maintenance and operation of the system, all sanitary and hygienic provisions and procedures outlined in paragraph 593–4.2.2 shall be followed where they are applicable to the VCHT system.

593-4.7.2.5 VCHT System Maintenance and Repair. Maintenance procedures for the VCHT system are covered in detail in the manufacturer's technical manual for the specific shipboard system. Maintenance personnel should refer to the technical manual for specific troubleshooting and repair procedures.

593-4.7.2.5.1 Preventive maintenance for the VCHT system shall be performed according to applicable MRCs. It should be noted that the use of commercial chemical pipe cleaners in the VCHT system is prohibited.

593-4.7.3 JERED VACU-BURN SEWAGE TREATMENT SYSTEM. The JERED Vacu-Burn Sewage Treatment System was built by JERED Industries, Inc. The system was designed for a complement of 200 and was installed on DD-963 Class and DDG-993 Class ships. Each ship was equipped with two JERED systems.

NOTE

The JERED system incorporates the applicable sanitary and hygienic provisions as discussed in paragraph 593–4.2.2. All sewage and gray water system sanitary and hygienic procedures as described in paragraph 593–4.2.3 should be followed, as they apply to the JERED system.

593-4.7.3.1 Operation. Operators of the JERED system should consult the system technical manual and applicable Sewage Disposal Operational Sequencing System (SDOSS) documentation for specific operating instructions and procedures. Special training is available through the Center for Naval Engineering (CNE). The description given in the following paragraphs is intended as a general explanation of the system and how it operates.

593-4.7.3.1.1 The interrelationship of the major components and the concept of operation of this system are shown in Figure 593-4-22. Sewage is introduced into the system through use of a vacuum collection system as described previously in this manual and more specifically in section 593-4.7.3.3.

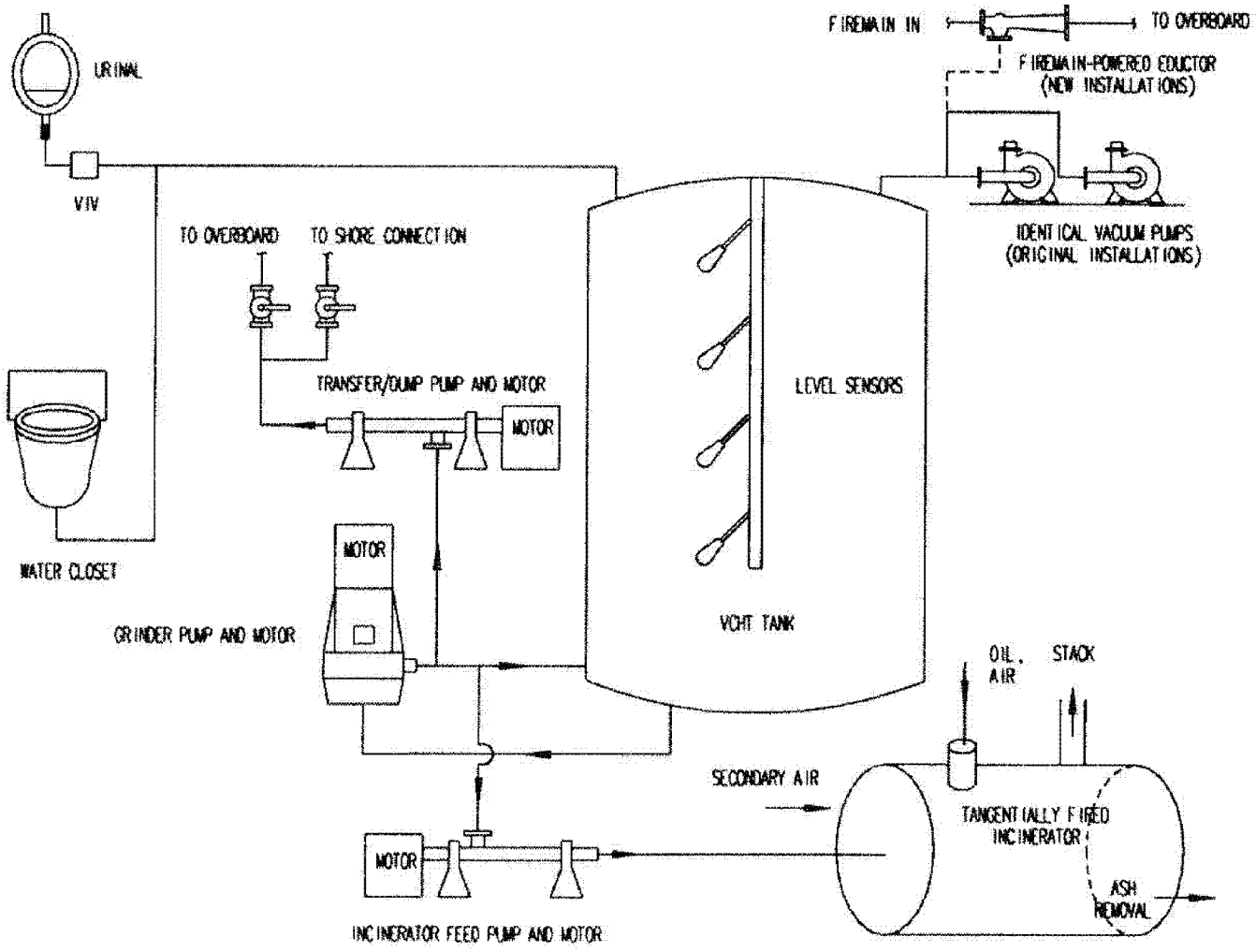


Figure 593-4-22 JERED Vacuum Collection and Incineration System.

593-4.7.3.1.2 Sewage solids and the small amount of flushing water are collected in the 240 gallon vacuum collection tank. The sewage from the vacuum collection tank is circulated through a grinder pump, activated on a time cycle, which macerates the sewage.

593-4.7.3.1.3 Sewage is burned in the tangentially-fired vortex incinerator at the rate of 0.5 gallons per minute (gal/min). In the event of an incinerator failure, the controls will automatically shut the system down. Sewage in the vacuum collection tank may then be pumped overboard or blown overboard using low pressure air.

593-4.7.3.2 Modes of Operation. The JERED system is designed to accommodate three different modes of operation. The vacuum collection system operates in all three modes.

1. The overboard dump mode (At-Sea Mode) for operation in non-restricted waters: In the overboard dump mode, the liquid level sensors in the vacuum collection tank control the transfer/dump pump which discharges overboard.
2. The incineration mode for operation in a restricted zone (Transit Mode): In the incineration mode, sewage is pumped by the incinerator feed pump from the vacuum collection tank and is injected into the incinerator. The transfer/dump pump can also be used to transfer sewage between two vacuum collection tanks. This transfer feature is used in the event only one incinerator is operational.

3. The pier discharge mode (In-Port Mode) for operation where pier discharge facilities are available: In the pier discharge mode, the liquid level sensors in the vacuum collection tank control the transfer/dump pump, which discharges to the pier or to a barge.

593-4.7.3.3 Components. Components of the JERED system are described in following paragraphs.

593-4.7.3.3.1 Vacuum Flush Water Closet. For a DD-963 Class and DDG-993 Class, the original vacuum flush water closet assembly contains a combination vacuum mechanical circuit to actuate, sequence, and time out the flush cycle. For the operational description of newer design water closets used in VCHT systems, see section 593-4.7.2.3.2 (Vacuum Water Closet).

To initiate the water closet flush cycle, the activation valve located on top of the water closet is depressed momentarily. Vacuum pressure operates and controls the flush valve assembly. The flushing cycle lasts approximately seven seconds, during which the discharge valve opens for one second and approximately two pints of clean flush water flows into the bowl. The discharge valve is a self-sealing diaphragm valve. The downstream vacuum tends to maintain a closed line. Should system vacuum pressure be below proper flushing range, the water closet will not flush. Instead, after the push-button is activated, the flush control valve will remain in a semi-cocked position until the vacuum level rises to adequate pressure for proper flushing action. At this time, the water closet will automatically initiate and complete the flushing action.

593-4.7.3.3.2 Urinal and VIV. A standard shipboard gravity drain urinal is used with the flushing water supplied from dedicated fresh water flushing systems. A reduced pressure seawater fire main can be used to flush sanitary fixtures in the event fresh water is not available, but is not recommended. Fire main flushing accelerates the buildup of scale in the drain piping. The urinal flushometer is adjusted to dispense one pint of water per flush. The urinal drain is connected to the vacuum collection piping through a Vacuum Interface Valve (VIV). In some installations, a single VIV handles flow from more than one urinal. The major components of the VIV are a sewage discharge valve and a vacuum-dispensing valve. When pressure in the upper chamber of the sewage discharge valve is high enough due to sewage draining from the urinal(s), the diaphragm in the vacuum interface rises. The diaphragm moves the vacuum switch from the closed to the open position, allowing vacuum pressure to be directed to the vacuum-dispensing valve. Vacuum pressure from the vacuum switch causes the vacuum-dispensing valve to open, allowing vacuum pressure to be directed to the bottom of the sewage discharge valve. Vacuum pressure in the lower chamber of the sewage discharge valve pulls the diaphragm down in that valve, which allows liquid and atmospheric air to flow to the collection tank. Internal springs for the VIVs' various valves return the valves to their closed positions, ready for the next flushing cycle.

593-4.7.3.3.3 Piping. Pipe sizes for the JERED system are 1-1/2 and 2 inches. All lines can be horizontal and local rises of up to eight (8) feet are permissible. Piping is copper-nickel and has silver brazed or bolted flanged joints. All pipe fittings such as elbow tees is of the long turn type. Valves are of the full flow type to minimize any obstructions.

593-4.7.3.3.4 Grinder Pump. The grinder pump draws sewage from the vacuum collection tank, macerates it, and discharges it back into the vacuum collection tank. The grinder pump also feeds the suction side of both transfer/dump pumps, so when those pumps are operating only macerated sewage is being pumped.

593-4.7.3.3.5 Transfer/Dump and Incinerator Feed Pumps. When the system is set in the overboard discharge mode, or when pumping to a shore facility or barge, the transfer/dump pump is used. When the system is set in the incinerator mode, the incinerator feed pump is used. Both pumps are Moyno, positive displacement progressive cavity pumps. The transfer/dump discharge pump has a flow rate of nine (9) gal/min and the incinerator feed

pump has a flow rate of 0.5 gal/min. Once the desired mode is set on the system control panel, the level sensors in the vacuum collection tank automatically control the pump operation.

593-4.7.3.3.6 Fire Main-Powered Eductors. The fire main-powered eductors used to generate vacuum for the collection system are supplied in accordance with MIL-E-24127 (SHIPS). One eductor is provided for each collection plant and discharges overboard below the waterline through an isolation valve and check valve. A vacuum relief valve is installed to maintain vacuum pressure between 18 and 20 inches Hg.

593-4.7.3.3.7 Vacuum Collection Tank. The 240-gallon vacuum collection tanks are of welded steel construction having a wall thickness of 0.125 inch. The vacuum collection tank design conforms to the American Society of Mechanical Engineers (ASME) pressure code for unfired pressure vessels.

593-4.7.3.3.7.1 Four float-type liquid level sensors are installed in the vacuum collection tank to monitor and control flow. Their functions are described below.

a. The effluent off (A) level sensor signals the master controller to stop the transfer/dump pump (In-Port Mode) or the incinerator feed pump (Incineration Mode) and the grinder pump in the automatic mode. The liquid level at the A level switch is approximately 67 gallons.

b. The effluent on (B) level sensor signals the master controller to start the transfer/dump pump (In-Port Mode) or the incinerator feed pump (Incineration Mode) and the grinder pump in the automatic mode. The liquid level at the B level switch is approximately 120 gallons.

c. The high (C) level sensor signals the master controller to provide a visual high level alarm in the VCHT pump room and a visual and audible high level alarm in Central Control Station. The liquid level at the C level switch is approximately 180 gallons.

d. The very high (D) level sensor signals the master controller to close the fire main-powered eductor's motor/solenoid operated suction valve (eductor systems) and provides a visual alarm in the VCHT pump room and a visual and audible alarm in Central Control Station. The liquid level at the D level switch is approximately 225 gallons.

The sensors described previously in this paragraph are presented in relative order to their distance from the vacuum tank bottom.

593-4.7.3.3.7.2 Compressed air can be used to discharge the vacuum collection tank contents as an alternate process, should the transfer/dump pump malfunction.

593-4.7.3.3.8 Liquid Waste Incinerator. The JERED system incinerates sewage in a cylindrical combustion chamber. The chamber is fired by a tangentially injected flame, which causes a whirlpool (vortex) of flaming gases. The flame temperature is approximately 1,095° C (2,003° F). Sewage is introduced at the eye (center) of the vortex as an atomized spray. Evaporation of the liquids and incineration of solid particulates occur at a rapid rate. Sewage is entrained in the vortex until complete combustion is achieved. The vortex system reduces solid buildup and corrosion of the incinerator liner by burning sewage within the flame, thus minimizing contact between corrosive elements in the sewage and the incinerator walls. The exhaust gases, cooled to approximately 370° C (698° F) leave the other end of the cylindrical chamber through the flue. Temperatures within the incinerator destroy odors. After the incinerator has cooled down, ashes are removed through a small, removable door located at the bottom of the main incinerator door.

593-4.7.3.3.8.1 The incinerator is cooled by air passing between the incinerator walls. Exhaust cooling air is vented to the atmosphere.

593-4.7.3.3.8.2 The incinerator has an overall capacity of 400 pounds per day of liquid sewage and a nominal burn rate of 0.5 gal/min. The incinerator has a commercial burner unit designed to operate on marine diesel, JP-5, or Navy distillate fuel. One gallon of fuel oil will incinerate approximately 5.4 gallons of liquid sewage.

593-4.7.3.4 Changing JERED System Modes of Operation. JERED system operators should consult the specific technical manual and Sewage Disposal Operational Sequencing System (SDOSS) documentation for detailed mode change instructions.

NOTE

During maintenance and operation of the system, all sanitary and hygienic provisions and procedures outlined in paragraph 593–4.2.3 shall be followed where they are applicable to the GATX MK I MSD system.

593-4.7.3.5 JERED System Maintenance. Maintenance procedures for the JERED system are covered in detail in the system technical manual. Maintenance personnel should refer to the manual for the specific troubleshooting and repair procedures.

593-4.7.3.5.1 Preventive maintenance shall be performed according to applicable MRCs. It should be noted that the use of commercial chemical pipe cleaners in the JERED system is prohibited.

593-4.7.4 GATX MK I MARINE SANITATION DEVICE (MSD). The GATX MK I MSD is a controlled volume flush Evaporative Treatment System (ETS), manufactured by General American Transportation Corp. (GATX). The GATX MK I MSD provides an extended holding time and is installed on MCM-1 Class ships. The GATX MK I MSD is depicted in Figure 593-4-23.

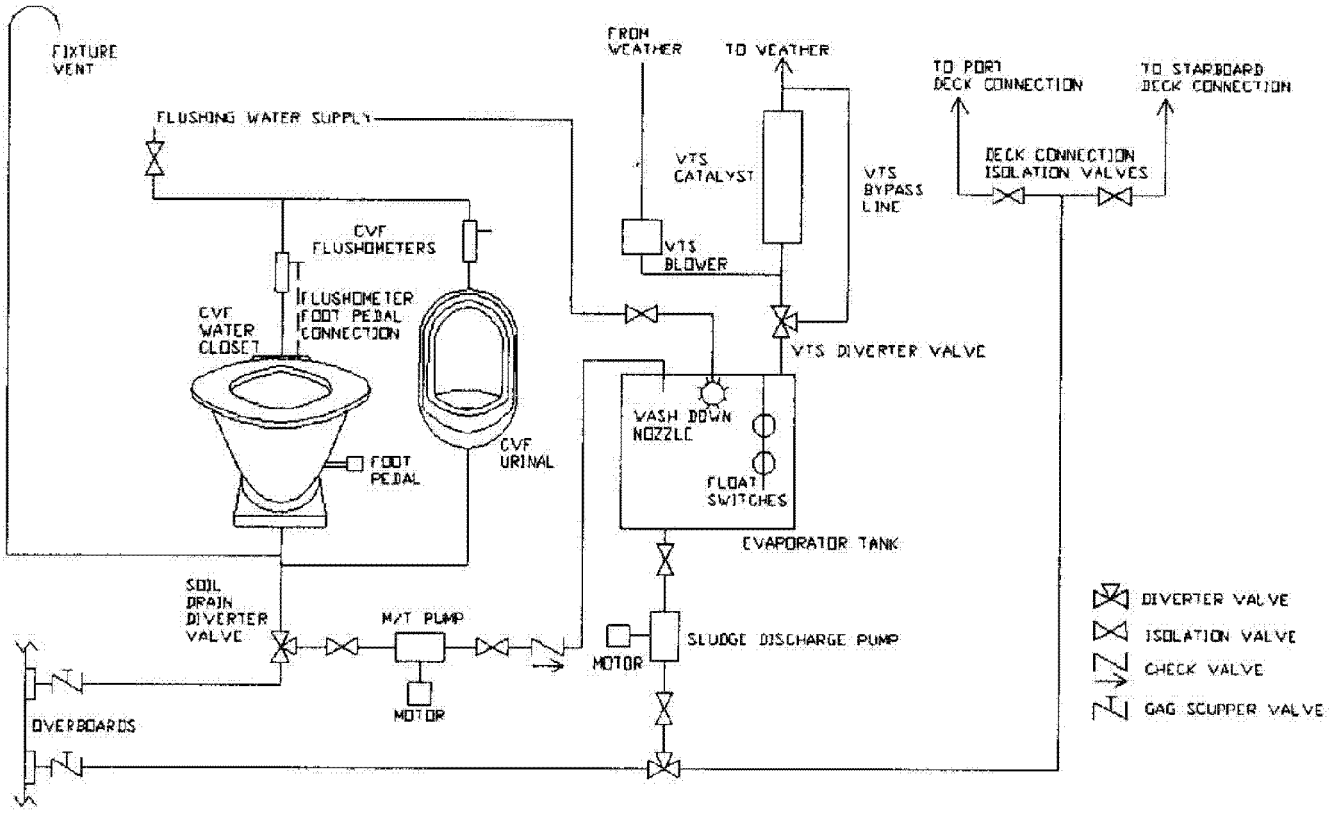


Figure 593-4-23 GATX MK I MSD Evaporative Treatment Systems

NOTE

The GATX MK I MSD incorporates the applicable sanitary and hygienic provisions as discussed in paragraph 593-4.3.2. All sewage and gray water system sanitary and hygienic procedures as described in paragraph 593-4.3.3 should be followed, as they apply to the GATX MK I MSD system.

593-4.7.4.1 Operation. Operators of the GATX MK I MSD should consult the system technical manual and applicable Sewage Disposal Operational Sequencing System (SDOSS) documentation for specific operating instructions and procedures. The description given in the following paragraphs is intended as a general explanation of the system and how it operates.

593-4.7.4.1.1 The GATX MK I MSD operates on the principal of volume reduction of sewage by:

a. Minimizing the volume of sewage generated, using a Controlled Volume Flush (CVF) collection system.

b. Boiling off most of the water content in sewage in an evaporation tank. The evaporator tank retains the remaining solid waste product in the form of sludge.

593-4.7.4.1.2 The GATX MK I MSD consists of controlled CVF urinals and water closets, macerator/transfer (M/T) pumps, a steam-jacketed evaporator with electrical heaters, a vapor (odor) treatment system, a sludge pump, system controls, and associated plumbing and wiring.

593-4.7.4.1.3 The relationship of the major components and the concept of operation of the GATX MK I MSD is depicted in Figure 593-4-22. Sewage is introduced into the system by CVF water closets or urinals. Flushing of the sewage is accomplished with a minimum of water so the total volume of diluted sewage to be handled is held to a low level (1 pint of flush water for urinals and three (3) pints in water closets). Flushing water can be either seawater or freshwater depending on how the specific ship configured.

593-4.7.4.1.4 The sewage output of the CVF water closets and urinals is fed directly to the input of a combined pump and macerator (Macerator/Transfer (M/T) pump). The M/T pump runs for no more than 10 to 12 seconds at the time of each flush of a water closet, reducing sewage materials to a slurry of small particle size, which is pumped through small diameter lines (1-1/4 to 1-1/2 inches) to the evaporator tank. The M/T pumps are designed so that occasional foreign debris, which may be dropped accidentally into the water closet, will be handled without difficulty.

593-4.7.4.1.5 All sewage is transferred to the evaporator tank, which is sized to accommodate normal water closet and urinal usage with a sludge removal cycle of every three (3) to five (5) days. The evaporator tank is steam-heated to 110° C (230° F), permitting the majority of the liquid in the sewage slurry to be vaporized and vented to the atmosphere off the ship. When reduced sludge has accumulated to the prescribed level (as indicated by an evaporator service lamp), the evaporator tank is manually purged. The sludge is pumped to a shore facility (if the ship is in restricted waters) or overboard (if the ship is in non-restricted waters). During continuous long-term operation of the evaporator, the ship should take advantage of any periods spent in nonrestricted waters to reduce the level of sludge in the evaporator tank by pumping sludge overboard in accordance with applicable SDOSS procedures.

593-4.7.4.1.6 The GATX MK I MSD Vapor Treatment System (VTS) is installed to eliminate odors emitted from the evaporator tank vent. Vapors produced in the evaporator tank are mixed with heated air in the vent and passed over a catalyst bed where malodorous components are oxidized and destroyed.

593-4.7.4.1.7 The evaporator tank may also be used as a holding tank, with the heaters secured, when the ship is making a short transit through restricted waters.

593-4.7.4.2 Modes of Operation. The GATX MK I MSD is designed to accommodate several different modes of operation.

NOTE

Ship's Force should refer to the applicable GATX MK I MSD system technical manuals and Sewage Disposal Operational Sequencing System (SDOSS) documentation for detailed explanations of operational scenarios and procedures for switching from one mode of operations to another.

a. For long periods in restricted waters (Transit (Evaporate) Mode), the system is fully operated as described in paragraph 593-4.7.4.1.

b. While in port (In-Port Mode) and for short period in restricted waters (short transits to sea or port) (Transit (Hold) Mode), the system is operated similar to a CHT system.

c. In non-restricted waters (At-Sea Mode), sewage is diverted directly overboard by gravity, with drain assistance provided by additional flushing water directed into the drain piping system (water closet trickle flush), and the evaporator treatment system and M/T pumps are secured.

NOTE

The GATX MK I MSD component description and operational procedures provided below are based on original manufacturer system configuration. Exact system configuration on each ship class may differ due to initial system requirements or alterations accomplished after installation. Specific system technical manuals and Sewage Disposal Operational Sequencing System (SDOSS) documentation should be used as the primary source of configuration and operational information.

593-4.7.4.3 Components. Components of the GATX MK I MSD are described in paragraphs 593-4.7.4.3.1 through 593-4.7.4.3.8.

593-4.7.4.3.1 CVF Water Closet. The GATX MK I MSD CVF water closet is a white vitreous china sanitary water closet similar to those found in domestic or industrial application. The unit differs from such units in that purging of human waste and flushing water from the bowl section is accomplished by opening a flapper valve at the bottom of the bowl at the completion of usage, permitting human waste and flushing water rinsed from the bowl to drop into a pump immediately below the bowl. Operation of the valve is actuated by depressing the flush pedal.

593-4.7.4.3.1.1 The CVF water closet is used dry-bowl for urination and wet-bowl for defecation. The lower section of the water closet bowl is normally filled with a small amount of water in the dry-bowl mode, and is ready to be used at any time for urination. After urination, the foot pedal labeled FLUSH is depressed, opening a valve to drain the water closet.

593-4.7.4.3.1.2 When the water closet is used for defecation in the wet-bowl mode, it is necessary that the user add two (2) pints of water to fill the bowl, both to provide aesthetic acceptability and to minimize the possibility of soiling the bowl surface. Filling is accomplished by the user depressing the hand lever, which allows water, under pressure from the supply line, to flow into the bowl. The volumes of water in both operational modes are automatically controlled by a flushometer.

593-4.7.4.3.1.3 After CVF water closet use, the flush pedal is depressed to complete the use cycle. Depression of the flush pedal in each case automatically opens the flapper valve to allow human waste and flushing water to fall to the suction end of the M/T pump, actuates the flushometer to provide additional flush water for the flushing process and to provide water in the bowl section of the water closet for the next use. This action also automatically actuates the M/T pump. The M/T pump will start after a short, about ten (10) second, delay, and operate for approximately 10 to 12 seconds. The M/T pump comminutes the sewage and transports the resultant slurry to the evaporator tank. A check valve located at the M/T pump outlet prevents any backflow of sewage after pump shutoff.

593-4.7.4.3.1.4 The CVF water closet is designed to interface with a standard three (3) or four (4) inch sewage line.

593-4.7.4.3.2 CVF Urinal. The CVF urinal (illustrated in Figure 593-4-22) supplied with the system is a white vitreous china unit equipped with a CVF water valve. The CVF flush valve is provided with a manual hand lever for flushing. Flushing of the urinal is accomplished by pushing the flush handle found on the flush valve mounted near the urinal. This admits approximately one (1) pint of flush water to the urinal.

593-4.7.4.3.3 Electrical Controls. The electrical controls contain the relay and logic circuitry to interface and control the water closets, urinal, M/T pumps, evaporator, and vapor treatment system. The relay and logic circuitry is the control center for the Evaporative Treatment System (ETS) portion of the GATX MK I MSD.

593-4.7.4.3.3.1 In general, except during initial start-up and except for switch actions to be accomplished during evaporator pump out, the automatic circuitry of the control system requires no manipulation during normal operation of the ETS.

593-4.7.4.3.3.2 The electrical controls are housed in a splash-proof enclosure intended for hull or bulkhead mounting. The circuit operates on 440 Vac, 60-Hz, 3-phase power. The circuit logic includes five status indicators:

1. Power ON
2. Vapor Treatment System ON
3. Evaporator ON
4. Evaporator FULL
5. Evaporator SERVICE

593-4.7.4.3.3.3 The status readout lamps should be monitored during each watch.

593-4.7.4.3.4 M/T Pump. The M/T pump comminutes the sewage materials from the water closet and transfers the macerated sewage through drain lines to the evaporator tank. The pumps run on a cycle of 10 to 12 seconds upon signal from a flush switch located on the CVF water closet, activated by activating a water closet flush pedal. Because of the reduction in particle size, slurry lines between the pump and the evaporator tank are not be larger than 1-¼ inch in diameter.

593-4.7.4.3.4.1 The M/T pumps employ specially designed cutters that macerate all normal human wastes and grind most deleterious materials that may be dropped accidentally into the water closet. The cutter and pump materials have been chosen to withstand the corrosive effects of sewage.

593-4.7.4.3.5 Drain and Transfer Piping. The GATX MK I MSD drain and transfer-piping system includes various diameter piping, valves and clean-outs. The valves and piping transfer sewage from the water closets and urinals to the M/T pumps and the evaporator tank, or directly overboard. A description of the piping system is provided below:

a. Gravity drain piping is provided for all water closets and urinals. Three (3) inch diameter piping leads from each water closet and two (2) inch diameter piping leads from each urinal (through the three inch water closet drain piping) to the inlet of a three way diverter valve. The soil drain diverter valve can be turned to two positions, TO TANK and TO OVERBOARD.
b. The diverter valves turned to the TO TANK position will direct the gravity-drained sewage to the inlet side of the M/T pumps through three (3) inch piping.
c. The M/T pump inlet piping is a short run of three inch piping running from the TO TANK port of each soil drain diverter valve to the inlet side of each M/T pump.

d. The M/T pump transfer-piping runs from the outlet side of the M/T pumps to the evaporator tank. This piping is a combination of 1-1/4 and 1-1/2 inch piping. The piping is equipped with a check valve, an isolation valve and at least one clean out for each M/T pump.

e. The diverter valves turned to the TO OVERBOARD position will direct the gravity-drained sewage into three inch overboard transfer piping.

f. The overboard transfer piping runs from the TO OVERBOARD port of each soil drain diverter valve to hull penetrations and overboard. This three-inch piping is equipped with isolation valves and gag scupper valves as required.

593-4.7.4.3.6 Evaporator Tank. The evaporator tank is used to store and process the sewage slurry collected by the water closet or urinals and delivered to the evaporator tank by the M/T pumps. The 80-gallon stainless steel, steam-jacketed, lined evaporator tank is provided with fiberglass insulation and an exterior metal protective shroud.

593-4.7.4.3.6.1 The steam jacket heats the evaporator tank to 110° C (230° F). Three electrical immersed heaters, each rated at 1.83 kW, vaporize water within the steam jacket and produce the steam necessary to heat the tank.

593-4.7.4.3.6.2 The evaporator tank has a gasketed top cover, which provides a positive watertight seal to prevent fluid seepage and leakage of tank odors. A ten (10) inch diameter gasketed port is provided in the cover to permit access to the interior of the evaporator tank for cleaning and inspection.

593-4.7.4.3.6.3 Inlet fittings are provided for slurry input, rinse water input, vapor venting, and for electrical connection to the two floats which are internal to the evaporator tank.

593-4.7.4.3.6.4 The evaporator tank is designed to operate approximately two-thirds full. Therefore, before initial evaporator start up, the system is pre-charged with 65 gallons of water. The heaters are turned on by relay action responding to a signal generated by the float level sensor positioned at the two-thirds liquid level point. The signal lamp on the evaporator control box will indicate when the heaters are on. When three heaters rated at 1.83 kW each are used, evaporation of the liquid portion of the slurry mix takes place at the rate of approximately 2 gal/hr as soon as the evaporator tank temperature reaches the evaporating temperature of 100° C (212° F). Six heaters are available, providing a sufficient evaporation rate for a crew of 70. The non-evaporable liquid and solid mix accumulates at the bottom of the evaporator tank as sludge.

593-4.7.4.3.6.5 As the sludge concentration increases to approximately 20 percent solids in the evaporator tank, the heat transfer from the steam in the jacket to the evaporator tank slurry is inhibited. When the jacket can no longer transfer heat at a fast enough rate, the jacket steam temperature will rise, causing the thermostatic switch to open at 116° C (240° F). This action will turn the heaters off. As long as prime power is still connected and at least 40 gallons of slurry remain in the evaporator tank, the heaters will come on again as soon as the jacket has cooled enough to close the switch.

NOTE

If the slurry level has dropped below 40 gallons, the point at which the evaporator tank low-level or pre-fill float has been set, the heaters will not come on.

593-4.7.4.3.6.6 The heaters will not operate if the steam pressure is greater than 27 psig. The jacket pressure switch opens when 27 psig is exceeded. The heaters will not operate unless water level in the steam jacket is sufficiently high. If the water level is too low, the level control switch will open, de-energizing the heaters until enough steam has condensed to sufficiently raise the water level.

593-4.7.4.3.6.7 Low-rate cycling of the heater circuitry may be experienced if the sludge accumulation is approaching the evaporator tank service point. Cycling of the heater circuitry causes no harm and will disappear when the sludge accumulation in the evaporator tank is pumped out.

593-4.7.4.3.6.8 Sludge removal should be performed shortly after the SERVICE light on the control panel illuminates. The sludge is drained by means of the sludge pump through the combined sewage input and sludge suction line in the evaporator.

593-4.7.4.3.6.9 The evaporator steam jacket pressure and water level should be monitored during each watch.

593-4.7.4.3.7 Vapor Treatment System (VTS). The GATX MK I MSD vapor treatment system (VTS) plays a significant role in ensuring user acceptability of the system. The VTS passes the water vapor over an electric heater and through a catalyst bed. The malodorous components of the vapor, heated to 177° C (350° F), combine with oxygen on the catalyst surface where they are oxidized and destroyed. The catalyst can be renewed in accordance with instruction provided in the system technical manual and system PMS. A new catalyst is needed when the old catalyst is exhausted.

593-4.7.4.3.7.1 Components of the (VTS) include the air supply system (VTS blower), the vapor treatment heaters, the catalyst bed, and the three-way vapor vent valve. To operate the system, the air supply pressure, which is regulated by the air supply pressure switch, shall be greater than 13 psig. The temperature of the air and vapor mixture entering the catalyst bed shall be controlled at less than 260° C (500° F). When this temperature is exceeded, the thermostatic switch opens and de-energizes the VTS heater. The VTS heater is reenergized as soon as the temperature drops below 260° C (500° F). The VTS heater is also de-energized when the air supply is shut off or the air pressure drops below 13 psig. A three way valve is installed in the evaporator vent line to direct vapors through the VTS or directly up the vent stack (bypassing the VTS heater and catalyst). When the temperature on the outlet side of the catalyst bed drops below 121° C (250° F), as sensed by a thermostatic switch, the evaporator heaters are de-energized and the three way vapor vent valve, located in the evaporator vent line, is manually turned and diverts vapors up the vent stack, precluding the possibility of steam condensation in the catalyst bed. As heated air continues to flow through the catalyst bed, the outlet temperature rises and the system returns to normal operation.

593-4.7.4.3.7.2 Operation of the VTS blower should be monitored during each watch.

593-4.7.4.3.8 Sludge Pump. The sludge pump is used to pump the concentrated and raw sewage from the evaporator tank, through the combined sewage input and sludge suction line, to either a shoreside pump out station, barge or overboard when the ship is in non-restricted waters. The pump is activated by a manual ON-OFF starter and should drain the evaporator within a few minutes. The sludge pump is identical in configuration to the M/T pump mode.

593-4.7.4.4 Changing GATX MK I MSD Modes of Operation. GATX MK I MSD operators should consult the specific technical manual and Sewage Operational Sequencing System (SDOSS) documentation for detailed mode change instructions.

NOTE

During maintenance and operation of the system, all sanitary and hygienic provisions and procedures outlined in paragraphs 593-4.3.2 and 593-4.3.3 shall be followed where they are applicable to the GATX MK I MSD.

593-4.7.4.5 GATX MK I MSD Maintenance and Repair. Maintenance procedures for the GATX MK I MSD are covered in detail in the manufacturer's technical manual for the specific shipboard system. Maintenance personnel should refer to the technical manual for specific troubleshooting and repair procedures.

593-4.7.4.5.1 Preventive maintenance for the GATX MK I MSD shall be performed according to applicable MRCs. It should be noted that the use of commercial chemical pipe cleaners in the GATX MK I MSD is prohibited.

593-4.7.5 GATX MK II MARINE SANITATION DEVICE (MSD). The GATX MK II MSD manufactured by General American Transportation Corp. (GATX) is installed on some boats and service craft.

NOTE

The GATX MK II MSD incorporates the applicable sanitary and hygienic provisions as discussed in paragraph 593-4.3.2. All sewage and gray water system sanitary and hygienic procedures as described in paragraph 593-4.3.3 should be followed, as they apply to the GATX MK II MSD.

593-4.7.5.1 Operation. The GATX MK II MSD for boats and service craft differs from the larger GATX MK I MSD in that sewage is retained in a holding tank only. There is no evaporative treatment included in the GATX MK II MSD. The significant feature of the GATX MK II MSD system is the reduction in the volume of the sewage/flush water mixture to be handled for a given crew size by means of decreased flush water volume. To compensate for any resulting loss of gravity flow, the system uses a M/T pump between the water closet and the holding tank. A block diagram of a typical GATX MK II MSD installation is shown in Figure 593-4-24. In this system, human waste is collected in the water closet along with three pints of flush water. The water closet operates similar to the water closet in the GATX MK I MSD (see section 593-4.7.4.3.1.). The sewage and flush water from the water closet drain by gravity to the inlet of the macerator/transfer (M/T) pump. The M/T pump reduces the mixture to a homogenous slurry and transfers this slurry overboard or to a holding tank. When the holding tank fills to 80 percent, a red light will be actuated in the head area to show that the system will need servicing soon. The holding tank is then pumped, by means of a disposal pump, preferably to a dock collection facility. If the craft is beyond the three (3) nautical mile limit, the holding tank is pumped overboard.

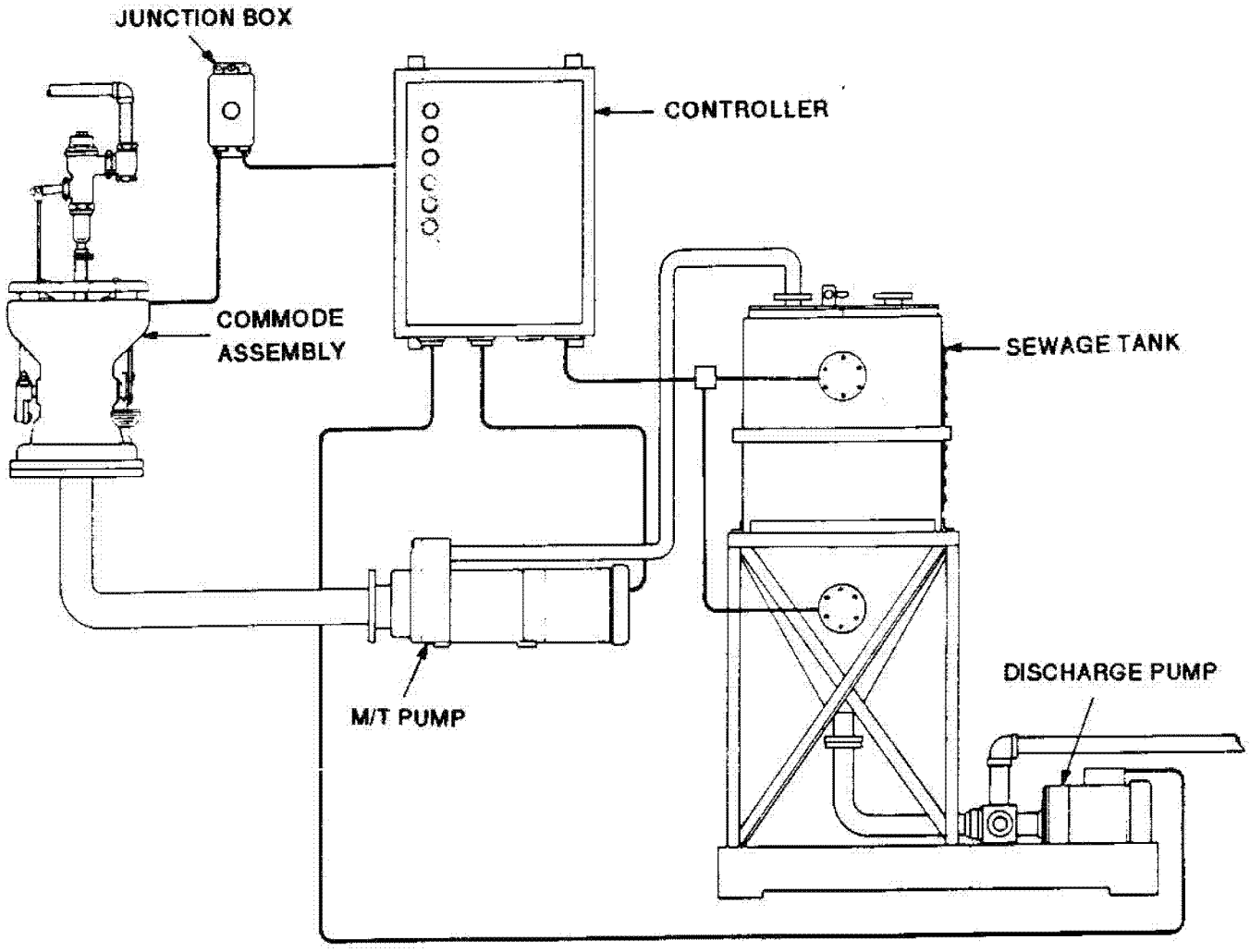


Figure 593-4-24 GATX MK II MSD

593-4.7.5.2 Modes of Operation. Modes of operation for the GATX MK II MSD are described in the following paragraphs.

a. While in port (In-Port Mode), the GATX MK II MSD collects sewage using water closets and macerator/transfer pumps. The sewage is stored in a holding tank and periodically pumped to shoreside receiving facilities or a barge.

b. While in restricted waters (Transit Mode), sewage is stored in the holding tank until the ship arrives in port or in non-restricted water at which time the holding tank is pumped out to shoreside receiving facilities, a barge, or overboard.

c. While in non-restricted waters (At-Sea Mode), sewage is stored in the holding tank and periodically pumped overboard.

593-4.7.5.3 Components. A typical installation includes two controlled volume flush (CVF) water closets, an M/T pump, a 50-gallon holding tank, a disposal pump, and associated plumbing accessories and instrumentation. Detailed descriptions of CVF water closet and the M/T pump are found in paragraphs 593-4.7.4.3.1 and 593-4.7.4.3.4.

593-4.7.5.4 Changing GATX MK II MSD Modes of Operation. GATX MK II MSD operators should consult the specific technical manual and Sewage Operational Sequencing System (SDOSS) documentation for detailed mode change instructions.

NOTE

During maintenance and operation of the system, all sanitary and hygienic provisions and procedures outlined in paragraphs 593–4.2.2 and 593–4.2.3 shall be followed where they are applicable to the GATX MK II MSD system.

593-4.7.5.5 GATX MK II MSD Maintenance and Repair. Maintenance procedures for the GATX MK II MSD are covered in detail in the manufacturer's technical manual for the specific shipboard system. Maintenance personnel should refer to the technical manual for specific troubleshooting and repair procedures.

593-4.7.5.5.1 Preventive maintenance for the GATX MK II MSD shall be performed according to applicable MRCs. It should be noted that the use of commercial chemical pipe cleaners in the GATX MK II MSD is prohibited.

593-4.7.6 GRAY WATER COLLECTION AND TRANSFER SYSTEMS. Gray water consists of liquid wastes from lavatory sinks, showers, laundries and galleys. When located pierside all Navy ships are required to collect and transfer gray water to shore facilities. Ships equipped with CHT systems typically have the capability to collect and transfer gray water to shore facilities while in port using the CHT system holding tanks and transfer pumps. Newer ship classes such as the DDG-51 Class were built with vacuum collection systems, which in some cases require gray water to be collected separate from sewage. As a result, these ships were built with separate gray water systems to meet the requirement to collect and transfer to shore all gray water while in port. Some older ship classes, such as LHA-1 Class and DD-963 Class, were not originally built with gray water collection capabilities. These ship classes were backfitted with separate gray water systems to allow collection and transfer of gray water in port.

NOTE

Gray water systems incorporate many of the sanitary and hygienic provisions as discussed in paragraph 593-4.3.2. All sewage and gray water system sanitary and hygienic procedures as described in paragraph 593-4.3.3 should be followed, as they apply to the gray water systems.

593-4.7.6.1 Operation. A typical gray water collection and transfer system is shown in Figure 593-4-25.

a. Collection Piping Element. The collection piping element consists of gray water drains with diverter valves. Depending on the position of the diverter valves, gray water can be diverted directly overboard or into the gray water collection tanks.

b. Collection Tank Element. The collection tank element consists of a tank for each system. These tanks are typically sized with little holding capacity. They are sized to prevent short cycling of the transfer pumps.

c. Transfer Element. The transfer element consists of two transfer pumps and possibly one firemain-powered eductor per system. Discharge to the pier or barge and overboard is typically accomplished using existing sewage system discharge piping.

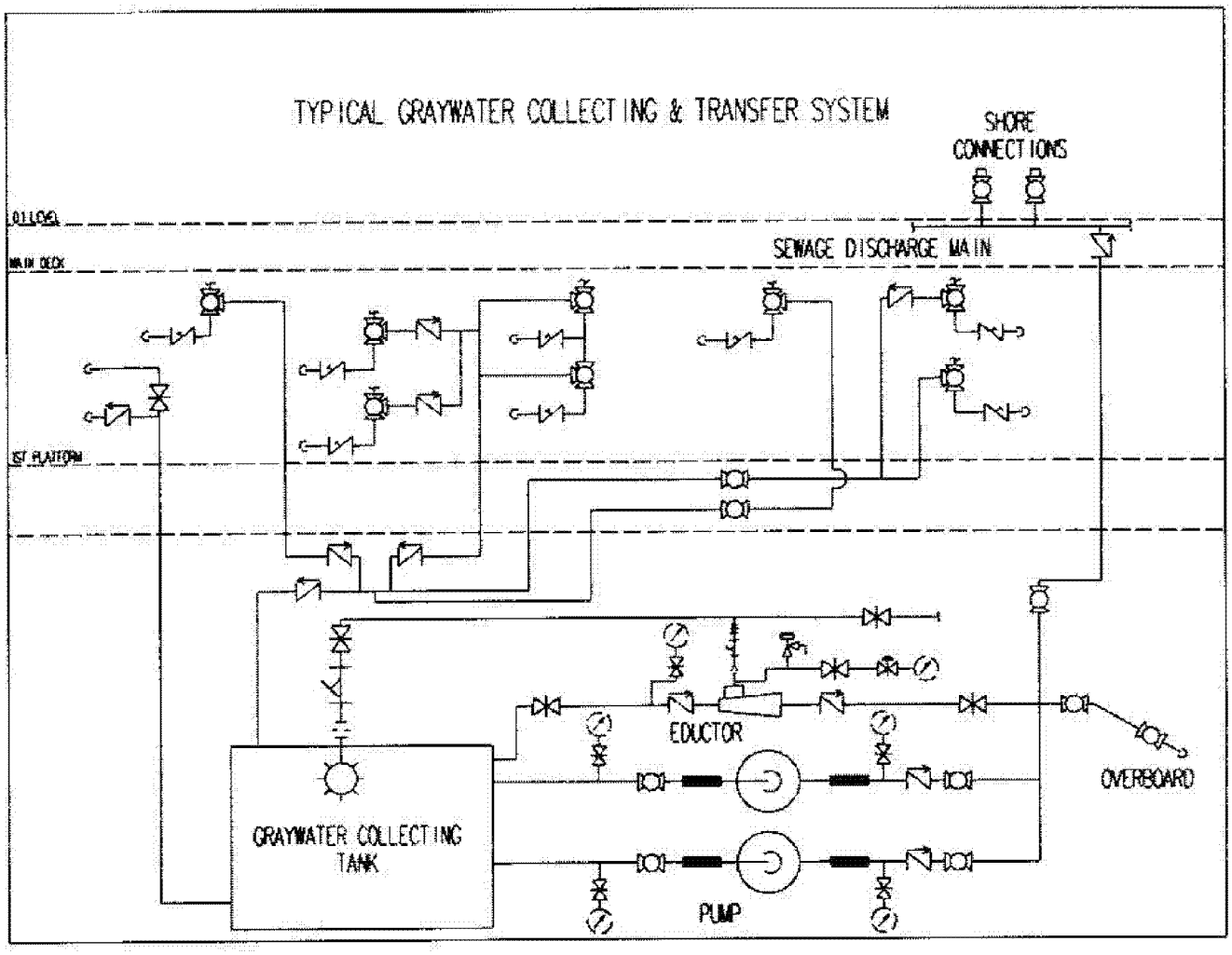


Figure 593-4-25 Gray Water Collecting and Transfer System

593-4.7.6.2 Modes of Operation. The gray water collection and transfer system can be used in any of three distinct modes of operation depending on the situation.

1. While in port (In-Port Mode), the gray water system will collect and transfer to a shore receiving facility or barge all discharges from the gray water drains.

2. While transiting (Transit Mode), the gray water system can be operated to collect and hold the discharges from gray water drains or divert all gray water drain effluent directly overboard. The amount of holding capacity provided in the gray water collecting tank is typically limited. The amount of time gray water can be held during transit will vary by ship class, and the need to hold gray water during transit will depend on local environmental regulations.

3. While in non-restricted waters (At-Sea Mode), the gray water system will be set up to divert discharges from the gray water drains directly overboard.

593-4.7.6.3 Components. Most gray water systems consist of components very similar in design and operation to CHT systems. See paragraph 593-4.7.1.2 as applicable.

593-4.7.6.4 Changing Gray water Collection and Transfer System Modes of Operation. Gray water collection and transfer system operators should consult the specific technical manual and Sewage Disposal Operational Sequencing System (SDOSS) documentation for detailed mode change instructions.

NOTE

During maintenance and operation of the system, all sanitary and hygienic provisions and procedures outlined in paragraphs 593-4.3.2 and 593-4.3.3 shall be followed where they are applicable to gray water systems.

593-4.7.6.5 Gray water Collection and Transfer System Maintenance and Repair. Maintenance procedures for gray water collection and transfer systems are covered in detail in the manufacturer's technical manual for the specific shipboard system and in applicable Planned Maintenance System (PMS) documentation. Maintenance personnel should refer to the technical manual for specific troubleshooting and repair procedures.

593-4.7.6.6 Gray water System Tanks and Hydrogen Sulfide Gas. Hydrogen sulfide gas can develop in gray water system collection tanks, especially on certain ships classes which are equipped with gray water system tanks that are not used for long periods of time (in the In-Port and At Sea modes of operation). If these tanks are not properly flushed and emptied, hydrogen sulfide gas can develop. Gray water tanks must be flushed and pumped out in accordance with applicable Sewage Disposal Operational Sequencing System (SDOSS) procedures when changing modes of operation, and in accordance with applicable PMS when the tanks are not used for long period of time (in the In-Port and At Sea modes of operation on certain ship classes, and prior to system lay-up).

593-4.7.7 SEWAGE AND GRAY WATER TRANSFER SYSTEMS. Typically, each sewage and gray water system is equipped with an effluent transfer system. A general description of a typical transfer system is provided in the following paragraphs. Some transfer systems may differ from the description that follows. Technical manuals and Sewage Disposal Operational Sequencing System (SDOSS) documentation for the specific system should be referenced prior to operating any system.

593-4.7.7.1 Operation. Typically, each sewage and gray water system holding tank is equipped with two non-clog marine sewage pumps connected in parallel. The pumps may discharge sewage and gray water to a tender, barge, shore receiving facility, or directly overboard, depending on the position of the discharge diverter valve and deck discharge diverter/stop valves.

593-4.7.7.1.1 Non-Nested Operation. Typical non-nested operational procedures for a sewage or gray water transfer system are provided in the CHT system section in paragraphs 593-4.7.1.6.2, step a. through 593-4.7.1.6.3, step d.

593-4.7.7.1.2 Nested Operation. Typical nested operational procedures for a sewage or gray water transfer system are provided in the CHT system section in paragraph 593-4.7.1.7.

593-4.7.7.2 Modes of Operation. Transfer systems are typically operated in one of two modes, the overboard mode or the deck discharge mode. The overboard mode is used only in non-restricted waters. The deck discharge mode is used while in port or while tied up to a tender or barge. In the overboard mode, contents of the holding tank are pumped directly overboard, while tank contents are pumped to a deck discharge connection in the deck discharge mode. Typically a diverter valve is provided to divert effluent from the transfer pumps either overboard or to the deck connections. Typical procedures are provided in the CHT system section (paragraphs 593-4.7.1.6 and 593-4.7.1.7).

593-4.7.7.3 Components. A typical sewage or gray water transfer system includes the components described in the following paragraphs.

593-4.7.7.3.1 Transfer Pumps. Each sewage and gray water system holding tank is equipped with two non-clog marine sewage pumps connected in parallel. Each pump is equipped with full-port plug or ball suction and discharge valves, and a discharging swing check valve with a hold-open device. An explanation of pump characteristics and curves is given in NSTM Chapter 503, Pumps.

593-4.7.7.3.2 Deck Discharge Connection. There are deck connections installed on both the starboard and port sides of the ship in accordance with NAVSEA Dwg 804-4444650. The deck connections include an isolation valve and a four inch male cam-lock quick disconnect fitting (Figure 593-4-26). Depending on the ship, the deck connection may also include a male quick-disconnect air fitting with stop check valve for sewage hose blowdown.

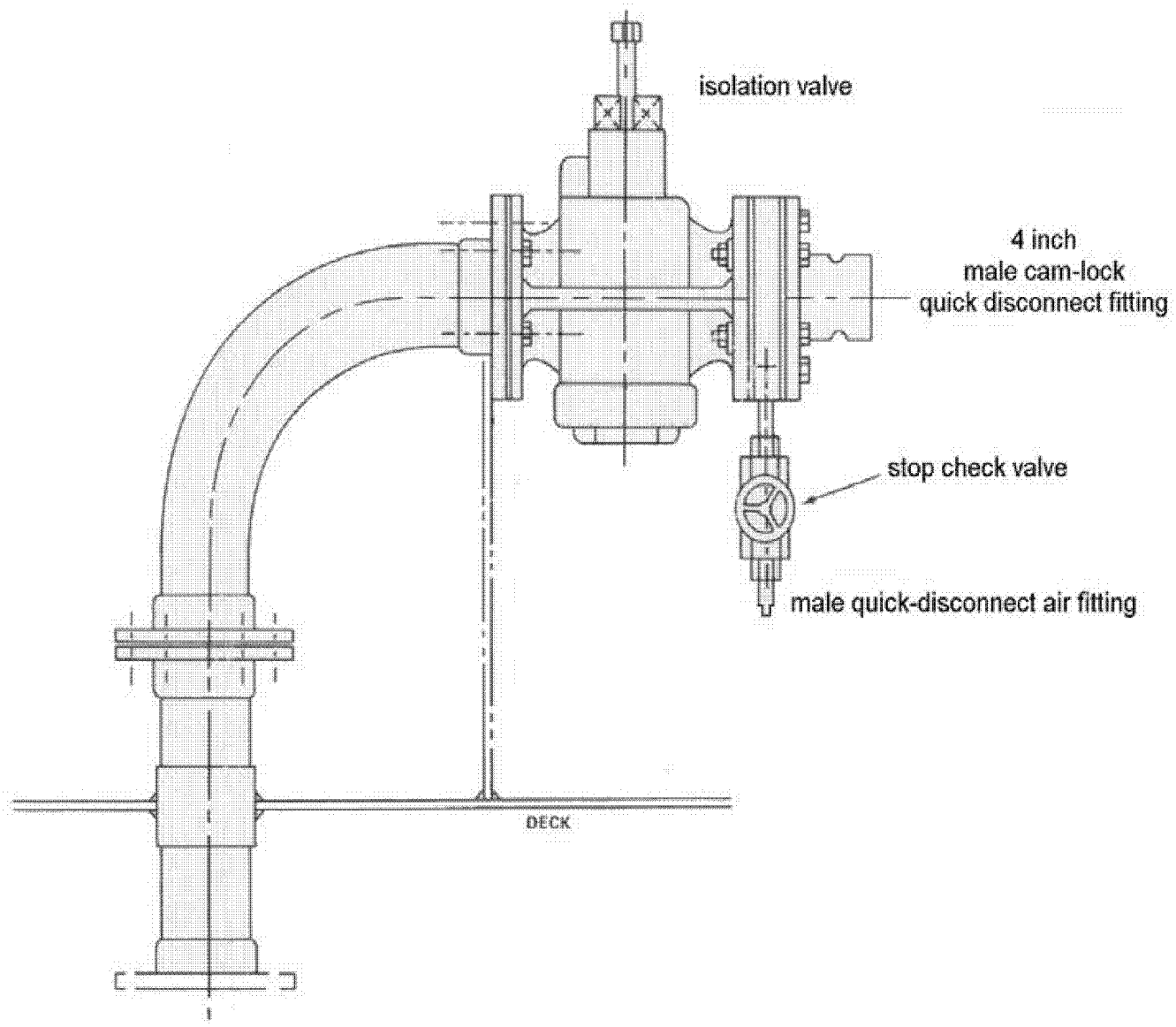
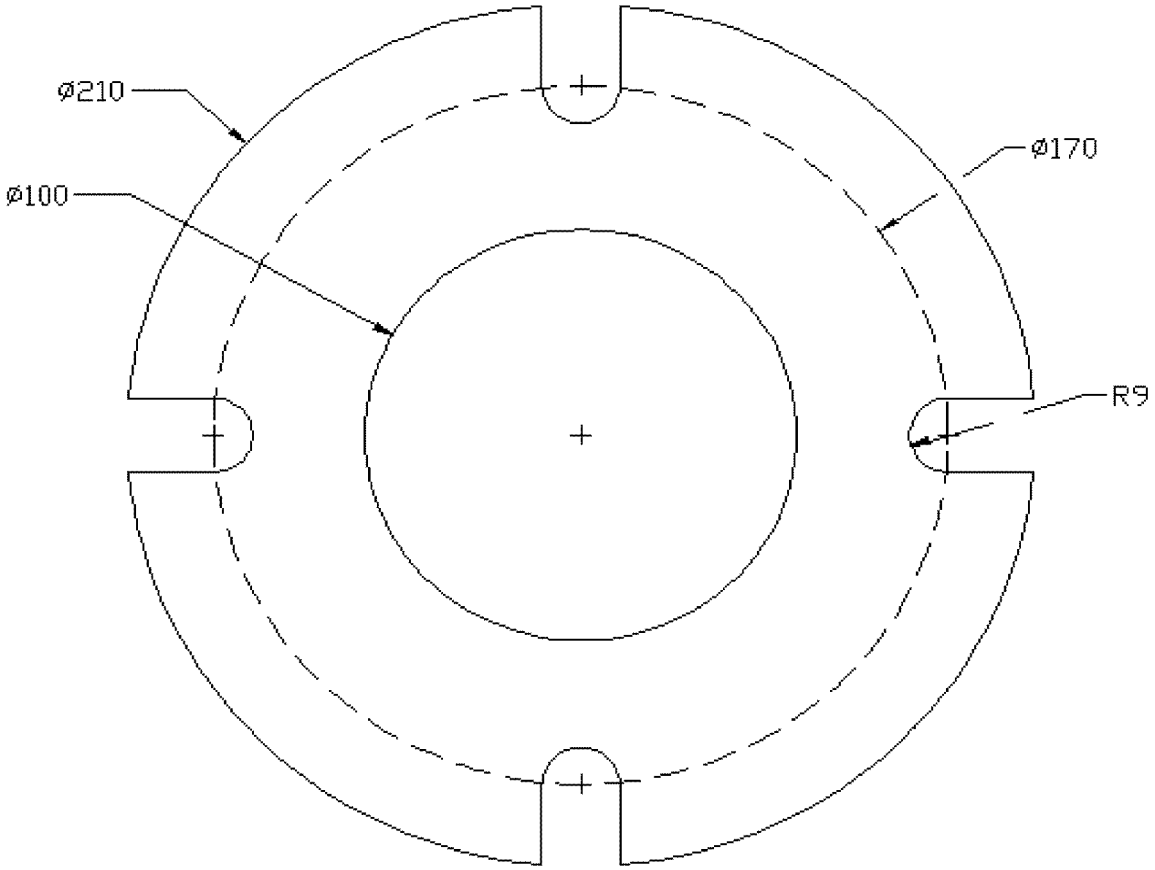


Figure 593-4-26 Deck Discharge Connection

To enable a ship to interface with pier receiving facilities using IMO flange (Figure 593-4-27)-equipped hoses, the ship must be provided with an adapter (Figure 593-4-28 and Table 593-4-1).



Outer Diameter: 210 mm, Inner Diameter: 100 mm (maximum), Bolt Circle Diameter: 170 mm
4 holes, 18 mm in diameter equidistantly placed on bolt circle slotted to the flange periphery.
Slot Width: 18 mm, Flange Width: 16 mm

Figure 593-4-27 IMO Flange

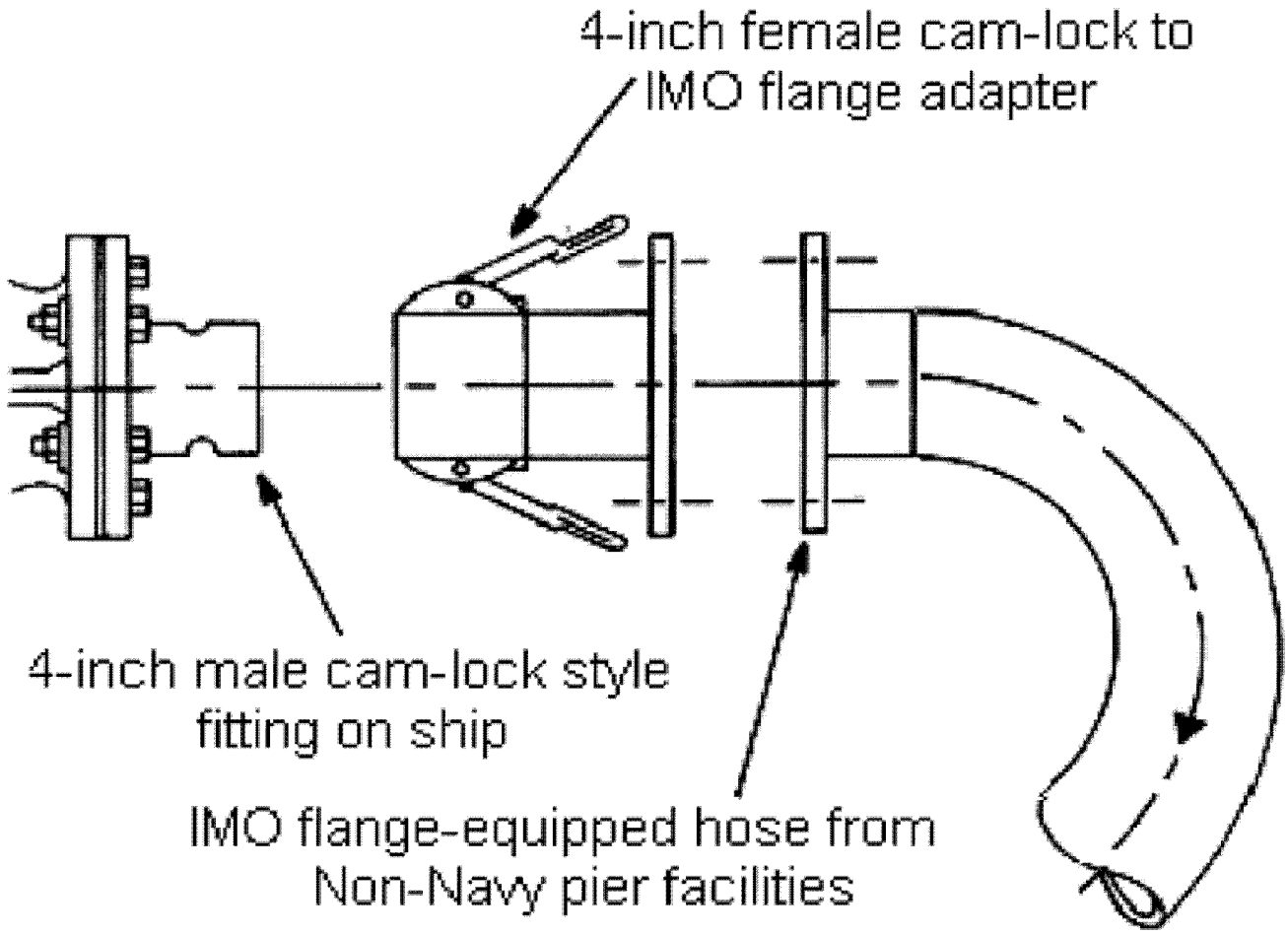


Figure 593-4-28 Four-inch Female Cam-Lock to IMO Flange Adapter

Table 593-4-1 Standard Dimensions of IMO Adapter for Four Inch Sewage Discharge Connections

Description	**Specification**
Cam-Lock End	4 inch female cam-lock in accordance with CID A-A-59326
IMO Flange End	- Outer Diameter: 210 mm
	- Inner Diameter: 100 mm
	- Bolt Circle Diameter: 170 mm
	- 4 holes, 18 mm in diameter equidistantly placed on bolt circle slotted to the flange periphery.
	- Slot Width: 18 mm
	- Flange Width: 16 mm
Cam-lock End to IMO Flange Face Dimension	4.91 inches (124.72 mm)
Adapter Material	Copper-nickel alloy in accordance with Unified Numbering System (UNS) C90300

Table 593-4-1 Standard Dimensions of IMO Adapter for Four Inch Sewage Discharge Connections - Continued

Description	Specification
Adapter Maximum Working Pressure	150 psi (10.5 Kg/cm^2)
Adapter Hydrostatic Test Pressure	300 psi (21 Kg/cm^2)
IMO Flange Gasket	- Material: FED-SPEC HH-P-151 Class 2 (ASTM D2000 Classifications BC, BE)
	- 1/8 inch thick and cut in accordance with IMO flange end dimensions
IMO Flange Bolting	- Four (4) bolts, 16 mm diameter, 80 mm long, American Iron and Steel Institute (AISI) Type 316 stainless steel
	- Four (4) nuts, 16 mm, AISI Type 316 stainless steel
Adapter Source:	Commercial cam-lock fitting suppliers/manufacturers

593-4.7.7.4 Changing Transfer Modes of Operation. Sewage and gray water system operators should consult the specific technical manual and Sewage Disposal Operational Sequencing System (SDOSS) documentation for detailed mode change instructions.

NOTE

During maintenance and operation of the system, all sanitary and hygienic provisions and procedures outlined in paragraphs 593-4.3.2 and 593-4.3.3 shall be followed where they are applicable to gray water systems.

593-4.7.7.5 Sewage and Gray water Transfer System Maintenance and Repair. Maintenance procedures for sewage and gray water transfer systems are covered in detail in the manufacturer's technical manual for the specific shipboard system. Maintenance personnel should refer to the technical manual for specific troubleshooting and repair procedures.

593-4.7.7.5.1 Preventive maintenance for the sewage and gray water transfer systems shall be performed according to applicable MRCs.

SECTION 5
SHIPBOARD USED/EXCESS HAZARDOUS MATERIAL

593-5.1 GENERAL INFORMATION

593-5.1.1 SCOPE. This section references policy and provides guidance applicable to shipboard management of used and excess Hazardous Material (HM). Each subsection provides information on proper collection and management of used and excess HM through offload to shore. Pollution control and safe handling practices are covered under the following topics:

593-5.1.2 TERMS AND DEFINITIONS

593-5.1.2.1 Aerosol. An aerosol is a suspension of fine sub droplets of a liquid in air.

593-5.1.2.2 Consolidated Hazardous Material Reutilization and Inventory Management Program (CHRIMP). Program to centrally manage and control hazardous material. CHRIMP implementation is required afloat and ashore per OPNAVINST direction and in accordance with Program requirements found in NAVSUP Publication 722.

593-5.1.2.3 Hazardous Material (HM). Any material that, because of its quantity, concentration, or physical or chemical characteristics, may pose a hazard to human health or the environment during use, handling, storage, transportation, or spill. Excluded are those materials cited in 29 CFR 1910.1200, Hazard Communication Standard, such as materials that do not require a Material Safety Data Sheet (MSDS), Food, Drug and Cosmetics Act items, articles, ionizing and non-ionizing radiation and biological hazards.

Hazardous Materials that require special handling and disposal procedures not specified herein include ammunition, weapons, explosives, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical waste, infectious materials, bulk fuels, asbestos, lead, and radioactive materials.

593-5.1.2.4 Hazardous Material Minimization Center (HAZMINCEN). A space designed, outfitted and manned to centrally manage and control the use of hazardous materials aboard ship in accordance with the requirements of CHRIMP.

593-5.1.2.5 Hazardous Material (HM) Contaminated Rags. Cleaning rags or other sorbents contaminated with solvents, adhesives, paint, or other HM.

593-5.1.2.6 Hazardous Substance. Hazardous substances are defined as HM (paragraph 593-5.1.2.3) or HW (paragraph 593-5.1.2.7).

593-5.1.2.7 Hazardous Waste (HW). A solid waste or combination of solid wastes, which because of its quantity, concentration or physical, chemical or infectious characteristics may: a. Cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or b. Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed. The term solid waste includes liquid, semi-solid or contained gaseous material.

593-5.1.2.8 Used and Excess Hazardous Material (HM). Used HM is material that has been used in a shipboard process and for which there is no further, immediate use on board the ship. Such material may ultimately be used on another ship, within the shore establishment, for a purpose other than that for which it was initially manufactured, or by commercial industry. Excess HM is unused material in unopened, properly sealed containers for which there is no further, immediate use on board the ship. Such material may ultimately be used on another ship, within the shore establishment, for a purpose other than that for which it was initially manufactured, or by commercial industry.

593-5.1.3 POLICY. OPNAVINST 5090.1C Series provides policy regarding the handling of used and excess HM on ships. This policy states:

a. Navy ships shall not discharge overboard used or excess HM generated aboard the ship within 200 NM of land unless specifically allowed by appendix L of OPNAVINST 5090.1C Series.

b. To the maximum extent practicable, ships shall retain used and excess HM on board for shore disposal.

c. Under no circumstances shall a ship collect used or excess HM from other ships or HW from shore facilities and transport it to sea for the purpose of disposal.

d. Ships shall transfer used or excess HM to a shore activity for determination of disposition.

e. Ships shall turn over used HM received from another ship within U.S. coastal territorial waters to a supporting shore activity for processing within 90 days of receipt.

593-5.1.3.1 The requirements detailed above shall not preclude the overboard discharge of HM during an emergency where failure to discharge would clearly endanger the health or safety of shipboard personnel or would risk severe damage to the ship. For additional information on Afloat overboard discharge policy refer to OPNAVINST 5090.1C Series, Environmental and Natural Resource Program Manual, Chapter 22 and Appendix L.

593-5.1.4 RESPONSIBILITY. HM and used/excess HM shall be strictly controlled to comply with pollution abatement regulations and to protect the ship and ship personnel. The central figure in this control is the shipboard HM Coordinator (HMC), who is tasked with effecting proper management of all shipboard HM and, if assigned, act as the Hazardous Material Minimization Center (HAZMINCEN) supervisor. General shipboard HM management requirements are given in the OPNAVINST 5090.1C Series, **Environmental and Natural Resources Program Manual** and OPNAVINST 5100.19 Series, **Navy Occupational Safety and Health Program Manual for Forces Afloat.** Information necessary for systematic control of shipboard Polychlorinated Biphenyls (PCBs) is provided in NAVSEA S9593-A1-MAN-010 **A Shipboard Management Guide for Polychlorinated Biphenyls (PCBs)** and in NAVSEA PCB Program advisories which give handling, storage and dis-

posal guidelines for PCBs aboard ship and for specific equipment and systems. Unique shipboard procedures associated with used/excess HM control are discussed in the following sections.

593-5.1.4.1 Shipboard Hazardous Waste. The Federal Facilities Compliance Act of 1992 states that any HW aboard an operational Navy ship is not subject to the storage, manifest, inspection, or record keeping requirements of the Resource Conservation and Recovery Act unless such waste is transferred to the ship within coastal territorial waters of the U.S. and is stored on that ship for more than 90 days.

593-5.1.4.2 Contractor Generated Hazardous Waste. Federal law pertaining to national defense requires that contracts for work on board naval vessels (other than new construction) identify and estimate the type and amount of HW to be generated, and assign responsibility for the disposal. The law further provides that a Navy generator number be used for Navy-generated HW, a contractor generator number for contractor-generated HW, and both a Navy and contractor generator number for HW co-generated by the Navy and the contractor, regardless of who owns the site where the waste is generated. The law further requires naval vessels to offload HW to the maximum extent feasible prior to arrival at a private repair facility.

593-5.1.5 PERSONNEL PROTECTION Personnel protection is necessary in every phase of HM and used/excess HM handling and use. Proper clothing and teamwork are discussed in paragraphs 593-5.6.3, 593-5.6.4, and 593-5.6.5.

593-5.1.6 INCOMPATIBILITY. Many shipboard chemicals will react spontaneously when in contact with each other, and so shall not be mixed, stowed, or handled together. Mixing these incompatible HMs can produce heat or pressure, fire or explosion, violent reaction, or toxic, irritating, or flammable dusts, mists, fumes, or gases. See paragraph 593-5.8.3 for further information on the storage of incompatible materials. See Appendix C for substance storage and incompatibility information. The **Hazardous Material User's Guide,** OPNAVINST 5100.28, also provides guidance on HM incompatibility.

593-5.1.7 DISSIMILARITY. Not all unlike substances react violently as soon as they are combined. Dissimilar substances form a mixture that is potentially dangerous when a third factor, such as open flame, is applied. For example, a small amount of volatile acetone added to JP-5 acts as a sensitizer, significantly lowering the flash point of the JP-5. But the hazardous reaction occurs only when a spark or flame is applied.

593-5.1.8 CONSOLIDATED HAZARDOUS MATERIAL REUTILIZATION AND INVENTORY MANAGEMENT PROGRAM (CHRIMP). HM reutilization and inventory management provide optimum control over the procurement, issue, use, storage, reutilization, and disposal of shipboard HM. Implementation of CHRIMP on ships demonstrated that these efforts will result in reduced quantities of HM carried and used, less used or excess HM generated, enhanced personnel safety and ship environmental compliance, and significant HM procurement cost avoidance and disposal cost savings. If ship manning and facilities are appropriate (normally surface ships, frigate and larger) control and management of all shipboard HM in a Hazardous Material Minimization Center (HAZMINCEN) is the goal of CHRIMP. HM which is unique to a work center (or a small number of work centers) is ordered through the HAZMINCEN, but may remain under the control and management of the work center(s). Material that is not unique (i.e., common-use) to one work center is controlled and managed by the HAZMINCEN.

593-5.1.9 USE OF SHIP'S HAZARDOUS MATERIAL LIST (SHML). The SHML is a record of the HM needed aboard U.S. Navy ships based on valid operational or maintenance requirements. The SHML provides ships with the capability for determining HM authorized for use in order to maintain an accurate inventory of

HM, and to preclude stocking of dangerous material for which the ship has no use. For ease of search the SHML is divided into two sections. The first section is ordered alphabetically according to the noun name of the material and the second section is ordered numerically according to national item identification number (NIIN) (the last nine digits in the 13 digit National Stock Number (NSN)). The NIIN, the trade name and the unit of issue are provided for each material in the SHML. The overall SHML is broken down into subsets applicable to each ship class or type. These subsets of the overall SHML are called Type SHMLs or T-SHMLs. Each Navy ship is assigned an applicable T-SHML providing a listing of HM authorized for use on that specific ship. It is recognized that equipment and operation or maintenance requirements vary among ships within a single type and that configurations of individual ships may change over time. As a result, the SHML Feedback Report (SFR) was developed to allow Fleet feedback on the SMHL and T-SHMLs. If a valid Fleet requirement exists for an HM not listed on a ship's T-SHML that ships should fill out an SFR (NAVSUP 1400 - 9/91) and submit it to the appropriate Fleet Type Commander and Naval Inventory Control Point-Mechanicsburg (Code 07122). The SFR should include a description of specific equipment/system application, technical documentation, or PMS requirements related to the HM needed, as well as estimated yearly requirement for the material.

593-5.2 POLLUTION CONTROL

593-5.2.1 EMERGENCY OVERBOARD DISCHARGE. If HM must be discharged overboard under an emergency situation in accordance with OPNAVIINST 5090.1C Series, policy (see section 593-5.1.3), the ship shall follow the procedures outlined in the HM overboard spill reporting requirements of this chapter. The following information related to any emergency release of HM shall be maintained and included in any message or report release:

1. The physical and chemical characteristics of material dumped.
2. Precise times and location of dumping.
3. Explanation of how human life at sea was in danger and how the emergency dumping reduced the danger.

593-5.3 IDENTIFICATION

593-5.3.1 CORRECT IDENTIFICATION. Correct identification of used/excess HM is necessary to ensure its safe collection, handling and stowage onboard, and its proper disposal ashore.

593-5.3.2 IDENTIFICATION AIDS. Identification of a used/excess HM requires knowledge of the material, operation, or process from which the material originated. A material is hazardous not only if it results from using HM but also if a non-HM has been contaminated with a HM (e.g. rags contaminated with solvent). To establish that use of a particular HM will result in used/excess HM, personnel should refer to the Department of Defense (DoD) Hazardous Material Information Resource System (HMIRS), DoD Instruction 6050.5 (DoD Hazard Communication Program), and the ship's T-SHML. Identification of items containing PCBs is described in the Shipboard Management Guide for PCBs and NAVSEA PCB Advisory series.

593-5.3.2.1 Navy-Issued CD-ROM. The Hazardous Materials Information Resource System (HMIRS) is a Department of Defense (DoD) automated system developed and maintained by the Defense Logistics Agency. HMIRS is the central repository for Material Safety Data Sheets (MSDS) for the United States Government military services and civil agencies. HMIRS also contains value-added information provided by the service/agency focal points. This value-added data includes hazard communication (HAZCOM) warning labels and transportation information. HMIRS provides this data for hazardous materials purchased by the Federal Government

through the Department of Defense (DoD) and civil agencies. The system assists Federal Government personnel who handle, store, transport, use, or dispose of hazardous materials. Access to HMIRS is available on line at http://www.dlis.dla.mil/hmirs/default.asp. HMIRS is also available through periodic CDROM/DVD releases. HMIRS shall be maintained current and shall be readily available on all ships as a responsibility assigned to the HM coordinator. The HM coordinator shall ensure that the only the most current version of HMIRs is used.

593-5.4 LABELING

593-5.4.1 LABEL DESCRIPTION. The Occupational Safety and Health Administration (OSHA) and the Department of Transportation (DOT) are responsible for regulations governing labeling of Hazardous Materials (HM). These regulations should ensure that most HM brought onboard from the supply system via procurements from commercial vendors will be properly labeled. New HM received without proper labels shall be labeled according to OPNAVINST 5100.19 Series. As with HM, the identification of used/excess HM is necessary to ensure that proper handling, stowage, and safety procedures are followed during handling and potential future use. The administrative requirements imposed on Navy shore activities by Federal and state laws to ensure safe and effective disposal of used/excess HM demands an accurate identification be provided for all used/excess HM offloaded from Navy ships. All used or excess HM shall be properly labeled, marked, or tagged noting the exact contents as the material is generated. This action will establish and maintain it's the identity of the HM as required by Federal legislation.

If used/excess HM is stored in the original material container, the original container HM label is acceptable for the used/excess HM during the time it is stored onboard. If the material is not in its original container, the work center shall ensure that the material is labeled per OPNAVINST 5100.19 Series, Paragraph C2302. In addition, a label identifying the material as used HM (See OPNAVINST 5100.19 Series, Appendix C23-B, 3-F) shall be completed and attached to the container. For offloading, each used/excess HM container shall be accompanied by a correct completed DD Form 1348-1(1A) identifying the used/excess HM and providing as much information as possible on the contaminants. OPNAVINST 5100.19 Series, chapter C23, states that the following information shall be clearly identified (where known) on the DD 1348-1(1A): the NSN, the material name, and the manufacturer's name and address. Local Public Works Centers and Fleet and Industrial Supply Centers (FISCs) can also provide information on completing the DD Form 1348-1(1A).

593-5.4.2 LABEL ATTACHMENT. It is imperative that labels, markings, or tagging be properly completed and attached to every container of used/excess HM as soon as it is generated. Immediate labeling will avoid potentially costly and dangerous mistaken identity of HM and facilitate safe handling, stowage, offload, and possible disposal. Any used/excess HM that is not properly identified, labeled, and provided with a properly completed DD Form 1348-1(1A) before offloading ashore may require a shore side lab analysis. The cost of such an analysis could be charged to fleet accounts.

593-5.4.2.1 PCB Labeling Requirements. All PCB items, including containers, awaiting disposal and their corresponding storage areas shall be provided with specially designed, Environmental Protection Agency (EPA) approved labels (see NAVSEA S9593-A1-MAN-010, Shipboard Management Guide for PCBs). See Figure 593-5-1 for information on PCB identification labels. The EPA approved PCB label can usually be obtained from local shore activity Hazardous Material Coordinator (HMC). These personnel are located typically in the shore side Public Works Center (PWC), Public Work Department (PWD), or Safety Department. Also, refer to the Shipboard Management Guide For PCBs for information on ordering these labels.

Large PCB Label

This label is available in the following sizes:

Size	Stock Number
6 x 6 inches	0116-LF-008-6500
4 x 4 inches	0116-LF-050-9021

Small PCB Label

This label is available in size:

Size	Stock Number
1 x 2 inches	0116-LF-050-9011

Figure 593-5-1 Large and Small PCB Identification Labels

593-5.4.2.2 Oily or greasy containers may repel the gum-backed used/excess HM or PCB labels. Clean the oily or greasy container with an appropriate solvent (e.g. general purpose cleaner) before applying the label.

593-5.4.2.3 Occasionally the container cannot be sufficiently cleaned so that labels will adhere. In these cases, secure the used/excess HM or PCB labels to the container with tape or wire. If necessary, encircle the container with the tape or wire to secure the label; or tape the label on a shipping tag wired to the container. Securing wires or tape should not obscure the label text.

593-5.4.3 UNIDENTIFIED USED AND EXCESS HM. Occasionally an unmarked quantity of potential HM is found aboard ship. Temporarily label such unidentified material as unknown material. Isolate the material to prevent additional material from being added to the container. Attempt to avoid the cost of shore side analysis by examining possible identifying records, and by questioning other department personnel to assist in identification of the material. If the contents still cannot be identified, label the container as unknown used and excess HM and handle it as extremely hazardous. Store the container in an appropriate stowage compartment, to be offloaded at the next port that can accept used/excess HM. If possible, maintain a separation distance of at least 3 feet from other materials.

593-5.4.4 EXCLUSIONS FROM USED/EXCESS HM LABELING. The following used/excess HM are controlled under specific programs and instructions, and thus have their own labeling procedures: ammunition, weapons, explosives, explosive-actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical supplies, infectious materials, radioactive materials, and bulk fuels.

593-5.5 COLLECTION AND STORAGE CONTAINERS

CAUTION

Used/excess HM should NOT be added to any container that once held dissimilar or incompatible materials. This is essential to avoid any violent chemical reactions.

593-5.5.1 CONTAINER REQUIREMENTS. All used/excess HM that is collected and stored for eventual disposal ashore shall be kept in containers that are durable enough to resist damage from routine handling and suitable for the particular used/excess HM they contain. Containers shall carry clear warning labels (paragraph 593–5.4). Ideally, original containers provided with new HM should be used to containerize used/excess HM of the same type.

593-5.5.2 STANDARD CONTAINERS. Place used HM either in the original material container or in an impervious container specified in Appendix A or B. The container shall be securely sealed using the installed or provided closure devices to ensure the container does not leak during transportation.

593-5.5.2.1 Packaging of PCB-Contaminated Items. Defective and small PCB items (e.g. small capacitors, pre-1979 fluorescent light ballast, contaminated clothing, spill cleanup materials, or tools) shall be placed in EPA-approved tight-sealing containers and packed with an absorbent material. (Appendix B includes EPA-approved containers and suggested absorbent.) Large PCB items, such as PCB transformers, PCB contaminated transformers, and large capacitors, need not be over packed if the items are not leaking, corroded, or in any way damaged. Before reusing an emptied container to collect PCBs, ensure that the container does not contain any incompatible residues. For guidance on the containment of PCB contaminated electrical cables and felt gaskets refer to NAVSEA PCB Program Advisories 93-1A **Management of Electrical Cables Removed From Vessels and**

Craft (Revised) , 94-1 **Removal and Handling of PCB Felt** , and 94-2 **Maintenance and Cleaning of Ventilation Ducts Containing PCB Felt Gaskets on Surface Ship and Submarines** .

593-5.5.3 CONTAINER INSPECTION. Inspect containers for damage to closures, open head drum covers, rims, gaskets, and body surfaces. Discard containers with serious defects, such as pitting, deep rust, creases, or cracks. If there is any question regarding the integrity of the original container, the contents shall either be transferred to a new container or the damaged container shall be placed into an ″overpack″ container (a steel drum with removable cover, see Appendix B). The overpack container shall be filled with sorbent material to absorb possible leakage and to prevent movement of the original container in the overpack container.

593-5.5.4 OTHER EMPTY CONTAINER INFORMATION. The following are additional guidelines for empty containers:

1. HM containers suitable for reuse shall be stored and safeguarded against incidental damage until needed for storage of used/excess HM.
2. Empty HM containers can contain hazardous, vapor-producing residues. Seal the containers tightly, and store in the same manner as full HM containers until reused to store similar used/excess HM. The original hazard labeling shall remain on these containers.
3. Some shipboard HM containers are non-reusable or ″single trip.″ These containers are stamped or marked NRC (for non-reusable container) or STC (for single trip container). Such containers should never be reused for the storage of used/excess HM. They shall be kept tightly sealed and stored as empty as used/excess HM until final disposal.
4. See Appendix D for additional information on empty HM container management and container air-drying guidance.

593-5.5.5 NUCLEAR REACTOR PROGRAM CHEMICAL CONTAINERS. Chemicals associated with the Nuclear Reactor Program (NRP) are currently in use aboard various Navy ships. To prevent uncontrolled distribution of information about reactor plant chemistry, containers for these chemicals (Special Material Identification Code (SMIC) X2) require special treatment. Prior to processing NRP material, classified or unclassified, that contains Naval Nuclear Propulsion Information (NNPI) or indicated application to Nuclear Propulsion, all markings (NSN, Nameplate data, SMIC, tags, stickers, transfer documents, meter face markings, etc.) that relate the material to Nuclear Propulsion must be removed or obliterated. If, after removal or obliteration of such markings, unclassified material still contains NNPI, the material shall be disposed in the same manner as classified material. Only labels and markings that identify the generic class of the chemical shall be retained on the container; or if necessary, the container shall be relabeled as described in paragraph 593-5.4 to provide that information. Containers for X2 chemicals shall not be reused onboard ship for non-NRP purposes. Empty containers or containers used to store same-substance used/excess HM shall be turned into responsible shore personnel, Public Work Centers (PWC), or Public Works Department, who shall remove traceability. Also, NRP chemicals turned into stocking activities by end users or otherwise identified and turned in by the stocking activities as over aged/defective, shall be transferred to the responsible PWC or Public Works Lead Activity.

593-5.6 HANDLING PRECAUTIONS

593-5.6.1 Used/excess HM released into the ship’s environment through improper handling can adversely affect both personnel and the ship’s structure/systems. These substances, if inhaled or contacted directly by personnel, can cause injury or irritation. They can also accelerate corrosion or pitting of decks or other ship structures.

Additionally, injury can result from improper container handling. A 55-gallon drum filled with spent cleaning solution, for example, can weigh as much as 450 pounds (204.1 kg).

593-5.6.2 Handling used/excess HM requires the same safety precautions as handling HM. These safety precautions are given in OPNAVINST 5100.28, **HAZARDOUS MATERIALS USER'S GUIDE (HMUG)** ; NSTM Chapter 541, **Ship Fuel and Fuel Systems** ; NSTM Chapter 550, Industrial Gases: Generating, Handling, and Storage; NSTM Chapter 670, **Stowage, Handling, and Disposal of Hazardous General Use Consumables** ; and OPNAVINST 5100.19 series, **Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat** .

593-5.6.3 PROTECTIVE CLOTHING AND EQUIPMENT. Personnel should use appropriate protective clothing and equipment when handling used/excess HM. Information on the use and requisitioning of Personal Protective Equipment (PPE) can be found in the HMUG or the applicable Material Safety Data Sheet (MSDS). Because degrees of hazard differ for various substances, personnel shall match personal protection requirements to the hazards of each particular used/excess HM. For example, personnel handling battery electrolytes require safety boots, a splash apron or coveralls, goggles, and gloves. Address any questions concerning protection requirements to the ship's Safety Officer/Medical Officer.

593-5.6.4 PPE FOR PCB HANDLING. Protective clothing and equipment requirements for PCB's may be obtained from NAVSEA S9593-A1-MAN-010, **Shipboard Management Guide for PCBs** (Section 4.0); NAVSEA Advisories 94-1, **Removal and Handling of PCB Felt** ; 94-1A, **Management of Electrical Cables Removed From Vessels and Craft** , and 94-2, **Maintenance and Cleaning of Ventilation Ducts Containing PCB Felt Gaskets on Surface Ship and Submarines** .

593-5.6.5 BUDDY SYSTEM. Personnel should work in teams when transferring or handling used/excess HM. At least two crew members with appropriate personal protective equipment, protective clothing, gloves, face shield, and respirator, shall handle the transfer of used/excess HM. One crew member should conduct the transfer, and the other should assist or remain on emergency standby.

593-5.7 TRANSFER AND TRANSPORT PRACTICES

593-5.7.1 Handling used/excess HM often requires transferring it from one container to another, and transporting used/excess HM containers from one part of the ship to another.

593-5.7.2 TRANSFER AREAS. First aid equipment, safety equipment, ventilation and spill cleanup materials should be furnished in major used/excess HM transfer areas. These critical areas may include:

1. The HAZMINCEN.
2. Shops where 10 gallons or more of used/excess HM are routinely transferred between containers such as the plating or battery shops.
3. Areas in or near storage spaces where used/excess HM from leaking containers are emptied into new containers.
4. Engineering maintenance spaces where substantial quantities of used/excess HM such as spent machine degreasers or lubricating fluids are collected or consolidated. Cognizant personnel in such areas should confine used/excess HM transfers to a specific location. First aid and safety equipment should be staged within

easy reach around this area. Emergency equipment may include a freshwater deluge shower and an eyewash (mandatory in battery shops), highly visible placards with emergency instructions and safety equipment locations, a first aid kit, and a fire extinguisher.

593-5.7.3 TRANSFER SAFETY. Deluge showers and eyewash fountains should be provided where corrosive chemicals are used. These units may be permanent installations or portable systems. Self-contained supplies of potable water for eye washing shall be of sufficient capacity to provide a minimum of 15 minutes of eyewash.

593-5.7.3.1 Area Safety. Strategically placed fire extinguisher, suitable to common used/excess HM types (class A or B fire risks), should be provided within all used/excess HM transfer areas.

593-5.7.3.2 Area Inspection. Used/excess HM transfer area emergency and safety equipment, as well as area ventilating systems, should be inspected at least annually according to Planned Maintenance Subsystem (PMS) instructions. Safety and cleanup equipment damaged during an HM spill or accident should be replaced immediately.

593-5.7.3.3 Containment Barriers. HM spill containment barriers should be provided in and around HM and used/excess HM transfer areas. These barriers may include: coamings, partitions, protective coverings for decks, and self-closing or manually closing deck drains. Containment barriers should be able to contain the maximum amount of used/excess HM to be transferred.

WARNING

COMPRESSED AIR UNITS SHALL NOT BE USED TO EMPTY DRUMS; THE RESULTING INTERNAL PRESSURE CAN CAUSE THE DRUM TO RUPTURE EXPLOSIVELY.

593-5.7.4 TRANSFER EQUIPMENT. Transfer equipment for used/excess HM includes manual hand pumps, siphons, and air-turbine pumps, as well as standard funnels, pails, and sewage hoses. All containers involved in transferring flammable used/excess HM should be electrically grounded or bonded to prevent static charges from building during the transfer process. This should be accomplished in accordance with NSTM Chapter 555, **Volume 1, Surface Ship Firefighting** , and NSTM Chapter 631, **Preservation of Ships in Service (Surface Preparation and Painting)** .

593-5.7.4.1 Transfer equipment should not be used for different used/excess HMs without prior purging because of the danger of mixing incompatible used/excess HM. Purge transfer equipment, such as pumps and hoses, of all residue before reuse with an incompatible used/excess HM. This equipment should be triple rinsed with a suitable solvent and allowed to dry before reuse.

593-5.7.5 PCB TRANSPORT EQUIPMENT. If liquid transport equipment is to be used with PCB's, the equipment shall be suitable for easy decontamination; or it should be considered disposable as a PCB-contaminated item. Use of tools or equipment composed of porous material (e.g. wood) that absorb PCBs shall be avoided since these materials will have to be classified as PCB-contaminated materials and disposed of accordingly.

593-5.7.6 TRANSPORTING USED/EXCESS HM. Transport equipment for used/excess HM containers includes standard types (such as hand trucks) and specialty equipment (such as carboys and compressed gas cylinder dollies). Additional information on this equipment is provided in OPNAVINST 5100.19 Series. Transport equipment shall be suited to the type of container being transported, and to passageway sizes between transit points. Containers shall be properly secured to the transfer equipment with chains, belts, or chime hooks. If a transport dolly or cart does not have integral securing equipment, secure the containers using line or other lashing.

NOTE

The line used to lash a container to the transfer equipment must not be frayed or stretchable (as is nylon).

593-5.7.7 TRANSPORT PROCEDURES. Observe the following safety procedures for two-wheeled hand trucks and other transport equipment:

1. Keep the load's center of gravity as low as possible. Place heavy objects on the bottom. When loading transport equipment, keep feet clear of the wheels.
2. Place the load so that the axle will carry the weight, not the handles.
3. Place the load so it will not slip, shift, or fall. Load only to that height where the view ahead remains unobstructed.
4. Raise a two-wheeled truck or dolly cautiously to traveling position from its horizontal loading position, to prevent slippage and overturning.
5. Never walk backwards with a handcart or dolly except when necessary to go up an incline. When going down an incline or steps, keep truck or cart ahead. When going up, keep truck or cart behind.
6. Wear protective shoes and gloves when using transport equipment.
7. Take extreme care if drums are rolled on their bottom edge or rim; such rolling can result in dropping the drum, which could release the head cover (if clamped with a circular ring clamp) or burst the drum and discharge its contents.
8. Raise and lower material through hatches in accordance with surface safety standards provided in OPNAVINST 5100.19 Series.
9. Use extra caution when lifting a load across a sill. If necessary, unload the transport device; lift the containers and device individually across the sill; and then reload the device.
10. During used/excess HM transport, use passageways with the minimum number of doors, deck level changes, and cramped transit zones. Avoid areas where used/excess HM could ignite or come into contact with ship's personnel. Also avoid hot work areas, living spaces, and restricted areas.

593-5.8 STOWAGE

593-5.8.1 GENERAL. Used/excess HM shall be properly labeled to indicate content, and stowed in appropriate locations following the stowage precautions in OPNAVINST 5100.19 Series, Chapter C23, for comparable HM. If improperly stowed, used/excess HM can leak or spill from containers and contaminate the ship environment. Not all of the following stowage procedures will apply to every used/excess HM area; but safety procedures are necessary for any used/excess HM stowage. Additional stowage information is available in NSTM

Chapter 550, **Industrial Gases: Generating, Handling, and Storage** ; NSTM Chapter 670, **Stowage, Handling, and Disposal of Hazardous General Use Comsumables** and NSTM Chapter 541, **Ship Fuel and Fuel Systems.** Detailed stowage information for PCB items is available in NAVSEA S9593-A1-MAN-010, **Shipboard Management Guide for PCBs** , NAVSEA Advisories 94-1, **Removal and Handling of PCB Felt,** 94-1A, **Management of Electrical Cables Removed From Vessels and Craft,** and 94-2, **Maintenance and Cleaning of Ventilation Ducts Containing PCB Felt Gaskets on Surface Ship and Submarines** .

593-5.8.2 FACILITIES. Stowage facilities must be appropriate and meet the storage requirements associated with the collected used/excess HM (e.g., flammable stowage). Stowage facilities must comply with the requirements listed in the NAVSEA Design Supplement (NDS) 1302 **Hazardous Materials Management- Shipboard Control** (NSWCCD-63-TM-2005/37 15 March 2005) (see SEIC website: www.navyseic.dt.navy.mil).

593-5.8.3 STOWAGE REQUIREMENTS. Observe the following general precautions for used/excess HM stowage:

a. Keep used/excess HM in suitable containers (see paragraph 593-5.5.1).

CAUTION

Use extreme care when storing incompatible used/excess HM in the same compartment because they cannot be fully segregated under this circumstance.

b. Store incompatible used/excess HM (Appendix C) in separate compartments or lockers whenever possible. Interaction of these substances can result in fire, explosion, or the release of toxic gases. When incompatible HM must be stored in the same compartment, insert a partition or other suitable containment barrier between them. Storage information for incompatible hazardous substances is presented in NSTM Chapter 670, **Stowage, Handling, and Disposal of Hazardous General Use Comsumables** . Containment barriers are discussed in paragraph 593-5.7.3.3.

c. If space limitations necessitate storing incompatible materials in the same compartment, a separation distance of at least 3 feet shall be maintained. This provides only limited protection and all precautions, such as high coamings, shall be used to prevent accidental mixing. Coamings will not prevent vapors, generated from incompatible HM in spaces, from mixing and reacting.

d. Stow empty gas cylinders according to NSTM Chapter 550 ,**Industrial Gases: Generating, Handling, and Storage.**

e. Stow flammable used/excess HM in designated flammable stowage compartments or approved factory metal lockers onboard ship if authorized.

CAUTION

Certain commercial flammable liquid lockers are authorized only for local stowage of greases and oils with flash points above 93.3° C (200° F). Stow all other flammable (flash point below 93.3° C (200° F) in flammable liquid storerooms, HM issue rooms, or in NAVSEA-approved flammable liquid lockers (NAVSEA drawing 803-5959316) when authorized by NAVSEA.

f. Store corrosives in acid stowage compartments or lockers onboard ship. Store acid containers only on lead-lined or acid-resistant shelves or on acid-resistant decks.

g. Store all containers with closures facing up. All containers should be inspected for leaks, especially at bungs, plugs, edges, and seams, according to NSTM Chapter 670, **Stowage, Handling, and Disposal of Hazardous General Use Comsumables** . Non-sparking metal faucets installed in drums will be considered plugs.

h. Drums filled with acidic used/excess HM should be vented at frequent intervals according to ship's instructions. Venting consists of cracking the closure cap a full turn (or until a hissing is heard) to relieve internal pressure. Gas free engineering guidance provided in NSTM 074 Volume 3 and the shipboard gas free engineer should be consulted for proper procedures when performing this action.

i. Store used/excess HM containers so that the container labels are plainly visible (e.g. labels facing aisle).

j. Label empty HM containers as used/excess HM and control the containers with the same precautions as applied to all other HM. Keep containers closed to avoid release of toxic or irritating vapors.

k. Store rags or absorbents contaminated with HM (e.g. rags used to wipe solvents) in tightly sealed, steel containers in a compartment containing compatible substances. Label as used/excess HM.

l. Consider contaminated protective clothing to be used/excess HM if it cannot be readily decontaminated. Containerize and stow in compartments with similar used/excess.

593-5.8.4 HOUSEKEEPING. Used/excess HM stowage and handling areas shall be maintained clean, dry, uncluttered, and free from combustible refuse to prevent container corrosion, prevent fires, and facilitate emergency access. These areas should be inspected weekly and any problems corrected. Damaged or leaking HM containers should be replaced immediately. Damaged PCB containers shall be packaged in an approved tightly sealed container as described in paragraph 593-5.5.2.1 . All used/excess HM spills shall be cleaned up immediately and any slippery conditions corrected promptly. Any water in the stowage area or on used/excess HM containers should be cleaned up immediately to prevent corrosion or similar damage to HM containers.

593-5.8.5 FIRE PREVENTION. Many used/excess HMs are flammable. Fire extinguishing systems and equipment should be routinely inspected for proper working order according to PMS requirements. Check permanently installed fire-extinguishing systems for such problems as inadequate pressure or quantity of agent, corrosion, and leaking joints according to NSTM Chapter 555, **Volume 1, Surface Ship Firefighting** . Portable fire extinguishers in HM storage spaces should be inspected according to PMS instructions or at least monthly. Fire extinguisher should be replaced immediately if they are below minimum required pressure, below required quantity of agent, or discharged. Smoking and open flames are prohibited in used/excess HM stowage areas.

NOTE

Warnings relative to certain permanently installed fire extinguishing systems (Halon 1301 or CO_2) are posted on compartments containing such systems.

593-5.8.6 VENTILATION. Flammable or toxic atmospheres can develop within poorly ventilated used/excess HM stowage compartments. Standard shipboard ventilation equipment will usually provide the required airflow in used/excess HM stowage compartments. However, additional airflow to the atmosphere may be required in these spaces at certain times (e.g. following an used/excess HM spill or during acid drum venting).

593-5.8.6.1 Portable Ventilating Blowers. Permanent ventilation systems, not rated as explosion-proof, may be unsafe to ventilate spaces that contain explosive vapors or fumes. In these cases, only portable ventilating blow-

ers equipped with explosion-proof motors can be safely used. There are two types of portable ventilating blowers commonly used by the Navy, with at least one unit of either or both types carried on the Allowance List of all ships. These types include:

a. The 0 1/2 (A or D) IX axial-flow type blower fitted with an 8-inch-diameter non-collapsible hose. This blower is driven by an explosion-proof electric motor. (These motors are explosion-proof when assembled at the factory but they may not be explosion-proof following overhaul.)

b. The A-3/4T air turbine-driven centrifugal type fitted with an 8-inch-diameter non-collapsible hose. This non-electric blower was developed to handle air that contains explosive vapors. Additional information on portable ventilating equipment can be found in NSTM Chapter 074, **Vol 3, Gas Free Engineering** .

593-5.8.6.2 Explosion-Proof Certification. Electrical devices without explosion-proof certification are prohibited in compartments containing explosive atmospheres. An explosion-proof certification, however, does not authorize the use of a particular type of electric motor in all explosive atmospheres. As specified in NSTM Chapter 074, **Vol 3, Gas Free Engineering** , equipment designated as Group D can be used in explosive atmospheres of gasoline, petroleum, naphtha, alcohol, acetone, lacquer solvent vapors, and natural gas. However, Group D equipment is prohibited in atmospheres of acetylene, hydrogen, ethyl ether, metal dust, or a variety of flammable dusts unless an identification plate, drawing, or technical manual clearly indicates they are suitable for use in these hazardous atmospheres.

NOTE

Some motors may not be explosion-proof after overhaul.

593-5.8.6.3 PERSONNEL ENTRY. All shipboard personnel shall notify department head/division officer prior to entering any unventilated, non-occupied space designated to store hazardous or toxic materials or any sealed space. Verify that the space was checked and certified by a gas free engineer prior to entry, and comply with the gas free engineering certificates posted outside the space.

593-5.8.6.4 Ventilation Alarms. Flammable liquid stowage compartments on ships may be fitted with a circuit (HF) airflow alarm system. This system provides an audible alarm signal when the ventilation system loses electrical power or becomes blocked and a low airflow results. Compartments fitted with the circuit HF airflow alarm are identified by an exterior door warning placard to protect against careless entry during alarm. Compartments fitted with an HF circuit do not need a flame arrester in exhaust ducts. A sample warning placard is presented in Figure 593-5-2. The letters on this placard shall be 3/8 inch high.

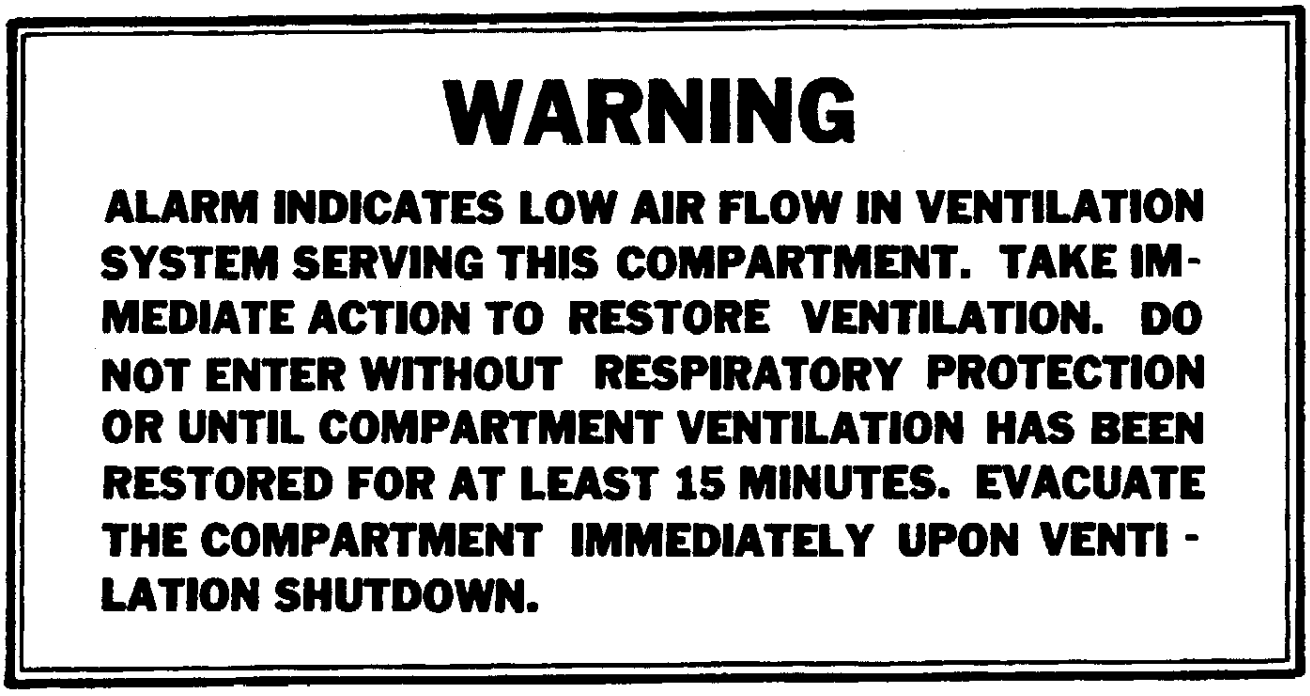


Figure 593-5-2 Sample Ventilation Warning Placard

593-5.8.7 SEPARATION DISTANCES. Separation distances are required within used/excess HM storerooms to allow access to doors, manholes, and operating gear, as well as to the stores kept in the area. In addition, separation distances are required for proper functioning of fire suppression, ventilation, and other safety systems. Guidelines follow.

593-5.8.7.1 The passages in used/excess HM stowage compartments should be wide enough to allow ready transit by personnel. Each pallet or stack of used/excess HM should be clear of the nearest beam, chord, bulkhead, or other obstruction. Within flammable stowage compartments, allow a minimum distance of 18 inches between the top of the stacked used/excess HM and the fire suppression discharge orifices. Separate flammable materials from heat-producing compartment bulkheads by a distance of at least 36 inches.

593-5.8.7.2 If space limitations necessitate storing incompatible materials in the same compartment, maintain a separation distance of at least 3 feet. This provides only limited protection. Other precautions, such as high coamings or partitions, shall be used to prevent accidental mixing of incompatible HMs. Coamings will not prevent vapors, generated from incompatible HM in spaces, from mixing and reacting.

593-5.8.8 PLACARDING. Warning placards or stencils in hazardous substance storage areas allow personnel to recognize immediately the potential dangers within those spaces. Warning placards or stenciled warnings should be placed on the exterior of all used/excess HM and HM stowage chests, lockers, or compartments. These signs should indicate potential hazards or caution against unsafe practices. Sample warning placards are presented in Figure 593-5-3. Place warning placards with letters 3/8-inch high where they are both protected from wear and easily visible. Storage areas used to store PCBs awaiting disposal shall be labeled in accordance with the requirements provided in paragraph 593-5.4.2.

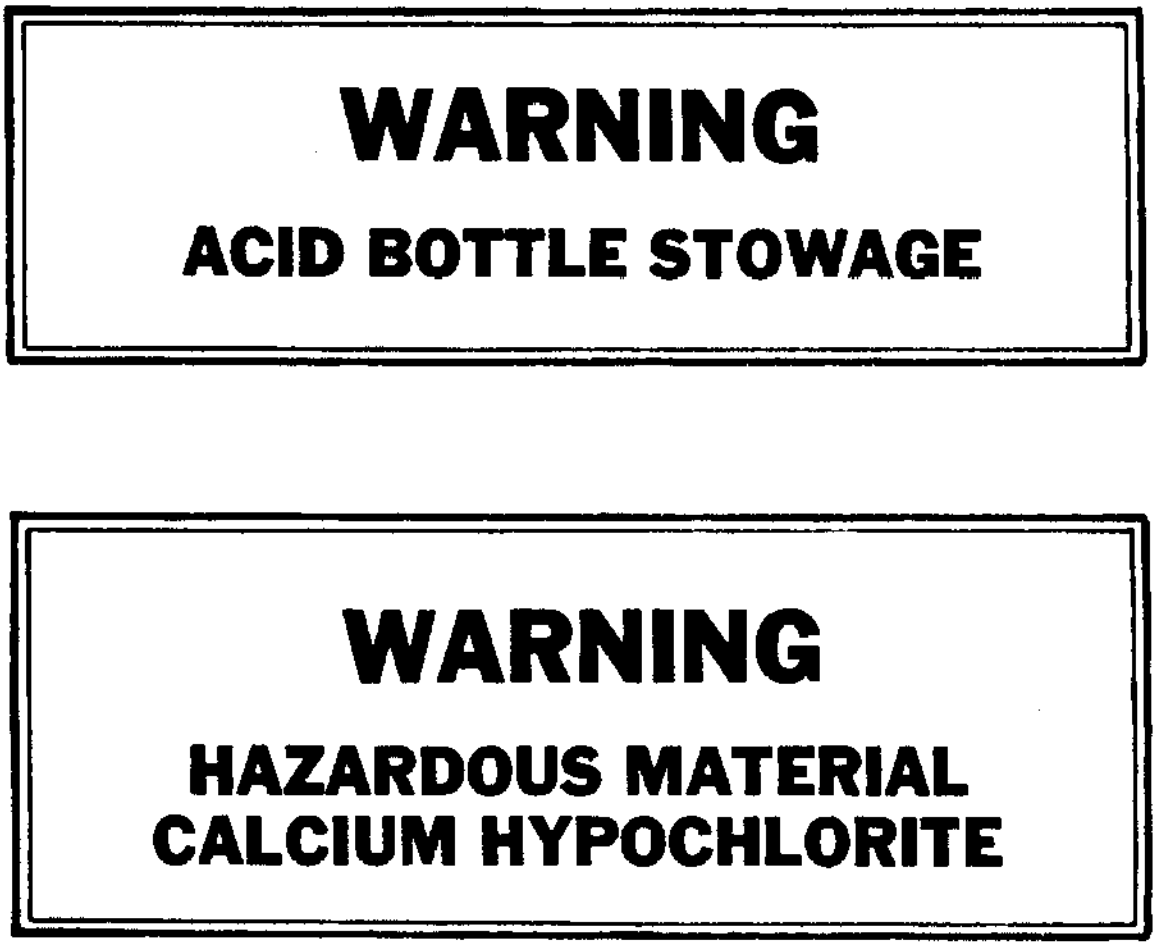


Figure 593-5-3 Sample Storage Area Warning Plates

593-5.8.9 SECURITY. Used/excess HM stowage compartments and lockers shall be secured using low security locks and hasps. A description of these types of locks and hasps can be found in NSTM Chapter 604, **Locks, Keys, and Hasps.**

593-5.9 USED/EXCESS HM COLLECTION

593-5.9.1 Because of their high toxicity, several shipboard used/excess HMs may never be discharged at sea. OPNAVINST 5090.1C Series, Appendix L, identifies these HMs and also types of used/excess HM that are to be retained under certain operating conditions (see paragraphs 593-5.10.4 through 593-5.10.14). These used/excess HM's shall be collected for eventual shore processing or disposal. Shipboard used/excess HM collection procedures shall suit both the nature of each substance and the requirements for later shore side processing, or for disposal ashore or at sea. These procedures shall include the same personnel safety precautions employed during HM operations. These precautions can be found in NSTM Chapter 541, Ship Fuel and Fuel Systems; NSTM Chapter 542, Gasoline and JP-5 Fuel Systems; NSTM Chapter 550, Industrial Gases, Handling and Storage; NSTM Chapter 670, **Stowage, Handling, and Disposal of Hazardous General Use Consumables** ; NSTM Chapter 700, **Shipboard Ammunition Handling and Stowage** ; OPNAVINST 5100.19 Series; and NAVSEA S9593-A1-MAN-010 **Shipboard Management Guide for PCBs.**

593-5.9.2 SEGREGATION. Used/excess HM must be kept segregated during collection to prevent the mixing of incompatible wastes or dissimilar wastes. Incompatible used/excess HM must be stored in separate containers. The potential consequences of mixing incompatible wastes or dissimilar wastes are presented in paragraphs 593-5.1.6 and 593–5.1.7.

CAUTION

Never add used/excess HM to an empty HM container that has held a dissimilar or incompatible substance.

593-5.9.3 CONSOLIDATION. Use a single designated container when consolidating each type of used/excess HM generated within an individual shop or other HM usage area. This designated collection container can be the one that originally held the HM now collected as used/excess HM or it can be an appropriate standard container (see paragraph 593-5.5.2). A container shall normally be filled with one type of HM, i.e., all the used HM in a container shall normally be of only one stock number.

593-5.9.3.1 Label the container clearly, as described in paragraphs 593-5.4.1 and 593-5.4.2; fit with a tight closure; electrically ground or bond (if flammable used/excess HM is being collected); and secure in the collection area. Fill the collection container to only 95 percent of its total capacity, leaving space for thermal expansion of the contained fluid. For example, fill a 55-gallon drum to within 3 inches of the drum top. Collected used/excess HM that shall be retained for shore side processing or disposal shall be stowed only in assigned stowage areas with similar HM.

593-5.9.4 HM CONTAMINATED ITEMS. Items contaminated by HM shall be collected and disposed of in the same manner as the contaminating substance. Special precautions shall be taken when PCBs are the contaminants. For information concerning collection and disposal guidance for radiologically, chemically, or biologically contaminated equipment and protective clothing see NSTM Chapter 070 **Nuclear Defense at Sea and Radiological Recovery of Ships After Nuclear Weapons Explosion** and NSTM Chapter 470 **Shipboard BW/CW Defense and Countermeasures** .

593-5.9.4.1 Rags, Mops, and Sorbents. Rags, mop heads, and sorbents used to clean up HM spills shall themselves be treated as used/excess HM. These shall be collected and stowed in tightly sealed steel containers to prevent release of toxic or hazardous vapors into ship spaces. To avoid creation of fire hazards, rags and sorbents that contain dissimilar or incompatible used/excess HM shall be stored in different containers. For example, oily rags shall not be stored in the same container as rags used to clean up liquid bleach. Dirt, dust, debris, rags and disposable PPE resulting from cleaning areas that may contain PCBs should be handled and disposed of as PCB waste. PCB wastes should be containerized, labeled and stored in accordance with the directions provided by the shipboard HM Coordinator per NAVSEA S9593-A1-MAN-010, **Shipboard Management Guide for Polychlorinated Biphenyls** .

593-5.9.4.2 Empty HM Containers. Containers emptied of their HM are to be considered used/excess HM, unless they meet the criteria provided in Appendix D for disposal as a solid waste. If the ship is equipped with a NAVSEA-approved aerosol puncturing/draining (and crushing) device, aerosol cans may be punctured and drained (and crushed). The resultant aerosol containers shall be marked empty and treated as any other empty HM container or solid waste if completely drained.

If the ship is not equipped with a NAVSEA-approved aerosol puncturing/draining device, aerosol containers shall be retained aboard intact until the ship is in port, where they can be disposed of as used HM. See Appendix D for additional information on empty HM container management and container air drying guidance.

593-5.9.4.3 Contaminated Protective Clothing. Protective clothing that becomes contaminated shall be treated as used/excess HM until its decontamination or disposal. Decontamination and reconditioning instructions for these articles are included with the clothing or can be found in NSTM Chapter 079, **Vol. 2, Damage Control - Practical Damage Control** and NSTM Chapter 655, **Laundry and Dry Cleaning** . Reclaimable contaminated clothing should be separated from expendable articles and promptly decontaminated. Articles that cannot be readily decontaminated shall be stowed in tightly sealed steel containers until recovery or disposal.

593-5.9.5 PCB ARTICLES. The primary PCB-containing articles onboard ships are electrical capacitors, transformers, reactors, cables, and ventilation system felt gaskets.

WARNING

AT NO TIME SHOULD PCBS BE ALLOWED TO CONTACT THE SKIN.

a. Consult the shipboard Safety Officer/Medical Officer before the collection of PCB articles or PCB-contaminated articles.

b. Wear impermeable neoprene boots, and gloves, (Tyvek or Saramet) protective clothing, and self-contained or air-supplied breathing apparatus with full face piece during collection.

c. Pack no-longer-used or leaking articles containing PCBs with sorbent material in tightly sealed steel containers. A list of EPA-approved containers and suggested absorbent, including NSN numbers, appears in Appendix B.

d. Collect and package PCBs or PCB-contaminated items in well-ventilated areas. Detailed collection procedures for PCBs are provided in NAVSEA S9593-A1-MAN-010, the Shipboard Management Guide for PCBs and applicable NAVSEA PCB Program advisories. The following personal protective equipment is required when cleaning vents and electrical cableways which may contain PCBs:

1. **Respirator. Half face respirator with HEPA cartridges. Personnel using respirators must be trained, medically qualified and fit-tested in accordance with OPNAVINST 5100.19 Series.**
2. **Disposable coverall, Tyvek with attached hood and booties.**
3. **Gloves. Latex gloves inside, followed by butyl rubber, neoprene, viton, or nitrile gloves outside tape to the coveralls to provide a seal.**
4. **Safety goggles or face shields.**

The requirements for handling and control of PCBs shipboard are further discussed in OPNAVINST 5100.19 Series, Appendix C23 (which contains summaries of NAVSEA PCB handling advisories) and NAVSEA S9593-A1-MAN-010, **Shipboard Management Guide for Polychlorinated Biphenyls.**

593-5.10 OFFLOADING AND DISPOSAL

593-5.10.1 The guidelines in OPNAVINST 5090.1C Series, Appendix L, have been established to minimize the quantity of used/excess HM offloaded to shore facilities, as well as to ensure the safety of shipboard personnel and the environment. Consult OPNAVINST 5090.1C Series, Appendix L, before any used/excess HM disposal.

593-5.10.2 OFFLOADING USED/EXCESS HM TO SHORE. Shore activities receiving used/excess HM from Navy ships are severely constrained by environmental regulations governing the storage, transport, and disposal of used/excess HM. It is imperative that all offloading of used/excess HM shall be coordinated through the shipboard HM Coordinator or HAZMINCEN Supervisor. The HM Coordinator or HAZMINCEN Supervisor will request pickup by the proper shore side activity, and will provide the ship's personnel with procedural details and documentation for conducting the actual transfer. Guidance for transferring used/excess HM ashore is provided in OPNAVINST 5100.19 Series, Appendix C23.

593-5.10.3 PROTECTING DRAINAGE SYSTEMS. Caustic or corrosive used/excess HM discharged through ship drainage systems may damage the piping or react violently with incompatible residues present in the piping. In addition, the Navy has agreed to local regulators to refrain from discharging industrial waste through domestic waste drain system (sewage and gray water). Therefore, industrial wastewater (e.g. metal plating, acid cleaning, photo processing, solvent cleaning, and painting materials) shall not be disposed of through ships' sewage or gray water systems. Any used/excess HM discharged overboard through the drainage systems should be diluted with large amounts of seawater. Acids and alkalis shall be neutralized, as described in paragraph 593–5.10.8, before dilution and discharge overboard. All drains used to discharge acids and alkalis shall be rinsed to remove any residues of the disposed waste after discharge.

593-5.10.3.1 The overboard discharge of caustic or corrosive HM, industrial wastes, or neutralized acid solutions is permitted only if the substance cannot be stored onboard ship safely for later disposal.

593-5.10.4 SOLVENTS. Shipboard personnel shall follow the disposal guidelines in OPNAVINST 5090.1C Series, Appendix L, when discarding spent solvents. Chlorinated and nonchlorinated solvents (and anything they have contaminated) shall be kept in separate containers. The use of Federal Specification P-D-680 Type II, Dry Cleaning and Degreasing Solvent, has been restricted to a limited number of authorized applications. Shipboard maintenance requirements have been modified in a number of applications to require the use of MIL-PRF-680, Type III.

593-5.10.4.1 It should be noted that certain solvents (e.g. acetone, toluene) evaporate during use, leaving no used/excess HM except the rag or cloth contaminated during use, while other solvents (e.g. ethylene glycol, xylene) evaporate slowly leaving substantial amounts of liquid material.

593-5.10.4.2 The overboard discharge of solvents is permitted only if the solvent cannot be stored onboard ship safely for later disposal.

593-5.10.5 BATTERIES. Often one or two cells of a lead-acid or alkaline battery become inoperable, causing the battery to function improperly. In some cases shore activities can rework or replace the defective cells and thus completely recondition the battery. Shipboard personnel should, therefore, containerize the entire defective battery for rework ashore, without emptying the electrolyte from the battery. See OPNAVINST 5100.19 series,

Chapter C9, and NSTM Chapter 313 **Portable Storage and Dry Batteries** for additional information on the safe handling and storage of batteries. Used or defective batteries should be stored in an appropriate battery locker or storeroom for offload to shore.

593-5.10.5.1 Defective or used lead-acid, alkaline, and lithium batteries shall be stowed in separate containers. The accidental mixing of the different types of electrolytes and components during storage could produce violent or dangerous reactions. See S9310-AQ-SAF-010 **Technical Manual for Batteries, Navy Lithium Safety Program Responsibilities and Procedures** for additional information on the safe handling and storage of lithium batteries.

593-5.10.5.2 The containers used to store defective wet-cell batteries shall be periodically vented to release any accumulated hydrogen gas.

593-5.10.6 SPENT ACID. Spent acid shall be neutralized and diluted before discharge overboard. To neutralize acid, slowly add sodium bicarbonate or a weak alkaline (basic) solution to the acid (see paragraphs 593–5.10.8 through 593–5.10.8.2 for information on the neutralization reaction and methods for determining when the reaction is complete). The neutralized acid solution can then be safely diluted with large amounts of seawater and discharged overboard. Guidance for the overboard discharge of neutralized spent acid is provided in OPNAVINST 5090.1C Series, Appendix L. In port, contact the local environmental coordinator or Public Works Center/Public Works Department or FISC for local authorized disposal procedures. The overboard discharge of neutralized acid solution is permitted only if the acid solution cannot be stored onboard ship safely for later disposal.

593-5.10.7 SPENT ALKALI. Spent alkali (base) shall be neutralized before being diluted and discharged overboard. To neutralize alkaline solutions, slowly add a weak acid, such as dilute acetic acid, to the alkali (see the following paragraphs for information on the neutralization reaction and methods for determining when the reaction is complete). The alkali can then be safely diluted with large amounts of seawater and discharged overboard. Guidance for the overboard discharge of neutralized spent alkali is provided in OPNAVINST 5090.1C Series, Appendix L. In port, contact the local environmental coordinator or Public Works Center/Public Works Department or FISC for local authorized disposal procedures. The overboard discharge of neutralized alkaline solution is permitted only if the alkaline solution cannot be stored onboard ship safely for later disposal.

593-5.10.8 NEUTRALIZATION. Neutralization is a chemical interaction between an acid and an alkali that reduces the corrosiveness of the acid or alkali. Detailed information on the neutralization process is presented in NSTM Chapter 220, **Volume 1, Boiler Water/Feedwater, Water Chemistry** , and paragraphs 593–5.10.6, 593-5.10.7 and 593–5.10.8.

593-5.10.8.1 The pH of a waste solution shall be between 6.0 and 8.0 before it can be diluted and discharged. Solutions with a pH less than 6.0 shall be neutralized using the procedure in paragraph 593–5.10.6. Solutions with a pH greater than 8.0 shall be neutralized using the procedure in paragraph 593-5.10.7.

593-5.10.8.2 For safety and environmental reasons, shipboard personnel must be able to determine when the neutralization reaction is complete. The extent of neutralization can be tested using a multi-range pH test paper with color comparator chart (NSN 6640-00-442-9005 and test paper refills NSN 6630-00-442-9015 or 6630-00-442-9025). To test a solution, carefully dip the edge of the test paper into the solution for the time period listed

in instructions on the pH paper package. Remove the paper from the solution and compare the color of the wet paper with the color on the package. An alternate method for measuring the neutralization reaction is using a pH meter.

593-5.10.9 HEAVY METALS. During the course of normal shipboard operations, wastes (e.g. metal plating solutions, painting wastes, and batteries) are produced that contain various heavy metals toxic to human and marine life. These and all other wastes containing mercury, silver, cadmium, chromium, nickel, copper, or lead shall be retained for shore disposal.

593-5.10.10 PHOTOGRAPHIC AND X-RAY PROCESSING WASTES. Ships with photographic and X-ray facilities are outfitted with silver recovery units to reclaim silver from waste fixer solutions. Ships that generate large quantities of silver contaminated waste, but do not yet have recovery units, should request them. The ship's single point-of-contact precious metals officer (usually the photographic officer) should communicate with the nearest Precious Metals Area Representative (PMAR). If the PMAR recommends the installation of silver recovery equipment, and NAVSEA concurs, the Defense Reutilization and Marketing Services will issue from stock or purchase the necessary equipment. The PMAR will instruct ship's personnel in equipment operation and maintenance and provide procedures for handling, security, and shipment of the recovered silver. Ships with silver recovery units shall use them to process black and white film and X-ray film fixer solutions. The recovery unit effluent may be discharged beyond the 12 NM. Within 12 NM, the effluent shall be containerized for shore disposal. Ships without silver recovery units shall containerize the fixer solutions for off-load ashore.

593-5.10.10.1 Batch quantities of all developer and intensifier solutions, batch quantities of fixer solutions used in color film processing, and any excess film shall be containerized for shore disposal. If suitable equipment is available, the effluent from all continuous processors shall be containerized when operating within 12 NM. Black and white film, X-ray continuous processor, and color film processing wastes shall never be discharged into drains that lead to sewage tanks or MSDs, because of their corrosive and toxic effects on sewage system components and MSD treatment systems. These and all other photo wastes may be discharged beyond 12 NM of shore.

593-5.10.11 OXYGEN BREATHING APPARATUS CANISTERS. Type A-4 Oxygen Breathing Apparatus (OBA), employed during damage control operations, use quick-starting canisters that produce oxygen through chemical reaction. The potassium superoxide in these canisters can react explosively with any oil or grease or if doused with water. These canisters require disposal when fully or partially depleted, or when the copper foil seal beneath the tear-off cap has been punctured.

593-5.10.11.1 After use or when they fail inspection, OBA canisters should be stored for shore disposal as used/excess HM. Handle OBA canisters according to NSTM Chapter 077, **Personal Protection Equipment** .

593-5.10.12 EMERGENCY ESCAPE BREATHING DEVICE. Emergency Escape Breathing Devices (EEBDs) are used for escape from spaces with life-threatening atmospheres. EEBDs also provide oxygen to trapped personnel awaiting rescue in life-threatening atmospheres. The oxidizing material within the EEBD canisters can react explosively with any oil or grease. In addition, immersion of EEBDs in water will create a very caustic solution. After use or when they fail inspection, EEBDs should be stored for shore disposal as used/excess HM. Label and handle EEBD in accordance with NSTM Chapter 077, **Personal Protection Equipment** and applicable Maintenance Requirement Card (MRC) guidance.

593-5.10.13 HYDRAZINE/MORPHOLINE AND SODIUM NITRITE BOILER WASTE. Hydrazine/morpholine and sodium nitrite are the primary chemicals used for lay-up of conventional boilers. Sodium nitrite is also used for waterjet and hydrostatic test processes. Hydrazine is classified as a reducing agent, while sodium nitrite is classified as an oxidizing agent. These two chemicals are incompatible. Mixing of these two boiler lay-up solutions would result in a violent reaction and for this reason is forbidden. Hydrazine/morpholine and sodium nitrite lay-up solutions may be discharged overboard in accordance with the guidelines provided in OPNAVINST 5090.1C Series, Appendix L. In port disposal of either of these two lay-up solutions requires containerization and proper disposal in accordance with local, state, and Federal regulations. Ships with boilers under hydrazine/morpholine lay-up in port are urged to dispose of this lay-up solution through light-off of the boiler and steaming. Steaming the boiler decomposes the hydrazine and allows for recycling of the morpholine throughout the steam system.

593-5.10.13.1 Disposal of 7% hydrazine solution contained in the one gallon bottles used as part of the chelant boiler feedwater treatment may be accomplished by discharging of the solution, in accordance with guidelines provided in OPNAVINST 5090.1C Series, Appendix L, following dilution of the contents contained in the one gallon bottle to 28 gallons in the chelant treatment continuous injection system. The chelant treatment continuous chemical injection system treatment solution is also authorized for discharge in accordance with the guidelines provided in OPNAVINST 5090.1C Series, Appendix L. Hydrazine is a contact hazard. Personnel shall not be permitted to enter the bilge area until the waste has been disposed. In port, disposal of the 7% hydrazine stock solution and chelant treatment solution requires containerization and disposal in accordance with local, state, and Federal regulations. Contact Public Works Center/Public Works Department or the local FISC for authorized procedures. Dispose of empty plastic bottles at sea in accordance with NSTM Chapter 593, Section 2. In port, dispose of bottles as solid waste. At sea or in port disposal requires that the bottle is flushed in the chelant treatment continuous injection system as detailed in the operating procedures of NSTM Chapter 220 **Volume 2, Boiler Water/Feedwater, Test and Treatment.** Further purging of the hydrazine bottle is not required.

593-5.10.13.2 Boiler waterjet wastewater. Sodium nitrite treated water generated during high pressure waterjet cleaning of boilers should be recycled using a wastewater recycling unit in accordance with NAVSEA Technical Manual S6300-AE-MMA-010 (**Technical Manual for Waterjet**).

593-5.10.14 CALCIUM HYPOCHLORITE. Calcium hypochlorite is a strong powder oxidizer used to provide the sanitizing and bleaching property of chlorine without the hazards associated with handling liquid or gaseous chlorine. Shipboard uses of calcium hypochlorite include chemical defense equipment decontamination and emergency potable water disinfection. Calcium hypochlorite handling and use practices are provided in NSTM Chapter 470, **Shipboard Biological Warfare/Chemical Warfare Defense and Countermeasures** and NSTM Chapter 533, **Potable Water Systems** . Contaminated or excess stock levels of calcium hypochlorite should be stowed in appropriate stowage facilities for eventual offload to shore. Empty calcium hypochlorite bottles are to be containerized, double bagged, separate from other empty HM containers and held for offload to shore.

SECTION 6
THERMAL, AIR AND NOISE POLLUTION

593-6.1 TERMS AND DEFINITIONS

593-6.1.1 AIR POLLUTION. Air pollution is the introduction into the atmosphere of materials, which are harmful to the environment.

593-6.1.2 CENTRIFUGAL DRY SPARK ARRESTER. A centrifugal dry spark arrester is a device used to remove particulate suspended in incinerator smoke by drawing the smoke through a cyclone chamber where the heavier particulates are thrown to the sides of the chamber by centrifugal force, and then are collected and removed.

593-6.1.3 ENVIRONMENTAL NOISE. The intensity, duration and character of sounds from all sources.

593-6.1.4 OZONE DEPLETING SUBSTANCES (ODS). Any chemical which is listed as a Class I or Class II substance as defined by the Clean Air Act (CAA). As of the issuance of OPNAVINST 5090.1C Series, ODS most prevalent in Navy applications include: CFC-11, CFC-12, CFC-113, CFC-114, CFC-115, HCFC-22, HCFC-123 (CFCs and HCFCs are also commonly referred to as Freons). Halon 1211, Halon 1301, methyl chloroform (1,1,1 trichloroethane) and carbon tetrachloride.

593-6.1.5 THERMAL POLLUTION. Thermal pollution is thermal (heat) discharge or pollution to the water by sources utilizing heat for energy.

593-6.2 LEGISLATION

593-6.2.1 FEDERAL WATER POLLUTION CONTROL ACT. The Federal Water Pollution Control Act, as amended, Public Law 92-500, prohibits discharge of any pollutant into navigable waters.

593-6.2.1.2 Clean Air Act (CAA). The CAA authorizes state and local governments to set standards for emissions of air pollutants. Federal agencies are required to comply with federal, state, interstate and local air pollution requirements. Although most air pollution regulations address shoreside sources, Navy ships operating within U.S. and state waters are also subject to regulation.

593-6.2.1.3 Montreal Protocol on Substances that Deplete the Ozone Layer. The presence of chloroflourocarbons (CFCs), halons, other chlorinated hydrocarbons (carbon tetrachloride, methyl chloroform), hydrochloro-flourocarbons (HCFCs), etc. in the stratosphere has been linked to the depletion of the earth's ozone layer, which protects life and vegetation from damaging ultraviolet light. In response to the threat ODSs present to the environment, more than 125 nations, including the United States, have signed an international agreement, known as the Montreal protocol, limiting ODS production. In 1990, due to increasing evidence of continued harm to the ozone layer, the Protocol was amended to provide for the eventual elimination of most ODSs. In November 1992, in a meeting in Copenhagen, parties to the Montreal Protocol agreed to accelerate the production phase-out schedules of CFCs to 1 January 1996 and halons to 1 January 1994.

593-6.2.1.4 Noise Control Act. The Noise Control Act provides that the Federal performance standards, which are to be incorporated into the design of new ship systems and equipment, to reduce noise emission. Retrofit modifications are not prescribed for existing noise sources. Military aircraft, combat equipment, and weapon systems are exempt from new product design standards. Workplace noise abatement is prescribed in OPNAVINST 5100.19 Series.

593-6.3 AIR POLLUTION

593-6.3.1 NAVY POLICY

593-6.3.1.1 Compliance with Regulations. Navy ships shall comply with applicable federal, state, and local regulations governing air pollution emissions. The continuing Air Pollution Abatement Program within the Navy calls for the reduction of non-complying and potentially harmful emissions into the atmosphere. Naval ships are required to meet national source emission and state and local ambient air quality standards for mobile sources. A ship is considered to be a mobile source. In port, local air pollution regulations generally apply. Senior Officer Present Afloat (SOPA) instructions in each port to be entered shall be carefully studied to ensure compliance with local regulations.

593-6.3.1.2 Boiler Stack Gases. Stack gas from boilers is an obvious form of air pollution. Smoke from operating boilers is made up, in part, of quantities of ash, carbon monoxide, carbon dioxide, unburned hydrocarbons, nitrogen oxides, and sulfur oxides. Navy efforts toward cleaning up stack gases concentrate on improvement of combustion rather than the addition of bulky, expensive, clean up equipment. The use of low sulfur, cleaner burning fuels, and proper combustion air ratios significantly reduces total pollutants in stack emissions. Stack gas monitors have a limited ability to control emissions as the readings from the monitors indicate either a ″black smoke″ or ″no black smoke″ condition.

593-6.3.1.2.1 Operation While Underway. When boilers are in operation, close surveillance of the exhaust shall be maintained and smoke discrepancies shall be corrected. Smoke must be minimized when boilers are being operated, lighted, or secured, or when they are shifted, baked out, or tested.

593-6.3.1.2.2 Training. Training Personnel whose watch duties may result in air pollution (e.g. diesel engine operators, boiler men or gas turbine operators) shall be trained in the minimization of air pollution as a part of the watch qualification.

593-6.3.1.3 Gas Turbines. Tests were conducted on the LM 2500 gas turbines at the Carderock Division, Naval Surface Warfare Center, (CDNSWC), Philadelphia Detachment, Philadelphia, Pa. Tests are currently being conducted by CDNSWC to evaluate using water injection to reduce emissions of Oxides of Nitrogen (NOx).

593-6.3.1.4 Diesel Engines. When diesel engines are in operation underway, close surveillance of the exhaust shall be maintained and smoke discrepancies shall be corrected. The potential for contamination of air compressor or ventilation intake shall be surveyed and corrected. A compilation of the different diesel engines in the fleet has been made. Existing pollution data generated by industry and other government agencies will be reviewed to determine whether any additional problem definition and control development will be necessary.

593-6.3.1.5 Incinerators. Burning of trash and refuse causes emission of pollutants to the atmosphere. Dry spark arresters and proper combustion air controls reduce fly ash and smoke emissions. The potential for incin-

erator exhaust contamination of air compressor or ventilation intakes shall be surveyed and corrected, if necessary. All personnel operating the incinerators shall be thoroughly familiar with OPNAVINST 5090.1C Series, Chapter 22, Naval Ship Technical Manual (NSTM) Chapter 593, Section 2 and the Trash Incinerator Operational Sequencing System (TIOSS) applicable before operating the incinerator.

593-6.3.1.6 Solvents and Coatings. To prevent violation of air pollution regulations, only approved solvents, paints, fuels, lubricants, and chemicals shall be used. A list of materials prohibited on ships is included in DOD Directive 6050.15 of 14 June 1985, **Prevention of Oil Pollution from Ships Owned or Operated by the DOD (NOTAL)** . A list of hazardous material approved for use onboard may be found in the Ships' Hazardous Material List (SHML). Precautions may include use of spray booths, filtered exhausts, and tight containers under well-planned and supervised conditions. Guidance for handling and removing these substances is in NSTM Chapter 074 Vol 3, **Gas Free Engineering** , and in Section 5 of this chapter. To conform to existing air pollution regulations (particularly those of the Los Angeles and San Diego Air Pollution Control Districts) prohibiting certain solvents in coatings, the formulation of coatings used by the Navy is being modified. The coatings are being reformulated, tested for performance, and the procurement specifications changed accordingly. A list of Naval Sea System Command (NAVSEA) specified paints and coatings authorized for shipboard use which meet the Volatile Organic Compound (VOC) requirements of the National Emissions Standard for Hazardous Air Pollutants (NESHAP) for ships is found in naval message 060340Z APR 99 COMNAVSEASYSCOM WASHINGTON DC//03M//.

593-6.3.1.7 Asbestos. Shipboard emergency asbestos rip out or removal shall not be performed by ship's force within U.S. coastal territorial waters. See OPNAVINST 5100.19 Series, Chapter B1 for guidance. Any asbestos material removed during shipboard emergency rip outs or repair actions performed by ship's force at sea shall be properly containerized and disposed of without release of asbestos residue and must be adequately wetted prior to double bagging in heavy duty (6 mil thickness) plastic bags or other suitable impermeable containers. All bags or containers shall be provided with standard asbestos danger labels. Disposal shall be accomplished in accordance with OPNAVINST 5090.1C Series, Appendix L. Removal by Navy shore facilities or contractors shall be governed by applicable laws, regulations and contract requirements.

593-6.3.1.8 Ozone Depleting Substances (ODS). Ozone depleting substances shall be recovered prior to maintenance performed on air conditioning and refrigeration systems and on fire protection systems using halons wherever possible. Only maintenance personnel trained in minimizing loss on ODS shall perform maintenance on equipment containing such substances. Where such procedures have been established, maintenance personnel shall use only approved procedures for minimizing loss of ODS, regardless of where ship may be located.

593-6.3.1.8.1 Training for Refrigerant Recovery. All personnel who perform maintenance on air conditioning and refrigeration equipment shall be certified as per 40 CFR part 82 in the handling, recovering and recycling of ODSs, and shall receive training on ODS regulations as well as spent/recyclable ODS labeling prior to performing these duties. Technicians may require additional State or local certifications if more stringent than Federal certification. For additional information on Navy policy and procedures on ODS management refer to OPNAVINST 5090.1C Series, Chapter 8.

593-6.4 NOISE POLLUTION

593-6.4.1 GENERAL. Control of noise emission is an important aspect of pollution control. Noise above certain sound levels can cause a wide variety of unwanted effects on personnel, ranging from discomfort and anxiety to illness and deafness. Because of these hazards, exposure of personnel to high sound levels shall conform to the OPNAVINST 5100.19 Series and 5090.1C Series, instruction.

593-6.4.2 NAVY POLICY

593-6.4.2.1 Noise Measurement. When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions:

$$\frac{C_1}{T_1} + \frac{C_2}{T_2} + \ldots \frac{C_N}{T_N}$$

exceeds unity, then the mixed exposure should be considered to exceed the maximum allowable noise exposure. C_1 indicates the total time of exposure at a specified noise level, and T_1 indicates the total time of exposure permitted at that level.

593-6.4.2.2 Noise Control. OPNAVINST 5090.1C Series requires that, except for navigational and testing requirements and during actual emergencies, alarms should be operated only to the extent necessary to assess proper operation. Use of the general announcing circuit should be curtailed. Topside speakers should not be used unless absolutely necessary. The use of powered tools and machinery or any other devices which emit excessive noise (such as chipping hammers, wire brushes, and deck winches), should be restricted to normal working hours when possible. The use of powered tools, machinery, outboard loudspeakers, or any other devices that emit excessive noise, either directly or indirectly through re-radiation, shall be restricted to normal daylight working hours to the maximum possible extent. These noise pollution control requirements are primarily time-exposure criteria in terms of A-weighted levels. For the appropriate octave-band levels for compartments and equipment, when specified, refer to the applicable shipbuilding specifications.

593-6.4.2.3 References. Shipboard personnel shall consult OPNAVINST 5090.1C Series, and 5100.19 Series for more comprehensive noise exposure control programs.

593-6.4.2.4 Violation of Law. If violations of noise pollution control standards are suspected, the Naval Sea Systems Command (NAVSEA) shall be contacted. NAVSEA will arrange for decibel measurements to be made.

593-6.5 THERMAL POLLUTION

593-6.5.1 NAVY POLICY. Heat is classified as a potential pollutant in the Federal Water Pollution Control Act, Public Law 92-500. The Navy has conducted a thorough environmental assessment of thermal pollution associated with naval ships, involving a detailed analysis of major ship types and including some test data. It was concluded that the environmental impact of thermal discharges to the water from naval ships is insignificant. Consequently, there is no thermal pollution control program at the present time.

SECTION 7
MEDICAL WASTE

593-7.1 TERMS AND DEFINITIONS

593-7.1.1 AUTOCLAVE. An autoclave is an apparatus used as a form of sterilization using pressurized steam. It is fitted with a gauge that automatically regulates the steam pressure, and thereby, the degree of heat to which the contents are subjected.

593-7.1.2 MEDICAL WASTE. Medical waste is any waste (medical or dental) that is generated during patient diagnosis, treatment, or immunization. Medical Waste is divided into two categories - infectious waste and non-infectious waste.

593-7.1.2.1 Infectious Medical Waste. Infectious Medical Waste is liquid or solid waste that contains pathogens in sufficient numbers and with sufficient virulence to cause infectious disease in susceptible hosts exposed to the waste. Examples of infectious medical waste are listed below:

a. Microbiology wastes including cultures and stocks of disease producing agents containing microbes that, due to their species, type, virulence, or concentration are known to cause disease in humans. Examples include specimens from medical and pathology laboratories; discarded live vaccines; wastes from biological testing, cultures, and stocks of infectious agents from clinical laboratories; and disposable culture dishes and devices used to transfer, inject, and mix cultures.
b. Pathological wastes include human tissues and organs, amputated limbs or other body parts, and similar tissue from surgery procedures. Body parts and bedding exposed to pathogens are also included in this category.
c. Liquid waste human blood, products of blood, items saturated or dripping with human blood, or items that were saturated or dripping with human blood that are now caked with dried human blood, devices used to contain blood or other body fluids (excluding urine that does not have visible blood in it). Absorbing materials containing small amounts of blood or body fluids and discarded products for personal hygiene, such as facial tissues, and sanitary napkins are not considered infectious.
d. Sharps, including: hypodermic needles, syringes, scalpel blades, Pasteur pipettes, specimen slides, cover slips, glass Petri plates, and broken glass potentially contaminated with infectious material.
e. Medical wastes from patients in isolation are often defined as infectious waste. However, only those items which were contaminated or likely to be contaminated with infective material are infectious waste.

593-7.1.2.2 Non-infectious Medical Waste. Non-infectious medical waste includes disposable medical supplies and material that do not fall into the categories of infectious medical waste. Examples of non-infectious medical waste include:

a. Absorbent materials containing small amounts of blood or body fluids (e.g., dressings, facial tissues and sanitary napkins with no unabsorbed or free-flowing blood or body fluid), unless the waste is from isolation rooms.
b. Disposable products used during routine medical or dental procedures (e.g., rubber gloves, rubber dams, cotton and paper products, equipment trays, tubing and catheters).
c. Empty pill bottles and intravenous (IV) bags.
d. Expired or unused culture tubes and plates.

e. Packaging and over wrap.

593-7.2 MEDICAL WASTE POLICY.

The Navy policy for discharge of medical waste is described below:

a. Infectious solid medical waste shall be steam sterilized, suitably packaged, and stored for disposal ashore. Autoclaving is the only currently approved method to treat shipboard infectious medical waste. See the Afloat Medical Waste Management Guide, OPNAV P-45-113-3-99 for a listing of NSNs of approved shipboard autoclaves.
   1. If retention of infectious solid wastes would endanger the health and safety of personnel on board infectious medical waste should be steam sterilized and properly packaged with the package weighted for negative buoyancy to ensure it will not be washed to shore, and discharged overboard. Refer to OPNAVINST 5090.1C Series, for permitted overboard discharge locations.
   2. Administrative records shall be maintained for instances of overboard discharge of infectious solid medical wastes.
   3. In foreign countries, the packaging, handling, storage, transport, and disposal of infectious solid medical waste shall be consistent with applicable SOFAs or international agreements. If no SOFA or international agreement exists, infectious solid medical waste shall be disposed of as specified by the cognizant Fleet commander.
   4. Shipboard packaging, labeling, handling, and storage of infectious solid medical waste shall be per the Afloat Medical Waste Management Guide, OPNAV P-45-113-3-99.
   5. After steam sterilizing, infectious paper and cloth-based solid medical waste may be incinerated aboard ship if this capability exists.

b. No sharps shall be discharged overboard under any condition. Sharps shall be collected in plastic autoclavable sharps containers. Never recap, clip, cut, bend, or otherwise mutilate needles or syringes to avoid causing accidental puncture wounds and infectious aerosols. All sharps shall be retained on board for proper disposal ashore in the same manner as infectious solid medical waste.

NOTE

Unused sharps shall be disposed of ashore in the same manner as infectious solid medical waste.

c. Plastic and wet infectious solid medical waste materials shall not be incinerated.

d. Non-infectious solid medical waste not containing sharps or plastic may be disposed of as solid waste (see section 2) and does not require steam sterilizing or special handling. All non-infectious solid medical waste disposed of at sea should be rendered unrecognizable and weighted for negative buoyancy to ensure it will not be washed ashore. Medical personnel may use shipboard solid waste management equipment for processing non-infectious solid medical waste. Refer to the Afloat Medical Waste Management Guide (OPNAV P-45-113-3-99) for additional information.

e. Liquid infectious and non-infectious medical wastes may be disposed of by discharging into the sanitary system outside 50 NM. Liquid infectious and non-infectious medical wastes shall be containerized for shore disposal inside 50 NM.

f. The requirement to steam sterilize prior to disposal at sea does not apply to submarines.

g. Shore based commanders shall provide the required shoreside services for disposal of medical waste gener-

ated by ships and ensure that disposal ashore is in compliance with applicable Federal, state, and local laws or regulations, and Status of Forces Agreement (SOFA).

h. It is the responsibility of all commanders to ensure that no medical materials are disposed of in a manner that may pose a risk to public health and welfare or the marine environment.

i. All shipboard personnel working with infectious medical waste shall receive training on all aspects of handling infectious medical waste to allow them to properly protect themselves. Training shall be per the Afloat Medical Waste Management Guide (OPNAV P-45-113-3-99).

SECTION 8
OIL AND HAZARDOUS SUBSTANCE SPILLS

593-8.1 TERMS AND DEFINITIONS

593-8.1.1 SPILL. A spill is defined as an accidental or not permitted discharge of Oil and Hazardous Substance (OHS) either onboard or into/upon the water.

593-8.2 OIL SPILL INFORMATION

593-8.2.1 Responsibilities concerning oil spills are described in OPNAVINST 5090.1C Series. Since shore-based units are seldom available at non-Navy or foreign ports, ships have the capability of providing initial remedial action until relieved by shore-based response units, or, in the case of non-Navy or foreign ports, to clean up the spill.

An On Scene Coordinator (OSC) shall be designated in accordance with OPNAVINST 5090.1C Series, and the Hazardous Material Spill Response Procedures as outlined in OPNAVINST 5100.19 Series, Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat, Appendix B3-A. The OSC shall direct Navy OHS spill response efforts.

593-8.2.2 Navy policy (OPNAVINST 5100.19 Series and OPNAVINST 5090.1C Series) and procedures for shipboard management of oil requires that each Naval vessel develop and implement oil spill contingency procedures. The Navy has developed a Shipboard Spill Contingency Plan Guide to aid ship's force in developing spill contingency procedures. A copy of the Shipboard Spill Contingency Plan Guide is available at www.navy-seic.dt.navy.mil/

593-8.2.3 All oil spills, slicks, or visible sheens shall be reported immediately according to the provisions of OPNAVINST 5090.1C Series, and the Navy Shipboard Spill Contingency Plan.

593-8.2.4 The Mark I and Mark II Spill Kits have been replaced with the Oil Spill Containment and Cleanup Kit. This kit is used for shipboard and overboard spills of less than 20 gallons. The kit contains sorbent sweeps, which have replaced the chemical components and sorbent material of the Mark I and Mark II Spill Kit for spills greater than 20 gallon multiple kits or additional sorbents can be used. When pierside, the appropriate Naval on Scene coordinator shall be contacted for additional response efforts. The recommended shipboard Allowance Equipage List (AEL Number 2-550024006) is as follows:

1. Oil-only sorbents
2. Personal Protective Equipment (PPE)
3. Clean up tools
4. Labels
5. Drums for the disposal of oil contaminated materials.
6. A handbook that instructs users on proper personal protective equipment for each type of spill, hot lines for spill guidance, dressing up/down instructions, and general spill response procedure.

The Oil Spill Containment and Cleanup Kit box and contents are stored as directed by the CHENG for each ship (locations will vary). The sorbent material is combustible and extremely flammable at temperatures exceeding 300° F so shall be kept away from open flame.

The Mark I Oil Spill Kit instruction booklet and Navy training film are obsolete and therefore should not be used. Basic instructions for responding to oil spills using the Oil Spill Containment and Cleanup Kit are as follows:

1. Stop source of the spill.
2. Contain the spill. If the spill is on deck, take action to prevent the spill from going overboard.
3. Notify the proper authorities; refer to the ship's Spill Contingency Plan (SCP).
4. Evaluate the situation and develop a response plan.
5. Execute the clean up and adjust the plan as needed.
6. Once clean up is complete, properly store and label all used/excess Hazardous Material (HM) collected. Used sorbent materials are hazardous and must be retained for disposal at a shore-based facility. If temporary shipboard storage is required, the used oily sorbent materials should be sealed in 55-gallon drums lined with plastic bags.
7. Restock all spill kits.

Detailed instructions for the deployment of the Oil Spill Containment and Clean-up Kit are provided in the kit's handbook (NAVSEA S9593-CJ-MAN-010) and in OPNAVINST 5100.19 Series.

593-8.3 HM SPILL INFORMATION.

593-8.3.1 Ships force shall prepare for possible HM spills by developing and using a Spill Contingency Plan (SCP Navy policy (OPNAVINST 5100.19 Series and OPNAVINST 5090.1C Series)) and procedures for shipboard management of HM requires that each Naval vessel develop and implement oil spill contingency procedures. The Navy has developed a Shipboard Spill Contingency Plan Guide to aid ship's force in developing spill contingency procedures. A copy of the Shipboard Spill Contingency Plan Guide is available at www.navyseic.dt-.navy.mil/.

593-8.3.2 Detailed guidance for HM spill response is given in OPNAVINST 5100.19 Series, Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat, Appendix B3-A, Hazardous Materials Spill Response Procedures and in NAVSEA S9593-CJ-MAN-010, Oil Spill Containment and Clean-up Kit Handbook. Guidance for PCB spill containment is provided in NAVSEA S9593-A1-MAN-010, Shipboard Management Guide for PCBs, NAVSEA Advisories 94-1, Removal and Handling of PCB Felt, 94-1A, Management of Electrical Cables Removed From Vessels and Craft, and 94-2, Maintenance and Cleaning of Ventilation Ducts Containing PCB Felt Gaskets on Surface Ship and Submarines.

593-8.3.3 To assist ship's force in successfully responding to a shipboard HM spill, the Navy has also developed and distributed a Shipboard Hazardous Material Spill Response Kit for surface ships. The kit contains:

1. Universal sorbents
2. Personal Protective Equipment (PPE)
3. Clean up tools

4. Labels
5. Storage containers for all types of HM.
6. A manual, which instructs users on proper personal protective equipment for each type of spill, hot line points of contact for spill guidance, dressing up/down instructions, and general spill response procedures.

593-8.3.4 Three Allowance Equipage Lists (AELs) are available for the HM Spill Response Kit. They include one for surface ship classes (AEL 2-550024007), one for small craft (AEL 2-550024008), and one for minesweepers (AEL 2-550024009). All three kits are similar, with the major differences being material quantity and size of the kit.

593-8.3.5 HM SPILL REPORTING.

593-8.3.5.1 Immediately report any HM spill, either overboard or onboard, to supervisory personnel and the Officer of the Deck (OOD)/Command Duty Officer (CDO), who will then activate response procedures according to the ship's SCP.

593-8.3.5.2 Within 12 NM of the U.S. shoreline, report overboard spills of any amount of HM prohibited from discharge by Appendix L of OPNAVINST 5090.1C Series, to the National Response Center (NRC), using the message format contained in Appendix H and Appendix I of OPNAVINST 5090.1C Series.

593-8.3.5.3 Outside of 12 NM of a U.S shoreline or when in waters of foreign countries, report all spills to the pre-designated NOSC assigned in the spill contingency plan, using release message format to be found in Appendix I in OPNAVINST 5090.1C Series. The Fleet NOSC will implement spill contingency plans.

593-8.3.5.4 Do not report as spills HM releases conforming to OPNAVINST 5090.1C Series, Appendix L, guidelines.

593-8.3.5.5 Report all significant spills resulting from catastrophes or with geopolitical implications, as defined in OPNAVINST 5090.1C Series, (section 22-9.2.8), using the OPREP-3 special incident report format prescribed in OPNAVINST 5090.1C Series, Appendix H and I.

SECTION 9
POLLUTION PREVENTION

593-9.1 TERMS AND DEFINITIONS.

593-9.1.1 EFFLUENT. Waste material (e.g. smoke, liquid industrial refuse, or sewage) discharged into the environment.

593-9.1.2 FEEDWATER. The water supplied to steam boilers.

593-9.1.3 HAZARDOUS MATERIAL (HM). See section 593-5.1.2.3.

593-9.1.4 HM CONTAMINATED RAGS. See section 593-5.1.2.5.

593-9.1.5 HAZARDOUS WASTE (HW). See section 593-5.1.2.7.

593-9.1.6 USED AND EXCESS HAZARDOUS MATERIAL . See section 593-5.1.2.8.

593-9.2 INTERNATIONAL CONVENTIONS AND LEGISLATION.

593-9.2.1 EO 13148 (GREENING THE GOVERNMENT THROUGH LEADERSHIP IN ENVIRONMENTAL MANAGEMENT). Executive Order (EO) 13148 mandates a 50% reduction in the use by the government of selected toxic chemicals, hazardous substances, and pollutants, and a 40% reduction in TRI (Toxic Release Inventory) releases by December 31, 2006. EO 13148 also places an emphasis on pollution prevention programs (i.e. source reduction).

593-9.2.2 THE CLEAN WATER ACT (CWA). The Clean Water Act (CWA) prohibits the discharge of harmful quantities of hazardous substances (HS) into or upon U.S. waters out to 200 NM.

593-9.2.3 THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA). The Resource Conservation and Recovery Act (RCRA) regulates generation, treatment, storage and disposal of hazardous waste. RCRA provides that HW generated on public vessels is not subject to storage, manifest, inspection or record keeping requirements until the ship transfers such waste ashore or transfers it to another public vessel within the coastal territorial waters of the U.S. and then only after that vessel stores it aboard for more than 90 days after the date of transfer.

593-9.2.4 TOXIC SUBSTANCES CONTROL ACT (TSCA). The Toxic Substances Control Act (TSCA) provides Federal restrictions governing the manufacture, use, labeling and disposal of polychlorinated biphenyls (PCBs), asbestos and asbestos-containing waste.

593-9.3 NAVY AFLOAT AND SUBMARINE POLLUTION PREVENTION PROGRAMS.

593-9.3.1 NAVY POLLUTION PREVENTION AFLOAT (P2A) PROGRAM. The Navy P2A Program was created in response to environmental laws/regulations, Navy policies and EOs mandating a substantial reduction

in use and offload of used/excess HMs. The primary motivating force behind the development of the P2A Program is Executive Order (EO) 13148 which requires the reduction of HM handled by all Federal facilities, as described in section 593-9.2.1. Suites of P2A equipment and material installations on Navy ships starting in 2000 and will be completed in 2006. The P2A equipment installed is intended to support maintenance process changes to support minimization of the procurement, shipboard use, storage, handling and offload of HM. The P2A equipment is also expected to provide maintenance manhour reduction benefits to the Fleet.

593-9.3.2 NAVY POLLUTION PREVENTION SUBMARINES (P2S) PROGRAM. The P2S Program was initiated in 2002 by identifying opportunities for pollution prevention aboard submarines in an approach similar to the P2 Afloat Program. Seventy-five potential P2S opportunities were identified and will be assessed by Navy engineers and the Fleet prior to implementation.

593-9.4 P2A EQUIPMENT ILS INFORMATION.

Refer to the Pollution Prevention Afloat (P2A) page under the Navy SEIC website (www.navyseic.dt.navy.mil) for current information on P2A equipment ILS and training.

593-9.5 P2A PROGRAM EQUIPMENT.

A matrix of pollution afloat SHIPALT equipment for specific ship classes can be seen in Appendix F.

593-9.5.1 PAINT-RELATED.

593-9.5.1.1 Paint Dispensers. Paint Dispensers were developed to minimize the generation of paint related solid wastes and hazardous materials for disposal. Paint Dispensers support issue and return of single component paints. Additionally, paint can be issued in the desired quantities so that return of excess or contaminated paint (and potential for subsequent hazardous waste disposal) can be minimized. Paint Dispensers have a capacity of 25 gallons. By adjusting the valve configuration, they re-circulate or dispense paint via a diaphragm pump that is driven by low-pressure air. It is essential that Paint Dispensers be operated in a re-circulated mode for ½ hour each day to keep paint from settling. Additionally, the level of paint in the Paint Dispensers must not be permitted to drop below the level of the screen, when there is less than approximately 5 gallons of paint in the system. See Figures 593-9-1 and 593-9-2. See Table 593-9-1 for ILS Support information.

Figure 593-9-1 Paint Dispensers

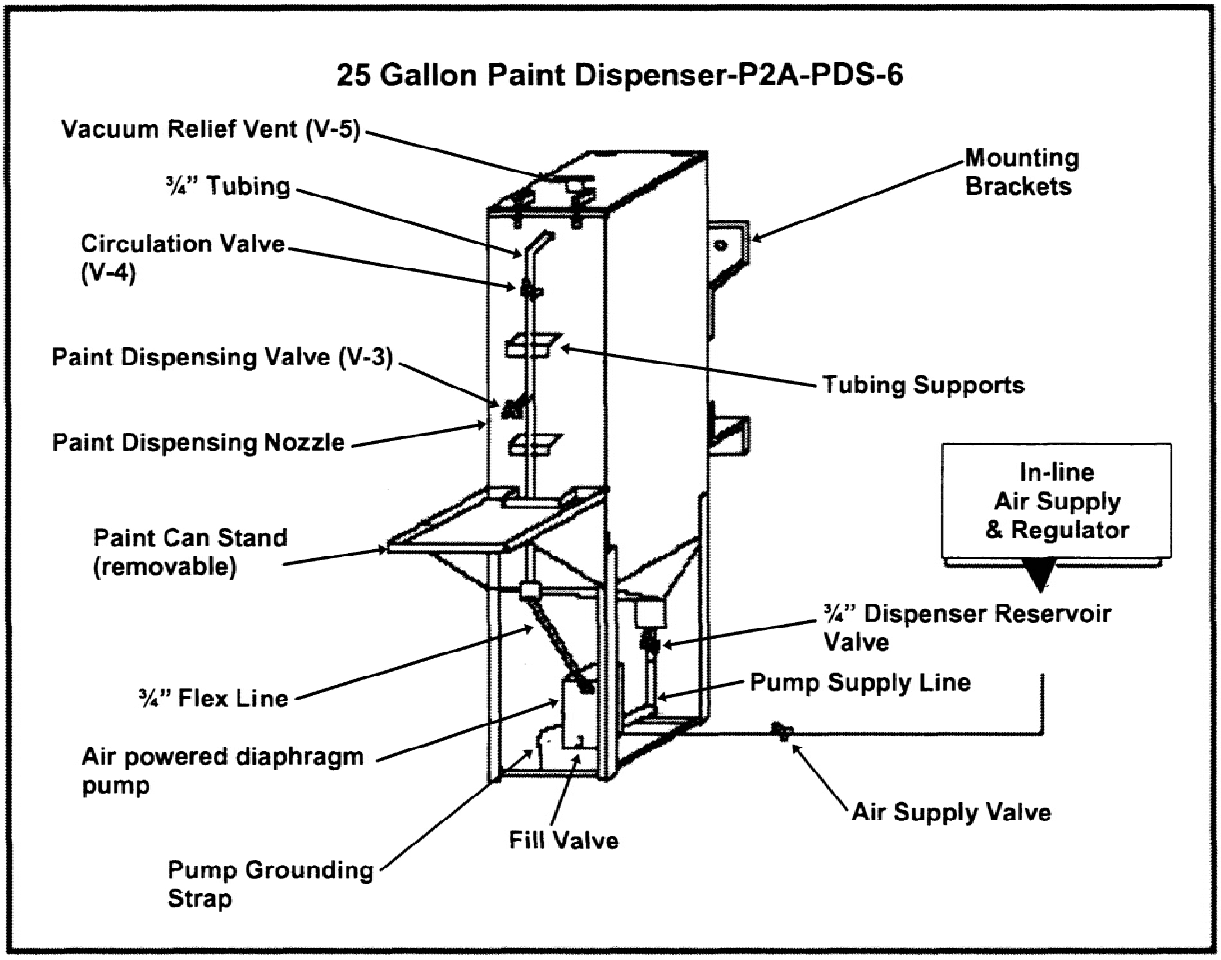


Figure 593-9-2 Paint Dispenser

Table 593-9-1 Paint Dispenser

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	6656/006
TECHNICAL MANUALS	SG200-DA-MMC-010DESCRIPTION, OPERATION, AND MAINTENANCE FOR PAINT DISPENSER MODEL: P2A-PDS-6
SHIPBOARD TRAINING COURSES	TBD
APL	419990364
NSN	4940-01-467-3245

593-9.5.1.2 Paint Mixer. A Paint Mixer is provided for each paint locker equipped with Paint Dispensers. The paint mixer consists of a pneumatically powered portable tool with an attachment suitable for mixing paint. Paint mixing should be done prior to placing paint in the Paint Dispensers. See Figure 593-9-3. See Table 593-9-2 for ILS Support information.

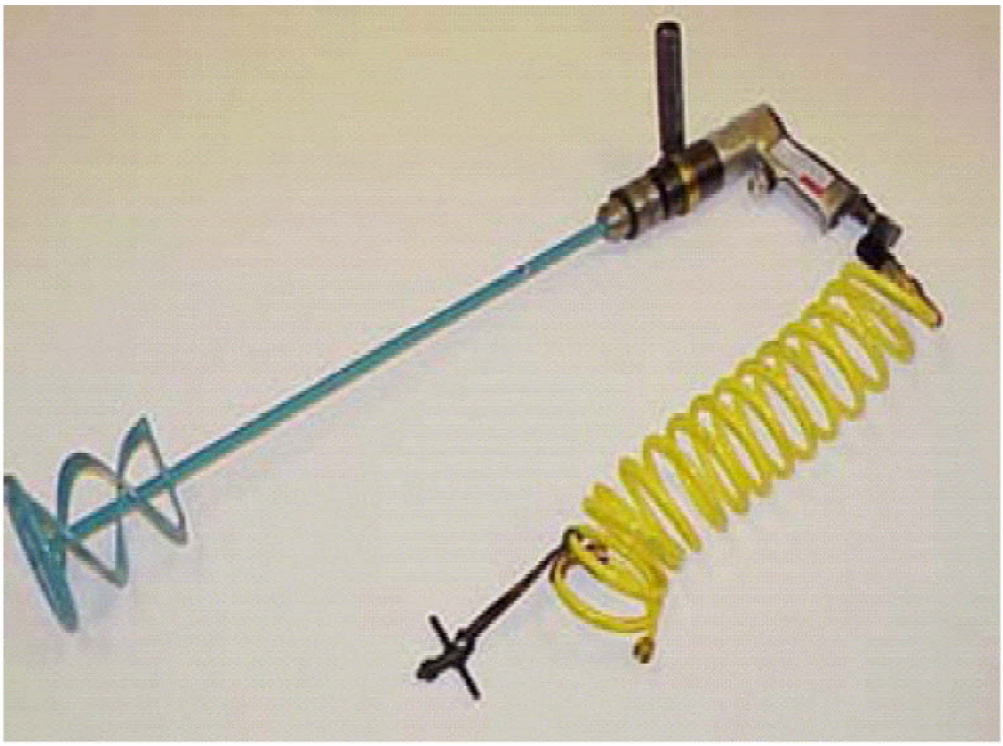


Figure 593-9-3 Paint Mixer

Table 593-9-2 Paint Mixer

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	None
TECHNICAL MANUALS	Under Development
SHIPBOARD TRAINING COURSES	TBD
APL	None
NSN	None

593-9.5.1.3 Paint Brush Holder. Storing the paintbrushes in the Paint Brush Holder allows for three times the normal brush life by providing a way to store paintbrushes in mineral spirits. See Figure 593-9-4. See Table 593-9-3 for ILS Support information.

Figure 593-9-4 Paint Brush Holde

Table 593-9-3 Paint Brush Holder

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	None
TECHNICAL MANUALS	Under Development
SHIPBOARD TRAINING COURSES	TBD
APL	99A020069
NSN	5140-01-465-2324

593-9.5.1.4 Paint Gun Cleaning System. The Paint Gun Cleaning System is an automated, closed-loop system that uses a solvent to flush and clean paint guns and accessories. The unit uses pneumatic power to move paint-cleaning solvent into the system to clean the guns and accessories, then recirculates and reuses the solvent. The equipment reduces the volumes of spent solvent generated and decreases the reliance on the use of rags to clean paint gun related equipment. Furthermore, the system reduces the time spent cleaning paint guns or other paint application tools. The system is equipped with an automatic fume extraction system when the equipment lid is opened. See Figure 593-9-5 and 593-9-6. See Table 593-9-4 for ILS Support information.

Figure 593-9-5 Paint Gun Cleaning System

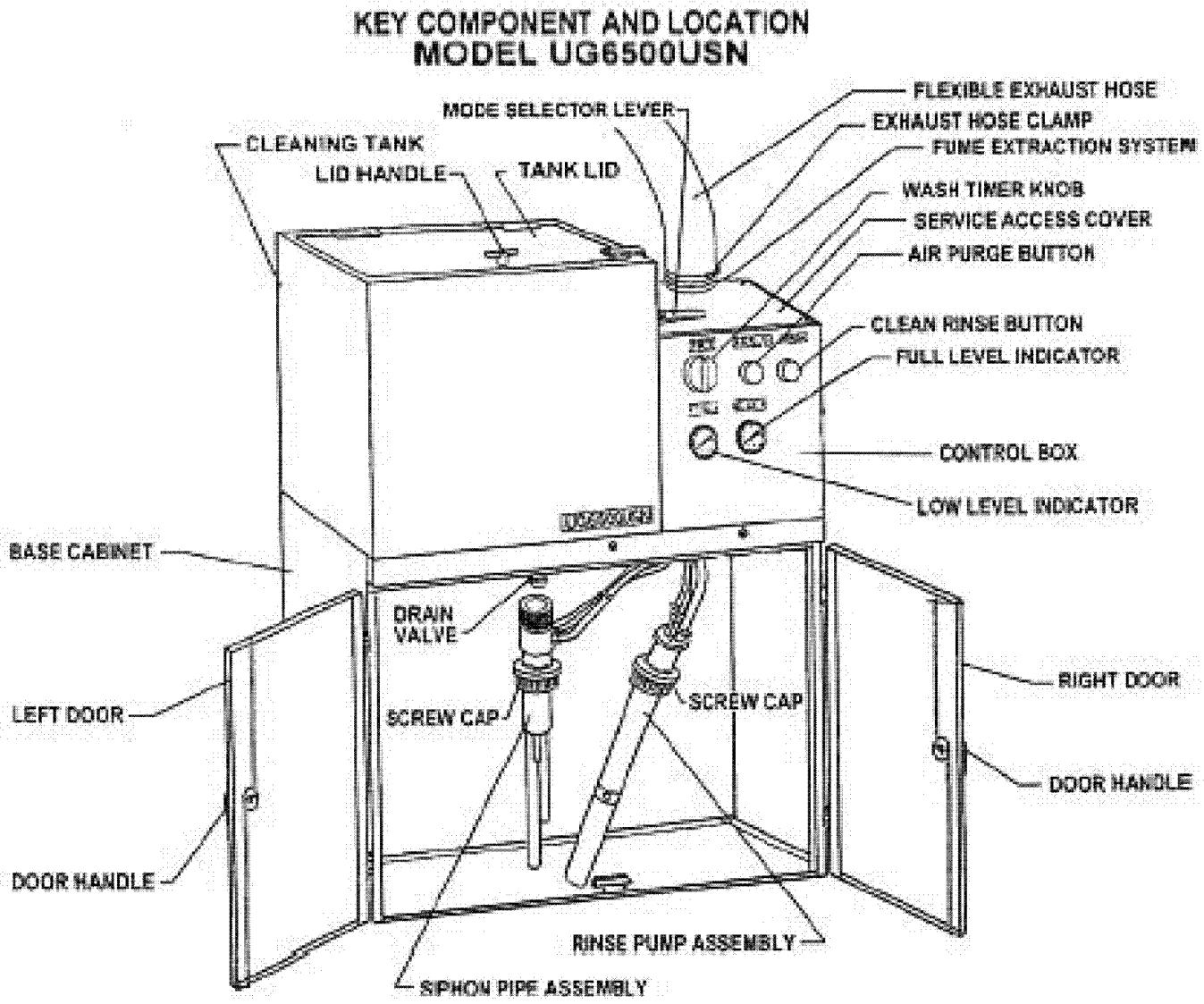


Figure 593-9-6 Paint Gun Cleaning System

Table 593-9-4 Paint Gun Cleaning System

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	None
TECHNICAL MANUALS	SG200-DE-MMC-010 DECSRIPTION, OPERATION, AND MANTAINANCE FOR PAINT GUN CLEANING STATION, UNIRAM CORP. MODEL UG6500USN, CONTRACT N68335-00-D-0147
SHIPBOARD TRAINING COURSES	TBD
APL	41A000019
NSN	4940-21-921-1555

593-9.5.1.5 Vacuum Sanding System. The Vacuum Sanding System prevents inadvertent overboard discharge of waste generated by shipboard corrosion control activities. The vacuum is powered on 120 volt AC electrical power. The system is equipped with a triple filtration system that includes a pre-filter, a 1-micron main filter and a high efficiency particle arresting (HEPA) filter that removes all particles greater than 0.3 microns at 99.99% retention. The system is equipped with a Y-connection that allows two Sailors to use the system simultaneously. The sanding system can be used as a vacuum cleaner or hooked up to pneumatically powered air grinders and needle guns that are supplied with the system. See Figure 593-9-7. See Table 593-9-5 for ILS Support information

Figure 593-9-7 Vacuum Sanding System

Table 593-9-5 Vacuum Sanding System

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	None
TECHNICAL MANUALS	TBD
SHIPBOARD TRAINING COURSES	TBD
APL	41A000023
NSN	7910-01-484-5601

593-9.5.1.6 Pneumatic Backpack Vacuum. The Pneumatic Backpack Vacuum assists in the prevention of inadvertent overboard discharge of waste generated by shipboard corrosion control activities. This vacuum runs on low-pressure air and is used for the collection of dry materials only. The equipment includes a 2-stage filtration system including a HEPA filter that removes all particles greater than 0.3 microns at 99.99% retention. The Pneumatic Backpack Vacuum can be used as a vacuum cleaner or hooked up to the pneumatically powered air grinder and needle guns that are supplied with the system. See Figure 593-9-8. See Table 593-9-6 for ILS Support information.

Figure 593-9-8 Pneumatic Backpack Vacuum

Table 593-9-6 Pneumatic Backpack Vacuum

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	None
TECHNICAL MANUALS	TBD
SHIPBOARD TRAINING COURSES	TBD
APL	41A000010
NSN	None

593-9.5.2 RAG REDUCTION.

593-9.5.2.1 Cable Cleaner and Lubricator. The Cable Cleaner and Lubricator (CCL) automatically removes grease from wire rope and applies new grease in one continuous process. The CCL changes the process of cleaning and lubricating wire rope from a manual process to an automatic mechanical process, eliminates the need for solvents, and greatly reduces the need for rags to clean wire ropes. The CCL greatly reduces the manpower and time required to clean and lubricate cable. The two halves of the CCL are placed around the cable and clamped in position, and the CCL is then shackled to the ship. The CCL is hooked up to a 5-gallon bucket of grease, which is connected to a low-pressure air supply. The groover, which removes existing grease on the cable, is placed on the end of the CCL where the wire rope enters the unit. As the cable is pulled through the unit, the groover removes old grease from the cable. As the cable travels further through the CCL, new grease from the 5-gallon bucket is pumped onto the cable. See Figures 593-9-9 and 593-9-10. See Table 593-9-7 for ILS Support Information.

Figure 593-9-9 Cable Cleaner and Lubricator

Table 593-9-7 Cable Cleaner and Lubricator

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	None
TECHNICAL MANUALS	S9582-BH-MMC-010 KIRK PATRICK WIRE ROPE LUBRICATION SYSTEMS
SHIPBOARD TRAINING COURSES	TBD
APL	658880017
NSN	4930-01-424-2197

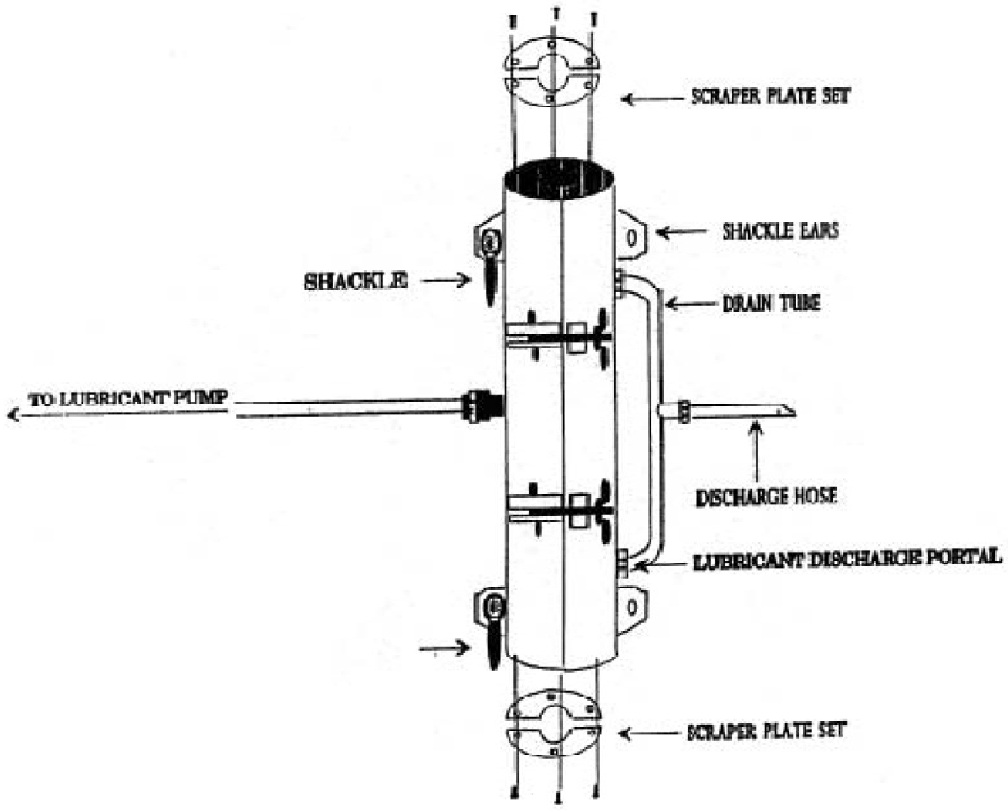


Figure 593-9-10 Cable Cleaner and Lubricator

593-9.5.2.2 Pneumatic Wet/Dry Vacuum. The Pneumatic Wet/Dry Vacuum assists in the prevention of inadvertent overboard discharge of waste generated by shipboard corrosion control activities. This vacuum is also intended to clean liquids collected in bilge pockets. Use of this vacuum reduces the reliance on the use of rags in bilge cleaning operations. This vacuum has a 4-stage filtration system including a HEPA filter that removes all particles greater than 0.3 microns at 99.99% retention. This vacuum runs on low-pressure air and is used for the collection of both wet and dry materials. See Figure 593-9-11. See Tables 593-9-8 for ILS Support information.

Figure 593-9-11 Pneumatic Wet/Dry Vacuum

Table 593-9-8 Pneumatic Wet/Dry Vacuum

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	None
TECHNICAL MANUALS	TBD
SHIPBOARD TRAINING COURSES	TBD
APL	41A000013
NSN	7910-01-400-0928

593-9.5.2.3 Explosion Proof Vacuum. The Explosion Proof Vacuum assists in the clean up of hazardous material (fuel, oil, and hydraulic) spills. This equipment reduces the reliance on rags and absorbent pads to clean these types of spills. This vacuum runs on low-pressure air and is used for the collection of wet materials only. This vacuum has a two-stage filtration system including a HEPA filter that removes all particles greater than 0.3 microns at 99.99% retention. The Explosion Proof Vacuum is electrically grounded via an embedded grounding wire that runs in the air hose and is permanently attached to the unit. The ground continuity of the air hose must be checked prior to each use. See Figure 593-9-12. See Table 593-9-9 for ILS Support information.

Figure 593-9-12 Explosion Proof Vacuum

Table 593-9-9 Explosion Proof Vacuum

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	6630/025
TECHNICAL MANUALS	TBD
SHIPBOARD TRAINING COURSES	TBD
APL	41A000011
NSN	7910-01483-1429

593-9.5.2.4 Pressure Washer. The pressure washer is used to clean the decks and bilge spaces. It is designed to reduce the number of rags and amount of solvents used to clean these spaces. This will ultimately reduce the ship's hazardous material offload. The detergent used in the pressure washer is non-hazardous. The system is pneumatic to reduce the safety concerns when used around flammable or hazardous materials. The pressure washer also reduces the man-hours needed to clean the decks and bilge spaces. The system is portable and fits through a standard Navy hatch.

Care must be taken when using the pressure washers for cleaning oil contaminated surfaces, such as bilges. The resulting oil from cleaning bilges will be atomized in a water solution that will pass through and damage the oil water separators, use only short lived detergent compatible with MIL-D-16791 Series or Allied P-98 by Allied Enterprises for cleaning since other detergents can cause damage to oil water separators. See Figure 593-9-13. See Table 593-9-10 for ILS Support information.

Figure 593-9-13 Pressure Washer

Table 593-9-10 Pressure Washer

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	None
TECHNICAL MANUALS	SG340-AB-MMC-010 DESCRIPTION, OPERATION, AND MAINTENANCE FOR PNEUMATIC PRESSURE WASHER HYDRO ENGINEERING, INC. MODEL: 3/1500-P1, CONTRACT 968335-00-D-0146
SHIPBOARD TRAINING COURSES	TBD
APL	41A000020
NSN	4940-01-483-2063

593-9.5.3 SOLVENT REDUCTION.

593-9.5.3.1 Large Aqueous Parts Washer. The Large Aqueous Parts Washer is provided to minimize the use of solvents to clean mechanical parts. The Large Aqueous Parts Washer automatically cleans parts by spraying them with a combination of re-circulated hot water and a non-hazardous, biodegradable cleaning powder (Natural Orange NSN: 6850-01-431-9025). The force of the spray, heat, and chemical action of the cleaning solution removes oil and grease from the parts. The cleaning solution is re-circulated minimizing waste generation. Proper cleaning powder concentration is essential to maintain system cleaning effectiveness and should be monitored weekly using a titration test kit (NSN: 6850-01-428-9322). Sludge buildup requires periodic removal and must be properly disposed of as a hazardous material. In addition to minimizing the use of solvents onboard ship, the Large Aqueous Parts Washer will reduce the man-hours required in hand cleaning of components using solvents. See Figure 593-9-14. See Table 593-9-11 for ILS support information.

Figure 593-9-14 Large Aqueous Parts Washer

Table 593-9-11 Large Aqueous Parts Washer

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	6613/034
TECHNICAL MANUALS	NAVAIR 17-5-7 OPERATION AND INTERMEDIATE MAINTENANCE INSTRUCTIONS WITH ILLUSTRATED PARTS BREAKDOWN FOR SMALL and LARGE AQUEOUS PARTS WASHERS MODEL NO. F-3000-N and F-4000-PN TEC: GCBA
SHIPBOARD TRAINING COURSES	TBD
APL	**NOMENCLATURE**
419990368	LARGE AQUEOUS PARTS WASHER
509991881	PANEL, LARGE AQUEOUS PARTS WASHER
NSN	4940-01-435-1595

593-9.5.3.2 Top Loading Aqueous Parts Washer. The Top Loading Aqueous Parts Washer (TLAPW) is provided to minimize the use of solvents used to clean mechanical parts. The TLAPW automatically cleans parts by spraying them with a combination of re-circulated hot water and a non-hazardous, biodegradable cleaning powder (Natural Orange NSN: 6850-01-431-9025). The force of the spray, heat, and chemical action of the cleaning solution removes oil and grease from the parts. The cleaning solution is re-circulated minimizing waste generation. Proper cleaning powder concentration is essential to maintain system cleaning effectiveness and should be monitored weekly using a titration test kit (NSN: 6850-01-428-9322). Sludge build up requires periodic removal from the unit and must be properly disposed of as a hazardous material. In addition to minimizing the use of solvents on board ship, the TLAPW will reduce the man-hours required in hand cleaning of components using solvents. See Figure 593-9-15. See Table 593-9-12 for ILS Support information.

Figure 593-9-15 Top Loading Aqueous Parts Washer

Table 593-9-12 Top Loading Aqueous Parts Washer

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	6613/033
TECHNICAL MANUALS	SL172-AB-LSS-010 TOP LOADING AQUEOUS PARTS WASHER MODEL NO. IMPULSE-W
SHIPBOARD TRAINING COURSES	TBD
APL	41A990009
NSN	4940-01-470-7015

593-9.5.4 HM MANAGEMENT.

593-9.5.4.1 Hand Pumps and Spray Bottles. This equipment minimizes the use of aerosol cans and provides cost savings due to the economy of bulk purchasing. The Hand Pumps are used to transfer general purpose cleaning solvents from 5 and 55-gallon containers into smaller containers, such as spray bottles. See Figures 593-9-16 and 593-9-17. See Table 593-9-13 for ILS Support information.

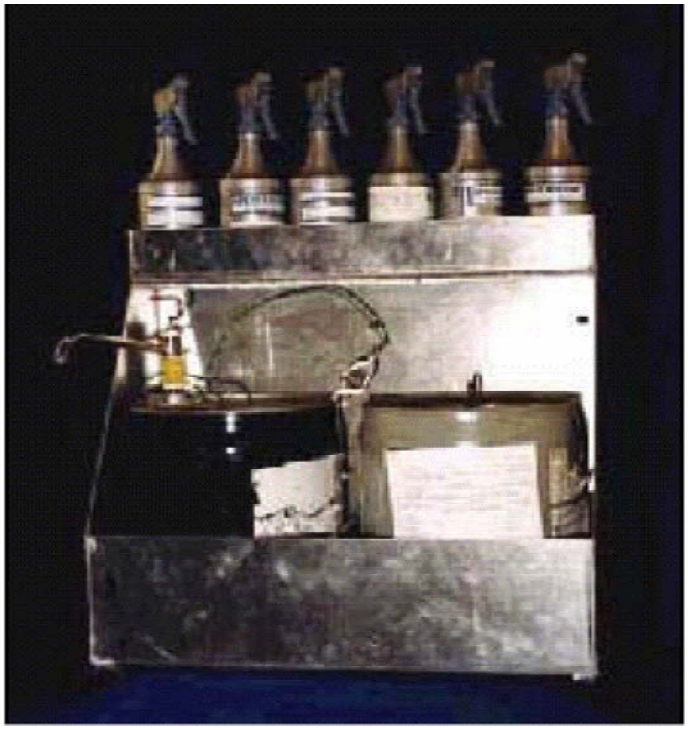


Figure 593-9-16 Hand Pumps and Spray Bottles

Figure 593-9-17 Hand Pump

Table 593-9-13 Hand Pumps and Spray Bottles

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	None
TECHNICAL MANUALS	TBD
SHIPBOARD TRAINING COURSES	TBD
NSN	
55 Gallon Pump, Drum	4320-01-463-9091
5 Gallon Pump, Pail	4320-01-463-9026
Spray Bottles, 32 oz	4940-01-364-8761

593-9.5.4.2 Drum Level Indicator. The Drum Level Indicator provides a simple, cost-effective way to gauge the fill level of 55-gallon drums. It prevents hazardous material spills and the subsequent handling and clean-up resulting from over-filling drums. It fits into the small bunghole on the drum and ″pops up″ when the drum is almost full. See Figure 593-9-18. See Table 593-9-14 for ILS Support information.

Figure 593-9-18 Drum Level Indicator

Table 593-9-14 Drum Level Indicator

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	None
TECHNICAL MANUALS	TBD
SHIPBOARD TRAINING COURSES	TBD
NSN	6680-01-481-1828

593-9.5.4.3 Hand Wipes. Using hand wipes reduces the volume of HM contaminated rags generated during various general cleaning procedures. These wipes are not plastic reinforced, so if used for general purpose (non-hazardous material related) cleaning, they can be disposed of as solid waste in pulpers located onboard ship. These wipes can also be pre-soaked with non-hazardous cleaners for ready use. See Figure 593-9-19.

Figure 593-9-19 Hand Wipes

593-9.5.5 MISCELLANEOUS EQUIPMENT.

593-9.5.5.1 Mercury Ion Exchange Cartridge System (MIECS). The Mercury Ion Exchange Cartridge System processes the mercury-contaminated wastewater resulting from boiler feed water and boiler water chloride testing. The MIECS is installed in the ships' Oil Lab where chloride testing is usually performed. Navy ships may generate as much as 85-gallons of mercury contaminated wastewater per 6-month deployment. Mercury-contaminated wastewater is generated during chloride testing, in which drops of mercuric nitrate are added to titrate the water sample. The resulting wastewater is poured through a gravity-fed funnel in the MIECS into resin beds specifically designed for mercury absorption. As the wastewater passes through the resin bed, mercury is captured. The resulting effluent is within legal limits for mercury levels and is then discharged into a sink drain in the space. The two resin cartridges must be replaced every six months, in accordance with the equipment technical manual. The cartridges must be filled with water from the bottom, to avoid water channeling through the resin bed. Air bubbles in the cartridges and inter-connected tubing need to be avoided.

If discoloration of the resin cartridge discharge tubing is observed the resin cartridges must be replaced. The discoloration of the tubing is an indictor that the resin cartridges are exhausted and mercury is not being captured from the wastewater. See Figures 593-9-20 and 593-9-21. See Table 593-9-15 for ILS Support information.

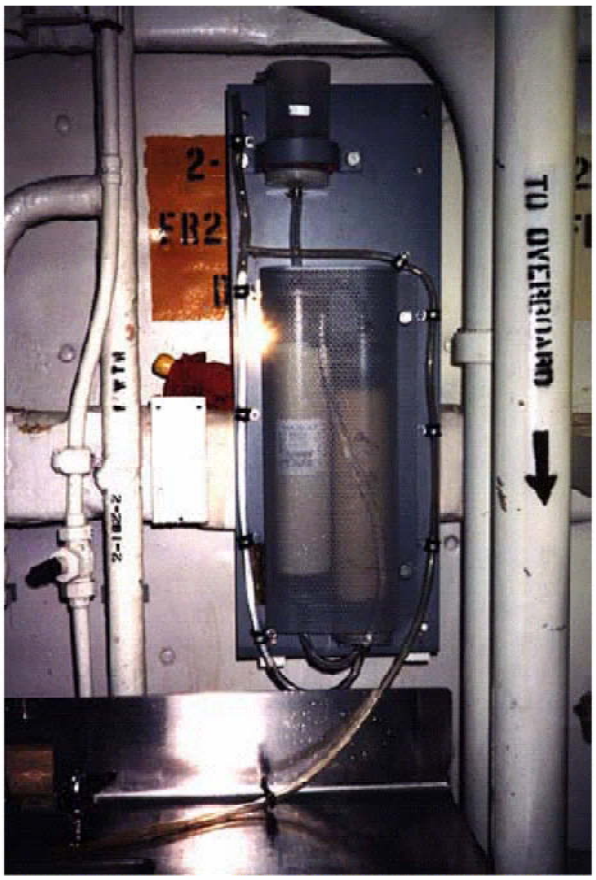


Figure 593-9-20 Mercury Ion Exchange Cartridge

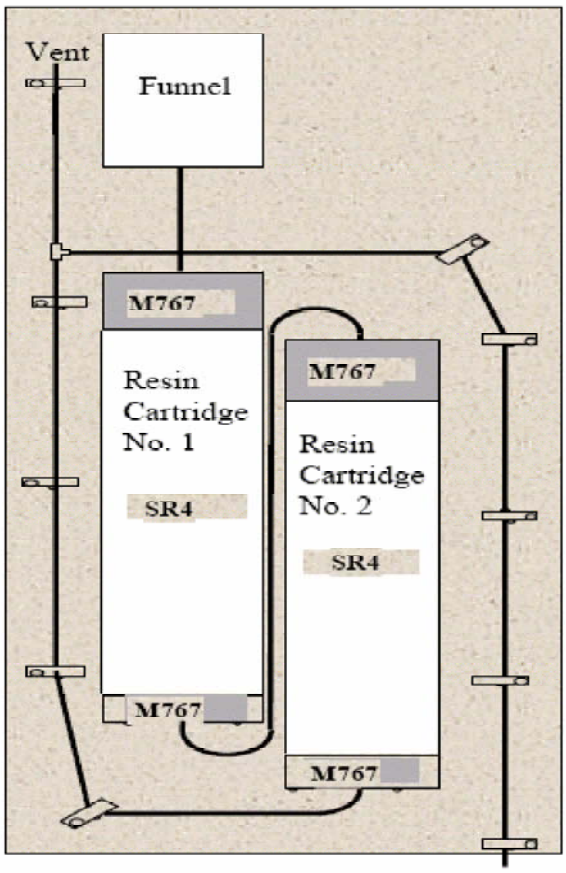


Figure 593-9-21 Mercury Ion Exchange Cartridge

Table 593-9-15 Mercury Ion Exchange Cartridge

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	6630/024
TECHNICAL MANUALS	TBD
SHIPBOARD TRAINING COURSES	TBD
APL	469990293
Cartridge Replacement NSN	4610-01-473-4675

593-9.5.5.2 Maintenance Free Batteries. Maintenance Free Batteries (Figure 593-9-22) replace lead-acid batteries and batteries that require electrolyte maintenance. The Maintenance Free Batteries eliminate the need for a sailor to handle and dispose of battery acid. The Maintenance Free Batteries are completely sealed, gel type batteries that should not leak even if the seals are broken. The Maintenance Free Batteries replaces the 6TL batteries in Rigid Hull Inflatable Boats (RIBS), small boats and Ground Support Equipment (GSE) (yellow gear). Recharging procedures are critical to maintaining expected battery life. Output: CCA 800 amps, Cranking amps 1100 amps, 12 Volts. See Table 593-9-16 for ILS Support information.

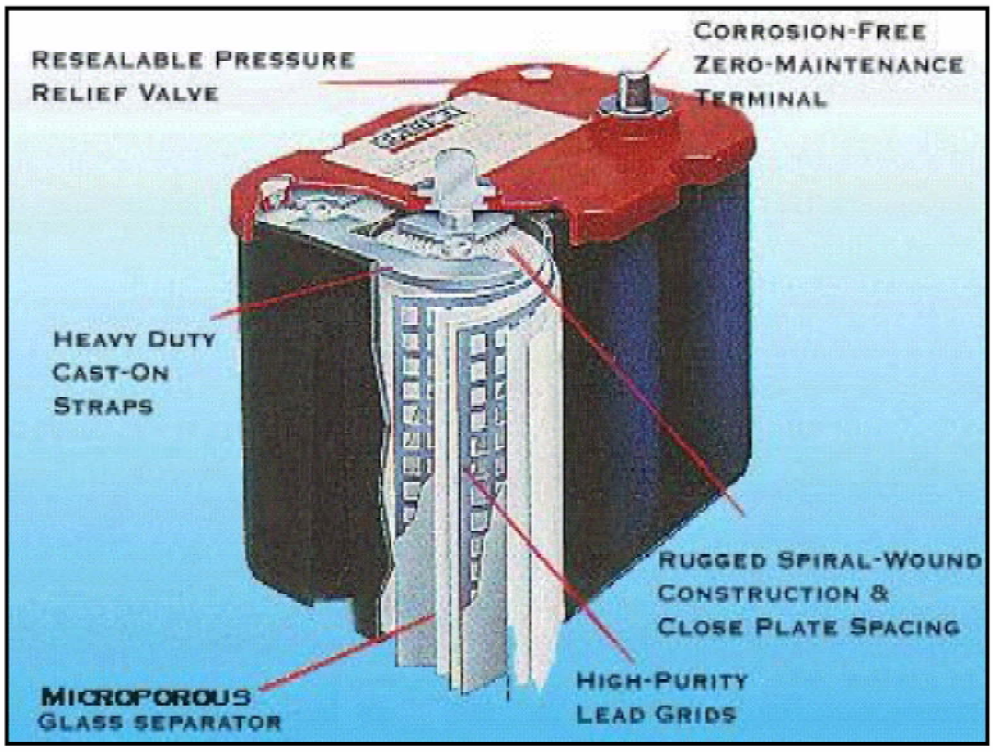


Figure 593-9-22 Maintenance Free Battery

Table 593-9-16 Maintenance Free Battery

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	3131/005 applies
TECHNICAL MANUALS	TBD
SHIPBOARD TRAINING COURSES	TBD
AEL	**NOMENCLATURE**
1620044190	BATTERY,STO,PRTL,12V,56AH-QTY 1-8
1620044191	BATTERY,STO,PRTL,12V,56AH-QTY 9-72
1620044192	BATTERY,STO,PRTL,12V,56AH-QTY 81
NSN	6140-01-378-8232

593-9.5.5.3 Reciprocating Saw. The electrically powered reciprocating saw provides an alternative method to using an acetylene torch for light metal cutting. This machine reduces the quantity of acetylene and other compressed gases that must be procured and stored. See Figure 593-9-23. See Table 593-9-17 for ILS Support information.

Figure 593-9-23 Reciprocating Saw

Table 593-9-17 Reciprocating Saw

NAVY TRAINING PLAN (NTP)/(NTSP)	None
MIP	3000/001 applies
TECHNICAL MANUALS	TBD
SHIPBOARD TRAINING COURSES	TBD
APL	None
NSN	5130-01-397-9674

593-9.6 P2A EQUIPMENT TRAINING VIDEOS.

Training video information is available on the Pollution Prevention Afloat (P2A) page on the Navy SEIC website (www.navyseic.dt.navy.mil/). Training videos are provided for the Paint Dispensing System, Top Loading Aqueous Parts Washer, Mercury Ion Exchange Cartridge System, and the Cable Cleaner/Lubricator System.

593-9.7 AUTHORIZED CHEMICAL CLEANING PRODUCTS AND DISPENSING SYSTEMS CATALOG, U.S. NAVY SURFACE SHIP (NON-SUBMARINE).

The Authorized Chemical Cleaning Products and Dispensing Systems Catalog, U.S. Navy Surface Ship (Non-Submarine), NAVSEA S6480-A4-CAT-010 (0910-LP-101-6896), contains general guidance to the U.S. Navy Surface Fleet for cleaning products that are authorized by NAVSEA for use onboard Navy surface ships only. This catalog does not apply to Navy submarines. The catalog contains a list of authorized shipboard chemical cleaning products (concentrates and ready-to-use products) for general cleaning applications, precautions required for handling, stowage, and disposal of chemical cleaning products, containment requirements for chemical cleaning concentrates, and a list of authorized dispensing systems.

593-9.7.1 The catalog provides the following information: General Information and Safety Precautions, Authorized Cleaning Concentrates, Authorized Dispensing Systems, and Authorized Ready-to-Use Cleaners.

593-9.7.2 Categories of cleaning applications covered by the catalog include:

a. Food Contact Surface Sanitizer Concentrates (No Cleaning Properties)
b. Food Contact Surface Sanitizer Concentrates with Cleaning Properties
c. Non-Food Contact Surface Disinfectant Cleaner Concentrates
d. General Purpose Heavy-Duty Cleaner Concentrates
e. Heavy-Duty Cleaner Concentrate for Machinery and Bilges
f. Floor Finish Restorer Concentrates
g. Shipboard Floor Stripper Concentrates
h. Glass Cleaner Concentrates

APPENDIX A

SHIPBOARD HAZARDOUS MATERIAL CONTAINER CROSS-REFERENCE

Hazardous Material	Container[1]
Acetic acid	Plastic bottle; plastic-lined steel drum
Acetic acid, glacial	Plastic bottle
Acetone	Tin can; steel drum, bung and vent
Activator/stabilizer (sodium borate)	Plastic-lined steel drum
Adhesive, lagging (organic polymer)	Steel drum
Adhesive, N.O.S.[5]	Steel drum
AFFF (aqueous film forming foam)	Variable[2]
Alodine 1201 (chromic acid)	Glass carboy
Ammonia solution, nickel electroplating	Plastic bottle
Aniline	Tin can; steel drum, bung, and vent
Asbestos	6 mil (6/1,000 inch) plastic bag
Batteries (lead-acid or alkaline wet cell)	Steel drum[4]
Battery acid (sulfuric)	Plastic bottle; plastic-line steel drum[3]
Baygon (phenolic pesticide)	Steel drum, bung, and vent
Blanket wash (acacia gum)	Steel drum
Bulbs, fluorescent light (with mercury)	Original carton
Chemicals, photographic, N.O.S.[5]	Plastic bottle
Chromium electroplating solution	Plastic bottle
Citric acid	Plastic bottle[3]
Cleaner, chemical, N.O.S.[5]	Tin can; steel drum
Cleaning solvent, N.O.S.[5]	Steel drum, bung, and vent
Cobalt electroplating solution	Plastic bottle
Compound, epoxy	Steel drum
Compound, silicone	Steel drum
Concentrated solutions (photo replenisher) N.O.S.[5]	Plastic bottle; plastic-lined steel drum
Copper electroplating solution	Plastic bottle
Compound, antiseize (graphite-petroleum)	Steel drum, removable cover
Compound, antiseize (lead oleate)	Steel drum, removable cover
Compound, boiler passivator (oxalic acid)	Plastic-lined steel drum
Compound, descaler (caustic/acid)	Plastic-lined steel drum
Compound, sealing (synthetic polymer)	Steel drum
Damping fluid (petroleum base)	Tin can
Darco drycoal activated	Steel drum (for contaminated material, removable cover)
Developer, N.O.S.[5]	Plastic-line steel drum
Disinfectant, fungisol (quinone)	Plastic bottle
Disinfectant, general purpose	Steel drum, bung, and vent
Disodium phosphate	Steel drum, removable cover
Earth, diatmaceous (filter)	Plastic-lined steel drum (for contaminated material)
Electroplating etching solution N.O.S.[5]	Plastic bottle; plastic-lined steel drum
Ethylene glycol (antifreeze)	Plastic-lined steel drum
Ethyl alcohol	Plastic bottle
Fiberglass epoxy	Steel drum
Fixer (w/silver halide), N.O.S.[5]	Plastic bottle; plastic-lined steel drum
Flux (sodium nitrate/nitrite) N.O.S.[5]	Tin can; steel drum
Formic acid solution, nickel electroplating	Plastic bottle; plastic-lined steel drum
Freon ™	Plastic bottle; plastic-lined steel drum

Grease, ball bearing	Steel drum, removable cover
Grease, general purpose	Steel drum, removable cover
Grease, graphite	Steel drum, removable cover
Grease, halocarbon	Steel drum, removable cover
Hydraulic fluid (petroleum)	Steel drum, removable cover
Hydraulic fluid (synthetic)	Epoxy-lined steel can; plastic lined steel drum
Hydrazine, 7%	Plastic bag; steel drum, removable cover[6]
Hydrazine boiler layup solution and hydrazine treatment tank	Plastic bottle, plastic lined steel drum[3]
Hydrochloric acid	Plastic bottle[3]
Hydrofluoric acid	Plastic bottle
Hydrogen peroxide	Plastic bottle; plastic-lined steel drum
Hypo cleaning (ammonium persulfate)	Plastic-lined steel drum
Indicator, stop bath (organic dye)	Steel drum, bung, and vent
Inhibitor, corrosion, engine coolant, MIL-A-53009	Plastic bottle
Inhibitor, corrosion, engine coolant, Nalcool 2000	Plastic bottle
Ink, black oil based	Steel drum, bung, and vent
Insecticide Diazinon (organophosphate)	
Isopropyl alcohol	Plastic bottle
Lacquers	Tin can; steel drum, bung and vent
Leak test (penetrant)	Plastic bottle
Lithographic solutions, N.O.S.[5]	Plastic bottle; plastic lined steel drum
Lithographic solvents, N.O.S.[5]	Steel drum, bung and vent
Mercuric nitrate	Plastic bottle
Mercury (amalgam)	Plastic bottle
Mercury remover (calcium oxide-sulfur)	Steel drum, removable cover
Methyl alcohol	Plastic bottle
Methyl ethyl ketone	Steel drum, bung, and vent
Molybdate solution, silica test	Plastic bottle
Molybdenum graphite, drylube	Steel drum, removable cover
Molybdenum nickel 447	Plastic bottle
Morpholine, 40 percent	Tin Can, steel drum[3] , bung and vent
Naptha	Steel drum, bung, and vent
Nickel, chromium, aluminum 441	Tin can; steel drum, removable cover
Nickel solutions	Plastic bottle
Nitrate, silver	Plastic bottle; plastic-lined steel drum
Nitric acid	Glass carboy
Nonskid flight deck compound (asphaltic)	Steel drum, removable cover
Oil, cutting (synthetic)	Epoxy-lined steel can
Oil, liquid coolant	Epoxy-lined steel can
Oil, lubrication (synthetic)	Epoxy-lined steel can
Oil, N.O.S.[5]	Steel drum, bung and vent
Oil, soluble, engine coolant	Epoxy lined steel drum
Oxygen breathing apparatus canister	Fiberboard box
Paint, enamel, N.O.S.[5]	Steel drum, bung and vent
Perchloroethylene	Steel drum, bung and vent
Petrobond sand with waste oils	Steel drum, removable cover
Phosphoric acid	Plastic bottle; plastic-lined steel drum
Pinso pads (shellac)	Steel drum, removable cover

Polychlorinated Biphenyls (PCBs), items containing	Polyethylene lined steel cans; plastic-lined steel drum, bung and vent/removable cover; (electrical cables) plastic bag
Remover, paint (caustic)	Plastic bottle; plastic-lined steel drum
Resin, ion exchange (activated polymers)	Steel drum (for contaminated material)
Resin, laminating (plastic)	Steel drum
Reverser (aromatic hydrocarbon reducers)	Steel can
Silver solutions	Plastic bottle
Sodium chromate (ballast)	Variable[2]
Sodium chromate	Plastic bottle
Sodium cyanide solution, gold electroplating	Plastic bottle
Sodium (Di, Tri, Tetra), EDTA, solid	Fiberboard box with plastic bag, plastic pail with lid
Sodium (Di, Tri, Tetra), EDTA, solution	Plastic bottle, plastic lined steel drum
Sodium hydroxide solid	Steel drum, removable cover
Sodium hydroxide solution	Steel can; steel drum[3] , bung and vent
Sodium nitrate	Steel drum
Sodium nitrate solid	Plastic bottle, plastic lined steel drum[3]
Sodium nitrate solution	Plastic bottle, plastic lined steel drum[3]
Sodium sulfite solid	Fiberboard box with plastic bag, plastic pail with lid
Sodium sulfite solution	Plastic bottle, plastic-lined steel drum[3]
Sodium phosphate	Steel drum[3]
Stannous chloride	Plastic bottle
Stannous fluoride	Plastic bottle
Stop bath, N.O.S.[5]	Plastic bottle
Sulfamic acid solid	Plastic-lined steel drum
Sulfamic acid solution	Plastic bottle, plastic-lined steel drum[3]
Sulfuric acid	Glass carboy; plastic bottle, plastic-lined steel drum
Thinner (organic), N.O.S.[5]	Tin can; steel can; steel drum
Tin Plating solution	Plastic bottle
Tin 2090	Plastic bottle
Toluene	Tin can; steel can; steel drum, bung, and vent
Trichloroethane solvent	Tin can; steel can; steel drum, bung, and vent
Trichloroethylene solvent	Tin can; steel can; steel drum, bung, and vent
Trichlorofluoromethane	Tin can; steel can; steel drum, bung, and vent
Trisodium phosphate	Steel drum[3]
Varnish, insulating electrical	Steel drum, bung and vent
Varnish, N.O.S.[5]	Steel drum, bung and vent
Varnish, phenolic residue	Steel drum
Xylene	Tin can; steel can; steel drum, bung, and vent
Zinc quick cold galvanizing	Plastic bottle; plastic lined steel drum

1. Whenever possible, the Department of Transportation-approved container used in the original issue of the material shall be reused. Container openings specified are for storage of those materials that are characteristically liquid, semi-solid, or solid. Some materials (e.g. for example, silicone compounds) may appear in more than one state, depending upon usage. The choice of openings for containers used to hold those materials shall be made on a case-by-case basis.

2. No standard container proposed. Containers may vary from 5-to 55-gallon drums to large bulk tanks.

3. Bulk usage is probable in large-scale operations.

4. Typical shipboard portable wet-cell batteries vary widely in size. Accordingly, personnel shall match the size of the storage drums used to the size and number of batteries to be containerized. A standard 18 gauge, 55-gallon steel drum, for example, will accommodate, respectively, two BB 259 batteries; four BB 258 batteries; six BB 257 batteries; or forty BB 255 batteries. (Weight constraints, however, may also be a factor in determining the total number of batteries per container.) Batteries shall be stored right side up.
5. Not otherwise specified.
6. The plastic bag and steel drum specified are used for cleanup and storage of any spilled hydrazine material, whether the material is collected with spill absorbent or is contained in the original plastic 7% hydrazine storage bottle.

APPENDIX B

SHIPBOARD HAZARDOUS MATERIAL CONTAINER DESCRIPTION AND SUPPLY DATA

Type	National Stock Number	Item Description	Applicable Specifications (DOT, Mil, Fed) [1]
Bag, Plastic	8105-00-848-9631	Polyolefin, single wall, 5 mil, 36-in by 54-in flat, wire tie	PPP-B-26 TY 2
Plastic Bottle with screw cap closure [3]	8125-00-174-0852	Polyethylene, 1 gal, round	MIL-B-26701
	8125-00-731-6016	Polyethylene, 13 gal, round	Not available
	8125-00-888-7069	Polyethylene, 5 gal, round	Not available
Fiberboard Box	8115-01-012-4597	Fiberboard, RSC style, 16-in by 17-in by 25-in, burst-strength 400 lb	DOT 2C PPP-B-636 PPP-F-320
Tin can with screw cap closure[3]	8110-00-879-7182	Tin, 1 gal, oblong, enamel outside surface treatment	DOT 2F PPP-C-96 TY 5 CL4
Steel can lined	8110-00-128-6819[4]	Steel, 24 gauge, 1 gal, screw cap with neoprene liner closure, epoxy resin interior lining	DOT 17C
	8110-00-282-2520[4]	Steel, 5 gal	PPP-P-704
Glass Carboy	8125-00-598-9380	Glass, 5 gal, wood box overpack	MIL-C-17932 TY B
Steel Drum with removable cover[3]	8110-00-030-7780[4]	Steel, 16 gauge, 55 gal, removable cover with lock ring, enamel outside surface treatment	DOT 17C TY B
	8110-00-254-5713	Steel, 22 gauge, 5 gal, removable cover with lock ring, enamel inside and outside treatment, reusable	MIL-D-6054
	8110-01-101-4055	Hazardous material recovery, 85 gal, open head	None

Type	National Stock Number	Item Description	Applicable Specifications (DOT, Mil, Fed) [1]
Steel Drum with removable cover[3]	8110-00-866-1728	Steel, 18 gauge, 30.0 gal., removable cover with lock ring, enamel outside/inside surface treatment	MIL-D-6054
	8110-00-082-2625	Steel, 18 gauge, 27 gal., removable cover with lock ring, enamel inside/outside treatment	MIL-D-6054
	8110-00-044-2984	Steel, 18 gauge, 20 gal., removable cover with lock ring, enamel inside/outside treatment	MIL-D-6054
	8110-00-254-5716	Steel, 20 gauge, 12 gal., removable cover with lock ring, enamel inside/outside treatment	MIL-D-6054
	8110-00-254-5715	Steel, 20 gauge, 9 gal. removable cover with lock ring, enamel inside/outside treatment	MIL-D-6054
	8110-00-254-5713	Steel, 22 gauge, 6 gal. removable cover with lock ring, enamel inside/outside treatment	MIL-D-6054
	8110-00-254-5722	Steel, 22 gauge, 4 gal. removable cover with lock ring, enamel inside/outside treatment	MIL-D-6054
Steel drum with bung and vent[3]	8110-01-101-4056	Hazardous material recovery 85 gal, open head	None
	8110-00-282-2520[4]	Steel, 5 gal, enamel exterior treatment, spout	PPP-P-704
	8110-00-292-9783[4]	Steel, 18 gauge, 55 gal with bung and vent, enamel outside surface treatment	PPP-D-729 TY 2 DOT 17E
Steel drum with bung and vent[3]	8110-00-597-2353[4]	Steel 16 gauge, 55 gal, with bung and vent, paint exterior surface treatment	DOT 17E PPP-D-729 TY 1
Plastic Liner	8115-00-145-0038[4]	Liner, polyethylene, 5 gal to be used with 5 gal steel drum	PPP-C-00569
Plastic drum	Not available	Polyethylene, 5 or 55 gal, used to contain AFFF, reusable[2]	PPP-C-1337
Plastic bag	8105-00-200-0195	Polyolefin, single wall, 24 in. width x 24 in. height	A-A-1668C PPP-B-26
	8105-01-086-5053	Red plastic bag, single wall, labeled with ″CONTAINS ASBESTOS FIBERS″	

NOTES:

1. DOT: Department of Transportation; Mil: Military, Fed: Federal.

2. This type can be reused **only** if the drum:

a. Is in good condition.

b. Is triple rinsed and completely drained before reuse.

c. Is properly relabeled.

3. Container openings specified are for storage of those materials that are characteristically either liquid, semi-solid, or solid. Some materials (e.g. silicone compounds) may appear in more than one state, depending upon usage. The choice of openings for containers used to hold those materials shall be made on a case-by-case basis.

4. EPA-approved container types for packaging liquid PCBs. Suitable containers that meet DOT specifications: 5, 5B, 6D (with 2S or 2S polyethylene inserts), 17C, and 17E may be used as substitutes. PCBs should be packed in these approved containers with absorbent material such as standard absorbent sweeping compound, NSN 7930-00-269-1272, or SafestepTM, NSN 7930-01-145-5797 25 lb. Electrical cables can be stored in a plastic bag in accordance with NAVSEA PCB Advisory 93-1A, **Management of Electrical Cables Removed from Vessels and Craft (Revised)** , 4 Feb 1994.

APPENDIX C

HMIS CODING AND STORAGE REQUIREMENTS HAZARD CHARACTERISTIC CODE FOR HAZARDOUS MATERIAL GROUPS

The Hazard Characteristic Code (HCC) is a two-digit alphanumeric code that is issued to provide a means of categorizing hazardous material (HM). HCCs are assigned by trained scientific or engineering personnel, thereby uniformly identifying HM that is managed by all government activities. HCCs allow personnel to properly receive, handle, store, and process HM. In particular, the HCC allows the user to determine which materials are compatible for storage with other materials. In addition, HCCs can be used to simplify spill response and cleanup, processing of HM during recoupment operations, and assist in the identification of potential hazardous wastes. The HCC serves as an identifier for automated processing of HM transactions and space utilization management

HAZARD GROUP	
1. Radioactive Materials	**HCC**
a. Licensed	A1
b. License Exempt	A2
c. License Exempt, Authorized	A3
2. Alkali Materials	.
a. Corrosive, Inorganic	B1
b. Corrosive, Organic	B2
c. Low Risk	B3
3. Acid Materials	.
a. Corrosive, Inorganic	C1
b. Corrosive, Organic	C2
c. Low Risk	C3
d. Corrosive and Oxidizer, Inorganic	C4
e. Corrosive and Oxidizer, Organic	C5
4. Oxidizers	.
a. Oxidizer	D1
b. Oxidizer and Poison	D2
c. Oxidizer and Corrosive, Acidic	D3
d. Oxidizer and Corrosive, Alkali	D4
5. Explosives (See OP4, OP5, and OP2165)	.
a. Explosives, Military	E1
b. Explosives, Low Risk	E2
6. Flammable/Combustible liquids	.
a. Flammable Liquid, DOT Packing Group I, OSHA	F1
b. Flammable Liquid, DOT Packing Group II, OSHA IB	F2
c. Flammable Liquid, DOT Packing Group III, OSHA IC	F3
d. Flammable Liquid, DOT Packing Group III, OSHA II	F4
e. Flammable Liquid and Poison	F5
f. Flammable Liquid and Corrosive, Acidic	F6
g. Flammable Liquid and Corrosive, Alkali	.
h. Flammable Solid	.F7
	F8

7. Compressed Gases	.
a. Gas, Poison (Non-flammable)	G1
b. Gas, Flammable	G2
c. Gas, Non-flammable	G3
d. Gas, Non-flammable, Oxidizer	G4
e. Gas, Non-flammable, Corrosive	G5
f. Gas, Poison, Corrosive (Non-flammable)	G6
g. Gas, Poison, Oxidizer (Non-flammable)	G7
h. Gas, Poison, Flammable	G8
i. Gas, Poison, Corrosive, Oxidizer (Non-flammable)	G9
8. Medical Substances	.
a. Infectious Materials	K1
b. Cytotoxic Drugs	K2
9. Magnetized Material	M1
10. Not Regulated as Hazardous	N1
11. Peroxides	.
a. Peroxide, Organic, DOT Regulated	P1
b. Peroxide, Organic Low Risk	P2
12. Reactive Chemicals	.
a. Reactive Chemical, Flammable	R1
b. Water Reactive Chemical	R2
13. Toxic Chemicals	.
a. DOT Poison - Inhalation Hazard	T1
b. UN Poison, Packing Group I	T2
c. UN Poison, Packing Group II	T3
d. UN Poison, Packing Group III	T4
e. Pesticide, Low Risk	T5
f. Health Hazard	T6
g. Carcinogen (OSHA, NTP, IARC)	T7
14. Miscellaneous Materials	.
a. Miscellaneous Flammable Materials - DOT Class 9	V1
b. Aerosol, Non-flammable	V2
c. Aerosol, Flammable	V3
d. DOT Combustible Liquid, OSHA IIIA	V4
e. High Flash Point Materials, OSHA IIIB	V5
f. Petroleum Products	V6
g. Environmental Hazard	V7

15.	OSHA and DOT Articles	.
	a. Article Containing Asbestos	Z1
	b. Article Containing Mercury	Z2
	c. Article Containing Polychlorinated Biphenyl (PCB)	Z3
	d. Article, Battery, Lead Acid, Nonspillable	Z4
	e. Article, Battery, Nickel Cadmium, Nonspillable	Z5
	f. Article, Battery, Lithium	Z6
	g. Article, Battery, Dry Cell	Z7

HM Storage Segregation Matrix: CORROSIVES												
HCC	HAZARD CHARACTERISTICS GROUP	PRIMARY SEGREGATION CODE										SECONDARY SEGREGATION
		A	C	D	E	F	G	L	P	R	T	
B1	Alkali, Corrosive Inorganic		*									NOTE B - Inorganic Alkali Storage - store away from acids by at least one 4 ft aisle width and away from organic alkalis by at least one 4 ft aisle width
B2	Alkali, Corrosive Organic		*									Note C - Organic Alkali Storage - store away from acids by at least one 4 ft aisle width and away from inorganic alkalis by at least one 4 ft aisle width.
C1	Acid, Corrosive Inorganic		*									NOTE D - Inorganic Acid Storage - store away from alkalis (caustics) by at least one 4 ft aisle width and away from organic acids by at least one 4 ft aisle width. Separate from other acids with subsidiary risk labels by at least one 4 ft aisle width.
C2	Acid, Corrosive Organic		*									NOTE E - Organic Acid Storage - store away from alkalis (caustics) by at least one 4 ft aisle width and away from inorganic acids by at least one 4 ft aisle width. Separate from other acids with subsidiary risk labels by at least one 4 ft aisle width. Organic Acids may be stored in a locker lined with acid-resistant material in the flammable liquids storeroom separated by a partition, or by at least 4 feet, from all other material.
C4	Acid, Corrosive and Oxidizer, Inorganic		*									NOTE D - Inorganic Acid Storage - store away from alkalis (caustics) by at least one 4 ft aisle width and away from organic acids by at least one 4 ft aisle width. Separate from other acids with subsidiary risk labels by at least one 4 ft aisle width.
C5	Acid, Corrosive and Oxidizer, Organic		*									NOTE E - Organic Acid Storage - store away from alkalis (caustics) by at least one 4 ft aisle width and away from inorganic acids by at least one 4 ft aisle width. Separate from other acids with subsidiary risk labels by at least one 4 ft aisle width. Organic Acids may be stored in a locker lined with acid-resistant material in the flammable liquids storeroom separated by a partition, or by at least 4 feet, from all other material.

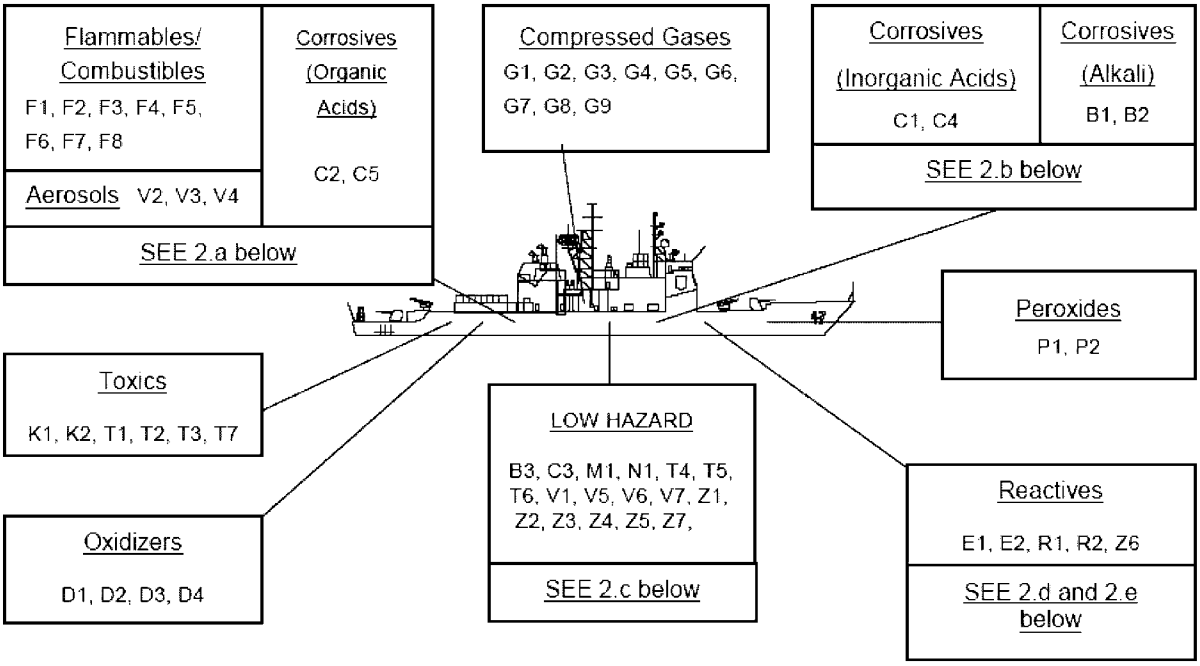
HM Storage Segregation Matrix: Low Risk												
HCC	HAZARD CHARACTERISTICS GROUP	PRIMARY SEGREGATION CODE										SECONDARY SEGREGATION
		A	C	D	E	F	G	L	P	R	T	
B3	Alkali, Low Risk							*				NOTE F - Further separate into Acid and Alkali Storage within the low hazard storage area to keep potentially incompatible products from mixing.
C3	Acid, Low Risk							*				NOTE F - Further separate into Acid and Alkali Storage within the low hazard storage area to keep potentially incompatible products from mixing.
E2	Explosive, Low Risk							*				NOTE A - Security Storage - must be well ventilated with limited access.
M1	Magnetized Material							*				None
N1	Not Regulated as Hazardous							*				None
T4	UN Poison, Packing Group III							*				NOTE BB - Store away from food.
T5	Pesticide, Low Risk							*				None
T6	Health Hazard							*				None
V1	Miscellaneous Hazardous Materials - Class 9							*				None
V5	Hi-Flash Point Liquids, OSHA IIIB							*				None
V6	Petroleum Products							*				None
V7	Environmental Hazard							*				None
Z1	Article Containing Asbestos							*				None
Z2	Article Containing Mercury							*				None
Z3	Article Containing Polychlorinated Biphenyls (PCB)							*				None
Z4	Article, Battery, Lead Acid, Nonspillable							*				None
Z5	Article, Battery, Nickel Cadmium, Nonspillable							*				None
Z7	Article, Battery, Dry Cell							*				None

HM Storage Segregation Matrix: Oxidizer												
HCC	HAZARD CHARACTERIS-TICS GROUP	PRIMARY SEGREGATION CODE										SECONDARY SEGREGATION
		A	C	D	E	F	G	L	P	R	T	
D1	Oxidizer			*								None
D2	Oxidizer and Poison			*								NOTE G - Separate from other oxidizers and oxidizers with secondary hazards by at least one 4 ft aisle width.
D3	Oxidizer and Corrosive Acidic			*								NOTE G - Separate from other oxidizers and oxidizers with secondary hazards by at least one 4 ft aisle width.
D4	Oxidizer and Corrosive Alkali			*								NOTE G - Separate from other oxidizers and oxidizers with secondary hazards by at least one 4 ft aisle width.

HM Storage Segregation Matrix: Explosive												
HCC	HAZARD CHARACTERISTICS GROUP	PRIMARY SEGREGATION CODE										SECONDARY SEGREGATION
		A	C	D	E	F	G	L	P	R	T	
E1	Explosive, Military				*							NOTE H - Magazine Storage.

HAZARDOUS MATERIAL COMPATIBILITY STORAGE DIAGRAM

The Hazardous Characteristic Code (HCC) for each SHML item can be found in the Hazardous Material Information System (HMIS). The HCC and their intended use are defined and explained in OPNAVINST 5100.19 Series.



Instructions:

1. Each block represents a separate stowage location. The codes in the boxes are grouped with other codes with which they are compatible for storage. A subdivision within a block represents secondary seperation within the primary classification.

2. The following secondary stowage requirements apply:

   a. Stow organic acids in a locker with acid-resistant material in the flammable liquids storeroom seperated by a partition, or by at least three feet, from all other material. Separate Aerosols (V2, V3, V4) from flammables by placing them in a locker or barrier such as floor to ceiling wire mesh, chain link fence, etc. to protect personnel from Aerosols that can become self – propelled projectiles.
   b. Separate B1, B2, C1, and C4 by at least three feet from each other.
   c. Separate B3 and C3 by at least three feet from each other
   d. Further segregate R1 into a Spontaneously Combustible storage within the Reactive Storage area.
   e. Should not store R2 in areas protected with water sprinkler system. Fire protection should be non-water based.

ACID AND ALKALI EXAMPLES

Inorganic acid (C1, C3)	**Organic acid (C1, C3)**	**Alkali (C2, C4)**
Alodine	Acetic acid	Ammonia
Aqua fortis	Citric acid	Ammonium hydroxide
Boric acid	Cresol	Barium hydroxide
Chromic acid	Cresylic acid	Calcium hydroxide
Hydrochloric acid	Glacial acetic acid	Caustic soda
Hydrofluoric acid	Oxalic acid	Caustic potash
Muriatic acid	Sulfosalicylic acid	Diethylenetriamine
Nitric acid	Trichloroacetic acid	Lithium hydroxide Monoethanolamine
Oil of Vitriol (sulfuric acid)	Vinegar	Morpholine
Orthotolidine solution		Potassium carbonate
Phosphoric acid		Potassium hydroxide
Sodium bisulfate		Soda lime
Sulfamic acid		Sodium sulfide
Sulfuric acid		Sodium hydroxide
		Sodium metasilicate
		Sodium phosphate
		Sodium silicate
		Sodium hypochlorite
		Tetraethylenepentamine

APPENDIX D

EMPTY HAZARDOUS MATERIAL CONTAINER MANAGEMENT GUIDANCE

D-1. Shipboard Procedures (CNO Policy Guide For Shipboard Hazardous Material Container Disposal, OPNAV P-45–114–95.)

1. Determine if the container is empty. A container is considered to be empty if it meets both of the following criteria:
   a. There is no liquid in the container **and**
   b. There is less than one inch of solid residue (hardened product) on the bottom.

Any liquid remaining in the container shall be removed and consolidated with other material of the same National Stock Number (NSN). Consolidation of Hazardous Material (HM) with identical composition but with different NSNs is permitted **only** if the different NSN represents the same product, but with different units of issue. To ensure that the container holds no liquids, turn the container upside down, and drain completely. Ensure that no liquid is trapped in the container under a surface film (commonly in paint).

NOTE

Prior to emptying the container, ensure the remaining contents have been used/exhausted to the maximum extent possible.

If the container does not meet **both** of the criteria, it is not considered empty and cannot be disposed of as solid waste. Used and excess HM should be stored in compartments that have the same design specifications as the compartments where unused HM is stored.

NOTE

After draining, if needed, the container may be air dried by properly securing on a weather deck. When in port, contact the local navy environmental coordinator prior to air-drying.

2. For the HM item in an aerosol container, the following guidance applies:
   Common pressurized dispensers (aerosol cans) are used for the application of products including paints, enamels, lacquers, insecticides, inspection penetrant kits, lubricating oils, silicones, and rust preventatives. Empty/used aerosol cans shall be handled in accordance with the requirements provided herein due to the presence of residual product solvents, low boiling point hydrocarbon-based propellant gases, such as propane or isobutene, and plastic.
   a. If equipped with a NAVSEASYSCOM-approved aerosol puncturing/draining or puncturing/draining/crushing device, the ship may puncture, drain and crush exhausted/used aerosol cans. After puncturing, and draining, uncrushed cans shall be marked ″empty.″ Residual waste from aerosol cans shall be placed into a properly marked steel drum and managed as a flammable liquid prior to offload to shore for disposal.
   b. If not equipped with a NAVSEASYSCOM-approved aerosol puncturing/draining device, the ship shall

containerize empty/used aerosol cans for shore disposal. Empty aerosol cans shall be placed into a properly marked steel drum and managed as a flammable liquid prior to offload to shore for processing or disposal.

WARNING

DO NOT ATTEMPT TO OPEN AEROSOL CONTAINERS TO DETERMINE IF THEY ARE EMPTY.

NOTE

Empty containers of HM not listed in the SHML (open purchased or unauthorized materials) shall be retained on board ship for HM shore disposal.

3. Container Disposal At Sea.
   Empty hazardous material containers that are metal or glass may be disposed of as solid waste unless specifically cited in Appendix L of OPNAVINST 5090.1C Series. Authorization from the ship's hazardous material coordinator or Supply Department shall be obtained prior to disposal of any empty hazardous material container as trash in dumpsters ashore or overboard when at sea. Containers to be disposed of overboard shall be made negatively buoyant to ensure they sink.

NOTE

Containers that contain or are made of plastic shall not be disposed of at sea. These containers must be held aboard for disposal ashore with other plastic materials. Aerosol cans, whether punctured/drained/crushed or not, shall be containerized for shore disposal. Aerosol cans contain plastic, which is prohibited for overboard discharge.

4. Container Disposal Ashore.
   While in port, empty HM containers shall be disposed of as trash. Prior to disposal of ″empty″ HM containers as trash, authorization from the ship's HM Coordinater is required. Some naval activities provide special receptacles for collection of empty metal containers, which held HM. If these receptacles are provided, only empty metal HM containers shall be disposed of into these receptacles.

NOTE

Some states and foreign countries treat empty paint containers and other HM containers as Hazardous Waste (HW). Check local Senior Officer Present Ashore Regulations regarding empty container disposal guidance.

D-2. Hazardous Material Container Drying Guidance (NAVAL MESSAGE (NAVSURFWARCEN SHIPSYSENGSTA PHILADELPHIA 171600Z JAN 95))

1. In port, contact the local navy environmental coordinator to determine if containers can be air dried without violating any Federal, State or Local environmental regulations.
2. Containers should be air dried on the weather deck, if possible. If air drying on the weather deck is not pos-

sible or permissible, a few containers can be air dried in the paint mix and issue room or flammable liquids storeroom. When first opening a compartment that is being used to dry empty containers, ensure ventilation is operable and ventilate for 15 minutes prior to entry. If after 15 minutes of ventilation, personnel still detect a strong odor or suspect the air quality, they should contact the shipboard safety officer. The safety officer will determine if additional ventilating is required or if personnel can work in the space under current conditions. The safety officer will also determine if personnel require air-filtering respirators equipped with organic vapor cartridges. All respirator use must conform to chapter B6 of OPNAVINST 5100.19 Series, ″NAVOSH PROGRAM MANUAL FOR FORCES AFLOAT″.

3. Compatible hazardous materials should be consolidated prior to air drying, in accordance with chapter B3 of OPNAVINST 5100.19 Series, to the maximum extent possible to reduce Volatile Organic Compounds (VOC) emissions. Prior to air-drying, use a spatula to remove more of the residual material than can be accomplished by draining alone. Ships should maintain a log of the materials being consolidated (materials, NSN, quantity added). Failure to adequately or accurately track consolidated materials will necessitate lab analysis to determine identity and concentration of consolidated items. Analysis of containers with unknown contents is very costly and can be charged to fleet accounts.
4. Used and excess hazardous materials should be stored in compartments that have the same design specifications as the compartments from which the unused hazardous material were stored.

APPENDIX E

GUIDELINES FOR SELECTING GARBAGE DISPOSAL MACHINES

Classification: Shipboard food waste disposer machines shall be classified as either Size I (generally a small 2 to 2-½ hp, processing rate of 50 to 200 lbs/hr unit to be utilized in the flag or captain galley), Size II (generally a 3 HP or higher unit, 200 to 1000 lbs/hr processing rate) to be utilized in the crew, CPO, wardroom galleys and sculleries. Size I machines shall be manufactured with materials suitable for fresh water, Size II machines shall be manufactured with materials suitable for both fresh and sea water use.

Design: The design of the machines shall be in accordance with the best engineering practice. Sizes I and II machines shall be designed to grind garbage and wash it down the drain when using up to 10 gallons of water per minute through the grinder body (additional water may be used below the grinder to keep the drain clear). Ground garbage shall not pack or adhere to any parts of the machine when water is flowing. Garbage shall be ground to a finely divided mash or pulp, capable of passing through a 2-inch (12 mm) screen. Machines shall not jam when operated at full capacity.

Cutting Mechanism: The cutting mechanism shall be composed of the impeller (rotor) and the cutting ring. The impeller and all rotating parts shall be accurately balanced to reduce vibration and ensure quiet running machines at designed speeds. The cutting mechanism shall be of alloy steel. Carburizing, cemented carbides and weld-on hard facing alloys may be used. Cemented carbides, when used, shall be as resistant to the attack of food acids and alkalis as the alloy steel used.

Construction: Each machine shall consist essentially of a grinding chamber containing the cutting edges, an impeller or rotor, and the electric driving motor. Assembly shall be such, either by separate motor enclosure or shield, that water cannot enter the motor in event of grinder seal failure. The grinding trap shall not be provided. Size I machines shall be suitable for mounting to a sink with sink adaptor, or conical hopper. Size II machines shall be provided with means of supporting the units from the deck (to be free standing).

Rotation Direction: The designed direction of rotation shall be clearly indicated by means of a circular arrow cast or permanently attached on the grinder housing. Machines, which may be operated in either direction, need not be so marked.

Shaft Seal: The grinder shaft shall be fitted with a positive seal to prevent water leaking from the grinding chamber along the shaft. The seal shall be protected against the entry of grit or dirt.

Bearings: All bearings for rotating elements shall be permanently lubricated anti friction type.

Discharge: The discharge outlet of each machine shall be such that it can be connected to standard pipe of not less than 1-½-inch size.

Flow Interlock : When specified, a flow interlock shall be provided that prevents operation of the machine when water flow is absent.

Garbage Feed Chute: Unless otherwise specified in contract or order, all machines shall be furnished without garbage feed chute or hopper.

Electrical Requirements: Electrical equipment shall be designed for operation on an ungrounded electrical system but shall operate satisfactorily and without hazard to personnel or equipment with an accidental ground on any conductor.

Motors: Motors shall conform to NEMA Publication MG-1, be UL listed, and shall have the following characteristics:

Ambient temperature	40° C.
Enclosure	Drip proof or Totally Enclosed Fan Cooled Motor (TEFC)
Duty	Continuous
Horsepower	As required for satisfactory performance
Electrical Characteristics	As specified (see 6.1)
Bearings	Ball or roller
Insulation	Class A or B

Motor Control: Motors shall be provided with either built-in motor overload protection for single phase and with magnetic motor starters with heaters for 3 phase.

Starting Controls and Wiring: Starting controls and wiring shall conform to the requirements of the National Electric Code. Control panels shall conform to the requirements of UL-508A. In addition, all wiring and controls shall be fully enclosed in shipboard watertight connections.

Identification Plate: Each machine shall have an identification plate located in a readily accessible location, on either the motor or the machine, giving the model and serial number of the machine, the type of current, voltage, phase and frequency (if alternating current) and rated horsepower. Identification plate shall be made of non-corrosive metal.

Instruction Plate: A non-corrosive metal plate, for installation by others, shall be provided. This plate shall contain instructions describing any special or important procedure to be followed in operating or servicing the machine.

Finish: The equipment shall be finished and painted in accordance with the manufacturer's standard practice.

Manuals: Manuals shall be the standard commercial manufacturer's instructions including manufacturer's illustrations or drawings to concisely outline the proper installation, operation, maintenance and parts identification of the food waste disposer machine furnished. The manuals shall be suitably bound in a self-cover of durable quality. Two copies of the manual shall be packed with each machine. Two copies of the manual shall be submitted to Naval Surface Warfare Center, Philadelphia Detachment, Code 135 for assignment of a technical manual identification number (TMIN) and national stock number.

Repair Parts And Maintenance Tools: Onboard repair parts and maintenance tools shall be as specified in the contract or order as selected from the list recommended by the manufacturer to maintain operation of each unit for one year.

Workmanship: Workmanship shall conform to the following:

a. Welds, where used, shall be cleaned and ground to present a smooth and uniform finish.

b. All surfaces shall be free of burrs and sharp edges.

c. Castings shall be smooth and free of blow holes.

d. Faying surfaces shall be properly machined for uniform fit.

APPENDIX F

POLLUTION PREVENTION AFLOAT - SHIPALT EQUIPMENT MATRIX

	AGF 11	ARS 50	AS 39	CG 47	CV 63	CV 67	CVN 65	CVN 68	DD 963	DDG 51	FFG 7	LCC 19	LCC 20	LHA 1	LHD 1	LPD 4	LPD 17	LSDs
P2 Opportunity	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty
Large Aqueous Parts Washer	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
Top-Loading Aqueous Parts Washer	2	1	2	1	5	4	3	3	1	1	1	2	2	2	2	2	2	3
Cable Lubricator & Cleaner	1	1	1	0	3	2	3	3	0	0	0	1	1	1	2	1	1	1
MIECS	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	0	1
Maintenance-Free Batteries (Red)	12	0	0	0	52	52	74	74	0	0	0	0	0	51	51	8	8	0
Maintenance-Free Batteries (Blue)	8	8	26	6	42	42	50	56	6	6	4	12	14	53	57	26	26	24
6TL Adapter	8	8	26	6	8	8	16	22	6	6	4	12	14	14	18	18	18	16
Paint Dispenser	6	3	6	5	7	7	7	7	5	4	4	3	6	6	6	6	6	5
Paint Gun Cleaning Station	0	0	1	0	1	1	1	1	0	0	0	1	1	1	1	1	1	0
Paint Brush Holder	4	4	4	4	4	4	4	4	4	2	4	4	4	4	4	4	3	4
Paint Brush Holder Rack	4	4	4	4	4	4	4	4	4	2	4	4	4	4	4	4	3	4
Drum Level Indicators	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Reciprocating Saw	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
Explosion Proof Vacuum	1	0	1	0	2	2	2	2	0	0	0	1	1	1	1	1	0	1
Hand Pumps; 55-gallon	2	2	2	2	5	5	5	5	2	2	2	2	2	5	5	2	2	2
Hand Pumps; 5-gallon	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Spray Bottles	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Hand Pump & Spray Bottle Rack	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
Hand Wipe (Set=4 conts and 6 wipes)	1	1	2	1	3	3	3	3	1	1	1	2	2	2	2	2	3	1
Paint Mixer	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pneumatic Backpack Vacuum	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	0	1
Vacuum Sanding System	1	0	1	0	2	2	2	2	0	0	0	0	0	1	1	1	0	0
Pneumatic Vacuum	6	2	5	2	8	5	4	4	4	2	2	5	5	4	4	4	4	5
Drum Dolly	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Pressure Washer	6	2	4	4	8	5	5	5	4	4	4	4	4	5	5	5	5	4

APPENDIX G

REFERENCES

DOCUMENT/DRAWING NUMBER	TITLE
29 CFR 1910.1200	Hazard Communication Standard
33, United States Code	Federal Water Pollution Control Act, P.L. 107-303
40 CFR, Part 82	Protection of Environment, Chapter I - Environmental Protection Agency, Protection of Stratospheric Ozone
ASTM D2000	Standard Classification System for Rubber Products in Automotive Applications
ASTM F412	Standard Terminology Relating to Plastic Piping Systems
CDNSWC-TM-63-00/117, NSWCCD LTR Ser 631/131	Performance Requirements for the Chemical Cleaning of Sanitary Waste System Piping on Navy Surface Ships by Contractor or Industrial Activity Resources
CID A-A-1440	General Purpose Disinfectant-Detergent (lodophor)
CID A-A-50371	Boots, Fireman's
CID A-A-55196A	Coveralls, Disposable
CID A-A-59326	Coupling Halves, Quick-Disconnect, Cam-Locking Type
CID A-A-59563	Sodium Carbonate, Anhydrous, Technical
COMFLTFORCOMINST 4790.3 Series	Joint Fleet Maintenance Manual (JFMM)
DoD 4715.5-G	Overseas Environmental Baseline Guidance Document (OEBGD)
DOD 4715.6-R1	Regulations on Vessels Owned or Operated by the Department of Defense
DOD Directive 6050.15	Prevention of Oil Pollution from Ships Owned or Operated by the DOD (NOTAL)
DoD Instruction 6050.5	DoD Hazard Communication Program
Fed Spec, HH-P-151	Packing, Rubber Sheet, Cloth Insert
Federal Specification P-D-680	Dry Cleaning and Degreasing Solvent
MIL-D-16791	Detergents, General Purpose (liquid non-ionic)
MIL-E-24127	Eductors: Gasoline, Oil and Water
MIL-G-12223	Gloves, Toxicological Agents Protective
MIL-PRF-15618	Filter-Seperator, Fluid, Pressure, Aviation and Distillate Fuel, Naval Shipboard
MIL-PRF-17331	Lubricating Oil, Steam Turbine and Gear, Moderate Service
MIL-PRF-680	Degreasing Solvent
MIL-R-17882	Repair Kits, Metallic Pipe and General Purpose, Damage Control
MIL-STD-1623	Fire Performance Requirements and Approved Specifications for Interior Finish Materials and Furnishings (Naval Shipboard Use)
MIL-STD-777 (SH)	Schedule of Piping, Valves, Fittings and Associated Piping Components for Naval Surface Ships
MIL-T-16420 (SH)	Tube, Copper-Nickel Alloy, Seamless and Welded (Copper Alloy Numbers 715 and 706)
NAVAIR 17-5-7	Operation and Intermediate Maintenance Instructions with Illustrated Parts Breakdown for Small and Large Aqueous Parts Washers Model No. F-3000-N and F-4000-PN TEC: GCBA
NAVMED P-117	Manual of the Medical Department

DOCUMENT/DRAWING NUMBER	TITLE
NAVMED P-5010	Chapter 7, Manual of Naval Preventive Medicine - Wastewater Treatment and Disposal, Ashore and Afloat
NAVSEA 0910-LP-074-7800	Cleaning CHT Piping Systems with High Pressure Water Jet Equipment Model WBD-150N
NAVSEA 0936-LP-039-7010	Waste Disposal System, Navy Model 5; Installation, Operation, Maintenance and Inspection Instructions
NAVSEA 0936-LP-040-5010	Garbage Grinder, Model 33AD, 75AD, (756AD), and 100AD; Description, Operation, Installation and Maintenance Instructions W/CHGS 1-7
NAVSEA 0951-LP-037-6010	Technical Manual, Repair and Overhaul Instructions, High Pressure Water Jet Cleaning Equipment Model No. WBD-150-150N
NAVSEA Advisory 94-1	Removal and Handling of PCB Felt
NAVSEA Advisory 94-1A	Management of Electrical Cables Removed From Vessels and Craft
NAVSEA Advisory 94-2	Maintenance and Cleaning of Ventilation Ducts Containing PCB Felt Gaskets on Surface Ship and Submarines
NAVSEA Drawing 505-7036295	CHT Sewage Tank and Sensor
NAVSEA Drawing 803-5959316	Cabinet, Stowage Combustible and Flammable Liquids
NAVSEA Drawing 804-4444650	Connection Surface Ship Sewage Discharge.
NAVSEA Instruction 9593.2	The Inspection and Certification Process for OPA Systems in US Navy Surface Ships and Craft
NAVSEA S6161-UK-FSE-010	Disposal System, Waste, Models 3 and 3S; Description, Operation and Maintenance
NAVSEA S6300-AE-MMA-010	Technical Manual for Waterjet
NAVSEA S6480-A4-CAT-010	Authorized Chemical Cleaning Products and Dispensing Systems Catalog, U.S. Navy Surface Ship (Non-Submarine)
NAVSEA S9310-AQ-SAF-010	Technical Manual for Batteries, Navy Lithium Safety Program Responsibilities and Procedures
NAVSEA S9582-BH-MMC-010	Kirkpatrick Wire Rope Lubrication Systems
NAVSEA S9593-A1-MAN-010	Shipboard Management Guide for Polychlorinated Biphenyls (PCBs)
NAVSEA S9593-CJ-MAN-010	Oil Spill Containment and Clean-up Kit Handbook
NAVSEA S9593-CN-MMA-010 (0910-LP-104-7411)	Trash-Burner, Vent-O-Matic, Model 3AC/5R; Maintenance Manual
NAVSEA S9593-CS-CAT-010	POLLUTION PREVENTION (P2) AFLOAT PROGRAM; MISCELLANEOUS EQUIPMENT TECHNICAL DOCUMENTATION
NAVSEA SG200-DA-MMC-010	Description, Operation, and Maintenance For Paint Dispenser Model: P2A-PDS-6
NAVSEA SG200-DE-MMC-010	Description, Operation, And Maintenance for Paint Gun Cleaning Station, Uniram Corp. Model UG6500USN, Contract N68335-00-D-0147
NAVSEA SG340-AB-MMC-010	Description, Operation, and Maintenance for Pneumatic Pressure Washer Hydro Engineering, Inc. Model: 3/1500-P1 Contract 968335-00-D-0146
NAVSEA T9500-AA-PR0-100	NAVSEA Design Criteria Manual for Sewage Collection, Holding and Transfer (CHT) Systems, Chapter 593, December 1985

DOCUMENT/DRAWING NUMBER	TITLE
NAVSEA T9640-AB-DDT-010/HAB	Shipboard Habitability Design Criteria Manual
NAVSEA Technical Manual S9550-AN-MMO-010/MOD VGS-10 (0910-LP-039-6400)	Oil Water Separator, 10 GPM, MOD VGS-10; Operations and Installation
NAVSEA Technical Manual S9550-B2-MMA-010/25204 (0910-LP-434-9700)	10 GPM Oil/Water Separator, Model 690231,; Description, Operation and Maintenance ; W/CHGS A-B
NAVSEA Technical Manual S9550-BD-MMO-010/60699 (0910-LP-326-8400)	Oil/Water Separator, Model CPS-3B15; Installation, Operation and Maintenance, W/CHGS A and B
NAVSEA Technical Manual S9593-AY-MMM-010 (0910-LP-103-6286)	10 GPM Bilge Oil/Water Seperator, AAE Model 740581, Fram Model OPB-10N/P; Installation, Operation, Maintenance and Repair Instructions with Parts List
NAVSEA Technical Manual S9593-CD-MMO-010/25204 (0910-LP-405-4400)	Monitor, Oil Content, Type ET-35N, MOD ST40000, Description, Operation and Maintenance
NAVSEA Technical Manual S9593-CL-MMO-010 (0910-LP-584-9900)	Separator, Oil/Water, Navy Model 3F, For Small Boats; Installation, Operation and Maintenance
NAVSEA Technical Manual S9593-CY-MMO-010 (0910-LP-102-2034)	Variable Speed, Model VS-50, Oil-Water Separator, Integrated Oil Pollution Abatement System; Installation, Operation Maintenance, and Repair Instructions with Parts List
NAVSEA Technical Manual S9593-DA-MMO-010 (0910-LP-101-7008)	Oil/Water Separator, 100 GPM Model C50//RF01; Installation, Operation Maintenance, and Repair
NAVSEA Technical Manual S9593-DK-MMO-010	Oil/Water Separator 50 Gal/Min, Model C50; Installation, Operation, Maintenance and Repair, W/CHG A
NAVSEAINST 5100.13	Synthetic Fire Resistant Hydraulic Fluids
NAVSEAINST 9593.1	Certification Program for Sewage Marine Sanitation Devices (MSDs) in the U.S. Navy Surface Ships and Craft
NAVSUP 1400	Shipboard Hazardous Material List (SHML) Feedback Report (SFR) Form
NAVSUP Publication 722	Consolidated Hazardous Material Reutilization and Inventory Management Program (CHRIMP) Manual
NSTM Chapter 070	Nuclear Defense at Sea and Radiological Recovery of Ships After Nuclear Weapons Explosion
NSTM Chapter 074	Volume 3, Gas Free Engineering
NSTM Chapter 077	Personnel Protection Equipment
NSTM Chapter 079	Volume 1, Damage Control-Stability and Buoyancy
NSTM Chapter 079	Volume 2, Damage Control - Practical Damage Control
NSTM Chapter 220	Volume 1, Boiler Water/Feedwater, Water Chemistry
NSTM Chapter 220	Volume 2, Boiler Water/Feedwater, Test and Treatment
NSTM Chapter 262	Lubricating Oils, Greases, and Hydraulic Fluids and Lubricating Systems.
NSTM Chapter 300	Electric Plant - General
NSTM Chapter 302	Electric Motors and Controllers
NSTM Chapter 313	Portable Storage and Dry Batteries
NSTM Chapter 400	Electronics
NSTM Chapter 470	Shipboard BW/CW Defense and Countermeasures
NSTM Chapter 503	Pumps
NSTM Chapter 505	Piping Systems
NSTM Chapter 533	Potable Water Systems
NSTM Chapter 541	Ship Fuel and Fuel Systems
NSTM Chapter 542	Gasoline and JP-5 Fuel Systems
NSTM Chapter 550	Industrial Gases: Generating, Handling, and Storage

DOCUMENT/DRAWING NUMBER	TITLE
NSTM Chapter 555	Volume 1, Surface Ship Firefighting
NSTM Chapter 593	Pollution Control
NSTM Chapter 604	Locks, Keys, and Hasps
NSTM Chapter 631V1	Volume 1, Preservation of Ships in Service – General
NSTM Chapter 631V2	Volume 2, Preservation of Ships in Service (Surface Preparation and Painting)
NSTM Chapter 633	Cathodic Protection
NSTM Chapter 655	Laundry and Dry Cleaning
NSTM Chapter 670	Stowage, Handling, and Disposal of Hazardous General Use Consumables
NSTM Chapter 700	Shipboard Ammunition Handling and Stowage
NSTM Chapter 997	Docking Instructions and Routine Work in Dock
NSWCCD-63-TM-2005/37	NAVSEA Design Supplement (NDS) 1302 Hazardous Materials Management- Shipboard Control
NSWCCD-TR-63-97/25	Shipboard Solid Waste Management Equipment Guide
OPNAV 4790/2K	Ships Maintenance Action Form
OPNAV P-45-113-3-99	Afloat Medical Waste Management
OPNAV-P-45-114-95	Chief of Naval Operations (CNO) Policy Guide for Shipboard Hazardous Material Container Disposal
OPNAVINST 5090.1C Series	The Environmental and Natural Resources Program Manual
OPNAVINST 5100.19 Series	Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces AFLoat
OPNAVINST 5100.28	Hazardous Material User's Guide
OPNAVINST 9640.1A	Shipboard Habitability Program
S6161-YZ-FSE-010	GARBAGE GRINDER MODEL 75AD; USERS MANUAL
S9550-BE-MMA-010/53918	5-GPM Oil Water Seperator, Model VGS-10, Operation, Maintenance and Installation
S9582-BH-MMC-010	Kirkpatrick Wire Rope, Lubrication Systems
S9593-BM-MMA-010	Operation and Maintenance MOD I Plastics Waste Processor, Compress Melt Unit 593-7556811
S9593-C2-MMM-010	OPERATION AND MAINTENANCE, PULPER, LARGE, NAVSEA DWG 593-6960300
S9593-C3-MMM-010	OPERATION AND MAINTENANCE, PULPER, SMALL, NAVSEA DWG 593-6960581
S9593-C4-MMM-010	Operation and Maintenance Processor, Plastics with MIL-SPEC. Control Enclosure NAVSEA DWG. 593-6961199
S9593-C5-MMM-010	Operation and Maintenance Shredder, Solid Waste with MIL-SPEC Control Enclosure 593-6960881
S9593-C7-MMM-010	Operation and Maintenance Processor, Plastics with Mark II Commercial Control Enclosure NAVSEA DWG. 593-6961199
S9593-C8-MMM-010	Operation and Maintenance Shredder, Solid Waste with Mark II Commecial Contol Enclosure NAVSEA DWG. 593-6960881
S9593-CT-TRS-010	Technical Repair Standard, Depot Processor, Plastics, NAVSEA DWG 593-6961199
S9593-CU-TRS-010	Technical Repair Standard, Depot Shredder, Solid Waste, NAVSEA DWG 593-6960881

DOCUMENT/DRAWING NUMBER	TITLE
S9593-DC-MMM-010 (0910-LP-028-7520)	Incinerators, TEAMTEC (Golar) Type GSA500C; Description, Operation and Maintenance
S9593-DP-MMM-010	Operation and Maintenance MOD I Plastics Shredder, 593-7556873
SEIC website	www.navyseic.dt.navy.mil
SL172-AB-LSS-010	TOP LOADING AQUEOUS PARTS WASHER, MODEL NO. IMPULSE-W

APPENDIX H

TECHNICAL MANUAL DEFICIENCY/EVALUATION REPORT (TMDER)

NOTE

Ships, training activities, supply points, depots, Naval Shipyards, and Supervisors of Shipbuilding are requested to arrange for the maximum practical use and evaluation of NAVSEA technical manuals. All errors, omissions, discrepancies, and suggestions for improvement to NAVSEA technical manuals shall be reported to the Commander, NAVSURFWARCENDIV, 4363 Missile Way, Port Hueneme, CA 93043-4307 on NAVSEA/ SPAWAR Technical Manual Deficiency/Evaluation Report (TMDER), NAVSEA Form 4160/1. To facilitate such reporting, print, complete, and mail NAVSEA Form 4160/1 below or submit TMDERS at web site https://nsdsa2.phdnswc.navy.mil/tmder/tmder-generate.asp?lvl=1. All feedback comments shall be thoroughly investigated and originators will be advised of action resulting therefrom.

TMDER / MAILER