S9086–T8–STM-010/CH-593R4

REVISION 4

NAVAL SHIPS' TECHNICAL MANUAL

CHAPTER 593

POLLUTION CONTROL

SUPERSEDES CHAPTER 593, REVISION 3, 1 SEPTEMBER 1991

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

PUBLISHED BY DIRECTION OF COMMANDER, NAVAL SEA SYSTEMS COMMAND.

1 SEP 1999

NAVSEA TECHNICAL MANUAL CERTIFICATION SHEET 1 of 1

Certification Applies to: New Manual ☐ Revision ☒ Change ☐

Applicable TMINS/Pub. No. S9086-T8-STM-010/CH-593R4

Publication Date (Mo, Da, Yr)

Title: NSTM Chapter 593, Pollution Control

TMCR/TMSR/Specification No:

CHANGES AND REVISIONS:

Purpose: Bars in the outside margins indicate changes since the last revision.

Equipment Alteration Numbers Incorporated:

TMDER/ACN Numbers Incorporated:

Continue on reverse side or add pages as needed.

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Printing Release	Digital Media Publishing				

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THIS CHAPTER HAS BEEN REFORMATTED FROM DOUBLE COLUMN TO SINGLE COLUMN TO SUPPORT THE NSTM DATABASE. THE CONTENT OF THIS CHAPTER HAS NOT BEEN CHANGED.

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 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 5090.1B, Change 2 **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. Navy policy, as stated in OPNAVINST 5090.1B, Change 2 with regard to shipboard pollution, is given in the following paragraphs.

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, establish methods of monitoring the effectiveness and compliance of such 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 substantive standards and criteria promulgated by such agencies. It is now required by the Clean Water Act of 1977,

PL 95-217 that naval facilities also comply with state or local administrative procedures for pollution abatement and control. The Oil Pollution Act of 1990 (OPA 90) 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, 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 5090.1B, Change 2 sections 18-1a through c 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 Overseas Environmental Baseline Guidance Document (OEBGD) of October 1992, host nation substantive pollution control laws of general applicability (as required by EO 12088), U.S. law with extraterritorial effect and applicable treaties (including SOFA). Naval vessels operating in the territorial seas (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 methodology afloat that establishes central control and management of ship’s common HM. CHRIMP relies on a controlled HM issue/reuse site (workcenter) with HM inventory tracking by the Hazardous Inventory Control System (HICS). This concept has worked 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 savings in HM cost avoidance and disposal costs. Fleet and type commanders will 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:

a. Situations constituting a direct health hazard.

b. Situations having economic implications.

c. 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, 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 has increased dramatically during the summer of 1988 when syringes and other medical wastes were found washed 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 the medical wastes generated shipboard. The Chief of Naval Operations has issued OPNAV P-45-113-99, Afloat Medical Waste Management Guide of June 1999, which contain specific instructions about the shipboard handling of medical waste.

593-1.2 TERMINOLOGY

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

593-1.2.2 AEROSOL. An aerosol is a suspension of fine subdroplets of a liquid in air.

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 AUTOCLAVE. An autoclave is an apparatus used as a form of sterilization by means of steam under pressure. It is fitted with a gauge that automatically regulates the pressure, and thereby, the degree of heat to which the contents are subjected

593-1.2.5 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 particulate are thrown to the sides of the chamber by centrifugal force, and then are collected and removed.

593-1.2.6 COLLECTION, HOLDING, AND TRANSFER SYSTEM. The Collecting, Holding, and Transfer (CHT) System is the system used for handling sewage and wastewater.

593-1.2.7 COASTAL TERRITORIAL WATERS. Coastal Territorial Waters are defined as an area which extends 3 nautical miles (NM) seaward from the coast of the continental United States. Also known as ″Territorial Sea″ in OPNAVINST 5090.1B, section 19.2.

593-1.2.8 COMMINUTOR. A comminutor is a motor-driven grinder used to pulp or liquefy sewage solids before they enter the CHT tank.

593-1.2.9 CONTIGUOUS ZONE. A Contiguous zone is a zone of the high seas which is contiguous to the territorial sea and which extends 9 NM from the outer limit of the territorial sea.

593-1.2.10 DECIBEL. A decibel (dB) is a unit for expressing the relative intensity of sounds on a scale from zero for the average least perceptible sound to about 130 for the average pain-level sound.

593-1.2.11 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.

593-1.2.12 DIVERTER VALVE. A diverter valve is a valve which can direct pipe flow to any one of several (at least two) discharge locations.

593-1.2.13 ENVIRONMENTAL PROTECTION AGENCY (EPA). A federal agency that regulates, enforces and promotes pollution control compliance and measures to protect and preserve the natural resources.

593-1.2.14 FOOD WASTE. Food waste is a mixture of animal and vegetable wastes containing up to 70-percent moisture and up to 5-percent noncombustible solids.

593-1.2.15 GRAYWATER. Discarded water from deck drains, lavatories, showers, dishwashers, laundries, and garbage grinders as well as discarded water from shipboard medical facilities. Does not include industrial wastes, infectious wastes, and human body wastes.

593-1.2.16 HYDROGEN-ION CONCENTRATION. Hydrogen-ion concentration is measured in terms of pH (pH is defined as the negative logarithm of the hydrogen-ion concentration or log [H]. The pH is used to express the apparent acidity or alkalinity of aqueous solutions. Values below seven indicate acidic solutions and values above seven indicate alkaline-solutions; seven indicates a neutral solution.

593-1.2.17 INTERNATIONAL MARITIME ORGANIZATION. The abbreviation for the International Maritime Organization is IMO.

593-1.2.18 INLAND WATERS. Inland waters are generally navigable fresh or brackish waters upstream from coastal territorial waters.

593-1.2.19 LITIGATION. Litigation is a legal contest carried on through judicial process; a lawsuit.

593-1.2.20 INTERNATIONAL MARITIME CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS. The abbreviation for the International Maritime Convention for the Prevention of Pollution from Ships is MARPOL.

593-1.2.21 MEDICAL WASTE. Medical Waste is divided into two categories - potentially infectious waste and other waste. Potentially infectious waste is that waste which may contain pathogens with sufficient virulence and quantity so that exposure to the waste by a susceptible host could result in an infectious disease. Other waste is defined as disposable medical equipment and material that does not fall into the category of potentially infectious waste.

593-1.2.22 MICROORGANISM A microorganism is a microscopic creature, not necessarily disease-producing; a microbe.

593-1.2.23 MARINE SANITATION DEVICE. MSD is a marine sanitation device.

593-1.2.24 NAVIGABLE WATERS OF THE UNITED STATES. Navigable waters of the United States are the coastal territorial waters (sea) of the United States, the inland waters of the United States; including the United States portion of the Great Lakes, the St. Lawrence Seaway, and the Panama Canal.

593-1.2.25 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.

593-1.2.26 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.

593-1.2.27 NAVAL SHIPS' TECHNICAL MANUAL. The Naval Ships' Technical Manual is referred to as the NSTM.

593-1.2.28 OIL. The term oil refers to oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, lubricating oil, sludge, oil refuse, oil mixed with wastes other than dredge soil, and refined products other than petrochemicals.

593-1.2.29 OIL CONTENT MONITOR (OCM). An oil content monitor is a piece of equipment 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.

593-1.2.30 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 waste water greater than legal limits. This equipment consists primarily of oily waste transfer systems, oil water separators, oil content monitors, oil spill kits and polisher systems.

593-1.2.31 OIL/WATER SEPARATOR (OWS). An oil/water separator is a piece of equipment that separates oil from oily waste drawn from the oily waste holding tank or the bilges. Processed effluent water, if suitable, is discharged directly overboard, while the separated oil is retained for pierside disposal to a shore facility.

593-1.2.32 OILY WASTE. Oily waste is defined as any petroleum product mixed with water that accumulates or collects in bilges, drainage tanks, etc.

593-1.2.33 OILY WASTE HOLDING TANK (OWHT). An oily waste holding tank is a tank specifically designated for the collection of bilge water, tank drainings, tank washings, and other oily mixtures prior to processing by an OWS.

593-1.2.34 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.

593-1.2.35 OLEOPHILIC. Oleophilic is having a tendency or inclination of attracting oil.

593-1.2.36 PARTS PER MILLION. Number of parts per one million parts of a mixture on a volume basis. The abbreviation for parts per million is ppm.

593-1.2.37 PLASTIC WASTE. Plastics wastes are Styrofoam, nylon, vinyl, and similar synthetic materials produced by polymerization that normally float when thrown overboard. There are two designated types of plastic wastes generated on ship: Food-contaminated and non-food-contaminated.

593-1.2.38 POLISHER. A polisher is a piece of equipment which helps further remove oil from the OWS effluent, thereby promoting better discharge water quality.

593-1.2.39 PROHIBITED ZONE. As prescribed by the Oil Pollution Act of 1961, the minimum prohibited zone is the area between a coast and 50 NM out to sea. Refer to OPNAVINST 5090.1B for areas in which the zone extends more than 50 NM.

593-1.2.40 RESTRICTED WATERS. A term used in Section 4 that applies to the navigable waters of the United States, 0 to 3 NM from shore.

593-1.2.41 SEWAGE. Sewage is defined as wastes of human origin from water closets and urinals and transported by the ship soil drain system.

593-1.2.42 SENIOR OFFICER PRESENT AFLOAT. The abbreviation for Senior Officer Present Afloat is SOPA.

593-1.2.43 SPECIAL AREA. A sea area where, for recognized technical reasons in relation to its oceanographical and ecological condition and to particular character of its traffic, the adoption of special mandatory methods for the prevention of sea pollution by solid waste is required. The IMO specifies special areas. Three Annex V special areas have been designated as of August 1994: the Baltic Sea, the North Sea, and the Antarctic (south of 60 degrees south latitude). Other Annex V special areas that are designated but not yet in effect are: the Mediterranean Sea, the Black Sea, the Persian Gulf, the Red Sea, and the Wider Caribbean Area.

593-1.2.44 STATUS OF FORCES AGREEMENT. The abbreviation for Status of Forces Agreement is SOFA.

593-1.2.45 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 sweepings.

593-1.2.46 WASTE OIL. Waste oil is oil whose characteristic have changed markedly since being originally refined and has become unsuitable for further shipboard use, and is not considered economically shipboard recyclable.

SECTION 2.
SOLID WASTE

593-2.1 TERMS AND DEFINITIONS.

593-2.1.1 DOMESTIC WASTE. All types of wastes generated in living spaces on board a ship, except food wastes.

593-2.1.2 FOOD WASTE. Any spoiled or unspoiled victual wastes such as fruits, vegetables, dairy products, poultry, meat products, food scraps, and food particles.

593-2.1.3 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.

593-2.1.4 GARBAGE. For consistency with international law, the Navy has adopted the 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.

593-2.1.5 MEDICAL WASTE. Medical waste is any waste that is generated during patient diagnosis, treatment, or immunization. Medical waste may be divided into two categories, infectious waste and non-infectious waste:

593-2.1.5.1 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 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.

593-2.1.5.2 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. Medical waste determined to be non-infectious can be treated as general waste, using procedures specified for solid waste in this chapter.

Examples 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).

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, unused culture tubes and plates.

e. Packaging and over wrap.

593-2.1.6 OPERATIONAL WASTE. All cargo associated waste, maintenance waste, cargo residues, and ashes and clinkers from shipboard incinerators.

593-2.1.7 PULPED GARBAGE. Pulped, ground, or comminuted garbage or trash capable of passing through a screen with openings no greater than 25 millimeters (0.98 inch).

593-2.1.8 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 traffic, enhanced efforts are required to minimize pollution from ships. Annex V special areas are designated by the International Maritime Organization (IMO) and come into effect internationally after the IMO determines that littoral nations have sufficient capacity to manage the waste that would be offloaded from ships after the special area status is effective. 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. This area is designated, but not ″in effect.″

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. This area is ″in effect″.

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. This area is designated, but not ″in effect.″

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). This area is designated, but not ″in effect.″

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). This area is designated, but not ″in effect.″

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. This area is ″in effect″.

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

N from Florida east to longitude 77° 30’ W; then by rhumb line to 20° N, 59° W; then by rhumb line to 7° 20’ N, 50° W to the coast of French Guiana. This area is designated, but not ″in effect.″

h. The Antarctic area means the sea area south of latitude 60° S. This area is ″in effect″.

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

593-2.2 INTERNATIONAL CONVENTIONS AND LEGISLATION

This section contains background material from which Navy policy is derived.

593-2.2.1 MARPOL. Annex V of MARPOL addresses shipboard solid waste discharge at sea. Annex V establishes three major requirements:

a. No plastic discharges at sea worldwide.

b. Outside of special areas, ships shall not discharge solid waste within 3 NM from shore. Ships may discharge comminuted, pulped, or ground wastes including food wastes, paper, rags, or glass whose discharge is able to pass through a screen with a mesh size no larger than 25 mm between 3 and 12 NM from shore. They may discharge non-floating solid waste beyond 12 NM from shore. Ships may discharge floating waste beyond 25 NM from shore.

c. Within special areas, food waste is the only solid waste discharge authorized. Ships may discharge food waste beyond 12 NM from shore. As of September 1996, three special areas are in effect internationally: the Baltic Sea, the North Sea and the Antarctic Region (south of 60 degrees south latitude).

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.

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 with the international standard, without compromising operational effectiveness.

593-2.2.2 ACT TO PREVENT POLLUTION FROM SHIPS (APPS). APPS implements MARPOL Annex V for the U.S. APPS requires that U.S. public vessels, including warships, to comply with MARPOL Annex V requirements by established deadlines: Surface ships must comply with the plastic discharge prohibition not later than 31 December 1998 and with the special area limitations by 31 December 2000. Once surface ships are equipped with plastic processors, surface ships must immediately comply with the plastic discharge prohibition. Submarines must comply with both the plastic discharge prohibition and the special area requirements after 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 12 millimeters 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.

593-2.2.3 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. EPA. ODA does not apply to waste that is generated aboard ships while underway.

593-2.2.4 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.)

593-2.2.5 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 5090.1B, The Environmental and Natural Resources Protection Manual, CHAPTER 19, ENVIRONMENTAL COMPLIANCE AFLOAT, defines environmental compliance policies and procedures applicable to shipboard operations. If there is any conflicting guidance between this chapter and OPNAVINST 5090.1B, the OPNAV instruction shall take precedence. Tables 593-2-3 and 593-2-4, shown at the end of Section 593-2, summarizes 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 593–2.3.2.2 and 593–2.3.2.3), 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 aboard for shore disposal.

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 plastic waste causes marine life. Plastics pose a special problem since it neither sinks like glass and metal nor disintegrates 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.

- 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. The Navy Solid Waste Policies are as follows:

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. Source segregation of plastics and nonplastics solid waste.

b. Onboard storage of plastics waste.

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

d. Training of personnel responsible for handling ship's garbage on the discharge restrictions applicable to the waste before assignment to these duties. Such training shall include the proper collection, treatment, and disposal of plastics and other solid waste.

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

f. A **Shipboard Solid Waste Management Equipment Guide** , NSWCCD-TR-63-97/25 September 1997, Carderock Division, Naval Surface Warfare Center, is available to assist Ships Force in developing a ship instruction. The Guide can be found at the following World Wide Web Page:http://www.navyseic.com/documents/swguide.pdf This document contains sample shipboard instruction, job qualification requirements, lessons learned, and other information needed to effectively operate and maintain the Plastic Processors, Metal/Glass Shredders, and Large and Small Pulpers.

593-2.3.4 Medical Waste. The Navy policy for discharge of medical waste is described below.

a. Infectious 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-45-113-93 for a listing of NSNs of approved shipboard autoclaves. If retention of infectious wastes would endanger the health and safety of personnel on board, create an

unacceptable nuisance condition, or compromise combat readiness, overboard discharge is authorized beyond 50 miles provided such waste (excluding sharps) has been:

(1) Steam sterilized

(2) Properly packaged

(3) Weighted for negative buoyancy to ensure that it will not be washed ashore.

Administrative records shall be maintained for instances of overboard discharge of medical wastes.

b. For foreign countries, the packaging, handling, storage, transport, and disposal of infectious medical waste shall be consistent with applicable SOFAs or international agreements. If no SOFA or international agreement exists, infectious medical waste shall be disposed of as specified by the cognizant fleet commander.

c. Shipboard packaging, labeling, handling, and storage of infectious medical waste shall be per the Afloat Medical Waste Management Guide, OPNAV P-45-113-93.

d. After steam sterilizing, infectious paper and cloth-based medical waste may be incinerated aboard ship if this capability exists.

e. 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.

NOTE

Unused sharps shall be disposed of ashore in the same manner as medical waste
.

f. Plastic and wet materials shall not be incinerated.

g. Liquid wastes may be disposed of by discharging into the sanitary system.

h. Non-infectious medical waste may be disposed of as trash and does not require steam sterilizing or special handling. In any event, if this material is disposed of at sea, it should be rendered unrecognizable and weighted for negative buoyancy to ensure it will not be washed ashore.

i. The requirement to steam sterilize prior to disposal at sea does not apply to submarines.

j. Shore based commanders shall provide the required services for disposal of medical waste generated 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).

k. 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.

l. 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-45-113-93.

593-2.3.5 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.

593-2.4 SHIPBOARD SOLID WASTE PROCESSING EQUIPMENT.

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. These equipments are discussed below.

593-2.4.1 COMPACTORS. Compactors compress trash and refuse into a denser and more solidly packaged mass to minimize trash volume and improve handling. Many ships are outfitted with compactors.

593-2.4.2 INCINERATORS. Incinerators are designed for disposal of combustible trash such as paper, cardboard, wooden boxes and crates, cartons, magazines, and rags. Food waste also may be burned in incinerators equipped with auxiliary burners. Incinerators conforming to MIL-I-15650 (CANCELLED) are normally installed (See Figure 593-2-1).

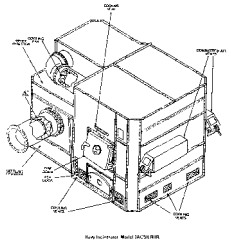

Figure 593-2-1 VENTOMATIC MILSPEC Incinerator

NOTE

Incinerators shall be used to the maximum extent possible. Incinerators shall be used for all combustible trash **except** plastics waste, hazardous materials and infectious medical waste. Application shall not be limited to burning of classified documents.

593-2.4.2.1 Operational Areas. Incinerators shall be operated in all areas except within 12 NM of the United States coast where local or state regulations may prohibit or limit incinerator use due to local air emission standards. Navy ships operating in the territorial sea (out to 12 NM) of foreign countries shall comply with the air emission standards defined in the SOFA or international agreement. If no SOFA or international agreement exists, vessels shall not operate incinerators within 12 NM of foreign coasts. The incinerator shall be available for operation at all other times except when ship operations may prohibit its use; for example during refueling or flight operations. When in port, incinerators shall not be used and all trash and refuse shall be transferred ashore for disposal.

593-2.4.3 INCINERATOR OPERATION. Incinerator operators shall use the operating manual for the unit and the instruction placard mounted on the unit for specific operating instructions. The general rules given in the following paragraphs should be followed. Personnel who operate the incinerator shall be aware of the location of, and have ready access to, a portable fire extinguisher and the manual sprinkler operation valve.

593-2.4.3.1 Safety Precautions. Safety precautions for operating the incinerator are described below.

a. Safety glasses, face shields, fireman's or welder's gloves, leather apron, anti-flash hood, and long sleeve shirts shall be worn whenever operating the incinerator. Safety glasses must be worn with the face shields; face shields alone do not provide adequate eye protection.

b. Open and inspect all trash bags prior to placing them into the firebox for batteries, aerosol cans, metal, glass, CO cartridges, and plastics. If these items are found, all trash from that division must be resorted. Do not allow resorting in the incinerator compartment. The operators should notify their division officer that improperly sorted trash was delivered for incineration. The division officer should take appropriate action to ensure proper segregation in the future.

c. Batteries or aerosol cans will explode in the incinerator. Keep the firedoor closed as much as possible to minimize the risk to personnel and to maintain proper system draft. Only personnel wearing all PPE listed above should be in front of the incinerator when the firedoor is opened.

d. To avoid a fire hazard, do not store trash in the incinerator compartment or allow trash to accumulate during operation.

e. No eating or drinking within the incinerator compartment.

f. All personnel operating the incinerator must know how to use the fire extinguisher installed in each compartment and how to activate the sprinkler system.

NOTE

The valves to activate the sprinkler system are located outside the incinerator compartment.

g. Do not overfeed the incinerator. Follow posted operating instruction and procedure placard.

h. Do not leave incinerator unattended while in operation.

i. When handling the ash during clean-out or disposal, wear gloves, goggles and a respirator with a HEPA filter. When the ash must be temporarily stored on board, do not place combustible materials in the vicinity of the ash containers.

593-2.4.3.2 Preparation for Operation. Before the incinerator is operated, the ash pit, settling chamber, and grates shall be cleaned out with the rake and shovel provided with the incinerator. Remove from the incinerator all wires, metal straps, and other non-burnable material. Ensure a continuous supply of air to the incinerator compartment; start incinerator blower and cooling fan, and make certain both fans are operating before loading trash into the incinerator.

593-2.4.3.3 General Operating Instructions and Procedures.

a. Do not leave loose trash unattended around the incinerator; the major cause of incinerator-related hazardous fires is ignition of loose trash stored around the incinerator.

CAUTION

Safety glasses, face shields, fireman's or welder's gloves, leather apron, anti-flash hood, and long sleeve shirts shall be worn whenever operating the incinerator. Safety glasses must be worn with the face shields; face shields alone do not provide adequate eye protection.

b. Shipboard incinerators installed after 1952 operate under an induced draft, creating a negative furnace pressure in most instances. Air passages to the incinerator compartment and trash stowage bins shall remain open to ensure an adequate and continuous supply of air for combustion and cooling.

c. Incinerators are provided with a double casing to maintain reasonable temperatures within the incinerator compartment and to keep the outer surface temperature safe for personnel. A cooling fan draws air between the two casings and keeps the outer casing temperature below 60° C (140° F). The cooling fan must be operating before loading trash into the incinerator.

d. The main draft fan ensures that exhaust gases from the firebox discharge into the exhaust stack and exit the ship through the stack discharge. The main draft fan must be operating before loading trash into the incinerator.

e. A centrifugal type dry-spark arrester is built in as an integral part of the incinerator to prevent discharge of particles from the stack. The settling chamber beneath the spark collector shall be kept clean to maintain satisfactory operation and prevent damage to the unit. Incinerator exhaust shall be placed so that it does not affect air compressor or ventilation air intakes.

f. Do not load the incinerator higher than the center of the fire door. Overloading causes smoking and backdraft and will burn a hole in the ducting between the firebox and the spark arrestor. Adjust ash door and furnace air intake door for good burning. Stir trash with the rake, as needed, to promote good burning. When the trash is about half consumed, more trash may be loaded.

g. On ships which have two incinerators with a common exhaust stack, fans for both units should be in operation whether or not both units are being used to burn trash. This is required to provide for a uniform flow of exhaust. Sparks can ignite loose trash in the adjacent incinerator compartment when the adjacent incinerator fan is not on. If one incinerator is removed, the draft fans must be resized for single incinerator operation. If the draft fans are not resized, damage to the incinerator, exhaust stacks, and exhaust stack screens may result.

h. In accordance with Gen Specs/GSO Section 162, a ½ inch mesh, 12 BWG, high temperature screen shall be installed in the exhaust stack or at the stack discharge. The screen shall be in an accessible location. As already placed on many ships, it is recommended that this screen be installed in the traverse ducting between the firebox and the spark arrester. This screen will significantly reduce the amount of unburnt material leaving the firebox which is important, especially for classified material burns.

593-2.4.3.4 MILSPEC Incinerator Operating Instructions and Procedures.

a. Each operator will be thoroughly familiar with these instructions, the safety precautions placard, OPNAVINST 5090.1B chapter 19, and all of the operating procedures and safety precautions contained in this Section before operating the incinerator.

b. Fan System Description.

(1) For VENTOMATIC incinerators, there are two fans on the incinerator. The cooling fan is located on the top of the incinerator. This fan draws in air through screens in the outer shell of the incinerator and discharges into the annular space between the inner and outer smoke pipe. The main draft fan is located next to the fire door. This fan blows air from the compartment into the inner smoke pipe and acts as an eductor, drawing exhaust gases from the firebox through the centrifugal spark arrester. The CVN-68 class ships have an additional induced draft fan installed on the stacks. These fans must be operating before loading trash into the incinerator. A small population of the fleet (submarine and destroyer tenders) have VENTOMATIC incinerators installed which operate under a fuel firing system (APL 302010018).

(2) For BRULE incinerators, there are two fans on the incinerator. The cooling fan draws in air through screens in the outer shell of the incinerator and discharges into the annular space between the inner and

outer smoke pipe. The main draft fan draws exhaust gases from the firebox through the centrifugal spark arrester and discharges into the inner smoke pipe. These fans must be operating before loading trash into the incinerator.

c. A thermometer is installed in the stack on all non fuel-fired incinerators to provide feedback to the operators on the incinerator stack temperature. This information is used to maximize the processing rate without exceeding the MILSPEC maximum temperature requirements.

NOTE

All ships may not have this thermometer installed. MACHALT FECP No. 410 will eventually install this thermometer on all non-fuel fired incinerator systems. (BRULE APLs 302100001 & 302100002; VENTOMATIC APLs 302010006 & 302010012)

d. Place a small amount of paper into the incinerator and ignite.

e. Once the paper is burning, turn on all the fans.

f. Add more paper until the trash level is up to the door sill but 6 inches below the air ports on the side and rear of the firebox. Do not add trash above this level. Rake as necessary to promote good burning.

g. Maintain the trash level as noted in step f. After the incinerator has been running for approximately one hour, the incinerator is at it's maximum operating temperature.

NOTE

- Note and record stack temperature _____° F (maximum operating temperature) -

h. Initially, have maintenance personnel remove the face plate on the temperature gauge. If the temperature as recorded in step g is less than 600° F, set the red indicating arrow to the temperature as recorded in step g and the green indicating arrow at 100° F below that temperature. If the temperature as recorded in step g is above 600° F, set the red indicating arrow at 600° F and set the green indicating arrow at 500° F. The operating range for the incinerator will be between the green and red arrows. The MILSPEC requires that the stack temperature not exceed 650° F.

i. Maintain trash level during operation. Do not overfeed the incinerator. If flames can be seen being drawn into the spark arrester, suspend feeding until the trash level burns down and the flames are no longer being drawn into the spark arrester.

j. To maintain the maximum processing rate during operation: when the stack temperature drops, either 1) add trash if the trash level is low or 2) rake the trash if the trash level is high.

593-2.4.3.5 Shutting Down (All incinerators).

a. When securing the incinerator, run fans for one half hour after the trash has burnt down and no visible embers are evident.

b. When the incinerator has cooled to room temperature, remove ashes from ash pit and spark arrestor. Remove ashes from settling chamber after approximately 72 hours of operation. Also remove ashes from plenum box (CVN-68 class ships only).

c. Places ashes into metal container (30 gallon trash can). Mix ashes with plenty of water to ensure that hot embers are out.

593-2.4.3.6 Maintenance (All incinerators). For satisfactory operation of the incinerator and the spark collector, it is necessary to maintain an adequate air supply. Avoid overloading, and clean out the ash pit and settling chambers of the spark collector frequently in accordance with PMS requirements.

CAUTION

Operators shall wear goggles and a respirator with a HEPA filter when cleaning the incinerator, incinerator compartment, and whenever handling the ash. For temporary storage of the ash, wet the ash prior to storage. Incinerator shall be at ambient temperature before cleaning.

The clean-out procedure is:

a. Clean out all residue and non-combustible material remaining on the grates after each burning of the incinerator. Air shall pass through the grates for proper draft and combustion.

b. Clean out ash pit under grates after each burning. Accumulation of ash in the ash pit will restrict air cooling of grates and cause needless damage to grates.

c. Perform all clean-out work daily before using the incinerator. This will help prevent the draft from discharging lightweight particles from the stack.

d. Worn or damaged firebrick lining of incinerator should be replaced with MIL-B-l5606 firebrick or firebricks from original equipment manufacturer.

e. If the incinerator compartment or unit gets excessively hot, check to see if cooling fan is operating satisfactorily.

f. Metal screens are required to prevent escape of unburned material from the exhaust gas system of incinerators. These screens may be either in the uptake stem or at the top of the stack. Inspect every three months for cleaning or replacement as required.

593-2.4.3.7 Ash disposal.

a. Storage Onboard - Store in incinerator compartment until ashes can be discharged overboard or disposed of in part. Wet ash prior to overboard discharge.

b. Overboard Discharge - Overboard discharge is permitted outside 25 NM.

CAUTION

Salt water and ash forms a weak acid and prolonged contact in metal container may cause it to leak. If prolonged storage is necessary, inspect container for leakage daily. If container leaks, place the leaking container in an overpacked drum.

593-2.4.4 FOOD WASTE DISPOSERS.

593-2.4.4.1 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 shipboard sewage holding tanks only when a ship is docked and the sewage tanks 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.

593-2.4.4.2 Location. Food waste disposer types and locations described in the following paragraphs:

a. Food Waste Disposal Room. One food waste disposer normally is installed in each food waste disposal room. The disposer is usually a SOMAT Navy Model 5. The disposer shall be fitted in a suitable stainless steel disposal table. The SOMAT Navy Model 5 unit, if fitted with a sizing ring with openings of 0.250-inch diameter maximum, may also be used for the destruction of all levels of pulpable classified information including that designated as Sensitive Compartmented Information.

NOTE

The unit will not pulp, and is not approved for the destruction of, miniaturized data media such as microfiche.

b. Flag/Captain Galley or Scullery. One food waste disposer, Size I (See Appendix E), normally is installed in the drain line of the designated pre-rinse sink. The designated pre-rinse sink should be fitted with a portable grating at dresser top level to support dishwashing machine racks. A flexible hose with a manually operated spray head will be provided above the sink.

c. Wardroom Galley or Scullery and Crew Sculleries. One food waste disposer, Size II (See Appendix E), with pre-rinse unit usually is installed in conjunction with each dishwashing machine in crew sculleries.

593-2.4.4.3 Operation. Operation of food waste disposer units depends on location. Methods of operation in various locations are described in the following paragraphs.

a. Food Waste Disposal Room. Fresh water or seawater is used to operate disposers installed in the food waste disposal rooms. Openings to the food waste disposer feed chute shall be kept covered while the disposer is being operated to prevent escape of water aerosols into the disposer room. Water aerosols contain bacteria and cannot be tolerated near food service areas, food preparation areas, or areas where dishware/utensils are stored. After the disposer has been used, the hopper shall be flushed clean with a steam lance and fresh water

b. Food Service Area. Fresh water only is used to operate disposers located in sculleries or food service areas. Freshwater piping is sized to limit the flow of fresh water to the hopper to that volume necessary for satisfactory disposer operation. Seawater is used to operate a standard 2-inch peripheral jet eductor installed in the drain line under the disposer to ensure that ground food waste is flushed through the drain line. The eductor also creates a negative pressure to retain aerosols within the disposer. An eductor is not used with SOMAT Navy Model 3 or 5.

NOTE

To conserve fresh water, a limited number of installations have been specifically approved for introduction of seawater into the body of the pulper as a pulping medium. A feed chute curtain is installed to prevent the dispersion of aerosols into the compartment.

593-2.4.5 FOOD WASTE DISPOSERS FOR NEW CONSTRUCTION AND REPLACEMENT PROGRAM.

593-2.4.5.1 Location and Types. Location and types of food waste disposers for the new construction and replacement program are discussed in the following paragraphs.

593-2.4.5.2 Dedicated Food Waste Disposal Rooms. The food waste disposal room (solid waste processing room) shall be fitted with a large pulper, NAVSEA DWG 593–6960300 or a small pulper, NAVSEA DWG 593–6960581. Seawater shall be used for both the pulping and flushing operations.

593-2.4.5.3 Crew, Chief Petty Officer, and Wardroom Galleys and Sculleries. The crew, Chief Petty Officer (CPO), and wardroom galleys and sculleries shall be fitted with waste pulping systems, Navy Model 3S, as manufactured by the SOMAT Corporation, Model P3–NSU Waste Disposal System, as manufactured by Insinger Machine Company, or its equivalent. In galley areas, the pulping systems shall be piped only with fresh water to prevent contamination of food preparation areas by seawater. In sculleries, the pulping system shall be piped with both seawater and fresh water, using the valves supplied with the pulper. The reduced pressure backflow preventer supplied with the pulper shall be used in the freshwater line. Seawater shall be used when operating in waters beyond three nautical miles of the U.S. coast. Only fresh water shall be used when the ship is in port and discharging ashore through the CHT system. Do not operate where discharge is prohibited. Clean dishware and utensils shall not be stored in any scullery where seawater is used in the pulper.

593-2.4.5.4 Flag and Captain Galleys. The flag and captain galleys shall be fitted with food waste disposers Model 75AD, as manufactured by American Delphi, Inc., or its equivalent. The disposers shall be resiliently mounted under the sink and shall be piped with fresh water only. These disposers are designed to handle soft food waste only. Silverware, metal and glass objects, and large bones should not be put into the unit, since permanent damage may result.

593-2.4.6 MODES OF OPERATION. Modes of operation of food waste disposers in various locations are discussed in the following paragraphs.

593-2.4.6.1 Underway Operation Mode. The food waste disposer shall not be used while operating within 3 NM of the U.S. coast or any foreign coast. Beyond these restricted zones, the food waste disposers shall be operated so that they discharge directly overboard by way of a diverter valve or other means.

593-2.4.6.2 In-Port Operation Mode. The food waste disposal system shall be arranged so that by use of the diverting valve or other means, the pulped waste is flushed to the ship CHT tanks.

593-2.4.6.3 Instruction Plates. The following instruction plates are for SOMAT Model 3S, SOMAT Model 5S or any garbage grinder/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:

NOTICE

THIS MACHINE SHALL NOT BE OPERATED WHEN THE SHIP IS OPERATING WITHIN 3 MN 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:

NOTICE

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

Use of seawater for pulping and flushing is restricted to the food waste disposal room and dedicated sculleries only, and shall not be permitted in food preparation areas. Additional indicator plates shall be installed at each diverter valve or control to indicate the setting for each mode.

593-2.4.7 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.

593-2.4.8 PLASTICS WASTE PROCESSOR. Plastics waste processors (PWPs) have been installed on most surface ship classes. 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, a compress melt unit, a closed loop cooling unit, and a heat sealer. The plastics processor used for most ships consists of two compress melt units, a CLCU, a 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. The larger ship classes received more than one plastics processor installation. See Table 593-2-1 for the equipment mix for a particular ship class.

593-2.4.8.1 Solid Waste (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, bag lined, collection bin. See Figure 593-2-2.

WARNING

Metal and Glass shall not be shredded with the Plastics Shredder. Metal and Glass shall be shredded with the Metal and Glass Shredder ONLY.

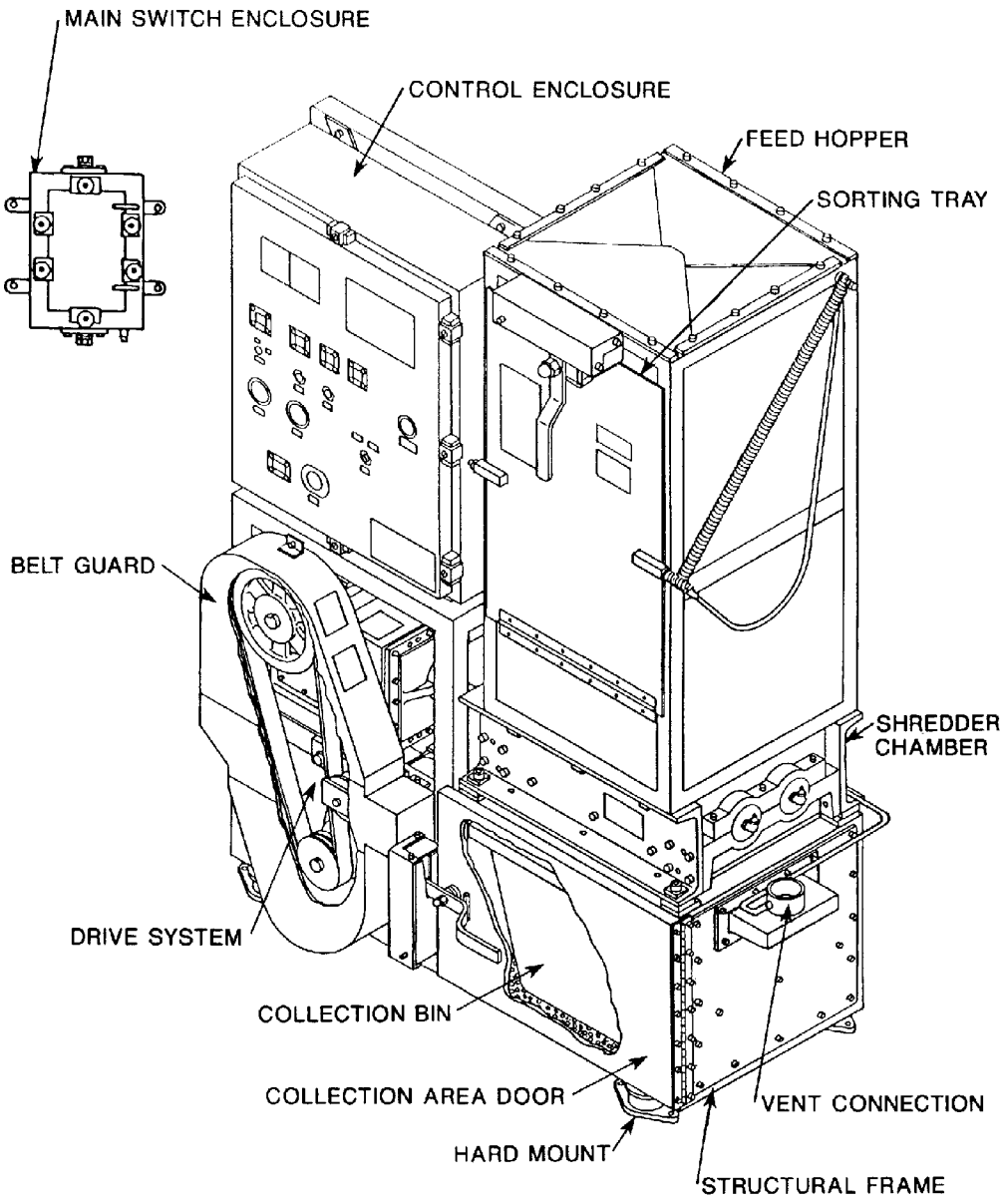

Figure 593-2-2 “Plastics” Shredder

NOTE

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

593-2.4.8.2 Compress Melt Unit. After shredding, the bagged plastics waste is loaded into the chamber of a compress melt unit, where it is compacted by a mechanical ram. The chamber, ram, and door are heated to soften, fuse, and sanitize 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 disk dimensions are 20 inches in diameter by 1.5-2 inches thick. Each disk weighs approximately 10 pounds. See Figure 593-2-3.

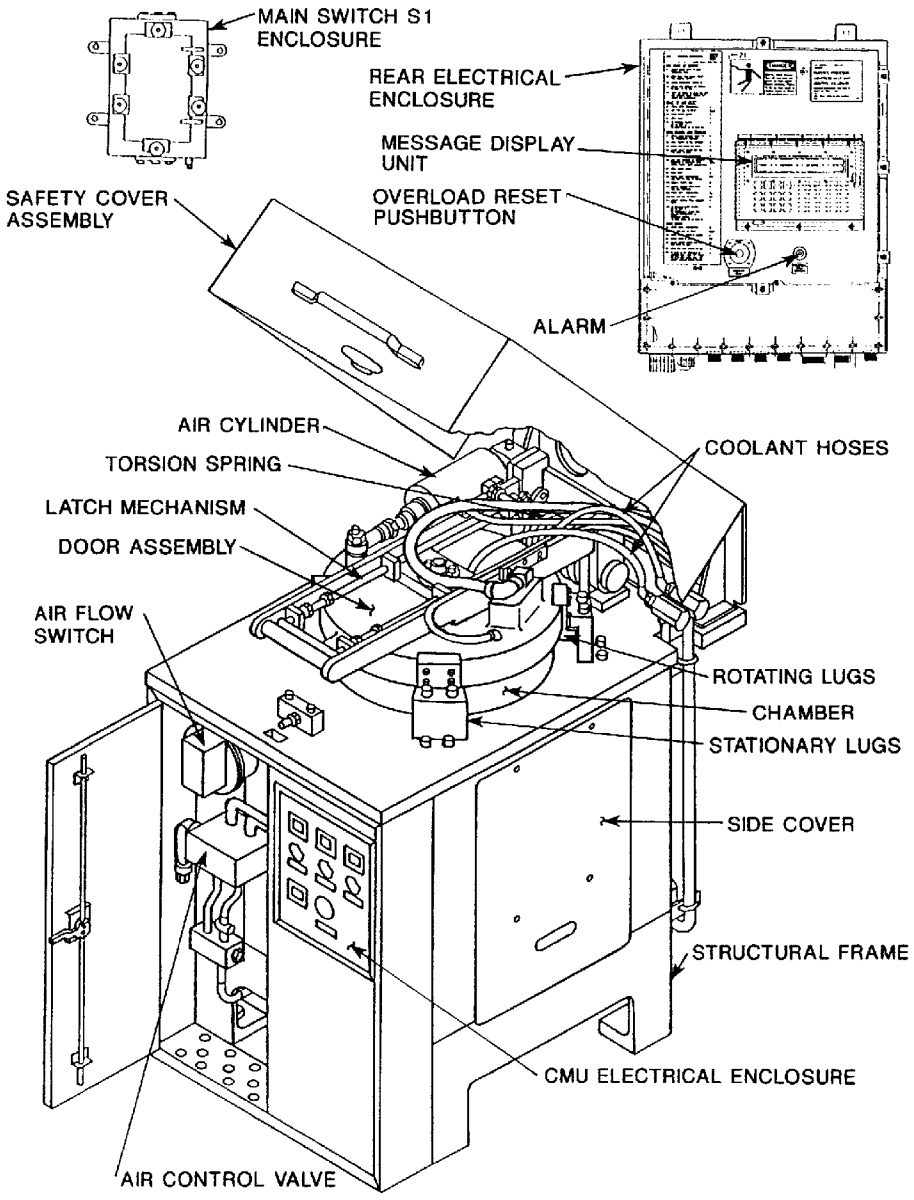

Figure 593-2-3 Compress Melt Unit

593-2.4.8.3 Instruction Plates. The following instruction plates are for the CMU. Instruction plates with letters 1/4-inch high shall be installed in the vicinity of the CMU control enclosure:

NOTE

STEP C1 REQUIRES THE APPLICATION OF MOLD RELEASE AGENT (NSN: 9150-01-447-4411) TO THE INSIDE OF THE DOOR AND CHAMBER AND THE TOP OF THE RAM. APPLY GENEROUS AMOUNTS PRIOR TO PROCESSING EACH LOAD OF PLASTICS TO ENSURE PROPER LUBRICATION, TO MINIMIZE WEAR, AND TO SIMPLIFY CLEANING.

CMU OPERATING INSTRUCTIONS

PRE START-UP CHECKS

A1	CHECK WATER LEVEL IN CLCU
A2	OPEN INLET AND OUTLET VALVES FOR COOLING WATER.
A3	CHECK THAT VENTILATION SYSTEM IS ON.
A4	CHECK THAT SHIP SERVICE AIR SUPPLY IS LINED UP TO CMU.
A5	TURN ON POWER TO CLCU AND CMU AND OBSERVE THAT WHITE “POWER ON” LIGHTS ARE ILLUMINATED.

START-UP AND RESET

B1	PRESS RESET PUSHBUTTON.
B2	WAIT FOR CMU TO RESET.
B3	OPEN SAFETY COVER.
B4	OPEN DOOR.
B5	TO PROCESS PLASTIC, GO TO STEP C1. TO SHUT DOWN, GO TO STEP D4.

LOAD PLASTIC AND PROCESS

C1	SPRAY MOLD RELEASE AGENT ON ALL PROCESSING SURFACES.
C2	LOAD PLASTIC TO FILL CHAMBER.
C3	CLOSE AND LATCH THE DOOR.
C4	CLOSE SAFETY COVER AND WAIT FOR DOOR TO LOCK.
C5	PRESS PROCESS PUSH-BUTTON.
C6	WAIT FOR PROCESS TO COMPLETE (PROCESS IS COMPLETE WHEN GREEN “READY” LIGHT ILLUMINATES).
C7	OPEN SAFETY COVER.
C8	OPEN DOOR.
C9	PRESS EJECT PUSH-BUTTON.
C10	REMOVE PLASTIC DISK.
C11	SCRAPE RESIDUE FROM DOOR AND RAM SURFACES.
C12	PRESS RESET PUSH-BUTTON.
C13	WAIT FOR CMU TO RESET.
C14	SCRAPE RESIDUE FROM CHAMBER SIDES.
C15	TO PROCESS MORE PLASTIC, GO TO STEP C1. TO THOROUGHLY CLEAN CMU, FOLLOW INSTRUCTIONS IN TECHNICAL MANUAL. TO SHUT DOWN, GO TO STEP D1.

SHUT DOWN

D1	PRESS RESET BUTTON.
D2	WAIT FOR CMU TO RESET.
D3	OPEN SAFETY COVER, IF CLOSED.
D4	CLOSE DOOR, IF OPENED.
D5	CLOSE SAFETY COVER AND WAIT FOR DOOR TO LOCK.
D6	TURN OFF MAIN POWER TO CMU.
D7	IF CLCU IS NOT REQUIRED BY ANOTHER CMU, TURN OFF POWER TO CLCU AND CLOSE INLET AND OUTLET COOLING WATER VALVES.

Refer to Technical Manual S9593–C4–MMM-010 “Processor, Plastics, NAVSEA DWG 593–6961199” for detailed instructions.

593-2.4.8.3 Closed Loop Cooling Unit. Processing heat is removed from the Compress Melt Unit by a separate cooling unit. The cooling unit consists of a pump, a motor, a heat exchanger, an expansion tank, and the electri-

cal 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. Either seawater or chilled water will be used as the medium to remove heat from the closed-loop side cooling fluid (potable water).

593-2.4.8.4 Heat Sealer. The Compress Melt unit might not heat-treat the disk enough to completely sanitize any food contamination in it. Disks with food contamination must be placed in specially designed 24- x 27-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. The heat sealer uses heat and compression rollers to close the odor-barrier bag with an airtight seal.

593-2.4.8.5 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.

HEAT SEALER OPERATION

1. PLUG IN HEAT SEALER AND SET THE THERMOSTAT KNOB TO 2.5.
2. DEPRESS THE ROCKER SWITCH TO THE PREHEAT SETTING. THE RED INDICATOR LIGHT WILL COME ON AND STAY ON UNTIL A TEMPERATURE OF 110-140° C HAS BEEN REACHED. (IT MAY BE NECESSARY TO ADJUST THE THERMOSTAT KNOB SLIGHTLY UP OR DOWN TO ACHIEVE PROPER BAG SEALING. INCREASE THE TEMPERATURE IF THE BAG IS NOT FULLY SEALED; DECREASE THE TEMPERATURE IF THE BAG MELTS.)
3. WHEN THE RED INDICATOR LIGHT GOES OUT, THE HEAT SEALER IS READY FOR USE.
4. TEAR OFF AN ODOR BARRIER BAG FROM THE ROLL.
5. PLACE THE ROCKER SWITCH TO THE HEAT/MOTOR SETTING.
6. DEPRESS THE ROCKER SWITCH TO THE HEAT/ MOTOR SETTING.
7. POSITION THE LEFT SIDE OF THE ODOR BARRIER BAG INTO THE RIGHT HAND SIDE OF THE HEAT SEALER AND GUIDE THE BAG THROUGH UNTIL THE SEAL IS COMPLETE ACROSS THE ENTIRE BAG.
8. RETURN THE ROCKER SWITCH TO THE PREHEAT SETTING TO MAINTAIN STANDBY MODE.
9. STACK THE SEALED DISKS CAREFULLY IN THE DESIGNATED STORAGE AREA.
10. REMOVE AND STOW HEAT SEALER PRIOR TO SPACE WASHDOWN.

593-2.4.8.6 Vacuum Heat Sealing Procedure for All Plastics Waste on Small Ships. The following procedure is for vacuum heat sealing food contaminated and non-food contaminated plastics waste into 36- x 50-inch odor

barrier bags (NSN: 8105-01-392-6515) using heat sealer (NSN: 3540-00-819-8837). A 24- x 27-inch (NSN: 8105-01-392-6510) odor barrier bag is also available. Ships with crew sizes less than 100 may prefer the smaller bag. Small ships not receiving plastics processor installations are encouraged to purchase heat sealers and employ this method of processing plastics waste to prevent odor and sanitation problems while storing plastics before returning to port. Vacuum heat sealing will reduce the volume of plastics waste by approximately 45% allowing ships to retain more plastics waste. It is not necessary to segregate food and non-food contaminated plastics waste when using this procedure. Any model wet/dry vac can be used as the vacuum source.

NOTE

This procedure can also be used if a vacuum is not available. If a vacuum is not used, there will be less volume reduction.

NOTE

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

1. Plug in the heat sealer and set the thermostat knob at 2.5.
2. Depress the rocker switch to the PREHEAT setting. The red indicator light will come on and stay on until a temperature of 110- 140° C has been reached (if the temperature exceeds 150° C, adjust the knob slightly lower and wait until the correct temperature is attained).
3. When the red indicator light goes out, the heat sealer is ready for use.
4. Slowly tear off an odor barrier bag from the roll, being careful to tear only along the perforations.
5. Fill the odor barrier bag by first untying or tearing open the polyethylene trash bags filled with plastic waste that have been brought to the staging area. Untying these bags will eliminate entrapped air. Place as many bags as necessary to fill the odor barrier bag, allowing enough room at the top for heat sealing the open end. Do not jam waste into the odor barrier bag since excessive force on hard plastic waste can result in puncturing the bag.
6. Depress the rocker switch labeled HEAT/MOTOR on the heat sealer to activate the drive motor and chains.
7. Pick up the filled odor barrier bag and pull the open end of the bag taut. Position the left side of the odor barrier bag into the right hand side of the heat sealer and guide the bag through until the seal is about 3/4 of the way across. Then quickly turn off the heat sealer motor by returning the rocker switch to the PREHEAT setting. The odor barrier bag will be held in place by the heat sealer rollers.
8. Place the wet/dry shop vacuum hose nozzle inside the odor barrier bag and turn on the electrical power to the shop vacuum. Move the hose inside the bag until a good vacuum is achieved. This may require manipulating the waste plastic inside the odor barrier bag to prevent plugging of the vacuum hose nozzle. To achieve full vacuum, gather the bag material around the open end of the bag and squeeze it against the inserted hose. Allow about 30-60 seconds to complete the vacuum operation.
9. Turn off the shop vacuum and quickly withdraw the vacuum hose from inside the odor barrier bag. Then turn on the heat sealer again by moving the rocker switch to the HEAT/ MOTOR setting to complete the heat seal across the bag. Visually check the seal to make certain that the seal is a good one. A good seal will not separate when pulled on both sides. If in doubt, reseal over the initial seal.

10. Return the rocker switch to the PREHEAT setting to maintain standby mode or turn off the heat sealer by depressing the rocker switch to the center position.

11. Carry the sealed odor barrier bags carefully to the designated storage area. Make sure that the bags are not scraped against abrasive objects in passageways during transit or stacked up against sharp objects in the storage area.

593-2.4.9 LARGE AND SMALL PULPERS. Large and small pulper installations are planned for most surface ship classes. Most installations should be completed by the end of 2000. The large and small pulpers process paper, food and cardboard waste into a 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.

593-2.4.9.1 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.

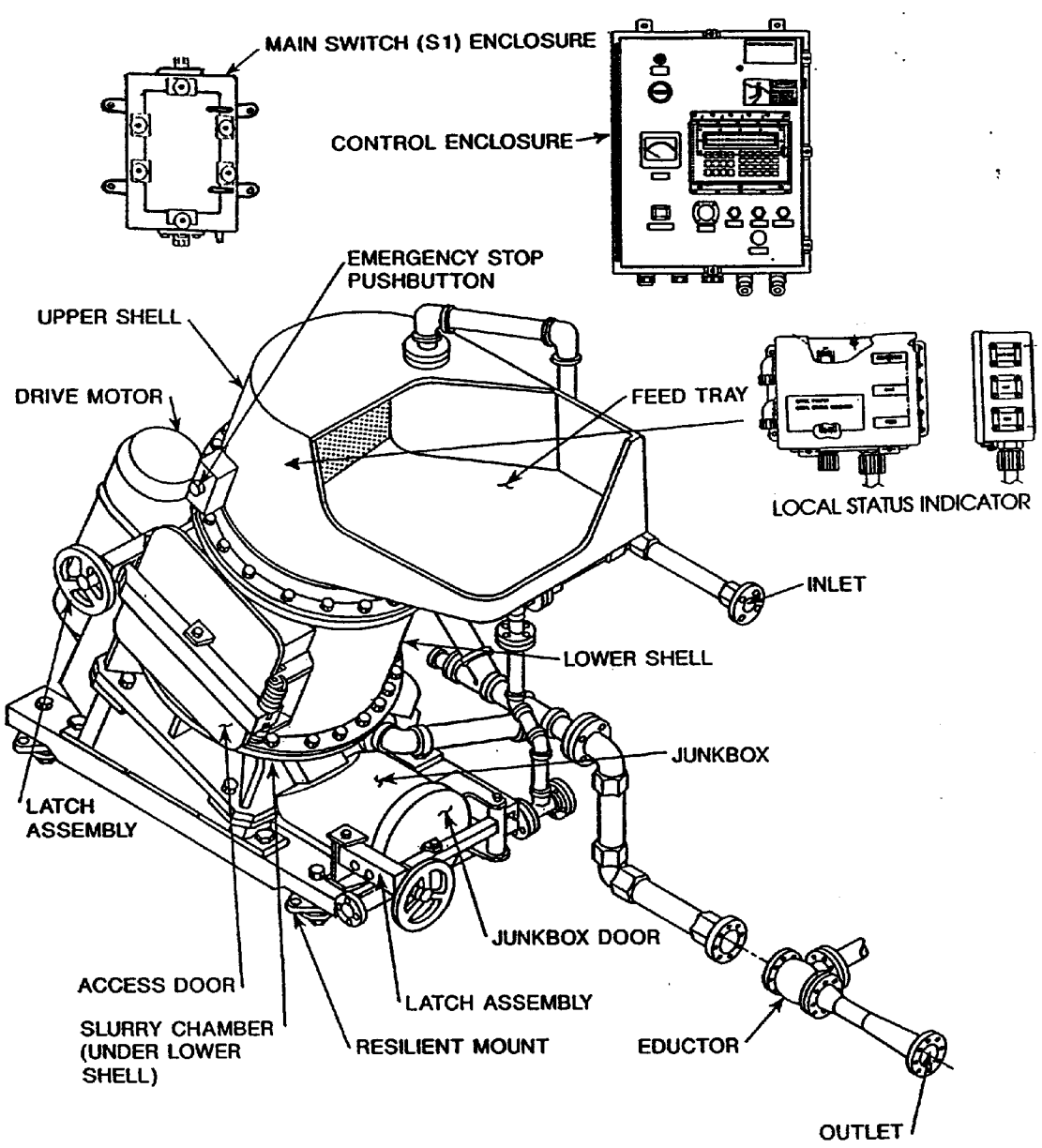

Figure 593-2-4 Large Pulper

NOTE

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

593-2.4.9.1.1 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:

NOTICE

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

LARGE PULPER OPERATION

1. CLOSE THE PULPER DRAIN VALVE.
2. OPEN THE MANUAL SEAWATER SHUTOFF VALVE(S).
3. ENERGIZE THE MAIN SWITCH. THE WHITE ″POWER ON″ LIGHT WILL ILLUMINATE.
4. PRESS THE TIMED START PUSH-BUTTON. AMBER ″WAIT″ LIGHT WILL ILLUMINATE, CHECK THAT THE TANK IS FILLING.
5. AFTER APPROXIMATELY 1 TO 3 MINUTES, THE GREEN ″FEED″ LIGHT WILL ILLUMINATE, INDICATING THAT FEEDING CAN BE STARTED.
6. FEED PAPER, CARDBOARD, AND FOOD WASTE ONLY WHEN THE FEED LIGHT IS ILLUMINATED. MAINTAIN A CONSTANT FEED RATE, OBSERVING THE PULP IN THE CHAMBER. STOP FEEDING WHEN THE AMBER ″WAIT″ LIGHT ILLUMINATES OR THE RED ″DON'T FEED″ LIGHT ILLUMINATES AND THE AUDIBLE ALARM SOUNDS.
7. WHEN PROCESSING IS COMPLETE, PRESS THE TIMED STOP PUSH-BUTTON. OPERATION WILL CONTINUE FOR APPROXIMATELY 15 MINUTES.
8. SECURE AND CLEAN THE PULPER IN ACCORDANCE WITH TECHNICAL MANUAL INSTRUCTIONS.

Refer to the technical manual S9593-C2-MMM-010, ″Pulper, Large, NAVSEA DWG 593-6960300″, for detailed instructions.

593-2.4.9.2 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.

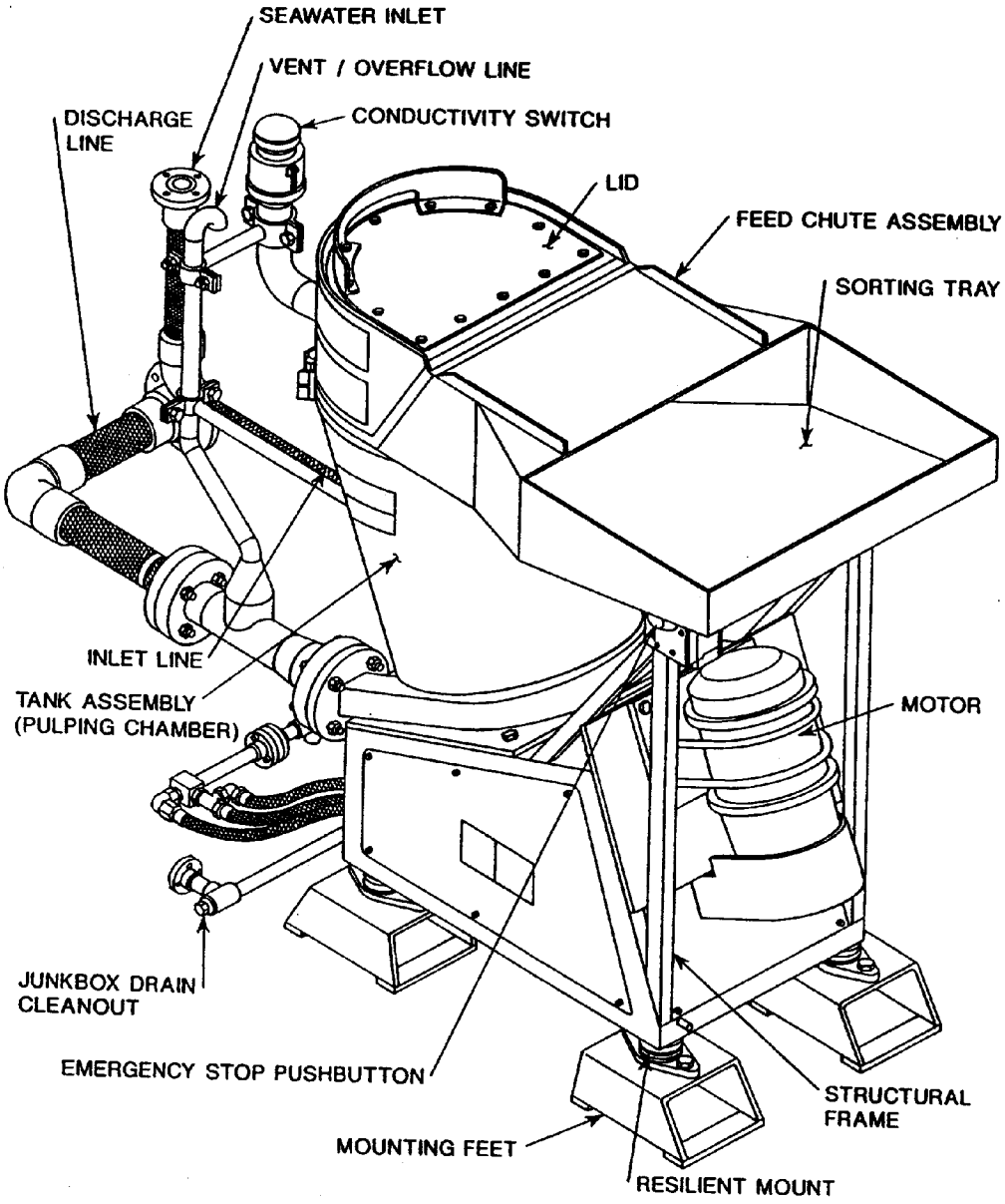

Figure 593-2-5 Small Pulper

NOTE

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

593-2.4.9.2.1 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:

NOTICE

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

SMALL PULPER OPERATION

PRE START-UP CHECKS

1. ENSURE THAT ALL FITTINGS, FASTENERS, AND ELECTRICAL CONNECTIONS ARE SECURE.
2. REMOVE LEFTOVER WASTE FROM PULPER TANK ASSEMBLY AND JUNKBOX.
3. INSPECT THE PULPER FOR IMPELLER BINDING AND / OR BROKEN OR LOOSE CUTTING BLADES.
4. SECURE JUNKBOX BASKET AND FEED CHUTE LID.
5. CLOSE VALVES V7 AND V15.
6. OPEN VALVES V3-V6, V8-V14 AND AIR VALVES AV2-AV4.
7. IF AN OVERBOARD DISCHARGE VALVE IS INSTALLED, VERIFY THAT IT IS OPEN.
8. ENSURE THAT ADEQUATE SEAWATER PRESSURE IS AVAILABLE TO THE PULPER.

START

1. PRESS TIMED START PUSH BUTTON.
2. WHEN GREEN FEED INDICATOR (LOCATED ON THE LOCAL STATUS INDICATOR) COMES ON, BEGIN SORTING AND FEEDING PULPABLE WASTE.

FEEDING PULPABLE WASTE

1. FEED PULPABLE WASTE AT A STEADY RATE WHILE CONTINUING TO SORT OUT NON-PULPABLE ITEMS. DURING PROCESSING, OBSERVE THE INDICATORS ON THE LOCAL STATUS INDICATOR. ALSO, OBSERVE THE MDU MESSAGES AND THE AMMETER ON THE CONTROL ENCLOSURE.

SHUT DOWN

1. WHEN ALL OF THE PULPABLE WASTE HAS BEEN PROCESSED, PRESS THE TIMED STOP PUSH BUTTON. THE RED DON'T FEED INDICATOR WILL LIGHT UP.
2. WHEN THE DON'T FEED INDICATOR GOES OUT, THE PULPER WILL BEGIN TO DRAIN. WHEN DRAINING IS COMPLETE, THE PULPER WILL RETURN TO START-UP CONDITION.
3. IF THE PULPER WILL NOT BE OPERATED FOR A NUMBER OF HOURS, SECURE MAIN SWITCH AND PERFORM CLEANING OPERATIONS IAW THE TECHNICAL MANUAL.

Refer to technical manual S9593-C3-MMM-010, ″Pulper, Small, NAVSEA DWG 593-6960581″, for detailed instructions.

593-2.4.10 METAL/GLASS SHREDDER. Metal/Glass Shredder installations are planned for most surface ship classes. Most installations should be completed by the end of 2000. 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. See Figure 593-2-6.

WARNING

Plastic waste shall not be shredded with the Metal Glass Shredder. Plastics shall be shredded with the plastics shredder only.

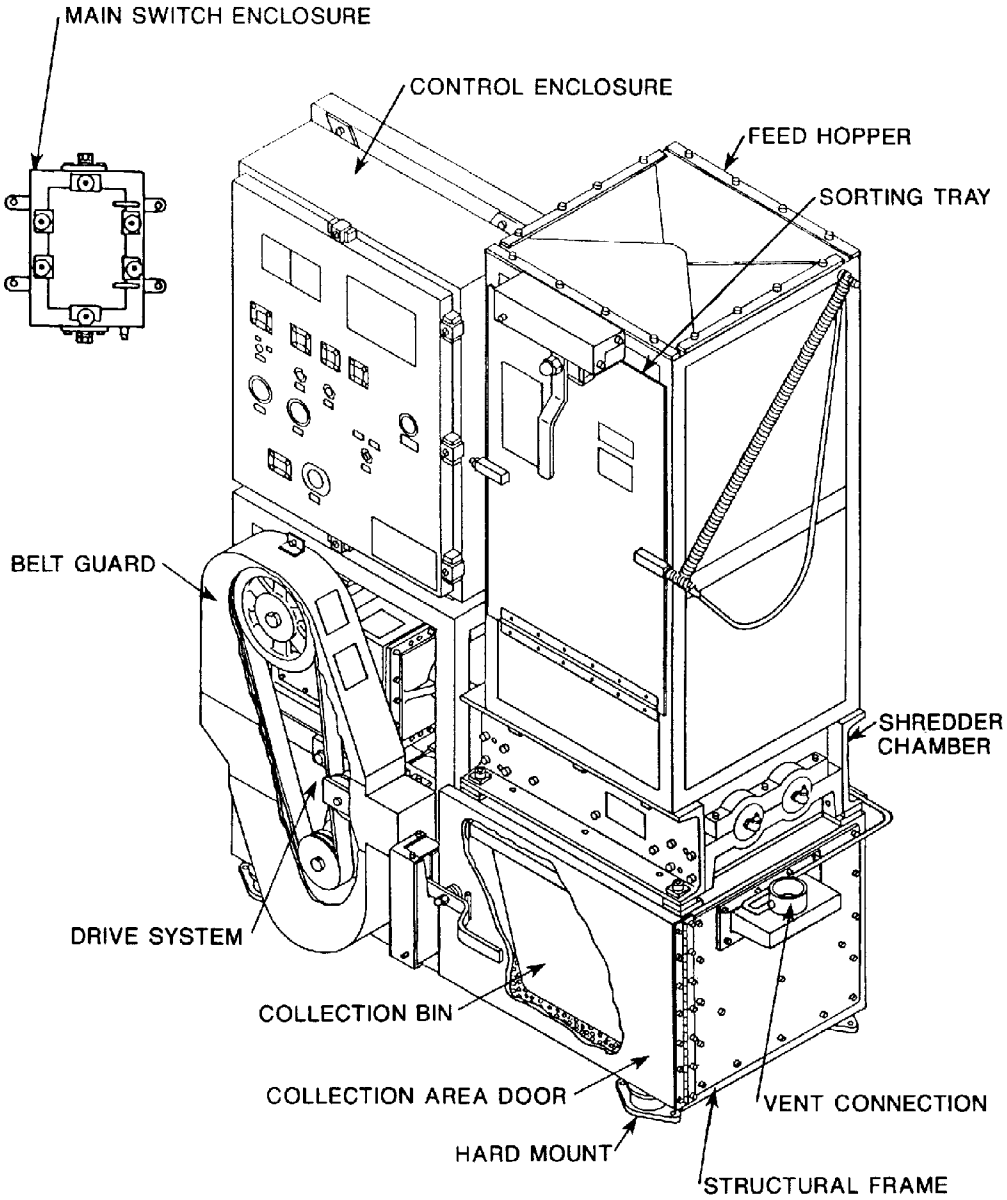

Figure 593-2-6 Metal / Glass Shredder

NOTE

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

593-2.4.10.1 Instruction Plates. 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:

NOTICE

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.

METAL/GLASS SHREDDER OPERATION

PRE START-UP CHECKS

1. ENSURE THAT THE BELT GUARD, COUPLING GUARD, ENCLOSURE ACCESS, AND EXTERNAL ELECTRICAL CONNECTIONS ARE SECURED.
2. PLACE MAIN SWITCH S1 IN THE ON POSITION. THE WHITE POWER AVAILABLE INDICATOR LIGHTS UP.
3. WITH THE SORTING TRAY AND COLLECTION AREA DOOR CLOSED, MAKE SURE THAT THE DOOR OPEN OR VENT OFF INDICATOR IS NOT LIT. THIS ENSURES THAT THE VENTILATION SYSTEM IS TURNED ON.
4. VERIFY THAT THE EMERGENCY STOP PUSH BUTTON IS PULLED OUT TO THE ON POSITION.
5. OBTAIN THE KEY IAW SHIPBOARD PROCEDURE. PUT THE KEY IN THE POWER ON/OFF SWITCH AND TURN IT TO ON. THE TOTAL HOURS METER STARTS RUNNING.
6. OPEN THE COLLECTION AREA DOOR. THE RED DOOR OPEN OR VENT OFF INDICATOR LIGHTS UP.
7. ENSURE THAT AN EMPTY COLLECTION BIN IS UNDER THE SHREDDER CHAMBER. IF THERE IS SHREDDED MATERIAL IN THE COLLECTION BIN, EMPTY THE BIN AND REPLACE.
8. CLOSE THE COLLECTION AREA DOOR AND LATCH IT SHUT. THE RED DOOR OPEN OR VENT OFF INDICATOR GOES OUT.

INSPECTING AND LOADING CANS AND GLASS

1. UNLATCH AND LOWER THE SORTING TRAY TO THE HORIZONTAL POSITION.
2. PLACE THE SOLID WASTE MATERIAL ON THE SORTING TRAY. INSPECT AND REMOVE ALL NON-ALLOWABLE WASTES.
3. LOAD APPROPRIATE CAN AND GLASS WASTE INTO THE FEED HOPPER, THEN RAISE THE SORTING TRAY AND LATCH IT SHUT.

INSPECTING AND LOADING PLASTICS

1. UNLATCH AND LOWER THE SORTING TRAY TO THE HORIZONTAL POSITION.
2. PLACE THE SOLID WASTE MATERIAL ON THE SORTING TRAY. INSPECT AND REMOVE ALL NON-ALLOWABLE WASTES.
3. LOAD APPROPRIATE CAN AND GLASS WASTE INTO THE FEED HOPPER, THEN RAISE THE SORTING TRAY AND LATCH IT SHUT.

STARTUP AND RUN

1. TURN MODE SWITCH TO SHRED.

2. PRESS THE START PUSH-BUTTON. THE GREEN SHREDDER OPERATING INDICATOR LIGHT LIGHTS UP.
3. IF SHREDDER STOPS DUE TO A SAFETY SHUTDOWN, ONE OF THE RED INDICATORS WILL LIGHT UP. TO CORRECT SAFETY PROBLEM, REFER TO TECHNICAL MANUAL.
4. LISTEN FOR AN INDICATION THAT SHREDDING HAS BEEN COMPLETED. WHEN SHREDDING NOISE STOPS AND THE SHREDDER MAKES A LOW HUMMING SOUND, IT MAY BE SHUT DOWN. THE METAL/GLASS SHREDDER AUTOMATICALLY SHUTS DOWN AFTER OPERATING FOR APPROXIMATELY 30 SECONDS. THE PLASTICS SHREDDER WILL RUN FOR 1 MINUTE BEFORE SHUTTING DOWN.

SHUTDOWN

1. PRESS THE STOP BUTTON OR ALLOW THE SHREDDER TO AUTOMATICALLY SHUT DOWN.
2. WHEN THE SHREDDER HAS STOPPED, OPEN THE COLLECTION DOOR AREA. AND REMOVE THE COLLECTION BIN.
3. REMOVE THE SHREDDED MATERIAL AND RETURN THE BIN TO THE COLLECTION AREA.
4. CLOSE THE COLLECTION AREA DOOR AND LATCH IT SHUT. THE RED DOOR OPEN OR VENT OFF INDICATOR GOES OUT.
5. CLEAN, IF REQUIRED, PER TECHNICAL MANUAL.
6. TURN THE POWER ON/OFF KEY TO THE OFF POSITION. THE TOTAL HOURS METER STOPS.
7. PLACE MAIN SWITCH S1 IN THE OFF POSITION. THE WHITE POWER AVAILABLE INDICATOR GOES OUT.
8. REMOVE AND SECURE THE KEY FOLLOWING SHIPBOARD PROCEDURE.

Refer to technical manual S9593-C5-MMM-010, ″Shredder, Solid Waste, NAVSEA DWG 593-6960881″, for detailed instructions.

Table 593-2-1 PLASTICS WASTE PROCESSOR (PWP)

Ship Class	Crew Size	Plastic Shredders	Compress Melt Units	Closed Loop Cooling Unit Cooling Medium	Heat Sealers
AD-41	2087	2	6	Sea Water	1
AGF-3	554	1	3	Sea Water	1
AGF-11	831	1	3	Sea Water	1
AO-177	279	1	3	Sea Water	1
AOE-1	719	1	3	Sea Water	1
AOE-6	630	1	3	Sea Water	1
ARS-50	90	0	1	Sea Water	1
AS-39	1771	1	4	Sea Water	1
CG-47	409	1	2	Sea Water	1
CGN-36	604	1	3	Sea Water	1
CV-63	5624	3	11	Sea Water	3
CV-64	5624	3	11	Sea Water	3
CV-67	5786	3	11	Sea Water	3
CVN-65	5815	3	11	Sea Water	3
CVN-68	6286	2-3	9-14	Sea Water	3
DD-963	396	1	2	Sea Water	1
DDG-51	303	1	2	Chilled Water	1
DDG-993	386	1	2	Sea Water	1
FFG-7	220	0	2	Sea Water	1
LCC-19	1516	1	3	Sea Water	1

Table 593-2-1 PLASTICS WASTE PROCESSOR (PWP) - Continued

LHA-1	2922	1	6	Sea Water	1
LHD-1	3151	1	6	Sea Water	1
LPD-4	1487	1	3	Sea Water	1
LPD-17 (LX)	1300	1	3	Sea Water	1
LSD-36	794	1	3	Sea Water	1
LSD-41	852	1	3	Sea Water	1
LSD-49	852	1	3	Sea Water	1
MCM-1	72	0	0	N/A	1
MCS-12	1746	1	3	Chilled Water	1
MHC-51	50	0	0	N/A	1

Table 593-2-2 PLANNED LARGE PULPER, SMALL PULPER, AND METAL / GLASS SHREDDER INSTALLATIONS

Ship Class	Crew Size	Metal / Glass Shredder	Large Pulper	Small Pulper
AD-41	2087	1	1	0
AGF-3	554	1	1	0
AGF-11	831	1	1	0
AO-177	279	1	1	0
AOE-1	719	1	1	0
AOE-6	630	1	1	0
ARS-50	90	1	0	1
AS-39	1771	1	1	0
CG-47	409	1	1	0
CGN-36	604	1	1	0
CV-63	5624	2	2	1
CV-64	5624	2	2	1
CV-67	5786	2	2	1
CVN-65	5815	2	2	1
CVN-68	6286	2	2	1
DD-963	396	1	1	0
DDG-51	303	1	1	0
DDG-993	386	1	1	0
FFG-7	220	1	0	1
LCC-19	1516	1	1	0
LHA-1	2922	1	1	0
LHD-1	3151	1	1	0
LPD-4	1487	1	1	0
LPD-17 (LX)	1300	1	1	0
LSD-36	794	1	1	0
LSD-41	852	1	1	0
LSD-49	852	1	1	0
MCM-1	72	0	0	0
MCS-12	1746	1	1	0
MHC-51	50	0	0	0

Table 593-2-3 SUMMARY OF NAVY SOLID WASTE DISCHARGE POLICY (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.
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. See Paragraph 593-2.4.b.	No Discharge.	See Section 593-2.3.4
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.				

Table 593-2-4 SUMMARY OF NAVY SOLID WASTE DISCHARGE POLICY (SUBMARINES)

Waste Type	Discharge Permitted			Comments
	U. S. Waters	Foreign Countries	MARPOL Special Areas	
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 (non-plastics)	- 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.

SECTION 3.
OIL POLLUTION ABATEMENT

593-3.1 GENERAL

593-3.1.1 MAJOR GOAL. For shipboard oil pollution abatement (OPA), the Navy has established as a major goal the complete discontinuation of all discharges of oily wastes into streams, harbors, and oceans by Naval ships. This goal is set forth in OPNAVINST 5090.1B, Chane 2 The Environmental and Natural Resources Protection 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 5090.1B, Change 2 and DOD Directive 6050.15, and enforces these requirements through mandatory initial and periodic system certification inspections.

593-3.1.2 Oil or oily wastes shall not be discharged to the sea or other waters from any Navy activity or ship.

593-3.1.3 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 6050.15 and are consistent with paragraph 593–2.1.8.

593-3.1.4 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 emergency condition exists, all reasonable precautions shall be taken to prevent or minimize the discharge of oil. In such cases, the incident shall be recorded using paragraph 593–3.5 guidelines.

593-3.1.4.1 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.

593-3.1.5 OILY WASTE SOURCES. Oily wastes generated by a particular ship usually are derived from the sources indicated in the following paragraphs.

593-3.1.5.1 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.

593-3.1.5.2 Fuel. Oily wastes derived from fuel are caused by:

a. Spillage 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 noncompensated 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.

593-3.1.5.3 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.

593-3.1.5.4 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.

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.

593-3.1.5.5 References. For a detailed description of the types of petroleum products or systems which contribute to oily wastes, refer to:

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

b. **NSTM Chapter 541, Petroleum Fuel Stowage, Use, and Testing** .

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

593-3.2 OIL POLLUTION ABATEMENT SYSTEM

593-3.2.1 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 wastes and synthetic from non-synthetic oils, and proper bilge management).

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

c. Monitor oil content in overboard discharges from the 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.

593-3.2.1.1 Typical Shipboard OPA System. Schematic diagrams of a typical shipboard OPA system are shown in Figure 593-3-1 and Figure 593-3-2. The features pertaining to oil pollution abatement are discussed in detail from paragraphs 593–3.2.1.2 to 593–3.2.1.15.

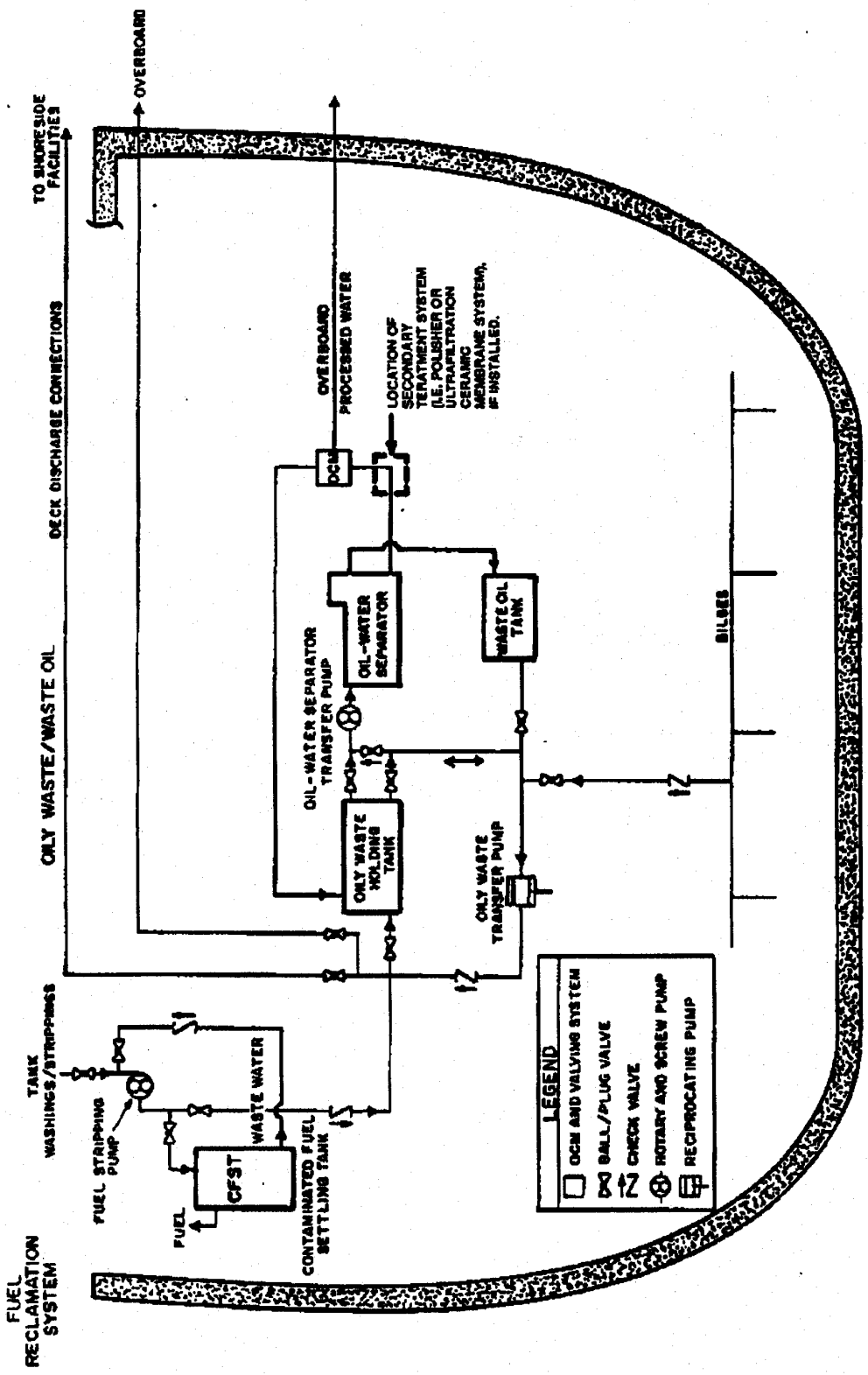

Figure 593-3-1 Oil Pollution Abatement System Interfaces

593-3.2.1.2 Oil/Water Separator. The Oil/Water Separator (OWS) is used to process oily waste by separating 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 affected once introduced into the system. The following types of OWS and OCM systems are installed onboard Navy ships:

a. Fram Model OPB-1ONP OWS, NAVSEA Technical Manual S9593-AY-MMM-010.

b. Parmatic OWS Model 690231, NAVSEA Technical Manual S9550-B2-MMA-010/25204.

c. SAREX 10 GPM OWS, NAVSEA Technical Manual S9550-AN-MMO-010/MOD VGS-10.

d. Facet Model C-50 OWS, NAVSEA Technical Manual S9550-CA-MMO-010/87405.

e. Facet Model C50RF01, NAVSEA Technical Manual S9593-DA-MMO-010

f. Quantek Model CPS-3B15, NAVSEA Technical Manual S9550-BD-MMO-010.

g. Navy Model 3-F Small Boat OWS, NAVSEA Technical Manual S9593-CL-MMO-010.

h. Parmatic OCM Model ET-35N, NAVSEA Technical Manual S9593-CD-MMO-010/25204.

i. World Water Systems OCM Model OMWW0300, NAVSEA Technical Manual S9593-CQ-MMO-010

593-3.2.1.2.1 The OWS is provided with a dedicated suction from the Oily Waste Holding Tank (OWHT). The primary mode of operation is for all oily waste waters 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 water; the OWHTs act as a presettling 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.

593-3.2.1.3 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 593–3.2.1.8), 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, etc. Under proper conditions, the small droplets join together (coalesce) to form larger droplets which rise faster to the 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. This action enhances the gravity separation of oil from water.

593-3.2.1.3.1 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.

593-3.2.1.4 Oily Waste Transfer Pump. The Oily Waste Transfer Pump (OWTP) is used to transfer oily waste within the 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 593–3.2.1.14). These pumps normally have the capacity to completely off-load waste oil and oily waste water from the WOT and the OWHT in approximately l to 2 hours, except on aircraft carriers where an off loading time of 4 hours is acceptable.

593-3.2.1.5 Oil Content Monitors. An Oil Content Monitor (OCM) is a device installed downstream of an OWS or a secondary treatment system (see paragraphs 593–3.2.1.15 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 concentrations of 15 ppm when operating within (in-port) 12 NM from the nearest land. When operating beyond (at-sea) 12 NM from the nearest land, the maximum allowable oil discharge concentration is still 15 ppm. However, 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 setpoints, to ensure that these discharge limits are not exceeded.

NOTE

The oil discharge concentration limits cited in this section are subject to changes pending 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.

593-3.2.1.6 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 593–3.1.4 for other cases). Whenever possible, only the water phase should be processed by the OWS to reduce maintenance and to ensure best OWS performance.

593-3.2.1.7 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 593–3.2.1.8). In addition, oily waste water 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.

593-3.2.1.8 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 depends on the difference in density/specific gravity between oil and water for separation, the OWS can not 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.

593-3.2.1.9 Contaminated Fuel Settling Tank. 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.

593-3.2.1.10 Oily Water Drain Collecting Tank. 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.

593-3.2.1.11 Oily Water Bilge Sump Tank. The Oily Water Bilge Sump Tank (OWBST) is an inner bottom drainage tank which collects bilge fluids through a grating.

593-3.2.1.12 Tank (Liquid) Level Indicator. 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.

593-3.2.1.12.1 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.

593-3.2.1.12.2 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.

593-3.2.1.13 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.

593-3.2.1.14 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 (according to NAVSHIPS Dwg 810-2145526) shall be installed on each side of the ship. The deck discharge connection is a 2-½ inch flanged cam-lock type fitting and can be easily adapted to an International Maritime Organization (IMO) oil discharge flange (Figure 593-3-2, Figure 593-3-3, and Figure 593-3-4). The standard deck discharge connection has been assigned the National Stock Number (NSN) 9C 4730-00-602-3160. Further information and details are available in the NAVSEA publication entitled, ″U.S. Navy Shipboard Sewage and Oily Waste Discharge Connections, Fittings, Adapters, and Hoses″, dated April 1978.

593-3.2.1.15 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 contains polymeric media which absorbs the oil droplets, and allows the water to pass. Some manufacturers use a combination of various polymers and activated carbon to increase its performance. The polisher contains 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 another form of a secondary treatment device. 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 pass 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.

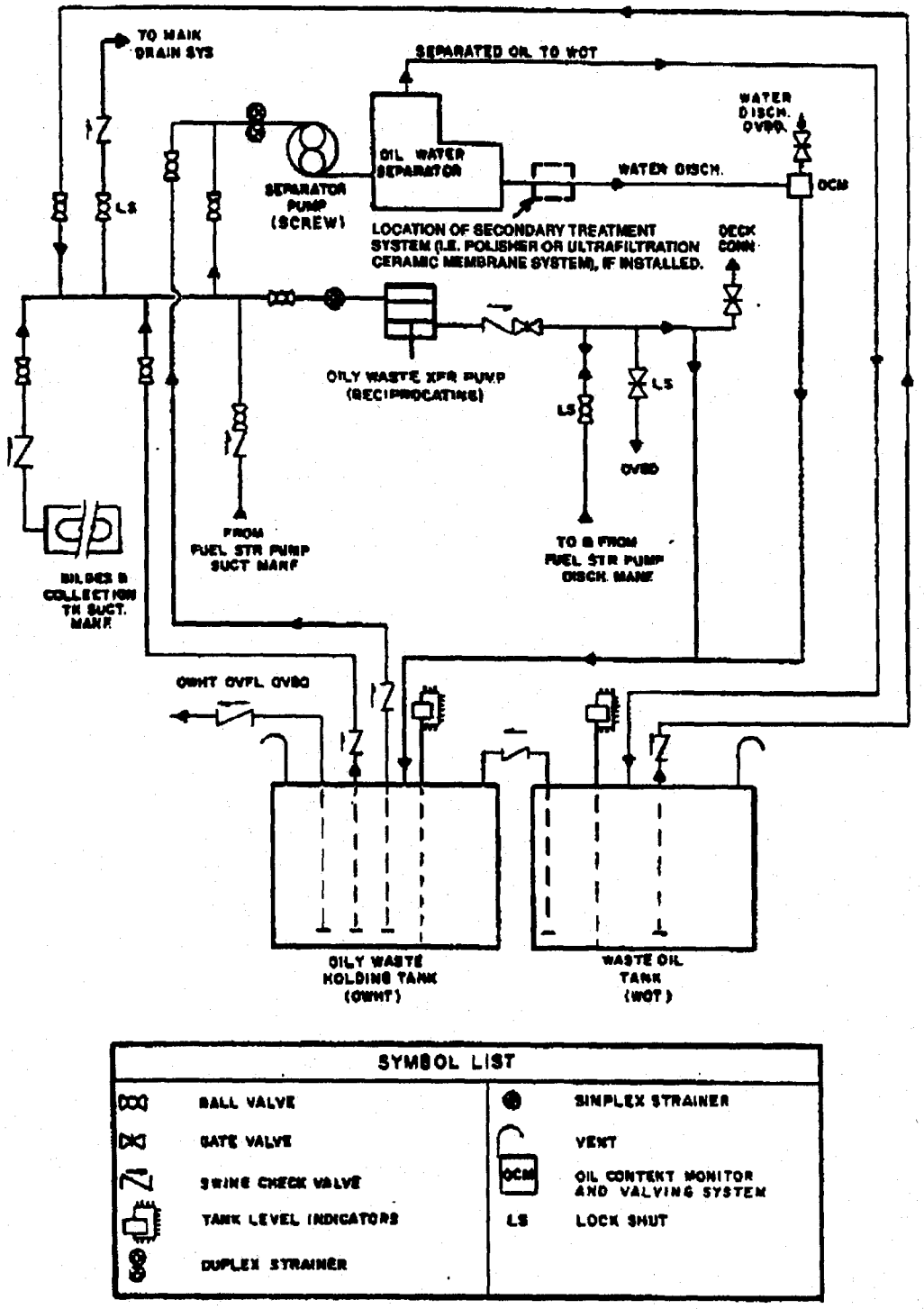

Figure 593-3-2 Typical Oil Pollution Abatement System

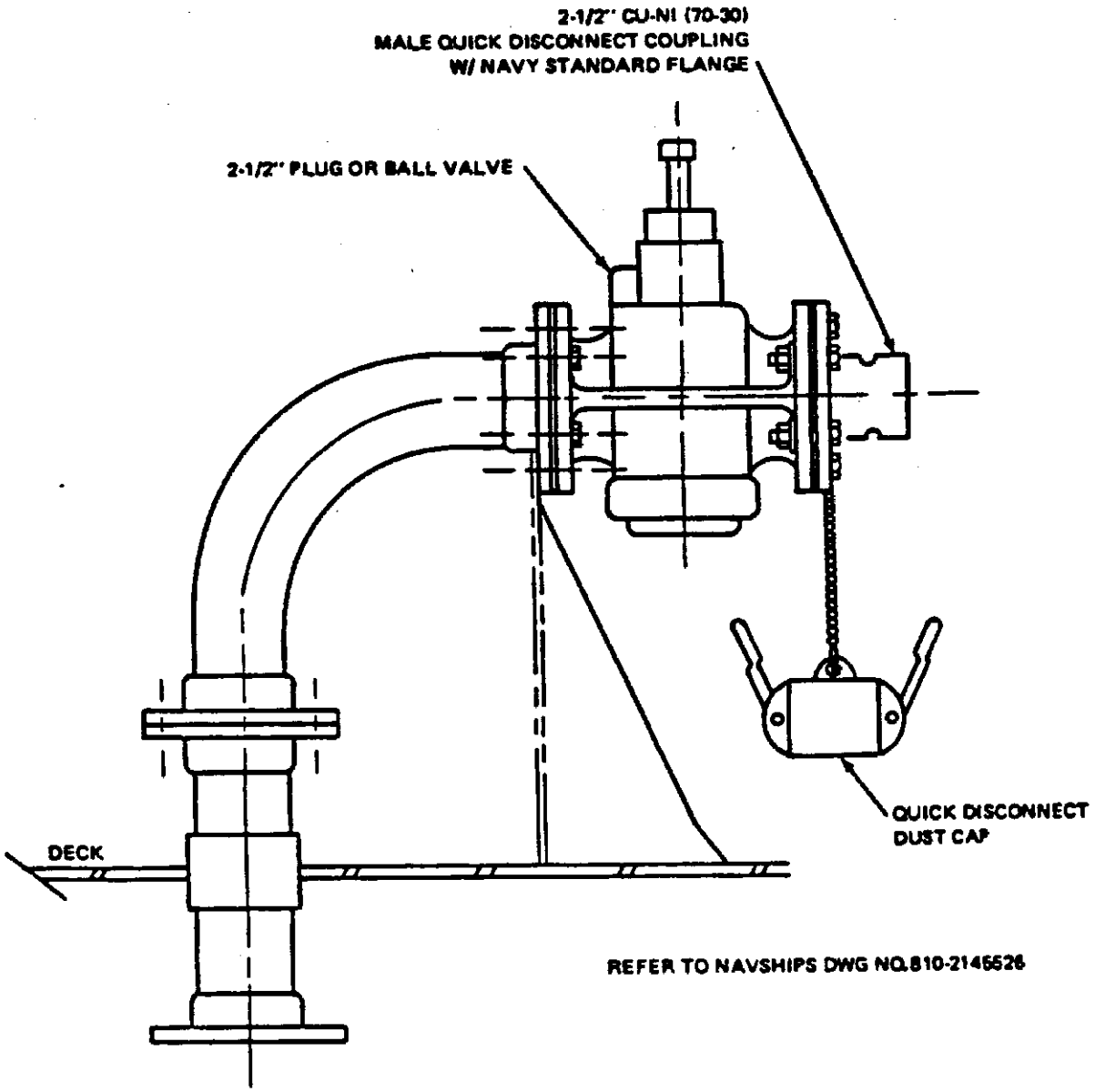

Figure 593-3-3 Surface Ship Oily Waste Discharge Connection

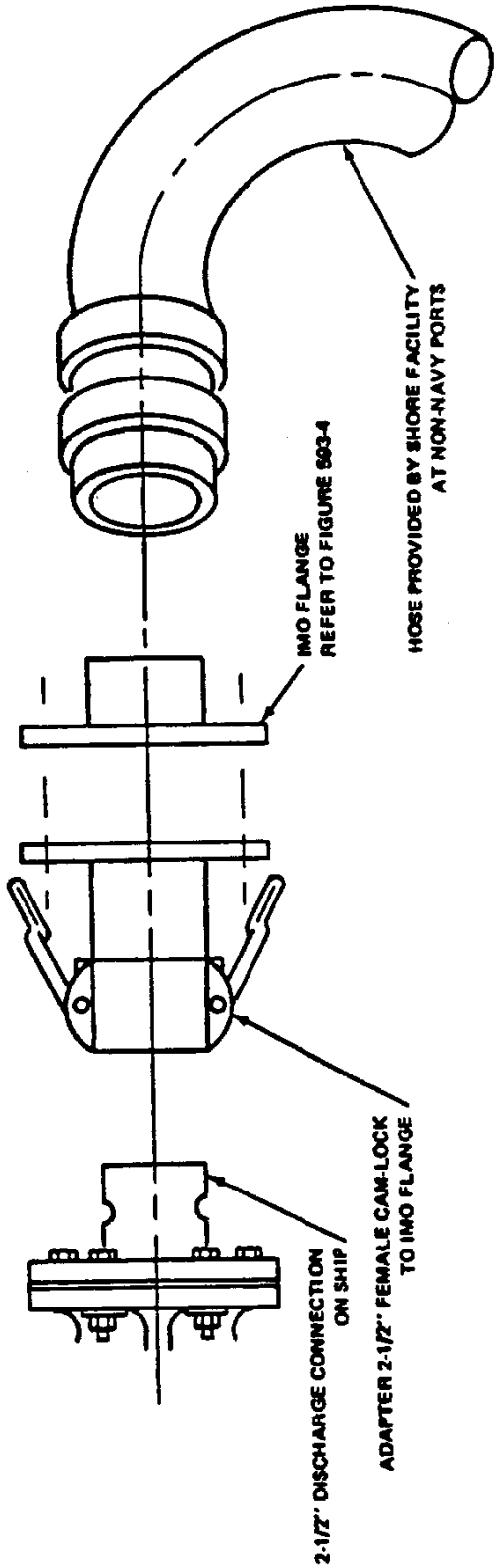

Figure 593-3-4 Adapter 2–1/2 Inch Female Cam-Lock to IMO Oily Waste Flange

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 A 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

593-3.3 OPA OPERATION

593-3.3.1 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).

593-3.3.2 AT-SEA OPERATIONS. At sea, oily waste may be generated from one or all of the sources discussed in paragraphs 593–3.1.5.1 through 593–3.1.5.4. 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 593–3.2.1.2) 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 designated alarm limit for the less than 15ppm mode. If equipment operation conditions prevent achieving less than 15ppm, limit discharges to less than 100ppm. 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 OWS (and secondary treatment system) or 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 593–3.2.1.8).

593-3.3.3 IN-PORT OPERATIONS. In port, OPA system operations shall be conducted according to paragraph 593–3.3.2. However, for in-port operations, the OCM shall be set at the designated alarm limit for the in-port mode. 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 15 ppm 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 its underway beyond (at-sea) 12 NM to operate its OWS (and secondary treatment system) to process the oily waste. IF THE OCM AND/OR ALARM SYSTEM ARE NOT OPERATIONAL 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 593–3.6.6 for reporting oil spills).

593-3.3.4 FUELING, DEFUELING, AND INTERNAL FUEL TRANSFER. As required by OPNAVINST 5090.1B, Change 2, 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. Checkoff 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) have been tested and are in proper working condition. This shall be according to appropriate NAVSEA, NAVSUP, or Marine Terminal instructions.

593-3.3.4.1 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.

593-3.3.4.2 Instructions for fueling at sea are provided in **NSTM Chapter 541** . 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.

593-3.3.5 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).

593-3.3.6 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 prefilter is a KEENE CORP. MODEL D-5-AR-FF-l, or equivalent, and the filter/separator is according to MIL-P-15618.

593-3.3.6.1 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 to 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.

593-3.4 REDUCTION OF OILY WASTE

593-3.4.1 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.

593-3.4.1.1 Oily and Nonoily Drains. Discharge from machinery oil and water drains contribute significantly to the volume of oily waste bilge water generated. When ship piping configuration permits, drains for nonoily 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 nonoily water drains. Where possible, nonoily water drains shall be directed to a wastewater drain tank or wastewater bilge sump tank. 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 blockage and/or damage. Discarding other materials into this system is prohibited. Such materials including non-approved detergents, AFFF, paints and/or thinners

Warning - *precedes*

can cause blockage and/or reduce the performance efficiency of the OWS. If drainage piping is blocked, overflow can occur through other funnel drains. Overflows can result in major fires. If clogging occurs, do not pressurize system. Pipe obstruction must be removed prior to system operation.

593-3.5 COMMANDING OFFICERS' RESPONSIBILITIES.

Commanding Officers are responsible for:

1. 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.
2. 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.
3. Reporting to the fleet commanders of any condition or system/equipment malfunction that would necessitate oily waste discharge upon restricted waters.
4. 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.
5. Taking immediate action to contain, control and mitigate all spills caused by the ship.

593-3.5.1 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 or general housekeeping. For the recommended detergents or solvent, see paragraph 593–3.7.2.1.

593-3.5.2 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.

593-3.6 SAFETY PRECAUTIONS

593-3.6.1 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. Appropriate sources of safety and precaution information are cited in paragraphs 593–3.6.2 through 593–3.6.6.2.

593-3.6.2 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 clear in color. All of the safety precautions cited in **NSTM Chapter 262** , and **NSTM Chapter 541** , relative to the stowage, use, and testing of petroleum fuels are invoked as applicable to the handling, storage, and processing of oily waste.

593-3.6.3 SHOCK HAZARDS. Oil pollution abatement equipment or systems are powered from 115 - 440 VAC sources. Strict adherence to safety precautions cited in **NSTM Chapter 300, Electric Plant General** , **NSTM Chapter 302, Electric Motors and Controllers** , and **NSTM Chapter 400, Electronics** is necessary.

593-3.6.4 HYDRAULIC FLUIDS AND TOXICITY Precautions regarding the toxicity of hydraulic fluids are outlined in NAVSEAINST 5100.13, **Synthetic Fire Resistant Hydraulic Fluids** , (MIL-H–194578 and MIL-H-22072), precautions relative to, 15 June 1979. The provisions of this instruction shall be adhered to in order to maintain the health and safety requirements established by OPNAVINST 5100.19B, **Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat** .

593-3.6.5 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 comply with 33 Code of Federal Regulations (Federal Register/Vol. 58, No. 226 of 26 Nov 93) which states the following:

″The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste into or upon the navigable waters of the United States, or the waters of the contiguous zone, or which may affect natural resources belonging to, appertaining to, or under the exclusive management authority of the United States. If such discharge causes a film or discoloration of the surface of the water or cause a sludge or emulsion beneath the surface of the water, violators are subject to substantial civil penalties and/or criminal sanctions including fines and imprisonment.″

When within 12 NM of foreign countries and for other special requirements, US Naval vessels shall abide by regulations specified in the **Status Of Forces Agreement (SOFA)** , OPNAVINST 5090.1B, and DOD Directive 6050.15.

593-3.6.6 OIL SPILLS. All oil spills, slicks, or visible sheens shall be reported immediately according to the provisions of OPNAVINST 5090.1B, Change 2, and the Navy Shipboard Oil Spill Contigency Plan. An On Scene Coordinator (OSC) shall be designated in accordance with OPNAVINST 5090.1B, Change 2, and the Hazardous Material Spill Response Procedures as outlined in OPNAVINST 5100.19B, **Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat, Appendix B3-A** .

593-3.6.6.1 Responsibilities concerning oil spills are described in OPNAVINST 5090.1B. Since shore-based units are seldom available at non-Navy or foreign ports, ships have the capability of providing first aid remedial action until relieved by shore-based response units, or, in the case of non-Navy or foreign ports, to clean up the entire spill.

593-3.6.6.2 The Mark II Oil Spill Containment and Cleanup Kit is provided for shipboard and overboard spills of less than 100 gallons. The kit contains improved polypropylene sorbent sweeps which have replaced the chemical components and sorbent material of the Mark I Spill Kit. The recommended shipboard Allowance Equipage List (AEL Number 2-550024006) is as follows:

NSN	ITEMS	QUANTITY
Ropte, 50 FT	9Q 4020-00-968-1350	1
Snap Hook	9Z 5340-00-275-4584	4
Steel Box	9C 2540-00-348-7792	1
Sorbent Sweep	9G 9330-01-281-4608	4

The Mark II Oil Spill Kit box and contents are kept on the main deck. Sorbent material should be kept away from open flame. The sorbent material is combustible and extremely flammable at temperatures exceeding 300° F. Under no conditions should the sorbent sweeps be stored in any area where the temperature might exceed 300° F. Used sorbent materials are hazardous and must be retained for disposal at a shore-based facility. Navy policy prohibits the overboard dumping of all plastic and hazardous materials. If temporary shipboard storage is required, the used oily sorbent materials should be sealed in 55-gallon drums lined with plastic bags. The Mark I Oil Spill Kit instruction booklet and Navy training film are obsolete and therefore discontinued from further use. Basic instructions for using the Mark II Oil Spill kit are provided as follows:

1. To deploy the sorbent sweeps, two small crafts are recommended. Where small crafts are not available, ships force will need to determine the best means to deploy the sweeps dependent upon the location of the ship in relation to piers, other ships and other structures. Place the sweep down current of the oil and slowly pull towards the body of oil. Finally, collect the oil soaked sorbent in 55-gallon drums lined with plastic bags. Seal the drums and store for disposal ashore.
2. For onboard oil spills, use the sorbent material to fabricate a barrier surrounding the oil. Use additional sorbent sweeps or sorbent sheets, if available, inside the containment area to absorb the remaining oil. Containerize the oil soaked material in 55-gallon drums lined with plastic bags. Seal and store for disposal ashore.
   • Detailed instructions for the deployment of the MKII oil spill containment and clean-up kit are provided in the Navy Shipboard Oil Spill Contigency Plan Model.

593-3.7 OPA MAINTENANCE

593-3.7.1 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_2 S) 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. Where 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.
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.

593-3.7.1.1 Sludge that has accumulated in the wet vacuum shall be disposed of according to Section 5, Shipboard Hazardous Waste, of this NSTM Chapter.

593-3.7.2 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 nonemulsifying nature be used for housekeeping in machinery rooms or spaces serviced by an OWS.

593-3.7.2.1 Short-Lived Nonemulsifying Detergents. MIL-D-16791 (made by Phipps Products Corporation, Boston, MA) and Allied P-98 (made by Allied Enterprises, Norfolk, VA) are acceptable short-lived nonemulsifying detergents for shipboard use. The MIL-D-16791 cleaning solution can be prepared by mixing 1-1/2 ounces of detergent to 3 gallons of freshwater (approximately a 400:1 mixture). 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.

	NSNs
MIL-D-16791	
1 Gallon	9Q 7930-00-282-9699
5 Gallons	9Q 7930-00-985-6911
55 Gallons	9Q 7930-00-282-9700
Allied P-98	
1 Gallon	9Q 68-01-278-4421
30 Gallons	9Q 68-01-278-3858
55 Gallons	9Q 68-01-278-9700

SECTION 4.
SEWAGE AND WASTE WATER

593-4.1 GENERAL

593-4.1.1 BACKGROUND. Sewage and waste 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 (soil or black water) and waste water (graywater) discharges under regulations promulgated by the Secretary of Defense. Navy policies and responsibilities are defined in OPNAVINST 5090.1B, **The Environmental and Natural Resources Program Manual** .

In the past, shipboard sewage and waste water was discharged overboard as a matter of routine design and operation. Studies have shown that concentrations of the constituents of sewage and waste 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.

Naval ships are now equipped with Marine Sanitation Devices (MSDs) and Waste Water Systems. These systems enable ships to comply with the sewage and waste water discharge standards without compromising the ship mission capability.

593-4.1.2 SYSTEM OVERVIEW. The various sewage and waste water systems installed on Navy ships are designed to collect, hold, transfer, and, in some cases, process sewage and waste water. The design goal of the 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 to hold sewage for the duration of the transit.

For some ship classes, space and other design constraints prevent the installation of gravity drain CHT systems. Such ship classes employ low volume flush systems such as Vacuum Collection, Holding and Transfer (VCHT) systems (some with incinerators), reduced volume flush evaporative toilet systems, or recirculation systems. One class of ships employs a biological sewage treatment system. These systems will all be discussed in later paragraphs.

593-4.1.3 RESPONSIBILITIES.

593-4.1.3.1 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) mile restricted zone. The Navigator shall inform the Officer of the Day (OOD) of the time of crossing.

593-4.1.3.2 ODD Responsibilities. Upon receipt of word from the Navigator that the ship is about to cross the three (3) mile restricted zone, the OOD shall initiate the appropriate mode change of the sewage and waste water systems in accordance with prescribed procedures. If the ship is approaching a port and has less than 12-hours 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 holding tank. For example, a destroyer with four (4) hours holding capacity should begin holding sewage about three (3) hours from the pier. Conversely, the same ship would begin holding sewage immediately before leaving the pier and would divert sewage drains overboard after the sewage holding tank is filled.

593-4.1.4 DISCHARGE WAIVER. Sewage and waste water discharge regulations do not preclude overboard discharge 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 5090.1B, DOD Directive 6050.4 series and in applicable type commander maintenance instructions (COMNAVSURFLANTINST 9000.19 series, COMNAVSURFPACINST 4700.6 series, etc.).

593-4.1.5 SHIPS IN DRYDOCK. Sewage and waste water discharge procedures for ships in drydock are discussed in **NSTM Chapter 997, Docking Instructions and Routine Work in Dock** .

593-4.1.6 SEWAGE AND WASTE WATER SYSTEM TRAINING.

593-4.1.6.1 Environmental Laws and Regulations Training. Ship's force training on environmental laws and regulations are required by OPNAVINST 5090.1B, sections 24-5.5 and 24-5.5.1. Specific training programs and their locations are provided in the instruction.

593-4.1.6.2 Operation and Maintenance Training. Ship's force training on operation and maintenance of sewage and waste water systems is provided by the fleet training centers. Supplemental to this training is the Personnel Qualification Standard (PQS) for Shipboard sewage and waste water systems. The PQS program is part of each command's overall training program. The Chief of Naval Education and Training (CNET) can provide detailed information on all formal training.

593-4.2 SAFETY AND HEALTH

593-4.2.1 SEWAGE AND WASTE WATER SYSTEMS SAFETY REQUIREMENTS. Numerous potential health and safety hazards are associated with the sewage systems. However, these systems may be operated safely by performing the required planned maintenance and most importantly, by carefully adhering to the safety precautions and procedures outlined throughout this manual and in this section.

593-4.2.1.1 A serious potential hazard associated with sewage 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 in holding tanks. It is toxic and can be explosive. When the available dissolved oxygen in sewage is depleted by the bacteria naturally present, certain types of bacteria will then produce hydrogen sulfide. Such sewage is often referred to as septic. Hydrogen sulfide will not only be present in the air above septic sewage, but can also be dissolved in large quantities in the sewage itself. Often, hydrogen sulfide will be produced in the lower levels of sludge layers which may accumulate in sewage holding tanks, since oxygen cannot reach these lower sludge layers. As a result, sewage holding tanks and all sewage system piping are designated as Immediately Dangerous to Life or Health (ILDH) spaces in accordance with **NSTM Chapter 074, Volume 3, (Gas Free Engineering)** . Entry into IDLH spaces 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 the sewage system, the following precautions shall be observed:

1. 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) mile restricted zone, while in-port as sewage and waste water are being collected, or any time sewage is being collected in the holding tank (for example, when a CHT

system must be used as an ejection 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. CHT 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 has been without aeration for approximately 12 hours.

2. Always assume that any sewage holding tank contains sewage and toxic gases. Any maintenance requiring the removal or disassembly of valves, pumps, flanges, or similar equipment inside the sewage or waste water system pump room or below the holding tank overflow, shall be conducted strictly in accordance with paragraph 593–4.2.4 of this manual. Ship's force shall never enter the holding tank or open the manhole access at any time unless at a suitable industrial facility and unless all requirements cited in paragraph 593–4.2.4 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 sanitary wastes would present a health or safety hazard (such as both pumps becoming inoperable), the system should be CASREPed and secured. OPNAVINST 5090.1B provides the authority to divert sanitary wastes 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.

3. Always ensure that the CHT pump room installed Hydrogen Sulfide Alarm System (see paragraph 593–4.3.2) 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.
   a Minimum hydrogen sulfide detection range of 0 to 50 parts per million (ppm).
   b Alarm set at ten (10) ppm with an audible or audible and visual alarm.
   c Battery operated.
   d Rechargeable power source or low power indicator.
   e Response time under 60 seconds to 90 percent of actual value.
   f Capable of onboard calibration or provided with replaceable sensor.

4. If hydrogen sulfide is detected by smell or by a hydrogen sulfide detector, when working in a sewage related space (pump room, comminutor space or any space containing sewage 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 as a 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 reentered only by personnel wearing respirators as described in paragraph 593–4.2.4.1.1, 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, 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** , 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.

5. Two Emergency Escape Breathing Devices (EEBD) shall be placed in each main sewage related space (CHT pump room, comminutor space, MSD space, etc.).

593-4.2.1.1.2 Additional information concerning potential hazards associated with hydrogen sulfide from sewage (CHT or MSD) systems is provided as follows:

1. Although a space or holding tank may be certified gas free and hydrogen sulfide levels are below safe levels (10 ppm), some danger may still exist if any sewage or sewage solids remain in the space or holding tank. These wastes 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 593–4.2.4.1.1, 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 593–4.2.4.1.1, 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 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 593–4.2.4.1.1, step b and all sewage wastes, including solids, have been removed from the space and the space washed down according to paragraph 593–4.2.3.f. Even if a space has been certified GAS FREE, until such time as all wastes can be removed from the space, recertification 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.
2. In some cases, sewage 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 to collect in these voids or compartments. This sewage may become septic and produce hydrogen sulfide. It is critical that before opening any unventilated void or compartment which contains sewage piping and which has not been inspected or opened for an extended period, that the compartment be opened using respirators as described in paragraph 593–4.2.4.1.1, 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 593–4.2.4.1.1, step b. A spare respirator, SAR/SCBA, or air-line 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 related space where the installed ventilation system is inoperable.
3. Although hydrogen sulfide poisoning occurs mainly through breathing the gas, 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.

593-4.2.1.1.3 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:

1. Ensure the aeration system is operated according to the applicable SDOSS to reduce the amount of hydrogen sulfide produced as described in paragraph 593–4.2.1.1. Aeration of the sewage 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 sewage holding tank does not pressurize the holding tank.
2. 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 system.
3. 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.
4. Smoking, eating, or drinking is never permitted inside the sewage system spaces (CHT/MSD pump rooms, comminutor spaces, etc.) or when working on any sewage system component.
5. 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 sewage holding tank by way of the waste or sewage drains is strictly prohibited.

593-4.2.1.4 Health and sanitation hazards may develop as a result of sewage spills in the sewage 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 sanitary wastes 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 the sewage system, always follow the sanitary and hygienic practices described in paragraph 593–4.2.3.

593-4.2.1.5 Flooding and electrical hazards in sewage system related spaces and other spaces containing sewage 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 that the sewage holding tanks are pumped out after exiting restricted waters. The SDOSS procedures also ensure that all diverter valves for both sewage and waste drains are diverted overboard.
2. Always assume the sewage holding tank contains 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 593–4.2.4.1.1, 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 verified quarterly as required by PMS.
4. Ensure proper operation of space and containment coaming flooding alarms quarterly.

5. Ensure that the sewage 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 through your sewage pump discharge piping (see Figure 593-4-4). 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 being pumped by other nested ships. The same is true on a few ship classes in which sewage 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 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.

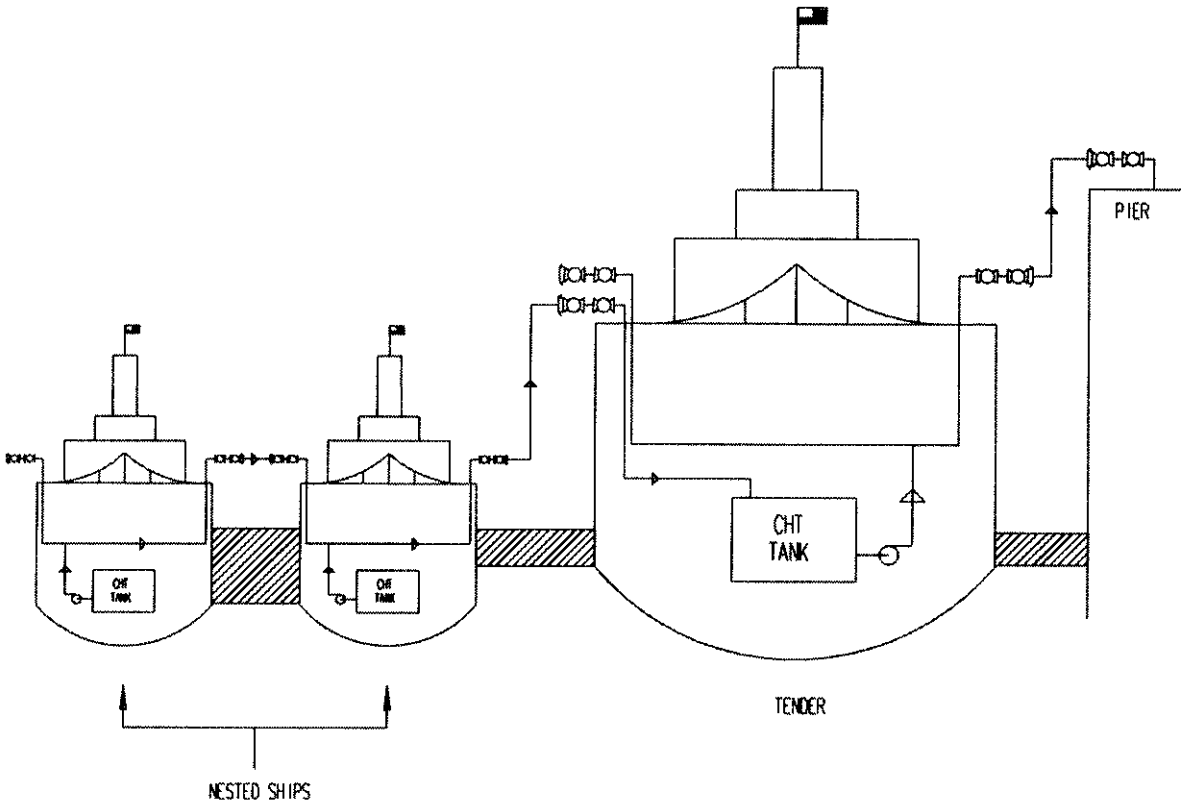

Figure 593-4-4 Nested Ship Sewage Transfer

593-4.2.1.6 The hazards discussed in this manual are real. However, other hazards may exist or develop if proper sewage 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 system. Those 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. The facilities are available through numerous shore activities and should be used to provide guidance, training and technical assistance. Although it is important to maintain a clean environment, crew health and safety shall come first. Don’t take chances.

593-4.2.2 SEWAGE AND WASTE WATER SYSTEM SANITARY AND HYGIENIC PROVISIONS. The provisions described in this paragraph are typically incorporated in the sewage and waste water systems, or are provided onboard to ensure that sanitary and hygienic conditions are maintained:

1. Sewage pumps incorporate seals designed to minimize the possibility of leakage.
2. Dedicated sewage and waste 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.
3. Where sewage and waste 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.
4. Individual sewage and waste water pump sets in dedicated CHT or VCHT 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 waste water. Equipment such as comminutors, mounted on decks, have similar coamings.
5. 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.
6. 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:
   a Food storerooms.
   b Food preparation or messing areas.
   c Spaces where utensils are stored or washed.
   d Medical and dental spaces.
   e Spaces where leakage can reach bilges contacting potable water tank boundaries.
   f In berthing spaces when valves are located above or immediately adjacent to bunks.
7. 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.
8. 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.
9. Health warning placards are posted in appropriate locations (deck connections, system pump rooms, etc.) identifying procedures to be followed in those areas.
10. A locker stocked in accordance with the requirements of Allowance Equipage Lists (AELs) 2-360044010 (SEWAGE SYSTEM PROTECTIVE GEAR) and 2-360044011 (SEWAGE SYSTEM 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:
    a Coveralls, Disposal Type I (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

b Goggles, Industrial
NSN 4240-00-203-0317

c Faceshield, Industrial
NSN 4240-00-764-5152

d Boots, Rubber (select appropriate size(s))
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 12, NSN 8430-00-147-1038

e Laundry Bags, Canvas

f Impermeable Rubber Gloves (select appropriate size(s))
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

g Trash Bags, Plastic, Laundry Size
NSN 8105-00-070-9496

h Detergent, Liquid Stock, Type I
NSN 7930-00-282-9699

i Mop, Cellulose Sponge
NSN 7920-00-728-1167

j Bucket, Cadmium Plated, 16 quart
NSN 7920-00-926-5243

k Paper Towels, Disposable

l Disinfectants
Betadine Surgical Soap,
NSN 6505-00-914-3593
Wescodyne, NSN 6840-00-882-2691
Povidone-Iodine Solution,
NSN 6505-00-994-7224

Stock numbers may have changed by the time this NSTM was revised. 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:

CAUTION

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.

593-4.2.3 SEWAGE AND WASTE WATER 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 transfer hoses shall not subsequently handle potable water hoses.

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

c. When performing maintenance which requires disassembly of sewage equipment or when contact with sewage is possible, rubber gloves, rubber boots, eye/faceshields 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 spaces or on sewage and waste water system equipment shall not smoke, eat, or drink before a thorough wash up with hot water and soap.

e. Personnel exposed to sewage or those who work in sewage spaces with MSD's shall keep basic immunizations current in accordance with BUMEDINST 6230.1 series and NAVMED P-5010-7 **Manual of Naval Preventive Medicine, Chapter 7, Sewage Disposal Ashore and Afloat** .

f. In the event spaces become contaminated with sewage as a result of leaks, spills, or sewage 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 593–4.2.4.1.1, step b. A safety watch with respiratory protection (preferably that specified in paragraph 593–4.2.4.1.1, 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 spilled sewage 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 need for temporary ventilation shall be determined by the ship's Gas Free Engineer. 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 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 transfer operations are terminated and the sewage 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 transfer operations to ensure that the connection is intact and that an unsanitary condition is not developing.

i. All sewage system components (such as valves, pumps, comminutors, and fitted flanges) shall be checked periodically for leakage. Sewage 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 593–4.4.7. Where drip pans are installed, the pans shall be checked periodically for sewage accumulations. Sewage and waste water system inspection requirements, including frequency, shall be according to NAVMED P-5010-7 **Manual of Naval Preventive Medicine, Chapter 7, Sewage Disposal Ashore and Afloat** , and the applicable MRC.

j. In cases where sewage 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 leakage 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 wastes 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 sewage 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 Waste Water Systems. The regular accomplishment of planned maintenance on the any sewage or waste 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 waste 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 593–4.2.1 and 593–4.2.3 before conducting any sewage or waste 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.

593-4.2.4 SEWAGE AND WASTE WATER SYSTEM HOLDING TANK OR COMPONENTS ENTRY. Sewage and waste 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 waste water system holding tank or pipe. In addition, the procedures provided in the following paragraphs must be followed to open or enter sewage or waste water system holding tanks or piping system for maintenance or repair.

593-4.2.4.1 Large Holding Tank Entry. Procedures for inspection and maintenance of sewage systems requiring large holding tank (CHT systems) 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 593–4.2.1. Inspection and maintenance requiring entry into submarine, DD-963/DDG 993 VCHT and smaller (receiving station, etc.) sewage holding tanks shall follow procedures in paragraph 593–4.2.4.1.3.

WARNING

Permanent metal internal holding tank access ladders in holding tanks shall not be used. Temporary ladders and safety harnesses secured to a point

Warning - *precedes*

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 the holding 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.

593-4.2.4.1.1 Inspection and Maintenance Requiring Holding Tank Entry. Sewage holding tanks shall be cleaned and inspected approximately every three (3) years, or when holding tank 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. 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 631** . Installed zinc anodes shall be renewed in accordance with the requirements of **NSTM Chapter 633** .

WARNING

Ship force shall not enter the sewage 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 593–4.2.4 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 system operation and require holding tank access for correction, divert all sewage and waste drains overboard and secure the sewage system until proper facilities are available. Repair the sewage 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 593–4.2.4.1.2, shall be observed as follows:

   1 Secure all sanitary spaces draining to affected tank if in port. Divert all sewage and waste 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 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, observing the precautions outlined in the following paragraph, and 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 593–4.2.4.1.1, 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 utilized (if installed) in the sewage and wastewater inlet lines to the holding tank to prevent inadvertent collection of sewage and waste water. If spectacle flanges are not available, blank flanges should be installed in place of all sewage and waste 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 (for example, by removal of manhole access covers or liquid level sensor flanges), or removing any valves or components below the highest level of the sewage holding tank overflow, all personnel in the area at the time the opening is made shall wear either of the following:

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

2 A full facepiece air-line 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 firehose 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 593–4.2.4.1.1, step f. When the holding tank is certified GAS FREE and safe, personnel may enter, using respiratory protection as specified in paragraph 593–4.2.4.1.1, step c and the internal metal holding tank access ladder precautions as specified in paragraphs 593–4.2.4.1.1, step h and 593–4.2.4.1.1, 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 sewage 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 593–4.2.4.1.1, step i. If the design of the sewage 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 593–4.2.4.1.1, 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 593–4.2.4.1.1, step k.

2 If major deposits remain, exit tank and accomplish the cleaning procedure specified in paragraph 593–4.2.4.1.1, step f. Repeat the cleaning procedure and recertify tank GAS FREE (paragraph 593–4.2.4.1.1, step g.) until deposits can be physically removed. Then proceed to paragraph 593–4.2.4.1.1, 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 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 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 waste water holding tanks may contain toxic or explosive gases. No personnel shall attempt sewage system maintenance unless they have thoroughly read and become familiar with the safety requirements and precautions outlined in paragraph 593–4.2.4 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 facility becomes available. If necessary, deactivate the system and divert drains overboard until such facilities are available.

593-4.2.4.1.2 Maintenance Not Requiring Holding Tank Entry. If maintenance not requiring holding tank entry, calls for equipment to be removed which will leave an opening in the holding tank, (for example, 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 facepiece, Supplied Air Respirator/Self-Contained Breathing Apparatus (SAR/SCBA) operated in the pressure-demand mode.
2. A full facepiece air-line 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 593–4.2.4.1.1, step a. This will remove any septic sewage from the holding tank and discharge piping, and force any hydrogen sulfide at the fluid surface out the holding tank overflow.
5. 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 593–4.2.4.1.1, step b. If the holding tank atmosphere is not within acceptable limits, repeat step 4. until acceptable gas levels are achieved.
6. Equipment may then be removed with personnel using a respirator. 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 can unintentionally collect in the holding tank due to faulty or misaligned valves. This is a potentially lethal situation since the sewage

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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 which may have remained in the sewage discharge piping for extended periods. Spillage of this sewage 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 in the space and release of hydrogen sulfide gas.

593-4.2.4.1.3 Inspection and Maintenance Requiring Entry into Submarine, DD-963/DDG 993 Class VCHT Systems and Smaller Sewage Holding Tanks. Procedures for inspection and maintenance requiring holding tank entry on surface ships are discussed in paragraph 593–4.2.4.1.1. No personnel shall attempt this maintenance unless they have thoroughly read these procedures and the safety precautions outlined in paragraph 593–4.2.1. 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 593–4.2.4.1.1. 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 593–4.2.4.1.3, step f.

a. Inspection and Maintenance Requiring Holding Tank Entry. Holding tanks shall be cleaned and inspected approximately every three (3) years, or when 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. 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 draining to affected tank if in port. Divert all sewage and waste 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 sewage pumps and pump isolation valves.

7 Inspect holding tank in accordance with paragraph 593–4.2.4.1.1, 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 utilized (if installed) in the sewage and wastewater inlet lines to the holding tank to prevent inadvertent collection of sewage and waste water. If spectacle flanges are not available, blank flanges should be installed in place of all sewage and waste 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 593–4.2.4.1.1, step m and 593–4.2.4.1.1, step n.

f. 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 and **NSTM Chapter 074, Volume 3 (Gas Free Engineering)** .

593-4.2.5 SEWAGE AND WASTE WATER SYSTEM COMPONENT LABELING AND INFORMATION LABEL PLATES

593-4.2.5.1 Components. All sewage and waste water system components are labeled and marked in accordance with NAVSEA 0902-LP-001-5000, **General Specifications for Ships of the United States Navy (GENSPECS), Section 507** . 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. Valves and remote operating gear are labeled by service and position for system operating modes and damage control. Drains are marked to show the type of service; that is, sewage drains, waste drains, garbage grinder drains, and so forth. 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 a equipment room are labeled ″1A″ and ″1B″. Corresponding label plates are on the motor controller switches.

593-4.2.5.2 Information Placards. Label plates providing specific system operating instructions for all modes of system operation are provided in each sewage pump room space, deck discharge connection station and other dedicated equipment space. **GENSPEC Section 507** provides details on their fabrication.

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

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

The following label plate 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 label plate 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 label plate is provided in the vicinity of each sewage pump controller for those sewage systems where gravity sewage and waste overboards exist below the sewage 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 label plate is provided on or in the vicinity of each sewage holding tank access and sewage 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/CH-074.

The following label plate 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.**

Warning-*continued*

Warning - *precedes*

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 label plates 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 HOSE-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 firemain flushing connection. Secure firemain 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 air line 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.**

Caution-*continued*

Caution - *precedes*

2. **Personnel who connect or disconnect sewage transfer hoses shall not subsequently handle potable water hoses.**
3. **Personnel shall not eat, smoke, or drink during 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 waste 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 label plate 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 label plate 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 label plate 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.

593-4.3 SEWAGE AND WASTE WATER SYSTEM SUBSYSTEMS

593-4.3.1 FLOODING ALARM SYSTEM. This system is installed to indicate flooding resulting from improper operation, malfunction or failure of sewage pumps, valves or fittings. For a dedicated sewage 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).

593-4.3.2 HYDROGEN SULFIDE ALARM SYSTEM. A hydrogen sulfide (H_2 S) alarm system is installed for each sewage system pump room on all ship classes (except those ship classes equipped with vacuum collection systems). The H_2 S alarm system is designed to continuously monitor for the presence of hydrogen sulfide, and provide immediate notification of that presence.

593-4.3.2.1 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_2 S gas leakage located outside the containment coaming.

593-4.3.2.2 Alarm Set Points. The H_2 S gas detector system control unit activates visual and audible alarms when the H_2 S 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.

593-4.3.2.3 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_2 S 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.

593-4.3.2.4 Remote Alarms. Most ship classes are equipped with remote visual and audible alarms located in Damage Control Central or another continuously manned space.

593-4.3.2.5 Warning Plates. A warning plate 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_2 S GAS DANGER. USE EEBD (EMERGENCY ESCAPE BREATHING DEVICE) WHERE ESCAPE IS DELAYED.

FLASHING YELLOW LIGHTS AND BUZZER. LOW LEVELS OF TOXIC H_2 S GAS PRESENT. LEAVE THIS SPACE. REPORT TO DCA.

A warning plate is installed at the access to each pump room near the H_2 S alarm control unit indicator lights, inscribed as follows:

WARNING

RED LIGHT AND BELL ALARM OR YELLOW LIGHT INDICATES TOXIC H_2 S GAS LEAKAGE.

DO NOT ENTER WITHOUT RESPIRATORY PROTECTION OR UNTIL COMPARTMENT HAS BEEN CERTIFIED GAS FREE BY THE GAS FREE ENGINEER.

593-4.3.2.6 System Maintenance. The system is maintained and calibrated in accordance with the system's Planned Maintenance System (PMS) and technical manual.

593-4.3.3 AIRFLOW ALARM SYSTEM. This system 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 the leakage of hazardous materials (hydrogen sulfide) could present an explosive fire or toxic hazard. The installation for each compartment consists of an airflow sensor and an indication and control panel in accordance with drawing, NAVSHIPS No. 804-1853145. 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. The airflow rate setting for actuating the alarm is designed as a point midway between the airflow indicator pointer position with supply and exhaust fans operating and the pointer with supply fan operating and exhaust fan secured, with the compartment access secured for both conditions. A label plate is installed in a conspicuous location on the exterior of the access door to the monitored compartment. The plate is 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.

593-4.3.4 FIREFIGHTING. Fire fighting equipment (15 pound CO_2 bottle, firemain station) are provided in or near sewage and waste water system spaces. Personnel are reminded that the sewage and waste water holding tanks may contain toxic or combustible gases which can present an added hazard in an emergency situation (see **NSTM Chapter 074, Volume 3, Gas Free Engineering**).

593-4.3.5 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.

593-4.4 SEWAGE AND WASTE WATER SYSTEM MAINTENANCE AND REPAIR

593-4.4.1 SYSTEM PIPING BLOCKAGES. The character of human waste and seawater used for flushing (in most 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 the sewage waste. This calcium carbonate scale is extremely hard and cannot be completely removed by conventional mechanical cleaning procedures. Drains can also be blocked by foreign objects, garbage, or grease. Practices and procedures for limiting blockages from sources other than calcium carbonate are provided in **NSTM Chapter 505, Piping Systems** .

593-4.4.2 PIPE SYSTEM CLEANING. There are two NAVSEA approved methods for cleaning scale from sanitary system piping. These two methods are hydroblasting and acid/chemical cleaning. Hydroblasting uses high pressure water to pulverize scale. Acid/chemical cleaning removes scale by soaking the piping with an acid-based or other approved chemical.

593-4.4.2.1 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.

593-4.4.2.1.1 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. Repair and overhaul procedures for the waterjet machine are included in NAVSEA technical manual 0951-LP-037-6010.

593-4.4.2.1.2 Hydroblasting Procedure. High-pressure water from the waterjet machine is 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. This process

requires clean-out fittings at 50-foot intervals in the piping for hydroblast lance access, to minimize hydroblast pressure losses, and maintain maximum cleaning effectiveness. Custom hydroblast fittings (spectacle flanges, etc.) are also required in the comminutor/pump rooms. The design and location of these fittings are specified in the applicable Hydroblast Planning Document. 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 a Readiness Support Group or a Maintenance Control Center. This will ensure that hydroblast cleaning is properly scheduled and that the appropriate hydroblast planning document has been prepared.

593-4.4.2.1.3 Hydroblasting Quality Assurance. 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) videoprobe (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 test should be witnessed by the cleaning activity or contractor, the applicable SUPSHIP, and ship's force Repair Officer.

593-4.4.2.2 Acid/Chemical Cleaning. Sanitary system piping acid/chemical cleaning can only be performed by NAVSEA approved contractors using NAVSEA approved standard procedures or NAVSEA approved contractor proprietary procedures.

593-4.4.2.2.1 Acid/Chemical Cleaning Waste Disposal. All acid/chemical cleaning evolutions must include complete and proper disposal of all cleaning procedure wastes by the contractor 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 and flushed of all waste prior to the contractor leaving the ship.

593-4.4.2.2.2 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. All piping from individual fixtures to the holding tank should be completely clear of all scale deposits. An electro-optic remote visual inspection (RVI) videoprobe (borescope) can also be used to inspect the interior of the piping. 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, the applicable SUPSHIP, and ship's force Repair Officer.

593-4.4.3 SCALE PREVENTION. Pipe scale forms inside shipboard sanitary piping when calcium and other minerals present in human waste and flushing water precipitate from the sewage and bond to the pipe wall. The formation 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 593–4.4.2. Several maintenance procedures and preventive methods are available for scale prevention.

593-4.4.3.1 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 9G 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 one 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.

593-4.4.3.2 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.

CAUTION

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.

593-4.4.3.2.1 Polyolefin Parts Information. Allowance Parts List (APL) 679990237 provides NSNs for all polyolefin components required to replace brass tailpieces and p-traps.

593-4.4.3.3 Flushometer Maintenance. Dilution of human waste will assist 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.

593-4.4.3.4 Cleaning Products. Cleaning products used on sanitary fixtures (urinals and water closets) and other fixtures/drains served by sewage and waste water systems (sinks, showers, sanitary space deck drains) can have a detrimental effect on sewage and waste 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 waste water system accelerates the formation of pipe scale. These products should not be used in or on shipboard fixtures served by sewage or waste water systems.

593-4.4.3.4.1 The recommended cleaning product (cleaner/disinfectant) for these fixtures is Cleaning Compound, Solvent-Detergent (see paragraph 593–4.4.3.4.2 for ordering information). This cleaner is a biodegradable, specially formulated disinfecting and deodorizing cleaner that can be used on all hard non-porous surfaces including tile, porcelain, fiberglass, aluminum, stainless steel, glass, rubber, vinyl, plastic, and concrete. This cleaner is authorized for shipboard use, as listed on the Shipboard Hazardous Material List (SHML). The product shall be used in accordance with all manufacturer provided instructions and the applicable Material Safety Data Sheet (MSDS). The cleaner is intended to be used in various dilutions for varying cleaning purposes. Dilution rates for specific uses are provided below:

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.)

593-4.4.3.4.2 Cleaning Compound, Solvent-Detergent is available in the stock system under several National Stock Numbers (NSNs). NSN data is provided below:

Description	NSN
55 gallons	9Q 7930-01-346-4290
5 gallons	9Q 7930-01-347-0490
Gal Containers (6)	9Q 7930-01-346-4289
Qt Containers (6)	9Q 7930-01-350-4280

593-4.4.4 Component Acid Cleaning. This procedure shall only be used to clean scale from pipe sections which may be removed and acid-soaked separate from the system.

WARNING

Personnel engaged in chemical acid cleaning treatment shall observe safety precautions. Rubber gloves and a full facepiece 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.

593-4.4.4.1 Cleaning Procedure. The use of commercial chemicals or any chemicals other than those described in paragraphs 593–4.4.2, 593–4.4.3.3 and 593–4.4.5 in any portion of the drainage system is prohibited. In the acid cleaning process, cleaning is done by soaking the scale 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 (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.

NOTE

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 part still submerged) by adding the same number of cups of dry neutralizing compound, anhydrous soda ash, FED Spec 0-5-571, NSN 6810-00-262-8567 as dry sulfamic acid originally used. Let stand 15 minutes and dispose of neutralized solution.
7. Flush component thoroughly with seawater and inspect.
8. Inspect the component. If scale remains, the acid treatment should be repeated until it is clean.

593-4.4.5 SULFAMIC ACID. Sulfamic acid described in paragraph 593–4.4.4.1 or the cleaning product described in paragraph 593–4.4.3.3 may be used for removing scale deposits and stains from porcelain fixtures.

593-4.4.6 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 waste water systems requires that piping be in proper condition. Inspections of sewage and waste 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 waste water system piping are provided in the following paragraphs. Epoxy coated discharge piping (see paragraph 593–4.4.6.3) 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).

593-4.4.6.1 Discharge Piping Replacement. This section provides guidance for determining when sewage pump discharge piping should be replaced due to corrosion-induced wall thickness reductions. The allowable pipe wall thickness are defined by **NSTM Chapter 505** . **NSTM Chapter 505** paragraph 505–1.6.11.3 provides an equation for determining minimum allowable wall thickness accounting for pipe size, service, operating pressure, strength of material and normal operating temperature. Inspection of the piping is accomplished according to **NSTM Chapter 505** , paragraph 505–1.3.

593.4.4.6.1.1 Replacement Criteria. For purposes of sewage system discharge piping replacement, the operating pressure is considered to be 125 psi, which is the maximum allowable firemain pressure for discharge pipe/hose washdown connections. The strength of materials (or maximum allowable stresses) are provided by Table 505-5 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 system piping and components per Military Standard MIL-STD-777(SH). A typical sewage system uses Class 200, 90-10 Cu-Ni, four (4) inch nominal pipe in accordance with MIL-T-16420K(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 firemain pressure.

S = 9,000 psi. Stress value at design temperature (in this application, 150° F) of the installed material (based on Table 505–5 in **NSTM Chapter 505** for 90–10 Copper-Nickel {Cu-Ni}) Type II piping. Class 200 Cu-Ni

pipe 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-16420K(SH)).

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

Y = 0.4 A coefficient based on Table 505–3 in **NSTM Chapter 505** .

= 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 which 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.

593-4.4.6.2 GRP Piping. Unless specifically waived by NAVSEA, or specified in the ship specifications, Glass Reinforced Plastic (GRP) piping is not approved for use in CHT/VCHT system piping except for piping inside sewage tanks. The installation of GRP piping and components (including ladders) is approved inside CHT tanks and is described in NAVSEA Drawing 53711-505-7036295. In those ships where GRP piping is installed, repair procedures are outlined in paragraph 593–4.4.6.2.1.

593-4.4.6.2.1 Repair Procedure. Repair kits in accordance with MIL-R-17882 are generally provided and located in each damage control locker. The repair kits contain synthetic thermosetting resin, liquid and paste form hardener, glass cloth accessories, and instructions necessary to make shipboard emergency repairs on damaged pipe or leaking joints. If the damage control kits are not available, follow repair methods described in the following paragraphs.

a. Patching. If the damaged area is small, repair as follows:
   1 Cut a length of new MIL-P-24608 GRP pipe long enough to adequately cover the damaged area and extend two (2) to four (4) inches to either side of the damaged area. This section of pipe is the patch.
   2 For piping one (1) to four (4) inches in diameter, slit the patch lengthwise twice so that 3/4 of the circumference remains. For piping six (6) inches and greater in diameter, slit the pipe so 1/2 of the circumference remains.
   3 Wearing protective eye and respiratory gear, thoroughly sand the inner surfaces of the patch, and sand a corresponding area on the pipe around the damaged section. Use coarse sandpaper or file to remove all the gloss from the surfaces to be bonded.
   4 Clean both surfaces with joint cleaner from an adhesive kit, apply a suitable adhesive (Types Nos. DS8014, DS8069, DS8024, or RP76) to both surfaces, snap the patch in place, then squeeze with hose clamps or a banding tool and leave until adhesive hardens. The clamping device should be removed after curing.

b. Extensive Repair. Refer to NAVSEA T9500-AA-PRO-110, **NAVSEA Design Practices and Criteria Manual for Glass Reinforced Plastic (GRP) Piping Systems** , Chapter 505.

593-4.4.6.3 Epoxy-Lined Pipe. To eliminate corrosion and subsequent piping failures, 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.

593-4.4.6.3.1 How 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.

593-4.4.6.3.2 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 paragraph593–4.4.6.3.3. For other types of failed epoxy-lined sewage system discharge piping, follow the procedure provided in paragraph 593–4.4.6.3.4.

593-4.4.6.3.3 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 079-43 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 **NTSM Chapter 079** and **NSTM Chapter 505**) until the next scheduled replacement and recoating of failed sewage system discharge piping.

593-4.4.6.3.4 Extensive Repair. Since excessive heat will damage the coating, repair to damaged 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.″

593-4.4.7 SEWAGE AND WASTE WATER PUMP MECHANICAL SEALS. Procedures and criteria for inspecting, maintaining and replacing sewage and waste water pump mechanical seals are provided in the following paragraphs.

593-4.4.7.1 Mechanical Seal Inspection and Maintenance. Utilizing the applicable Maintenance Requirement Card (MRC), inspect the appearance of the mechanical seal oil. If water is detected in the seal oil cavity, 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 during normal operation, however, this does not necessarily indicate seal failure. A small amount of water will not adversely affect seal performance provided seal oil level is inspected and

seal oil is changed in accordance with the applicable MRC. It should also be noted that seal oil may take on a milky appearance after a period of operation due to entrained air, but this also does not indicate a seal failure. For those sewage pumps made by Peabody Barnes (Prosser/Enpo or Crane International), an oil fill plug (NSN 9G 6680-01-271-2251) is available which permits ship's force to visually check mechanical seal oil level without having to remove the plug. The oil level indicator shows a bright yellow dot in the center of the view port if the oil level is full, as required. If the oil level is low, the entire center view port appears yellow or clear indicating oil should be added to the cavity. Always clear the tip of the oil level indicator when adding oil before reinstalling the indicator.

593-4.4.7.2 Mechanical Seal Replacement. Sewage and waste water pumps have a zero leakage requirement past the secondary seal. Mechanical seal replacement is recommended if any leakage is detected past the secondary seal into the pump room or sewage pump disassembly is required. Replacement of the mechanical seals is accomplished in accordance with the applicable MRCs and pump technical manual.

593-4.5 GENERAL DESIGN CRITERIA

593-4.5.1 GARBAGE GRINDER DRAINS. Garbage grinder gravity drains connected to the waste drains are generally installed with a minimum slope of three (3) in/ft. Garbage grinder drains are also provided with a check valve to preclude back-flow from the waste drain, and a dedicated diverter valve to permit drainage to either the holding tank or directly overboard. When the garbage grinder employs seawater for flushing, the waste piping downstream of the garbage grinder must be copper-nickel alloy.

593-4.5.2 DAMAGE CONTROL. Sewage and waste 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 round, 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.

593-4.5.2.1 Where system valves are designated as damage control closures, the damage control valve bonnet and handwheel 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 waste water system classification and label plate.

593-4.6 SYSTEM DESCRIPTIONS

593-4.6.1 COLLECTION, HOLDING AND TRANSFER (CHT) SYSTEM. Most operational fleet ships of sufficient size will be equipped with CHT systems. The CHT system is designed to accept sewage discharge from water closets and urinals, and waste discharge from showers, laundries, and galleys. As the name of the system implies - collection, holding, and transfer - three functional elements constitute the CHT system.

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

3. Transfer Element. The transfer element includes sewage pumps, overboard and deck discharge piping, and deck discharge fittings.

NOTE

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

593-4.6.1.1 Modes of Operation. The CHT system can be used in any of three distinct modes of operation depending on the situation.

593-4.6.1.1.1 Transiting Restricted Waters. When transiting restricted waters, the CHT system will be set up to collect and hold the discharges from sewage drains only. Waste drains will typically be diverted overboard.

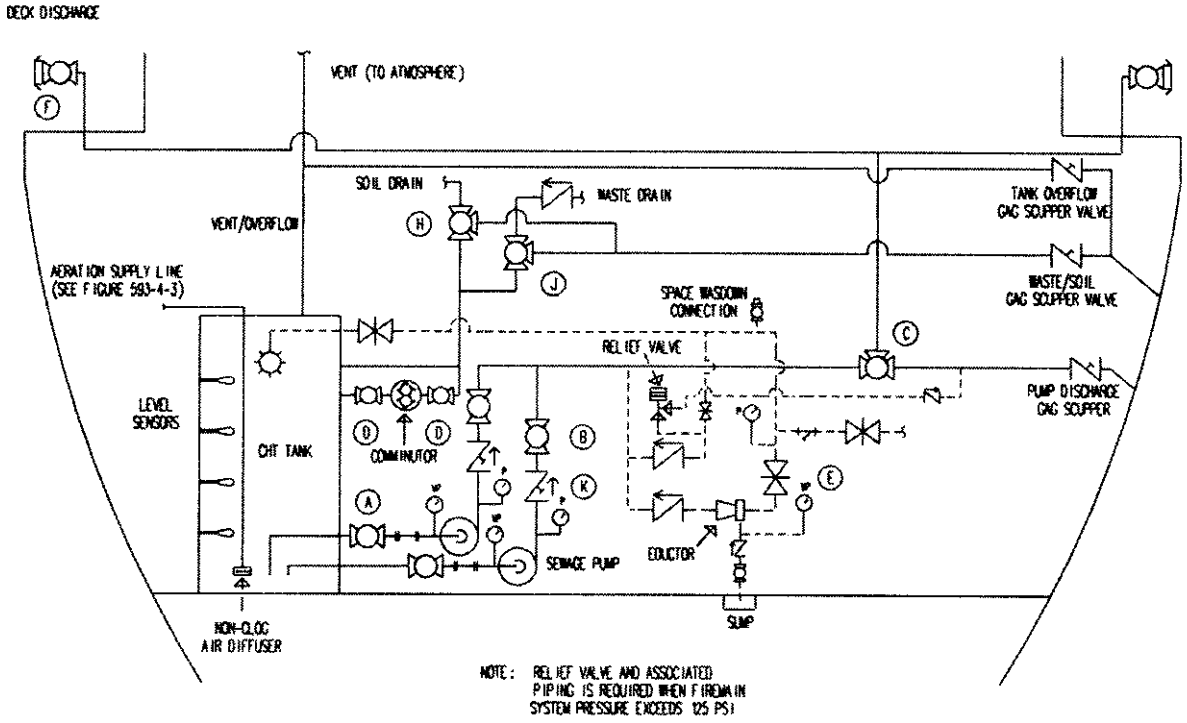
593-4.6.1.1.2 In-Port. During in-port periods, the CHT system will collect, hold, and transfer to a shore receiving facility all discharges from sewage and waste drains.

593-4.6.1.1.3 At-Sea. When operating at sea, outside restricted waters, the CHT system will be set up to divert discharges from both sewage and waste drains directly overboard.

593-4.6.1.2 System Types. Two 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. Smaller systems with holding tanks having a capacity of less than 2,000 gallons use a strainer type CHT system.

593-4.6.1.2.1 Comminutor Type CHT System. In a comminutor type CHT system the comminutor, located in the sewage drain main or the combined sewage and waste 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 593-4-1) include:

1. 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.
2. 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.
3. The Comminutor. One comminutor is located in each sewage drain main or combined sewage and waste drain main entering each holding tank.
4. The Gravity Collection System. The collection system consists of piping, valves, and fittings necessary to transfer sewage (and waste) from fixtures to the holding tank or overboard.

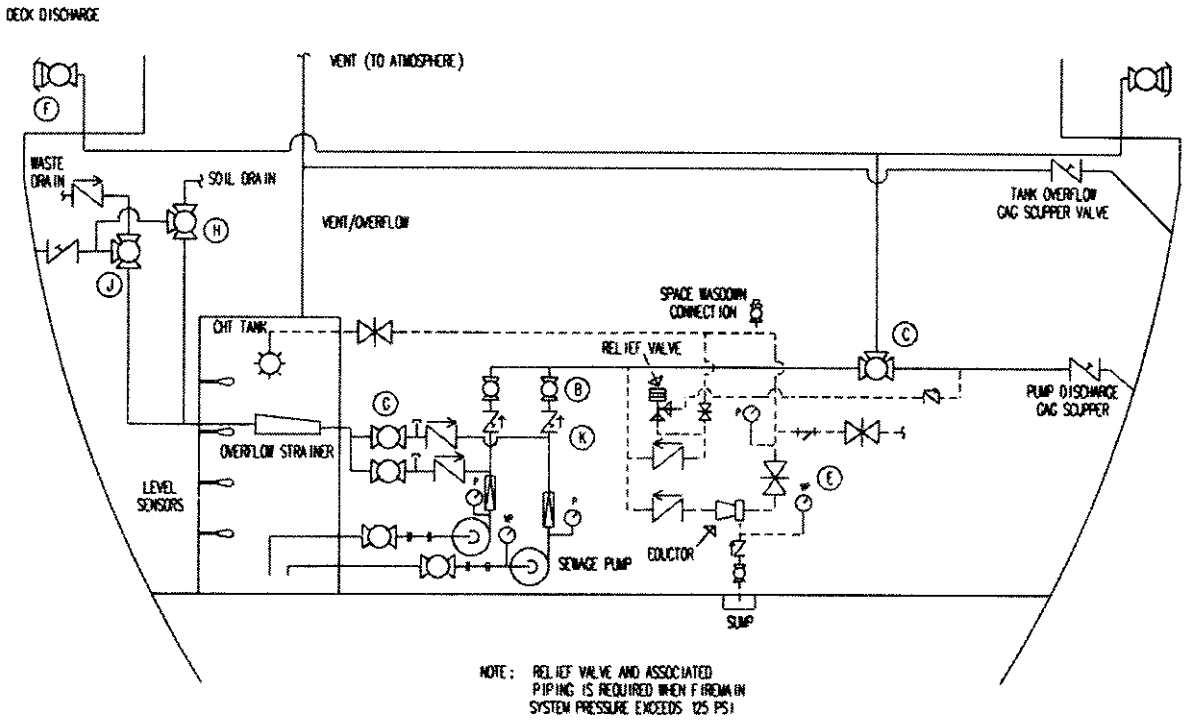


VALVE SERVICE LEGEND		
(A) PUMP SUCTION VALVE	(D) COMMINUTOR ISOLATION VALVE	(H) SOIL DRAIN DIVERTER VALVE
(B) PUMP DISCHARGE VALVE	(E) EDUCTOR SUPPLY VALVE	(J) WASTE DRAIN DIVERTER VALVE
(C) PUMP DISCHARGE DIVERTER VALVE	(F) DECK DISCHARGE VALVE	(K) PUMP DISCHARGE CHECK VALVE

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

Figure 593-4-1 Comminutor Type CHT System

593-4.6.1.2.2 Strainer Type 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, solid and liquid wastes 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 system components (Figure 593-4-2) 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	GAG 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 593-4-2 Strainer Type CHT System

1. 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.
2. 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.
3. The Gravity Collection System. The collection system consists of piping, valves, and fittings necessary to transfer sewage (and waste) from fixtures to the holding tank or overboard.

593-4.6.1.3 Element Installation Descriptions. Detailed descriptions of the installation of CHT system components are provided in the following paragraphs.

593-4.6.1.3.1 Collection Element. The basic CHT system concept requires that gravity waste drains be kept separate from gravity sewage drains wherever practical until they reach their respective overboard diverter valves. Downstream of their overboard diverter valves, both waste drains and sewage drains may be combined into a single gravity drain line leading to the CHT holding tank and overboard. All sewage and waste drains above the waterline may be diverted either to the CHT holding tank or directly overboard by gravity. Sewage and waste 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.

593-4.6.1.3.1.1 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.

593-4.6.1.3.1.2 Garbage grinder drains connected to the waste drains are generally installed with a minimum slope of three (3) in/ft. Garbage grinder drains are also provided with a check valve to preclude back-flow from the waste drain, and a dedicated diverter valve to permit drainage to either the CHT holding tank or directly overboard. When the garbage grinder employs seawater for flushing, the waste piping downstream of the garbage grinder must be copper-nickel alloy.

593-4.6.1.3.1.3 Plumbing (sewage and waste) 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 round, 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 CHT holding tank are used in place of bulkhead stop valves to prevent progressive flooding.

593-4.6.1.3.1.4 Where CHT system valves are designated as damage control closures, the damage control valve bonnet and handwheel 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 label plate.

593-4.6.1.3.2 Holding Element. The CHT holding tank is usually sized for a 12-hour holding period of sewage 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 hold-

ing 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 631, Preservation of Ships in Service (Surface Preparation and Painting)** , for protecting sanitary holding tanks and preventing corrosion. Each CHT holding tank is fitted with a vent to the atmosphere and an overflow to overboard. Vents should be positioned to avoid intake of CHT 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.

593-4.6.1.3.2.1 A fire main connection is provided for flushing and cleaning the CHT holding tank. Seawater can be 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 firemain for flushing the pump discharge piping and the transfer hose when the ship is preparing to leave port. A threaded firemain hose connection also is provided in the CHT pump room to permit attachment of a hose for rinsing the adjacent area.

593-4.6.1.3.3 Transfer Element. Each holding tank is equipped with two non-clog marine sewage pumps connected in parallel. 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. 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. An explanation of pump characteristics and curves is given in **NSTM Chapter 503, Pumps** .

593-4.6.1.3.3.1 Level Sensors. Each holding tank is equipped with level sensors that provide control of the transfer pumps and various alarms. The level sensors are located at various levels in the holding tank (low level alarm, low (pump stop) level, duty pump on level, standby pump on level, high level alarm level). See paragraph 593–4.6.1.4.1 for a description of level sensor operation.

593-4.6.1.4 Controls and Alarms.

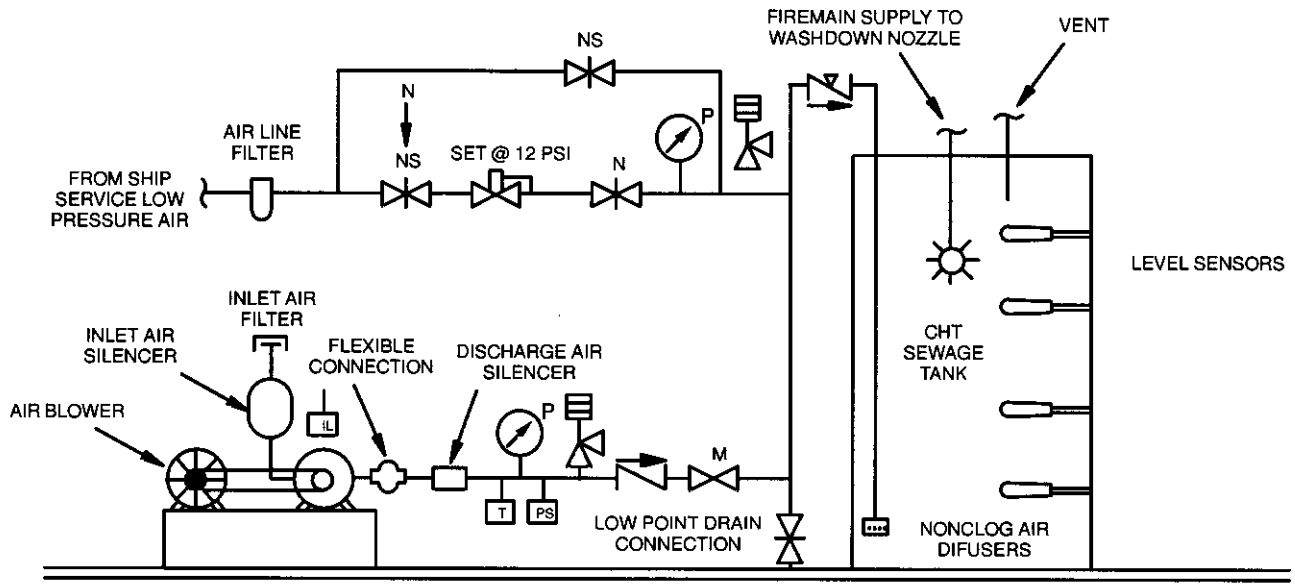
593-4.6.1.4.1 Pump Control. The CHT system pump controller provides for both manual and automatic modes of operation. In the MAN1 mode, when the pump controller selector switches are set to MAN1, either or both pumps may be actuated by the operator independent of the liquid level sensors located in the holding tank. 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 low level sensor. In the automatic mode, 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.

1. The controller provides duty pump alternation.
2. The pump stop (low) level sensor signals the controller to stop the pump(s) when the liquid level in the holding tank reduces to a pre-determined level.
3. The duty pump start level sensor signals the controller to start the duty pump when the liquid rises to a predetermined level.
4. 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.
5. 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 CHT pump space and in a continuously manned, remote location.

The sensors described previously in this paragraph are presented in relative order to their distance from the holding tank bottom. Some ships also have a low level alarm, controlled by the low level sensor to alert ship's force that the pumps will soon be running dry. This feature is not incorporated on all ships, but is being installed on new designs.

A slightly modified variation of the automatic level sensor system is installed on some ships. In this system the highest level sensor activates both the high level alarm and the standby pump. The next lower level sensor serves as the duty pump start sensor. The next lower level sensor stops the pump(s). Finally, the lowest level sensor in the holding tank activates a low level alarm to alert the ship force to the fact that the pumps will soon be running dry.

593-4.6.1.5 Aeration Subsystem. In the comminutor type CHT system, air is supplied to the holding tank to prevent the contents from becoming anaerobic (devoid of oxygen), and also to keep the solids in suspension. A typical aeration subsystem is illustrated in Figure 593-4-3. Aeration subsystems may vary somewhat from ship to ship.



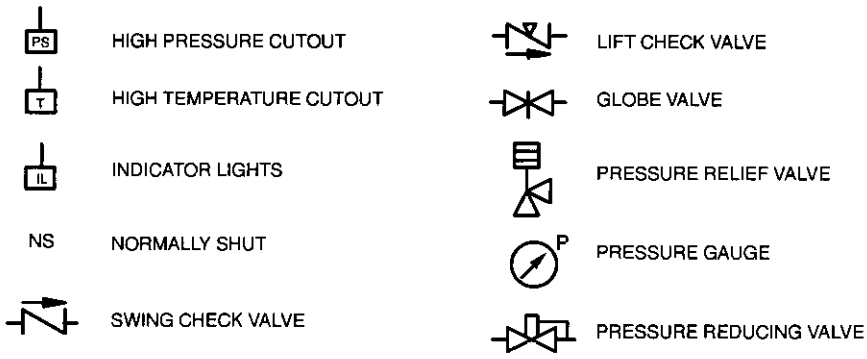


Figure 593-4-3 Aeration Subsystem

593-4.6.1.5.1 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. Air is supplied by a motor-driven blower.

593-4.6.1.5.2 In some systems, ship service air is provided as a secondary source. CHT systems onboard some aircraft carriers have no blowers for aeration and use ship service air as the primary source.

593-4.6.1.5.3 Where certain conditions dictate, some CHT 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.

593-4.6.1.5.4 Where an aeration or aspiration system is installed, it shall be operated whenever sewage is in the holding tank. Where an air blower or ship service air is used (Figure 593-4-3), 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.

593-4.6.1.6 CHT Operational Modes Descriptions. As discussed in paragraph 593-4.6.1.1, the CHT system is designed for three modes of operation: Transit Mode, In-Port Mode, and At-Sea Mode (see Figure 593-4-1 and Figure 593-4-2 for location of drains, valves, and other components). Detailed descriptions of the CHT operational modes are given in paragraphs 593–4.6.1.6.1 through 593–4.6.1.6.3. 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.

593-4.6.1.6.1 Transit Mode. While transiting a restricted zone, sewage drains are routed to the CHT holding tanks and waste drains are diverted overboard. Both CHT pump controller switches are in the OFF position. Pump suction valves A and inflow stop valves G (for strainer system only) are open (Figure 593-4-2). 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. Waste drain diverter valves J are in the OVERBOARD position, discharging overboard through the gag scupper valves.

593-4.6.1.6.1.1 For systems equipped with a comminutor (Figure 593-4-1) and an aeration system (Figure 593-4-3), 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 593-4-3). 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 activated immediately.

593-4.6.1.6.2 In-Port Mode. While in port the sewage transfer deck connections are connected to the receiving facility using sewage transfer hoses. Both sewage and waste drains are routed to the CHT 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 transfer 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 593–4.6.1.7 for nesting operations)

1 The sewage transfer 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 CHT pump room that hose connections have been made (Figure 593-4-1 and Figure 593-4-2).

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 sewage (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 Waste 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 CHT holding tank shall be washed down a minimum of 30 minutes each week.

8 While discharging waste through transfer 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 waste 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.

c. Sewage Leak or Hose Snag In Port. In the event of leakage or snagging of the transfer hoses, only valve F (Figure 593-4-1 and Figure 593-4-2) at the deck connection should be closed (closing the pier sewer valve may cause the discharge 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 593–4.6.1.7 for nesting operations).

1 Waste drain diverter valve J (Figure 593-4-1 and Figure 593-4-2) 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 transfer 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 transfer hose operations shall observe all applicable safety precautions described in paragraph 593–4.2.1 and sanitary and hygienic procedures described in paragraph 593–4.2.3.

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.

593-4.6.1.6.3 At-Sea Mode. While at sea, the sewage and waste drains are diverted overboard. The transfer pumps and the holding tank aeration system are secured. If the ship has sewage or waste drain lines located below the waterline, they will continue to drain to the holding tank while at sea. In this case, the transfer pumps will be in automatic and the aeration system will be in operation.

a. Procedure for changing to at-sea mode. For CHT systems not required to be operated as an ejection system (see paragraph 593–4.6.1.3.1), 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 waste drain diverter valves H and J should be set to the OVERBOARD position (Figure 593-4-1 and Figure 593-4-2).

2 For CHT systems outfitted with comminutors, the comminutor should be secured.

3 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.

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 593–4.6.1.6.2, 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 593-4-3). 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 593–4.6.1.3.1) the following system operational changes from paragraph 593–4.6.1.6.3, 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 CHT holding tank should be washed 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 593–4.6.1.6.2, step a.

6 **All sewage and waste drain diverter valves H and J should be set to the TO TANK position (Figure 593-4-1 and Figure 593-4-2).**

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. If an air aspirator system is installed, the system should be operated at all times.**

CAUTION

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.

593-4.6.1.7 Nesting Operations. To transfer CHT 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.

593-4.6.1.7.1 Hose Connections. When hoses are secured and 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 593–4.6.1.6.2. A schematic representation of the nested ship sewage transfer flow path is shown in Figure 593-4-4. In systems using aeration, valves N or M shall be open while pumping out sewage, and aeration shall be operating.

593-4.6.1.7.2 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 waste 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 593–4.6.1.7. 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, contain-

ing 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.

593-4.6.1.7.3 Surface Ship Tender and Submarine Tender Operations. During most tending operations, the ships being serviced transfer sewage to tender receiving tanks through tender receiving stations. Typical surface ship tender and submarine tender receiving stations are shown schematically in Figure 593-4-5 and Figure 593-4-6. Sewage 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 from the receiving tank inlet line directly to the receiving tank pump discharge line.

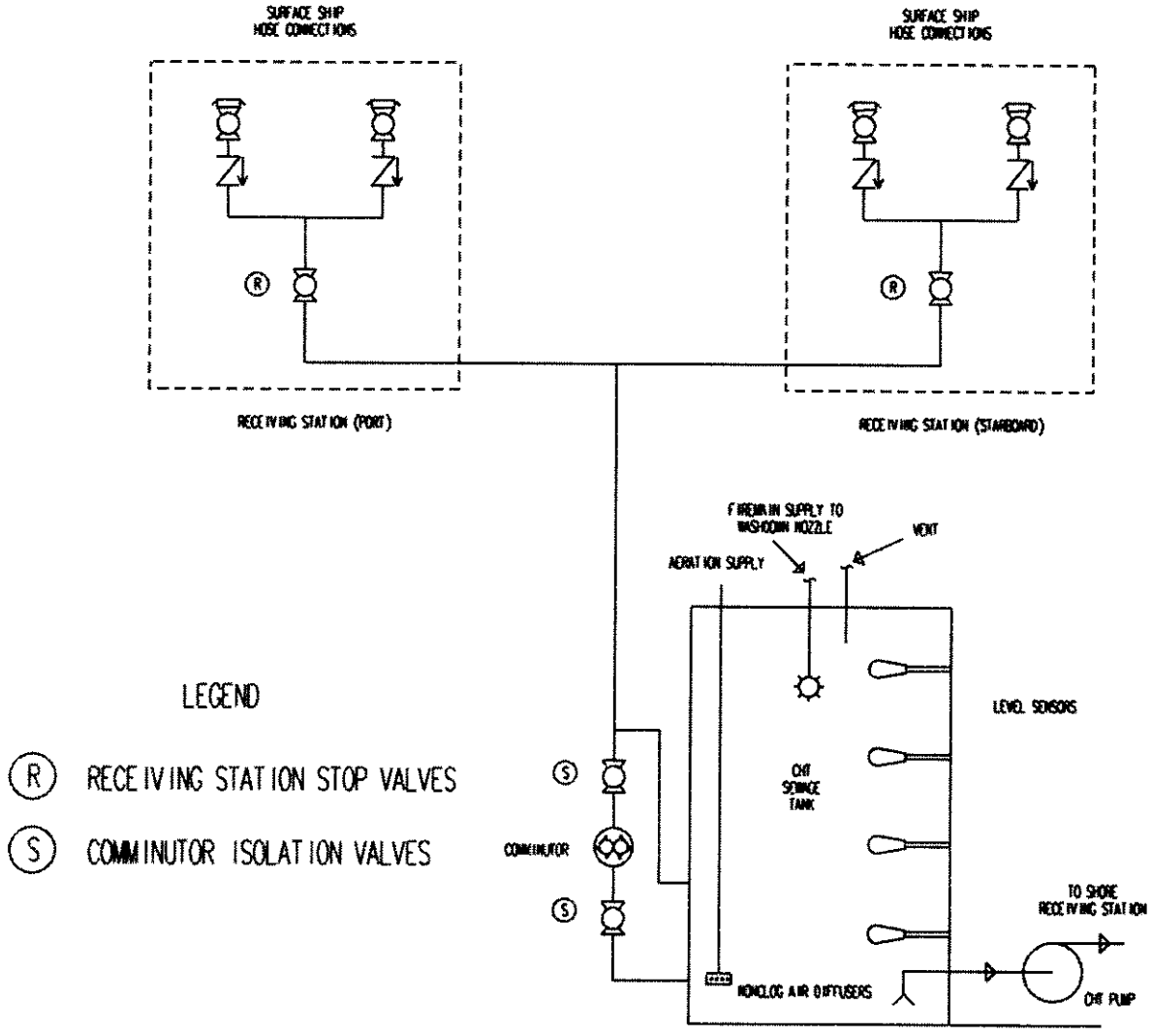


Figure 593-4-5 Surface Ship Tender Receiving Station

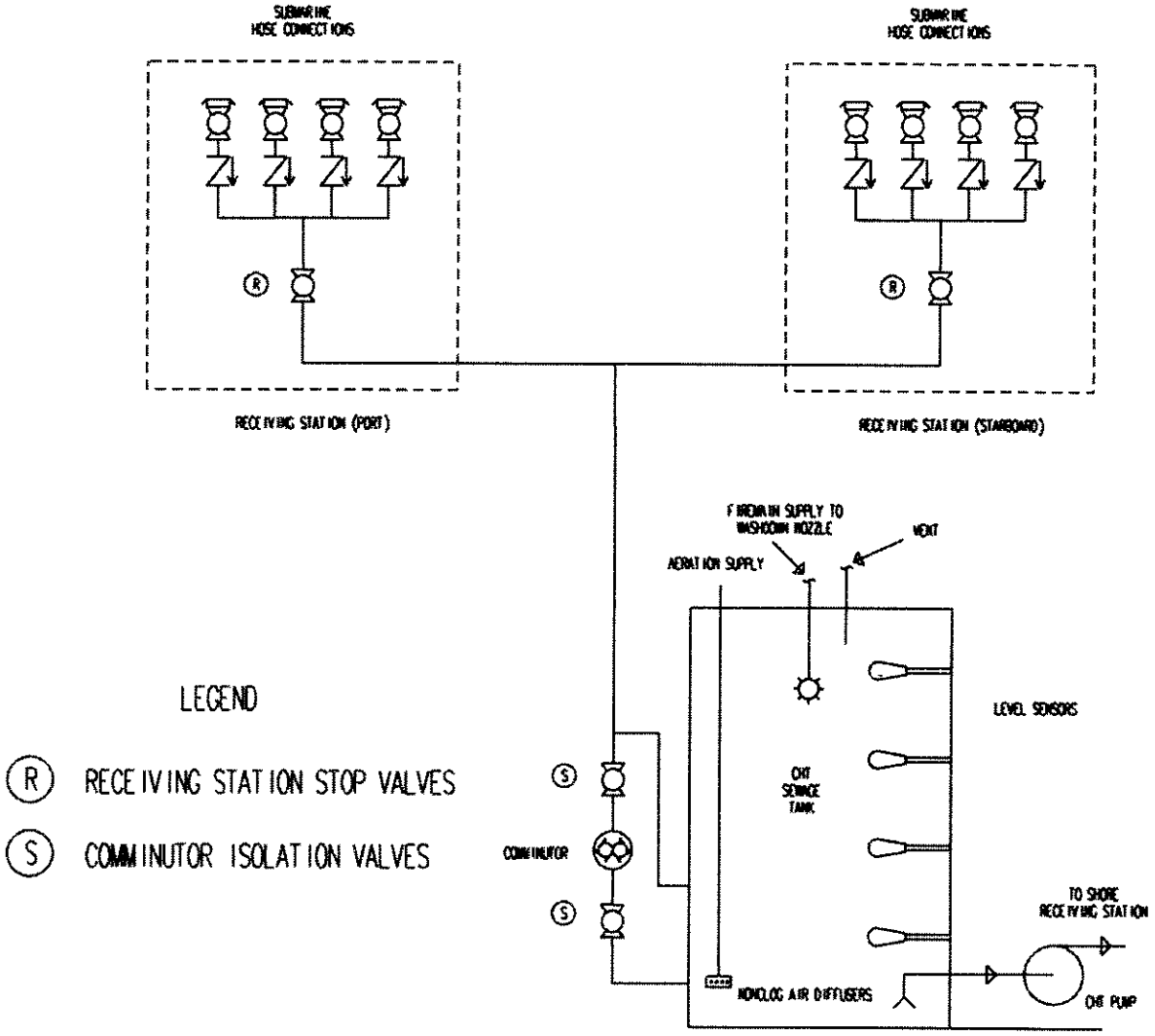


Figure 593-4-6 Submarine Tender Receiving Station

593-4.6.1.7.3.1 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.

593-4.6.1.7.3.2 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.

593-4.6.1.7.3.3 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 593–4.6.1.7 and 593–4.6.1.7.1. Then, as illustrated in Figure 593-4-5 and Figure 593-4-6, 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 receiv-

ing 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.

593-4.6.1.7.3.4 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 593–4.6.1.7.2 through 593–4.6.1.7.2, 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.

593-4.6.1.7.3.5 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.

593-4.6.1.8 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 593–4.2.2 and 593–4.2.3 shall be followed where they are applicable to the CHT system.

593-4.6.1.9 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. Maintenance personnel should refer to the technical manual for specific troubleshooting and repair procedures.

593-4.6.1.9.1 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.

593-4.6.2 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 waste 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 waste water system sanitary and hygienic procedures as described in paragraph 593–4.2.3 should be followed, as they apply to the VCHT system.

593-4.6.2.1 Operation. There are two major types of VCHT systems used on operational fleet ships, the firemain powered eductor type (DD-963 Class, DDG-993 Class, DDG-51), and the sewage powered ejector type (DDG-52 and follow, PC-1 Class, MHC-51 Class). Both systems include a holding tank and transfer system. The difference between the two systems is related to the method of vacuum collection.

1. The firemain powered eductor system generates vacuum in the holding tank and collection piping using a firemain powered eductor connected to the top of the VCHT holding tank.
2. The sewage powered ejector system generates vacuum 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.

593-4.6.2.2 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.

1. **While in port (In-Port Mode), the vacuum collection system is in operation collecting all sewage waste from water closets and urinals. The sewage is stored in the holding tank until pumped to shoreside facilities using a transfer system similar to the CHT system.**
2. **While in restricted waters (Transit Mode), the vacuum collection system is in operation collecting all sewage waste 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.**
3. **While in non-restricted waters (At-Sea Mode), the vacuum collection system is in operation collecting all sewage waste from water closets and urinals. The sewage is stored in the holding tank and pumped overboard periodically using the transfer system.**

593-4.6.2.3 Components. Components included in the VCHT system are described in the following paragraphs.

593-4.6.2.3.1 Vacuum Collection Piping. The vacuum collection piping design and operation is the same for both types of vacuum systems. The piping transports sewage from vacuum water closets (see paragraph 593–4.6.2.3.2) and urinals through vacuum interface valves (VIVs) (see paragraph 593–4.6.2.3.3) to the holding tank in the form of a slug. The sewage slug is formed when atmospheric air is admitted into the system by flushing a vacuum water closet or automatic actuation of a urinal VIV. The slug forms a seal as it conforms to the circumference of the piping, being propelled by the air on one side, and the system vacuum on the other. As the slug moves down the line, it begins to break up as the atmospheric air is consumed. In long piping runs one flush does not provide enough 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. Normal system vacuum levels range between 18 and 12 inches of mercury (Hg) with optimal levels from 14 to 16 inches of mercury (Hg). Two inch nominal diameter piping is the basic size for vacuum mains, and 1-1/2 inches is the basic size for branch lines from water closets and urinal VIVs. For efficient and proper operation vacuum collection, mains and branch lines is 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 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.

593-4.6.2.3.2 Vacuum Water Closet. The vacuum water closet is made of white vitreous china, and is deck mounted. Flushing water supplied by the ship’s potable water or reduced pressure sea water firemain system. 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 which opens the flushing water and discharge valves. The flushing water valve dispenses water to rinse the bowl as atmospheric air propels 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. The flushing water is supplied by the ship's potable water or reduced pressure sea water firemain system. Approximately three pints of water is dispensed per flush. If the vacuum water closet flush cycle is initiated when the system vacuum is below the minimum required for operation, it will automatically flush when the minimum operating vacuum level is restored.

593-4.6.2.3.3 Urinal and Vacuum Interface Valve (VIV). A standard shipboard gravity drain urinal is used with the flushing water supplied by the ship's potable water or reduced pressure sea water firemain system. 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). The major components of the VIV are a level sensing activator and a discharge valve. The activator and discharge valve are connected to the urinal drain by tubing referred to as the buffer volume area. As waste and flushing water collect in the buffer area, hydrostatic pressure is created. When the pressure reaches a pre-set level it deflects a diaphragm in the activator which starts a vacuum-mechanical circuit. Vacuum is directed to the discharge valve, causing it to open, allowing the buffer contents to flow into the collection pipe propelled by atmospheric air. The discharge valve is then vented, causing it to close, completing the flushing cycle.

593-4.6.2.3.4 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.

593-4.6.2.3.5 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.

593-4.6.2.3.6 Holding Tank. The VCHT system includes a sewage holding tank to hold sewage until pumped overboard or to a shoreside facility. In the firemain powered eductor system the holding tank is under vacuum. In the sewage powered ejector system the tank is not under vacuum.

593-4.6.2.3.7 Transfer System. The VCHT system is typically equipped with a transfer system similar in design and operation to a CHT system.

593-4.6.2.4 Changing VCHT System Modes of Operation. 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.

593-4.6.2.5 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.

593-4.6.2.5.1 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.

593-4.6.3 JERED VACU-BURN SEWAGE TREATMENT SYSTEM. The JERED Vacu-Burn Sewage Treatment System is built by JERED Industries, Inc. The system is designed for a complement of 200 and is installed on DD-963 and DDG-993 Class ships. Each ship is 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 waste water system sanitary and hygienic procedures as described in paragraph 593–4.2.3 should be followed, as they apply to the JERED system.

593-4.6.3.1 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 at the Fleet Training Center, Naval Station, San Diego, CA and Fleet Training Center, Norfolk, VA. The description given in the following paragraphs is intended as a general explanation of the system and how it operates.

593-4.6.3.1.1 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 at the Fleet Training Center, Naval Station, San Diego, CA and Fleet Training Center, Norfolk, VA. The description given in the following paragraphs is intended as a general explanation of the system and how it operates.

593-4.6.3.1.2 The interrelationship of the major components and the concept of operation of this system are shown in Figure 593-4-8. Sewage wastes are introduced into the system by vacuum flush water closets and urinals, which use a reduced volume of water (three (3) pints for water closets and one (1) pint for urinals). Sewage is transported through the piping by inrushing air which enters the system when the water closet valve is opened. The vacuum flush system is independent of gravity and the lines do not require a sloping run. Where it is necessary to negotiate existing structures, piping can be routed up and over for short distances. Piping for the JERED system offers the advantage of more effective odor containment since line leakage, if any, will be inward.

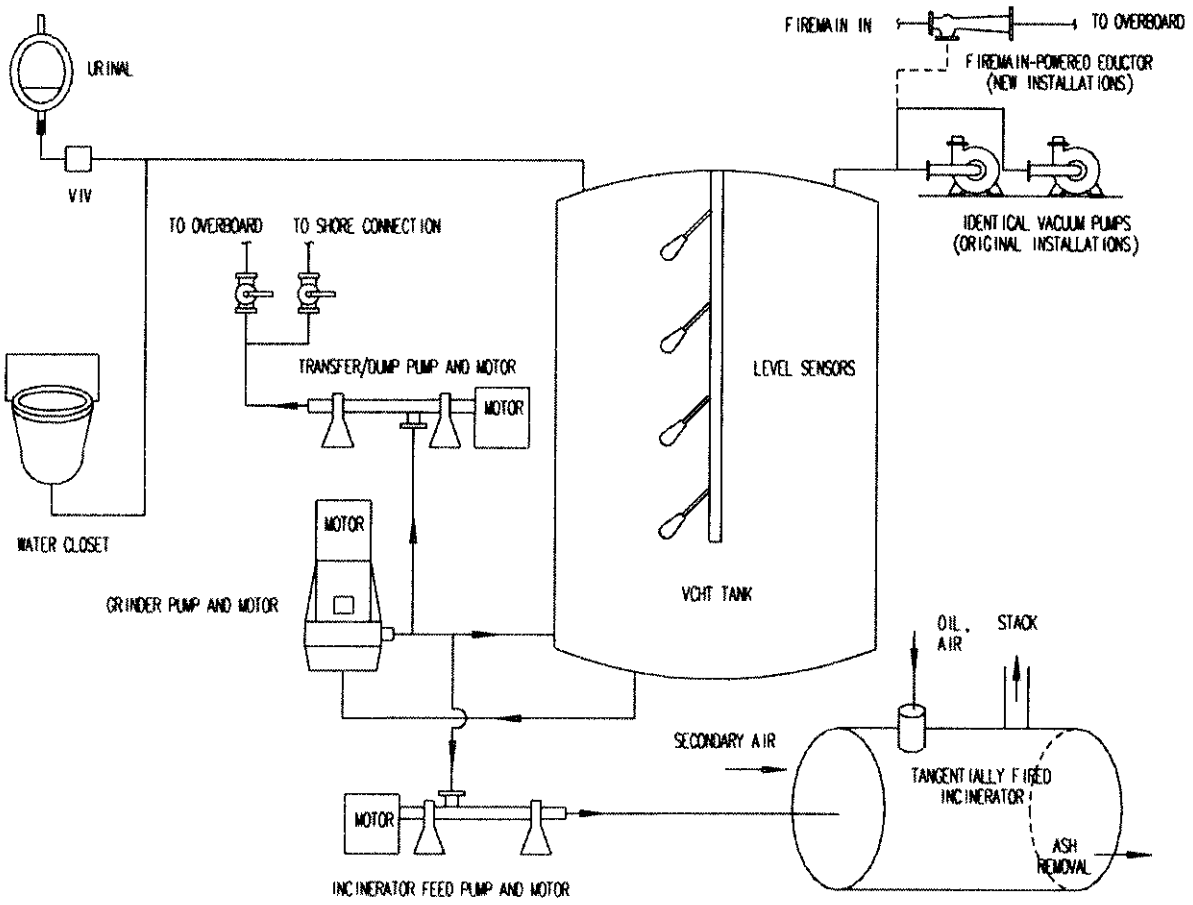


Figure 593-4-8 JERED Vacuum Collection and Incineration System

593-4.6.3.1.3 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.

593-4.6.3.1.4 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.

593-4.6.3.1.5 Original installations use two liquid ring vacuum pumps to maintain the vacuum collection tank at a partial vacuum of 20 inches of mercury (in Hg). The pumps alternate in function to provide equal usage. The vacuum pumps can maintain low pressure conditions during a flush rate of 10 to 20 flushes per minute. However, due to high failure rates, the vacuum pumps are being removed and replaced with a firemain-powered eductor assembly for each system.

593-4.6.3.2 Modes of Operation. The JERED system is designed to accommodate three different modes of operation. The vacuum collection system shall operate in all modes.

1. The overboard dump mode (At-Sea Mode) for operation in non-restricted waters: In the overboard dump mode, the liquid level in the vacuum collection tank controls a transfer/dump pump which discharges overboard.

2. The incineration mode for operation in a restricted zone: In the incineration mode, sewage is pumped by the incinerator feed pump from the vacuum collection tank and 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 in the vacuum collection tank controls a transfer/dump pump which discharges to the pier.

593-4.6.3.3 Components. Components of the JERED system are described in following paragraphs.

593-4.6.3.3.1 Vacuum Flush Water Closet. The vacuum flush water closet assembly contains a combination vacuum-mechanical circuit to actuate, sequence, and time out the flush cycle. The majority of the operating mechanisms parts are plastic or rubber.

593-4.6.3.3.1.1 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.

593-4.6.3.3.1.2 Although bulky objects will be trapped in the bowl, the system is designed to allow free passage of most objects all the way to the vacuum collection tank.

593-4.6.3.3.2 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 sea water firemain can be used to flush sanitary fixtures in the event fresh water is not available, but is not recommended. Firemain 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, VIVs handle flow from two urinals. 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 waste draining from the urinal, the diaphragm in the vacuum interface rises. The diaphragm moves the vacuum switch from the closed to the open position, allowing vacuum to be transmitted to the vacuum dispensing valve. Vacuum from the vacuum switch causes the vacuum dispensing valve to open, which allows vacuum to be transmitted to the bottom of the sewage discharge valve. Vacuum in the lower chamber of the sewage discharge valve pulls the diaphragm down in that valve, which allows liquid and inrushing air to flow to the collection tank. Internal springs for the VIVs' various valves return them to their closed positions, ready for the next flushing cycle.

593-4.6.3.3.3 Piping. Pipe sizes for the JERED system are 1-1/2 and 2 inch. 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 should be of the long turn type. Valves are of the full flow type to minimize any obstructions.

593-4.6.3.3.4 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.

593-4.6.3.3.5 Transfer/Dump Pumps. When the system is set in the overboard discharge mode, or when pumping to a shore facility, 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.

593-4.6.3.3.6 Vacuum Pump and Motors. The vacuum pumps are the liquid ring type, each capable of evacuating 35 ft^3 /min of air at 29 inches Hg conventional inches of mercury. The pumps are supplied with water from the 50-gallon reservoir and are motor-driven. The pumps are mounted on top of the reservoir. Vacuum pumps maintain a vacuum in the vacuum collection tank and collection lines.

593-4.6.3.3.6.1 A lead pump and a backup pump alternate to equalize usage. The lead pump cuts in when the line vacuum decreases to 16 inches Hg. The backup pump augments the system if the vacuum continues to decrease beyond 14 inches Hg. Both units cut off at 20 inches Hg. The vacuum pumps can maintain normal vacuum conditions during a flushing rate of 10 to 20 flushes per minute. Note that firemain-powered eductors are being installed to replace the liquid ring vacuum pumps as a vacuum source in order to reduce maintenance effort.

593-4.6.3.3.7 Firemain-powered Eductors. The firemain-powered eductors 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.

593-4.6.3.3.8 Vacuum Collection Tank. The 240-gallon vacuum collection tank is 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.

593-4.6.3.3.8.1 Four float-type liquid level controls are installed in the vacuum collection tank to monitor and control flow. Their functions are described below.

1. 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.
2. 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.
3. 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.
4. The very high (D) level sensor signals the master controller to close the firemain-powered eductor's motor/solenoid operated suction valve (eductor systems) or secure vacuum pumps (vacuum pump systems) and pro-

vides a visual very high level alarm in the VCHT pump room and a visual and audible very high level 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.

593-4.6.3.3.8.2 Compressed air can be used to discharge the vacuum collection tank contents as an alternate process should the transfer/dump pump malfunction.

593-4.6.3.3.9 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 (2,000° 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 (700° F) leave the other end of the cylindrical chamber through the flue. Odors are destroyed by temperatures within the incinerator. After the incinerator has cooled down, ashes are removed through a small, removable door located at the bottom of the main incinerator door.

593-4.6.3.3.9.1 The incinerator is cooled by air passing between the incinerator walls. Exhaust cooling air is vented to the atmosphere.

593-4.6.3.3.9.2 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.

593-4.6.3.4 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.

593-4.6.3.5 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.

593-4.6.3.5.1 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.

593-4.6.4 GATX MK I SYSTEM. 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 MSOs and MCMs. It is illustrated in Figure 593-4-7.

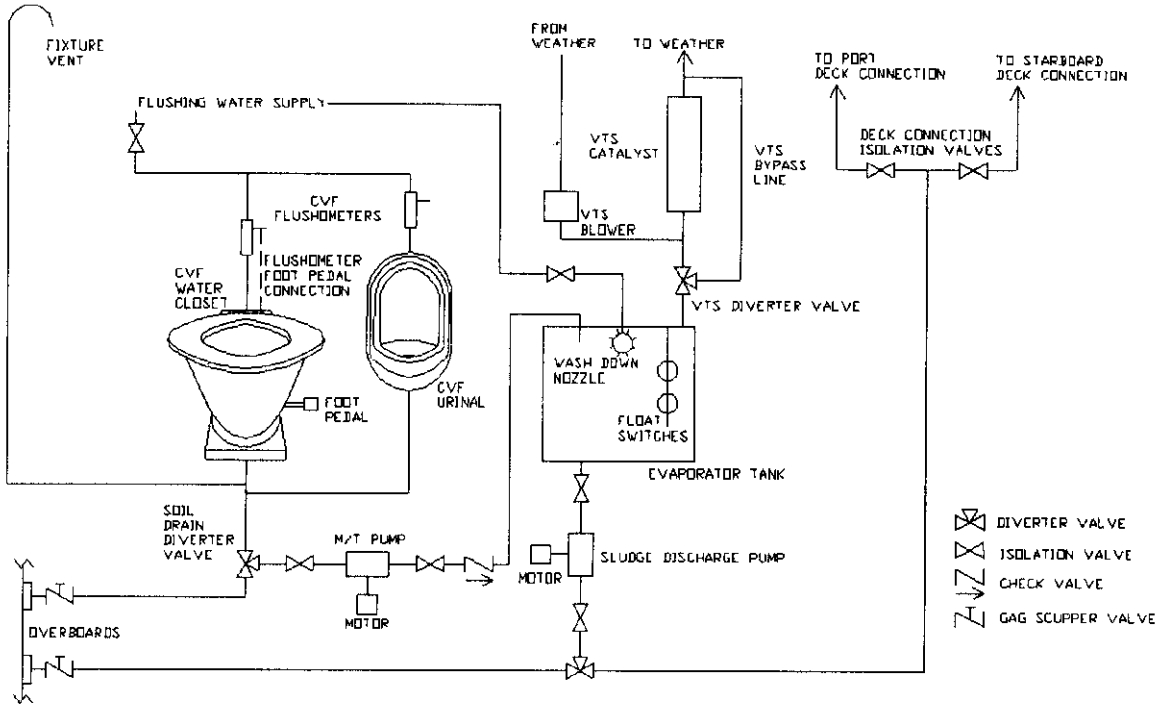


Figure 593-4-7 GATX MK I Evaporative Toilet System

NOTE

The GATX MK I MSD incorporate the applicable sanitary and hygienic provisions as discussed in paragraph 593–4.2.2. All sewage and waste water system sanitary and hygienic procedures as described in paragraph 593–4.2.3 should be followed, as they apply to the GATX MK I MSD system.

593-4.6.4.1 Operation. Operators of the GATX MK I 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.

593-4.6.4.1.1 The GATX MK I system operates on the principal of volume reduction of sewage by:

1. Minimizing the volume of sewage generated, using a Controlled Volume Flush (CVF) collection system.

2. Boiling off most of the water content in an evaporation tank; the evaporator retains the remaining solid waste product in the form of a sludge.

593-4.6.4.1.2 The GATX MK I system 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.

593-4.6.4.1.3 The relationship of the major components and the concept of operation of the GATX system may readily be seen by reference to Figure 593-4-7. Sewage wastes are introduced into the system by a CVF water closet. Flushing and dilution of the waste is accomplished with a minimum of water so the total volume of diluted waste material to be handled is held to a low level (1 pint of flush water for urinals and three (3) pints in water closets).

593-4.6.4.1.4 The diluted waste output of the CVF water closet 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, reducing waste 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.

593-4.6.4.1.5 All wastes are 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 depending on the class of ship. The evaporator tank is steam-heated to 110° C (230° F), permitting the majority of the liquid in the slurry to be vaporized and vented to the atmosphere. 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 non-restricted waters to reduce the level of sludge in the evaporator tank by pumping sludge overboard in accordance with applicable SDOSS procedures.

593-4.6.4.1.6 The GATX MK I vapor treatment system (VTS) was developed 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.

593-4.6.4.2 Modes of Operation. The GATX MK I system 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.

1. **For long periods in restricted waters (Transit(Evaporate) Mode), the system is fully operated as described in paragraph 593–4.6.4.3.6.**
2. **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.**
3. **In non-restricted waters (At-Sea Mode), wastes are diverted directly overboard by gravity and the evaporator treatment system and M/T pumps are secured.**

NOTE

The GATX MK I system 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.

593-4.6.4.3 Components. Components of the GATX MK I system are described in paragraphs 593–4.6.4.3.1 through 593–4.6.4.3.8.

593-4.6.4.3.1 CVF Water Closet. The GATX MK I 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 waste from the bowl section is accomplished by opening a flapper valve at the bottom of the bowl at the completion of usage, permitting solids and wastes rinsed from the bowl to drop into a pump immediately below the bowl. Operation of the valve is actuated by depressing the flush pedal.

593-4.6.4.3.1.1 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.

593-4.6.4.3.1.2 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 dolphin-type flushometer.

593-4.6.4.3.1.3 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 waste 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 automatically actuates the M/T pump. The M/T pump will immediately start (except on MCMs where a short, about ten (10) second, delay prior to pump start will occur), and operate for approximately 10 to 12 seconds. The M/T pump comminutes the waste and transports the resultant slurry to the evaporator tank. A check valve located at the M/T pump outlet prevents any backflow of wastes after pump shutoff.

593-4.6.4.3.1.4 The CVF water closet is designed to interface with a standard three (3) or four (4) inch sewage line.

593-4.6.4.3.2 CVF Urinal. The CVF urinal (illustrated in Figure 593-4-7) 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.

593-4.6.4.3.3 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 ETS.

593-4.6.4.3.3.1 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.

593-4.6.4.3.3.2 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

593-4.6.4.3.3.3 The status readout lamps should be monitored during each watch.

593-4.6.4.3.4 M/T Pump. The M/T pump comminutes the waste materials from the water closet and transfers the macerated waste 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 action of the water closet flush pedal. Because of the reduction in waste particle size, slurry lines between the pump and the evaporator tank need not be larger than 1-¼ inch in diameter.

593-4.6.4.3.4.1 The M/T pumps employ specially designed cutters that macerate all normal sanitary 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 sanitary wastes.

593-4.6.4.3.5 Drain and Transfer Piping. The GATX MK I drain and transfer piping system includes various diameter piping, valves and clean-outs. The valves and piping transfer waste 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:

1. Gravity drain piping is provided for all water closets and urinals. Three (3) inch diameter piping leads from each water closet and two (3) 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.
2. The diverter valves turned to the TO TANK position will direct the gravity drained waste to the inlet side of the M/T pumps through three (3) inch piping.
3. 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.

4. 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.
5. The diverter valves turned to the TO OVERBOARD position will direct the gravity drained waste into three inch overboard transfer piping.
6. 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.

593-4.6.4.3.6 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.

593-4.6.4.3.6.1 The steam jacket heats the evaporator tank to 110° C (230° F). Three electrical immersed heaters, for crews to 30, each rated at 1.83 kW, vaporize water within the steam jacket and produce the steam necessary to heat the tank.

593-4.6.4.3.6.2 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.

593-4.6.4.3.6.3 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.

593-4.6.4.3.6.4 The evaporator tank is designed to operate approximately two-thirds full. Therefore, before initial evaporator start up, the system is precharged 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 two-thirds the 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 a sludge.

593-4.6.4.3.6.5 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.

593-4.6.4.3.6.6 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, deenergizing the heaters until enough steam has condensed to sufficiently raise the water level.

593-4.6.4.3.6.7 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.

593-4.6.4.3.6.8 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 waste input and sludge suction line in the evaporator.

593-4.6.4.3.6.9 The evaporator steam jacket pressure and water level should be monitored during each watch.

593-4.6.4.3.7 Vapor Treatment System. The GATX MK I vapor treatment system (VTS) is a significant factor in ensuring user acceptability of the system. The VTS passes the water vapor over an electric heater and through the catalyst bed. The malodorous components of the vapor, heated to 260° C (500° 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.

593-4.6.4.3.7.1 Components required to operate the vapor treatment system are 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 deenergizes the VTS heater. The VTS heater is reenergized as soon as the temperature drops below 260° C (500° F). The VTS heater is also deenergized 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 deenergized 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.

593-4.6.4.3.7.2 Operation of the VTS blower should be monitored during each watch.

593-4.6.4.3.8 Sludge Pump. The sludge pump is used to pump the concentrated sewage from the evaporator tank, through the combined waste input and sludge suction line, to either a shoreside pump out station 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.

593-4.6.4.4 Changing GATX MK I MSD Modes of Operation. GATX MK I 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 and 593–4.2.3 shall be followed where they are applicable to the GATX MK I MSD system.

593-4.6.4.5 GATX MK I MSD Maintenance and Repair. Maintenance procedures for the GATX MK I 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.

593-4.6.4.5.1 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 system is prohibited.

593-4.6.5 GATX MK II SYSTEM. The GATX MK II system manufactured by General American Transportation Corp. (GATX) is installed on some boats and service craft.

NOTE

The GATX MK II system incorporate the applicable sanitary and hygienic provisions as discussed in paragraph 593–4.2.2. All sewage and waste water system sanitary and hygienic procedures as described in paragraph 593–4.2.3 should be followed, as they apply to the GATX MK II system.

593-4.6.5.1 Operation. The GATX MK II system for boats and service craft differs from the larger GATX MK I in that sewage is retained in a holding tank. The significant feature of this system is the reduction in the volume of waste/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 installation is shown in Figure 593-4-9. In this system, waste is collected in the water closet along with three pints of flush water. 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) mile limit, the holding tank is pumped overboard.

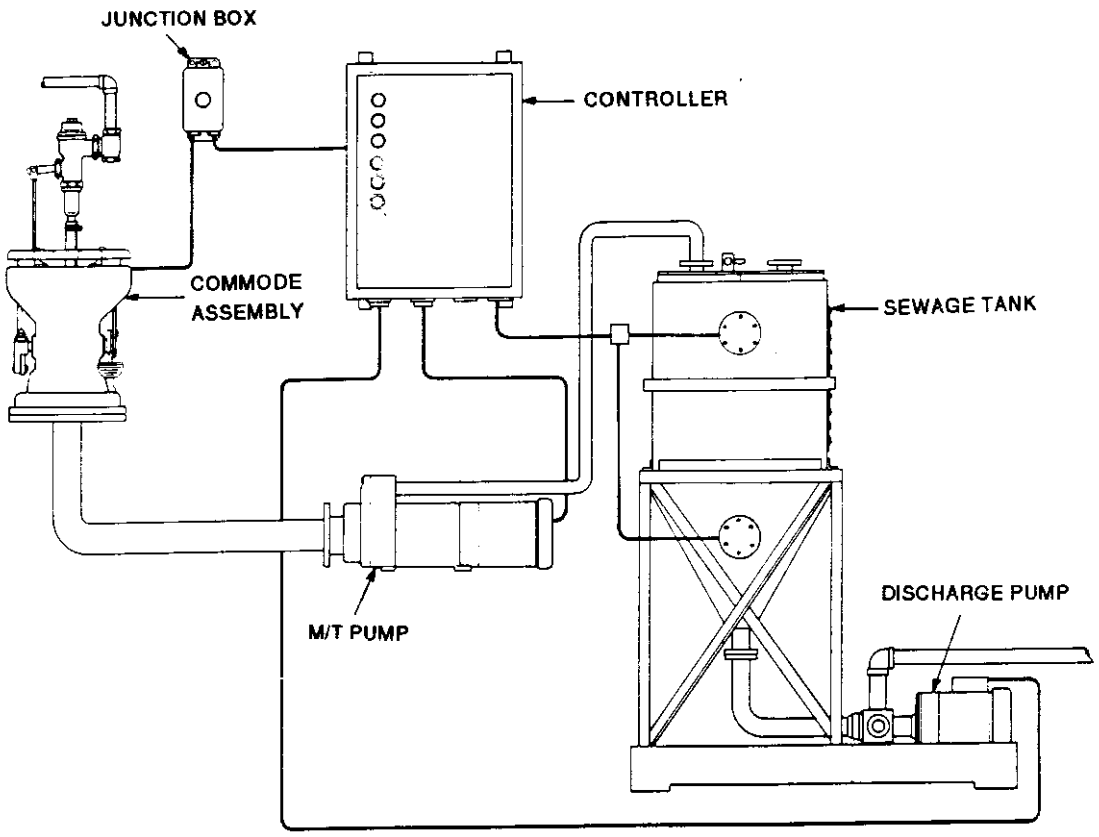


Figure 593-4-9 GATX MK II System

593-4.6.5.2 Modes of Operation. Modes of operation for the GATX MK II MSD are described in the following paragraphs.

1. While in port (In-Port Mode), the GATX MK II system collects waste using macerator/transfer pumps. The waste is stored in a holding tank and periodically pumped to shoreside receiving facilities.

2. While in restricted waters (Transit Mode), waste 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 or overboard, respectively.

3. While in non-restricted waters (At-Sea Mode), waste is stored in the holding tank and periodically pumped overboard.

593-4.6.5.3 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 found in paragraphs 593–4.6.4.3.1 and 593–4.6.4.3.4.

593-4.6.5.4 Changing GATX MK II MSD Modes of Operation. GATX MK II 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 593–4.2.2 and 593–4.2.3 shall be followed where they are applicable to the GATX MK II MSD system.

593-4.6.5.5 GATX MK II MSD Maintenance and Repair. Maintenance procedures for the GATX MK II 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.

593-4.6.5.5.1 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 system is prohibited.

593-4.6.6 KOEHLER-DAYTON RECIRCULATING FLUSH MSD. The Koehler-Dayton MSD is a recirculating toilet. Recirculating systems present general advantages such as low water consumption, low volume, and low weight. The reduction in the flushing-water requirement due to recirculating the flush water is as much as 99 percent.

NOTE

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

593-4.6.6.1 Operation. A schematic block diagram of the Koehler-Dayton MSD is shown in Figure 593-4-10. The Koehler-Dayton MSD unit tank is initially charged with four (4) gallons of fresh water (hand loaded from storage cans or hose) to which is added four (4) ounces of a chemical additive containing deodorizing coloring and wetting agents plus disinfectant. In a freezing environment, an ethylene-glycol base antifreeze is employed. With each use of the toilet, a pump integral to the unit is operated to pump fluid from the unit tank through a strainer or baffle device to the top of the bowl and to flush waste into the unit tank.

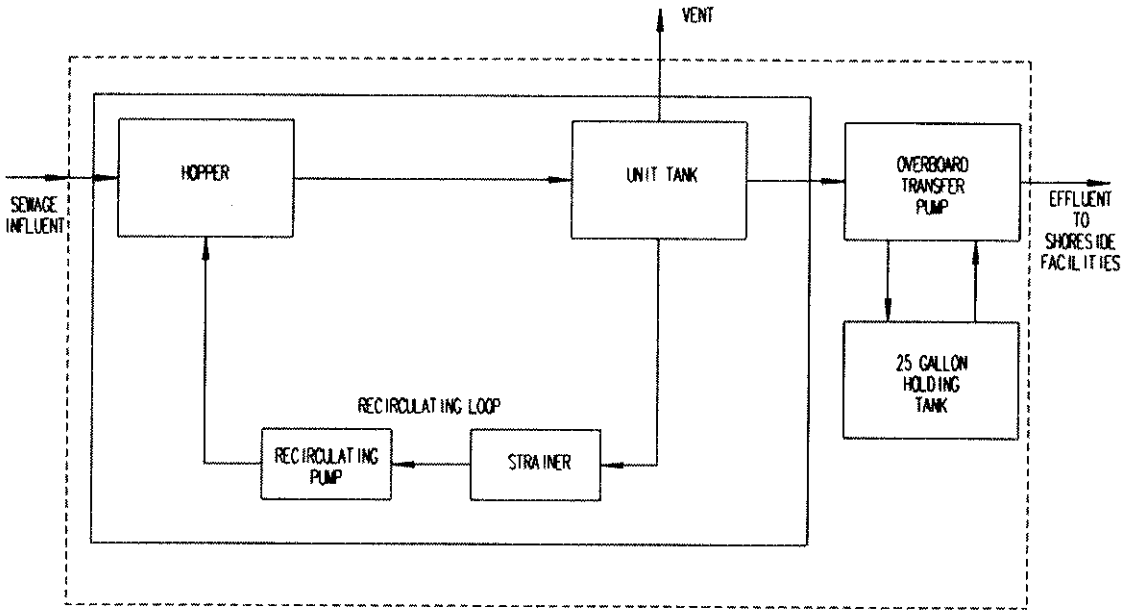


Figure 593-4-10 Koehler-Dayton Marine Sanitation Device Functional Schematic

593-4.6.6.1.1 Although the unit tank is designed to accommodate approximately 160 uses before the tank requires emptying into the associated holding tank, the unit should be drained and re-primed at two (2) day intervals, regardless of the number of usages, to ensure odor-free operation. Whenever the unit tank is drained, it is recharged with fresh water and chemical and the cycle is repeated.

593-4.6.6.1.2 The 25-gallon holding tank contains a level sensor which actuates a red warning light in the head area whenever the tank level reaches 80 percent of capacity. After the proper valve alignment, the holding tank can be emptied overboard or to a shoreside facility using the macerator/transfer (M/T) pump.

593-4.6.6.2 Components. Components of the Koehler-Dayton MSD are listed below:

1. A Koehler-Dayton recirculating flush toilet unit, which includes a 20 gallon unit tank.

2. An electrical, mechanical pump to bring fluid from the unit tank to the toilet bowl.

3. A 25-gallon stainless steel holding tank. The 25 gallon holding tank is included to extend the holding capabilities of the system.

4. A macerator/transfer (M/T) pump to empty either the unit tank or the holding tank.

5. Associated plumbing and instrumentation.

593-4.6.6.3 Changing Koehler-Dayton MSD Modes of Operation. Koehler-Dayton 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 Koehler-Dayton MSD system.

593-4.6.6.4 Koehler-Dayton MSD Maintenance and Repair. Maintenance procedures for the Koehler-Dayton 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.

593-4.6.6.4.1 Preventive maintenance for the Koehler-Dayton MSD shall be performed according to applicable MRCs. It should be noted that the use of commercial chemical pipe cleaners in the Koehler-Dayton MSD is prohibited.

593-4.6.7 PALL TRINITY SYSTEM. The Pall Trinity MSD system is a biological sewage treatment system installed on LHA-1 Class ships. This system uses aerobic bacteria to digest and break down the organic waste matter in sewage. Aerobic bacteria are bacteria which live only in the presence of dissolved oxygen. Aerobic bacteria reduce the harmful organic matter in sewage to harmless carbon dioxide and water. Such a system is called an aerobic system. Three systems are installed on each ship in the LHA-1 Class.

NOTE

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

NOTE

If the plant is operating properly, the contents of the aeration tank will have an earthy brown color. A damp peat odor is normal. A hydrogen sulfide odor (resembling rotten eggs) should not be present under any circumstances. The liquid level should be approximately six (6) inches below the tank top and a continuous, vigorous, and uniform roll of the liquid should be evident. If these conditions do not exist, check the air diffuser, described in the following paragraph for damage or clogging.

593-4.6.7.1 Operation. The Pall Trinity system is known more specifically as an activated sludge system. The system is shown in Figure 593-4-11. Raw sewage flows into an influent box where it can be directed through a comminutor and macerated or through a bar screen where coarse solids are screened out. Sewage then enters the aeration compartment. In the aeration compartment microorganisms naturally present in the sewage convert the organic matter in the sewage to carbon dioxide, water, and new bacteria cells. By this process dissolved organic matter and very fine suspended matter, otherwise unremovable, are converted into harmless by-products and into new bacteria cells which are easily settled out. Air is supplied to this chamber by a blower or ship service air. This air supplies the oxygen needed for the biological processes and mixes the tank contents to keep the micro-organisms constantly in contact with the sewage. The aeration tank contents are warmed by a heat exchanger to accelerate the treatment process. The aeration tank contents then flow to the sedimentation chamber where the mass of micro-organisms settle out. The clear upper layer of water flows into the chlorination tank where

hypochlorite is added to disinfect the water. The settled mass of micro-organisms (called activated sludge) is returned to the aeration chamber by air lifts where it aids in breaking down fresh sewage. A skimmer in the sedimentation chamber also removes floating scum and returns it to the aeration chamber for treatment. After the water is disinfected in the effluent holding tank, it is pumped overboard or to a pierside connection. A series of four level sensors activates and deactivates discharge pumps. The treated water is can be pumped overboard or to a pierside connection. Effluent testing requirements can be found in the plant's technical manual (NAVSEA 0936-LP-4010).

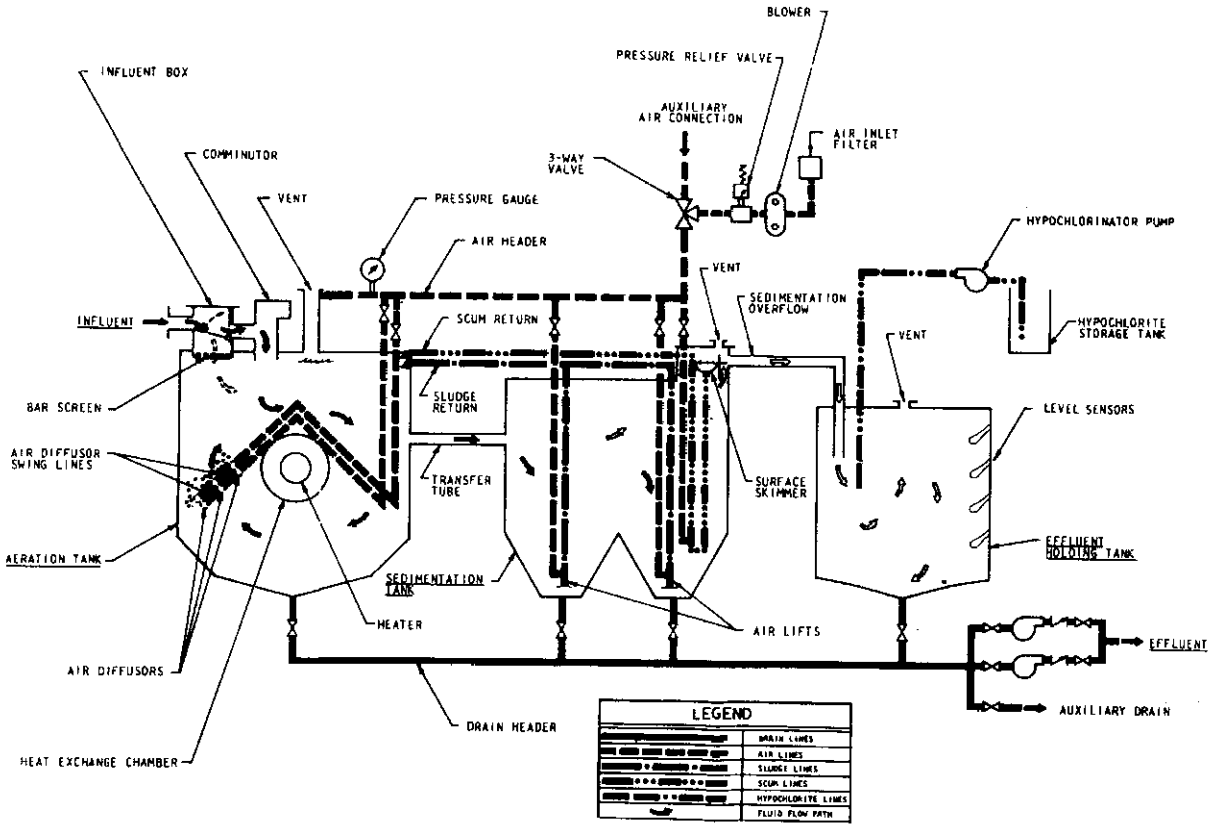


Figure 593-4-11 Pall Trinity Biological Treatment System

593-4.6.7.2 Components. The components of the Pall Trinity system are described in the paragraphs that follow.

593-4.6.7.2.1 Sewage Treatment Plant (STP). The sewage treatment plant is a heat-energized, continuous, aerobic digestion unit. The plant includes an aeration tank for continuous, uniform mixing and digestion; a sedimentation tank in which sludge and floatable solids are separated and returned to the aeration tank; a chlorine contact tank; and an effluent holding tank. The plant has level sensors to control the chemical feed and overboard discharge pumps, and the necessary valving, piping, and accessory equipment. The plant is constructed of reinforced steel plate. The interior is coated in accordance with the holding tank coating requirements of paragraph 593–4.6.1.3.2, and the exterior is provided with a zinc chromate primer. The aeration, sedimentation, and effluent holding compartments are provided with access manholes with removable covers for inspection and service. In addition, the influent mixing compartment has a clear plastic port to permit observation without removing the cover.

593-4.6.7.2.2 Influent Mixing Compartment. The influent connection is a 150-pound ASA RF steel flange connection located at the upper front center of the plant. Raw sewage is mixed with the returned sludge and directed to the aeration compartment through either the comminutor or bar screen. Flow direction is provided by a manually operated flip gate.

593-4.6.7.2.3 Aeration Compartment. Aerobic digestion takes place in the aeration compartment.

WARNING

If inspection is required and the plant has been used but is not operating at the time of inspection, open front and rear aerator supply valves, turn on air blower, and operate for a minimum of 30 minutes. Under no circumstances should any personnel enter tanks.

593-4.6.7.2.4 Aeration System Diffusers. Air is released into the aeration compartment through non-clog diffusers located to provide efficient mixing of oxygen transfer. The diffusers may be removed from the compartment for inspection without the plant being drained. The air piping is constructed so the diffusers may be inspected with minimum headroom and without disassembly of piping. This is accomplished by raising the air diffuser assembly using the plastic coated lift cable in each manhole.

593-4.6.7.2.5 Aeration System Blower. The standard plant includes a blower, complete with motor, mounted on the upper center section of the plant. The blower, sized to operate at a speed not higher than 75 percent of its rated capacity, provides air for the aerobic digestion process, the roll of the liquid for efficient mixing, and the sludge return air lifts. Air header pressure should be 3 ± or 1/4 lb/in read on gages located both on the top and side of the aeration tank. In the event the air blower is inoperative, ship service air can be accessed by operating the diverter valve installed in the air header.

593-4.6.7.2.6 Heat Exchanger. The elevated temperature of the aeration compartment is provided by a heat exchanger, including an electric heater immersed in a heat exchange fluid. Fill and drain ports are conveniently located. Heat exchange fluid level should be at the full mark on the sight level gage. When the aeration tank heater switches are in the AUTO position the conditions that should exist are:

1. Aeration tank fluid temperature should be between 29.4° and 40.6° C (85° and 105° F).
2. The aeration tank thermoswitch should be set at 35° C (95° F).
3. Heater No. 1 thermoswitch should be set at approximately 127° C (260° F), or a setting adequate to maintain 35° C (95° F) aeration tank fluid temperature.
4. Heater No. 2 thermoswitch is set 11° C (20° F) higher than heater No. 1 thermoswitch.

593-4.6.7.2.7 Sedimentation Compartment. The sedimentation compartment is a quiescent (still) zone which permits separation of sludge from the treated liquid. The settled sludge is returned to the influent mixing chamber by air lifts (Figure 593-4-11).

593-4.6.7.2.8 Sludge Return System. The operation of the air lifts can be observed through the transparent cover above the inlet mixing compartment. Air is provided by the aeration system blower. The air lifts are constructed for convenient rodding, if required. Flows can be observed through clear sections of the four (4) inch sludge return piping at the top of the plant.

593-4.6.7.2.9 Surface Skimmer. The surface skimmer is constructed to collect floatable solids into a skimming trough by gravity and to discharge them into the aeration section by a separate air lift. The surface skimmer operates when the surface skimmer air supply valve is opened.

593-4.6.7.2.10 Chlorination Process. Chlorine solution is contained in plastic storage containers mounted on a steel rack. A chemical feed pump, located on the equipment deck, pumps solution from the storage container into the effluent holding tank. Chlorination is automatic, requiring only periodic filling of the storage containers.

593-4.6.7.2.11 Effluent Holding Tank. Pumps discharge treated effluent from the holding tank either overboard or to a pierside sewer.

593-4.6.7.2.12 High Level Alarm. A level sensor is located in the effluent holding tank to indicate the high water level in the event of effluent stoppage. A red light on the control panel as well as a local audible alarm informs the operator of this condition. An alarm light is also provided in Damage Control Central.

593-4.6.7.2.13 Control Panel. Electrical controls are located in an enclosure located at the front of the plant.

593-4.6.7.2.14 Sampling System. Taps are provided for taking samples from the aeration, sedimentation, and effluent holding compartments. Influent and sludge return samples may be taken from the influent mixing compartments.

593-4.6.7.2.15 Cleanout System. The standard plant includes piping, valving, and connections for complete draining of the plant. For cleaning, the aeration, sedimentation, and effluent holding compartments are provided with firemain-supplied washdown nozzles. The tanks are flushed before servicing. Cleaning of the drainage piping to the plant is the same as that required for the CHT system in paragraphs 593–4.4.1 through 593–4.4.2.2.2, 593–4.4.4, and 593–4.4.5. Draining of the entire plant is accomplished by opening five valves connected to the bottoms of the aeration, sedimentation, and effluent holding tanks and using the effluent discharge pumps.

593-4.6.7.2.16 Comminutor. A comminutor, with controls, is installed as an integral part of the plant to grind entering solids. The comminutor is powered by an electric motor and runs continuously. The use of a comminutor eliminates the necessity for manual cleaning of the bar screen. The location of the comminutor permits inspection and servicing without draining the plant. A bar screen and flip gate are provided to screen incoming raw sewage and return sludge when the comminutor is not in use.

593-4.6.7.2.17 Overboard Discharge Pumps. Dual centrifugal pumps are provided with check and isolation valves as well as level sensors for control. Pumps are provided with an automatic alternator to provide rotation of the pumps.

593-4.6.7.3 Changing Pall Trinity System Modes of Operation. Pall Trinity 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 593–4.2.2 and 593–4.2.3 shall be followed where they are applicable to the Pall Trinity System.

593-4.6.7.4 Pall Trinity System Maintenance and Repair. Maintenance procedures for the Koehler-Dayton 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.

593-4.6.7.4.1 Preventive maintenance for the Pall Trinity system shall be performed according to applicable MRCs. It should be noted that the use of commercial chemical pipe cleaners in the Pall Trinity system is prohibited.

593-4.6.8 WASTE WATER SYSTEMS. Waste water from sinks, showers, laundries and galleys is classified as graywater. Ships equipped with CHT systems have the capability to collect graywater as well as sewage in the CHT holding tanks. Newer ship classes such as DDG-51 were built with various separate and integral graywater collection systems. Older ship classes such as LHA-1, DD-963 and DDG-993 are being backfitted with separate graywater systems.

NOTE

Waste water (graywater systems) incorporate many of the sanitary and hygienic provisions as discussed in paragraph 593–4.2.2. All sewage and waste water system sanitary and hygienic procedures as described in paragraph 593–4.2.3 should be followed, as they apply to the waste water systems.

593-4.6.8.1 Operation. A typical graywater collection system is shown in Figure 593-4-12. Most graywater systems work on the CHT system principle (collect/hold/transfer).

1. Collection Element. The collection element consists of waste drains with diverter valves. Depending on the position of the diverter valves, the waste can be diverted directly overboard or into the graywater holding tanks.

2. Holding Element. The holding element consists of a holding tank for each system.

3. Transfer Element The transfer element consists of two sewage transfer pumps and possibly one firemain-powered eductor per system. Discharge to the pier and overboard is typically accomplished using existing sewage systemdischarge piping.

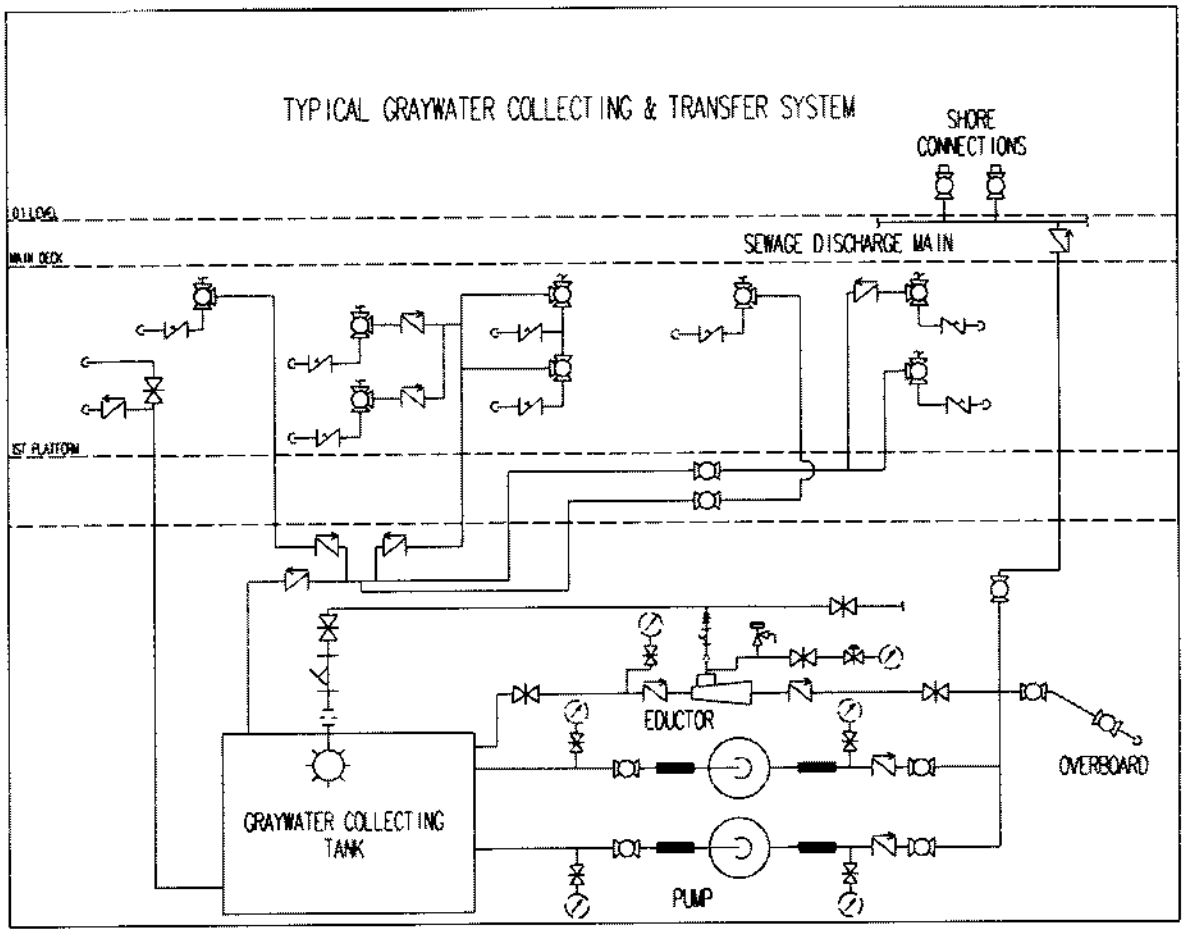


Figure 593-4-12 Graywater Collection System

593-4.6.8.2 Modes of Operation. The graywater system can be used in any of three distinct modes of operation depending on the situation.

1. While in port (In-Port Mode), the graywater system will collect, hold, and transfer to a shore receiving facility all discharges from the waste drains.
2. While transiting (Transit Mode), the graywater system can be operated to collect and hold the discharges from waste drains or divert all waste drain effluent directly overboard. The configuration of the graywater system in the transit mode will depend on local environmental regulations.
3. While in non-restricted waters (At-Sea Mode), the graywater system will be set up to divert discharges from the waste drains directly overboard.

593-4.6.8.3 Components. Most graywater systems consist of components very similar in design and operation to CHT systems. See paragraph 593–4.6.1.2 as applicable.

593-4.6.8.4 Changing Waste Water System Modes of Operation. Waste water (graywater) 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 593–4.2.2 and 593–4.2.3 shall be followed where they are applicable to waste water (graywater) systems.

593-4.6.8.5 Waste Water System Maintenance and Repair. Maintenance procedures for waste water (graywater) 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.

593-4.6.8.6 Waste Water System Tanks and Hydrogen Sulfide Gas. Hydrogen sulfide gas can develop in waste water systems holding tanks, especially on certain ships classes which are equipped with waste 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. This toxic gas could enter the ship through the ship's ventilation system when the tank is next pumped out to overboard. Waste 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).

593-4.6.9 SEWAGE AND WASTE WATER TRANSFER SYSTEMS. Typically, each sewage and waste 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.

593-4.6.9.1 Operation. Typically, each sewage and waste water system holding tank is equipped with two non-clog marine sewage pumps connected in parallel. 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.

593-4.6.9.1.1 Non-Nested Operation. Typical non-nested operational procedures for a sewage or waste water transfer system are provided in the CHT system section in paragraphs 593–4.6.1.6.2, step a. through 593–4.6.1.6.3, step c.

593-4.6.9.1.2 Nester Operation. Typical nested operational procedures for a sewage or waste water transfer system are provided in the CHT system section in paragraph 593–4.6.1.7.

593-4.6.9.2 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 of 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 593–4.6.1.6 and 593–4.6.1.7).

593-4.6.9.3 Components. A typical sewage or waste transfer system includes the components described in the following paragraphs.

593-4.6.9.3.1 Transfer Pumps. Each sewage and waste 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** .

593-4.6.9.3.2 Deck Discharge Connection. There are typically deck connections installed on both the starboard and port sides if the ship. The deck connections include an isolation valve and a CAMLOCK quick disconnect fitting. Depending on the ship, the deck connection may also include an air fitting for hose blow back, a pressure gage or an in-line flowmeter.

593-4.6.9.4 Changing Transfer Modes of Operation. Sewage and waste 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 593–4.2.2 and 593–4.2.3 shall be followed where they are applicable to waste water (graywater) systems.

593-4.6.9.5 Sewage and Waste Water Transfer System Maintenance and Repair. Maintenance procedures for sewage and waste 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.

593-4.6.9.5.1 Preventive maintenance for the sewage and waste 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/excess Hazardous Material (HM). Each subsection provides information on proper collection and management of used/excess HM through offload to shore. Pollution control and safe handling practices are covered under the following topics:

Topic	Subsection
General Information	593-5.1
Pollution Control	593-5.2
Identification	593-5.3
Labeling	593-5.4

593-5.1.2 HM AND USED/EXCESS HM DEFINITION. Any material that, because of its quantity, concentration, or physical or chemical characteristics, may pose a substantial hazard to human health or the environment when incorrectly used, purposefully released, or accidentally spilled. Subcategories of HM include:

(a) Flammable/combustible materials

(b) Toxic materials

(c) Corrosive materials (including acids and bases)

(d) Oxidizing materials

(e) Aerosol containers

(f) Compressed gases

Not included in this definition are ammunition, weapons, explosives, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, pharmaceutical supplies (if not considered hazardous based on composition, physical form, and review of procedures which may involve the handling/dispensing of the materials), medical waste and infectious materials, bulk fuels, and radioactive materials. Even though the above items may not be considered HM, submarine atmosphere control requirements in chapter D15 of OPNAVINST 5100.19 series may apply. Asbestos and lead require special guidance for handling and control, which are addressed in OPNAVINST 5100.19 series, Chapter B1 and B10, respectively. Guidance on the handling of PCBs may be obtained in NAVSEA S9593-A1-MAN-010, Shipboard Management Guide for PCBs. See para-graph 593-5.3.2 for further assistance in identification of HM.

It is Navy policy that ships only generate HM which may be reused or transferred to the appropriate shore activity for determination of suitability for further use or disposal. Therefore, used/excess HM may be defined as HM for which there is no further, immediate use on board the ship possessing the material. Such material may ultimately be used on another ship or within the shore establishment for a purpose other than that for which it was initially manufactured, or by commercial industry.

593-5.1.3 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, the Hazardous Material Minimization Center (HAZMINCEN) supervisor. General shipboard HM management requirements are given in the OPNAVINST 5090.1B **Environmental and Natural Resources Program Manual** and OPNAVINST 5100.19C **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)** which gives handling, storage and disposal guidelines for PCBs aboard ship and in NAVSEA PCB Program advisories for specific equipment and systems. Unique shipboard procedures associated with used/excess HM control are discussed in the following sections.

593-5.1.4 PERSONNEL PROTECTION Personnel protection is necessary in every phase of HM and used/excess HM operations. Proper clothing and teamwork are discussed in paragraphs 593–5.6.3, 593–5.6.4, and 593–5.6.5.

593-5.1.5 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 incompatibility information. The **Hazardous Material User's Guide** , OPNAV P-45-110-96, will also provide guidance on HM incompatibility.

593-5.1.6 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.

593-5.1.7 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. Shipboard CHRIMP installations 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 savings in HM cost avoidance and disposal costs. If ship manning and facilities are appropriate (normally surface ships, frigate and larger) physical consolidation of the maximum amount of HM into a Hazardous Material Minimization center (HAZMINCEN) is the goal of this effort. HM which is unique to a workcenter (or small number of workcenters) shall be ordered through the HAZMINCEN (if installed aboard), but may remain under the control and management of the workcenter(s). Material that is not unique (i.e., common-use) shall be under the control and management of the HAZMINCEN.

593-5.1.8 USE OF SHIP'S HAZARDOUS MATERIAL LIST (SHML). The SHML is a record of the HM carried aboard U.S. Navy ships for which there exists a valid requirement. The SHML provides ships with the capability for determining HM authorized 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 list has been 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). The NIIN, the trade name and the unit of issue are provided for each material in the list. It is recognized that equipment and tasking vary among ships within a single type and that configurations of individual ships may vary over time. If a valid requirement exists for an HM, fill out a SHML Feedback Report (NAVSUP 1400 - 9/91) and submit it to the appropriate type commander and Naval Inventory Control Point-Mechanicsburg (code 07122).

593-5.2 POLLUTION CONTROL

593-5.2.1 EMERGENCY OVERBOARD DISCHARGE. If HM must be discharged overboard under an emergency situation, the ship shall follow the procedures outlined in HM overboard spill reporting in this chapter. The following information accompanying any emergency release of HM shall be maintained and included in any message 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.

593-5.2.2 HM SPILLS. Ships force shall prepare for possible HM spills by developing and using a Spill Contingency Plan (SCP). Detailed guidance is given in OPNAVINST 5100.19C, Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat, Appendix B3-A, **Hazardous Materials Spill Response Procedures** . 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** . To assist ship's force in successfully coping with a shipboard spill, the Navy has also developed and distributed a Shipboard Hazardous Material Spill Response Kit for surface ships. The kit contains a high capacity universal sorbent, tools, labels, storage containers and personal protective equipment for all types of hazardous materials. It also includes a manual which 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. Three Allowance Equipage Lists (AELs) are available for the HM spill kit. They include one for surface ship classes (AEL 2-55002-4007), one for small craft (AEL 2-55002-4008), and one for minesweepers (AEL 2-55002-4009). All three kits are similar, with the major differences being material quantity and size of the kit.

Immediately report any HM spill, either overboard or onboard, to the officer designated by the ship's commanding officer to be in charge of HM spill response, who will then activate response procedures according to the ship's SCP.

Overboard spills of HM can have a serious impact on the environment. Within 12 NM of the U.S. shoreline report overboard spills of any amount of HM or of used/excess HM prohibited from discharge by Appendix L of OPNAVINST 5090.1B to the National Response Center (NRC), using the message format contained in Appendix F and Appendix G of OPNAVINST 5090.1B. Outside of 12 NM of a U.S shoreline or when in waters of foreign countries, report all spills to the predesignated NOSC assigned in the spill contingency plan, using release message format to be found in Appendix J in OPNAVINST 5090.1B. The fleet NOSC will implement spill contingency plans. Do not report as spills used/excess HM releases conforming to OPNAVINST 5090.1B, Appendix L, guidelines. Report all significant spills resulting from catastrophes or with geopolitical implications, as defined in OPNAVINST 5090.1B (section 19-9.2.8), using the OPREP-3 special incident report format prescribed in OPNAVINST 5090.1B, Appendix J.

593-5.3 IDENTIFICATION

593-5.3.1 CORRECT IDENTIFICATION. Correct identification of used/excess HM is necessary to ensure its safe collection, handling, 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 (for example, 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 System (HMIS), DOD 6050.5, Ship's Hazardous Material List (SHML), and the Navy Environmental Health Bulletins (NAVMED P-5112). 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 Material Control and Management (HMC&M) CD-ROM is a Navy data application which contains the HMIS, Hazardous Material User's Guide (HMUG), SHML, and the Shipboard Safety Equipment Shopping Guide. The HMIS is a compilation of MSDS data applicable to DOD. It is arranged by National Item Identification number (NIIN), but a nomenclature to NIIN cross-reference is included. Each entry contains an MSDS which identifies the hazardous constituents and physical properties of the stock number-specific HM in addition to providing recommended safety, handling, and storage procedures for the material. Proper spill response procedures are presented at the end of each listing. If a MSDS is not available for material provided to the ship for use, the HMIS shall be scanned to determine if such data are resident within it. The HMIS shall be maintained at least by the HM coordinator. The CD-ROM is issued quarterly. Ensure that the only the most current version is used.

593-5.3.2.2 Use of Navy Environmental Health Bulletins. The Navy Environmental Health Bulletins are a collection of data sheets describing frequently used hazardous chemicals, and emphasizing their associated health hazards. Each bulletin identifies the physical properties, physiological hazards, storage requirements, and emergency first aid procedures associated with a specific chemical. Shipboard personnel should contact the Safety Department/Medical Department for further information.

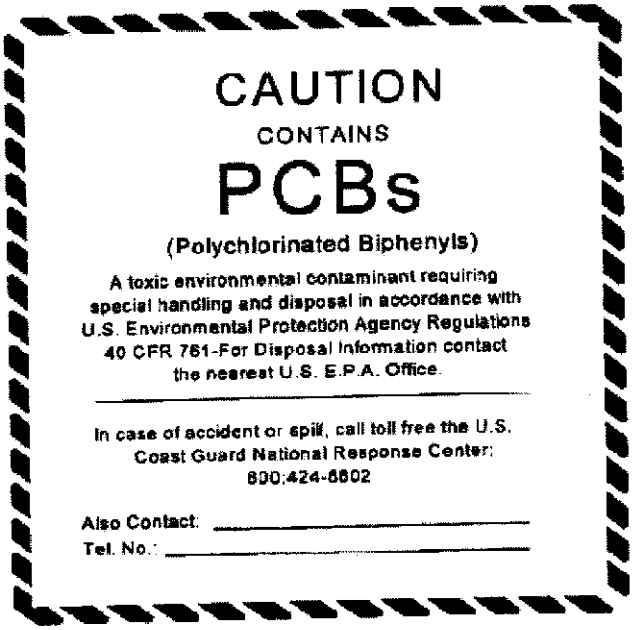
593-5.4 LABELING

593-5.4.1 LABEL DESCRIPTION. The Occupational Safety and Health Administration (OSHA) and the Department of Transportation (DOT) have regulations on the labeling of Hazardous Materials (HM). These regulations should ensure that most HM brought onboard will be properly labeled. New HM received without proper labels shall be labeled according to OPNAVINST 5100.19C. As with HM, the identification of used/excess HM is necessary to ensure that proper handling, stowage, and safety procedures are followed during operations. The administrative requirements imposed on Navy shore activities by federal and state laws to ensure safe and effective disposal of used/excess HM also demand an accurate identification of used/excess HM that is offloaded from Navy ships. Labeling, marking, or tagging the used/excess HM as to the exact contents as soon as it is generated will establish and maintain its identity 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 5100.19C, Paragraph B0305. In addition, a label identifying the material as used HM (See OPNAVINST 5100.19C, Appendix B, 3-F) shall be completed and attached to the container. For offloading, each used/excess HM container shall be accompanied by a correctly completed DD Form 1348-1(1A) identifying the used/excess HM and providing as much information as possible on the contaminants. OPNAVINST 5100.19C, chapter B3, 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 can also provide information on completing the DD Form 1348-1(1A).

593-5.4.2 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 sample PCB identification labels.

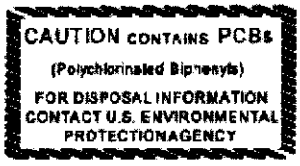
Large PCB Label



This label is available in the following sizes:

Size	Stock Number
6" X 6"	0116-LF-050-9030
4" x 4"	0116-LF-050-9020

Small PCB Label



This Label is available in the following size:

Size	Stock Number
1" X 2"	0116-LF-050-9010

Figure 593-5-1 Large PCB Label

593-5.4.3 LABEL ATTACHMENT. It is imperative that labels, markings, or taggings be properly completed and attached to every container of used/excess HM as soon as it is generated. Immediate labeling will avoid dangerous mistaken identity and facilitate safe handling, stowage, and offload. Any used/excess HM that is not properly identified, labeled, and provided with a properly completed DD Form 1348-1(1A) before offloading ashore, will require a shore side lab analysis. The cost of such an analysis shall be charged to fleet accounts. 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.

593-5.4.3.1 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 (for example, general purpose cleaner) before applying the label.

593-5.4.3.2 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.

593-5.4.3.3 Securing wires or tape shall not obscure the label text.

593-5.4.4 UNIDENTIFIED USED/EXCESS HM. Occasionally during collection or handling, an unmarked quantity of material is found aboard ship. Temporarily label such unidentified material as unknown material. It should be isolated to prevent additional material being added to the container. Attempt to avoid the cost of shore side analysis which shall be charged to fleet accounts, by examining possible identifying records, and by questioning other department personnel. If the contents still cannot be identified, label it unknown used/excess HM and treat it as extremely hazardous. Information, such as whether the material is flammable or combustible (the most common types of HM aboard ship), reactive, toxic, or corrosive shall be supplied in the “Special Stowage Requirements” line of the Used HM identification label to allow proper stowage at the receiving shore activity. Store it in an appropriate stowage compartment, to be offloaded at the next port that can accept used/excess HM.

593-5.4.4.1 The HMC shall be notified about the unknown material so that the required shore side analysis can be requested. Provide as much information as possible when completing the label for the unknown used/excess HM; this will assist shore side personnel in their analysis.

593-5.4.5 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 overboard discharge or disposal ashore shall be kept in containers that are durable enough to resist damage from routine handling and that are suitable for the particular used/excess HM they contain. Containers shall carry clear warning labels (paragraph 593–5.4.1). Each container would ideally be reused only to collect as used/excess HM the same substance it originally contained as HM.

593-5.5.2 STANDARD CONTAINERS. Containers meeting Department of Transportation (DOT) specifications, and therefore **marked or stamped with the identifying specification numbers** , are typically used to package shipboard HM. (Appendix B indicates the DOT specification numbers for a variety of standard containers.) Containers lacking DOT specification markings shall be discarded. Utilize standard containers from the supply system when old containers cannot be reused (select appropriate container type from Appendix A; select specific standard container from Appendix B).

593-5.5.2.1 Packaging of PCB-Contaminated Items. Defective and small PCB items (for example, 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 safeguarded against incidental damage.
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 HM. The original hazard labeling shall remain on these containers.
3. Some shipboard HM containers are nonreusable or one-trip. These containers are stamped or marked NRC (for nonreusable container) or STC (for single trip container). Such containers are never reused for the storage of used/excess HM. They shall be kept tightly sealed and stored 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 distri-

bution of information about reactor plant chemistry, containers for these chemicals (special material identification code X2) require special treatment according to NAVMATlNST 6240.5, Disposal of Chemicals Used in Nuclear Reactor Program. Container labels, markings, stock numbers, and other data which in anyway could identify the subject chemicals to the NRP or the governing technical ordering specification, shall be removed or obliterated before disposal of the container. Only labels and markings that identify the generic class of the chemical shall be retained on the container; or if necessary, it shall be relabeled 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. 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 OPNAV P-45-110-96, HAZARDOUS MATERIALS USER'S GUIDE (HMUG); **NSTM Chapter 541, Petroleum Fuel Stowage, Use, and Testing** ; **NSTM Chapter 550, Industrial Gases: Generating, Handling, and Storage** ; **NSTM Chapter 670, Stowage, Handling, and Disposal of Hazardous General Use Consumables** ; and OPNAVINST 5100.19C, **Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat** .

593-5.6.3 PROTECTIVE CLOTHING AND EQUIPMENT. Personnel may need 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. Maintenance Requirement Cards (MRC) also provide guidance on specific PPE needed when using a specific HM. Because degrees of hazard differ for various substances, personnel shall match protection requirements to the hazards of each particular used/excess HM. For example, personnel handling battery electrolyte require safety boots, a splash apron or coveralls, goggles, and gloves; but personnel handling crushed asbestos during rip out operations require a full face mask, air-line respirator, disposable Tyvek coveralls, two pair of overlapped gloves, and impermeable boot covers. 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 9593-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 crewmen with appropriate personnel protective equipment, protective clothing, gloves, face shield, and respirator, shall handle the transfer of used/excess HM; one crewman to effect the transfer, and the other to 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. Furnish first aid, safety equipment, and spill cleanup materials to major used/excess HM transfer areas. These critical areas may include:

1. HAZMINCEN.
2. Shops where 10 gallons or more of used/excess HM are routinely transferred between containers such as the plating or battery shop.
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 locale. Arrange first aid and safety equipment within easy reach around this small 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. Provide deluge showers and eyewash fountains where corrosive chemicals are used. These units may be permanent installations or portable systems. Self-contained supplies of potable water for eyewash shall be of sufficient capacity to provide a minimum of 15 minutes of eyewash.

593-5.7.3.1 Area Safety. Strategically place fire extinguisher, suitable to common used/excess HM types (class A or B fire risks), within the used/excess HM transfer area.

593-5.7.3.2 Area Inspection. Inspect transfer area emergency and safety equipment, as well as area ventilating systems, according to Planned Maintenance Subsystem (PMS) instructions or at least annually. Quickly replace safety and cleanup equipment damaged during an HM spill or accident.

593-5.7.3.3 Containment Barriers. Provide HM spill containment barriers 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 transferred used/excess HM.

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 transfer hoses. Electrically ground or bond

containers involved in transferring flammable used/excess HM to prevent static charges from building during the transfer process, according to **NSTM Chapter 555, Vol 1, Surface Ship Firefighting** , and **NSTM Chapter 631, Preservation of Ships in Service (Surface Preparation and Painting)** Transfer equipment should not be used for different used/excess HM because of the danger of mixing incompatible used/excess HM.

593-5.7.4.1 Purge transfer equipment, such as pumps and hoses, of all residue before reuse with 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 PCB-contaminated item. Use of tools or equipment composed of porous material (that is, 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 5100.19C. 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 this 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 the weight will be carried by the axle, not by 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 or down 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 should be 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 5100.19C.

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 5100.19C, 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; NSTM Chapter 670** and **NSTM Chapter 541** . 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 General Specifications For Ships Of The United States Navy.

593-5.8.3 STOWAGE REQUIREMENTS. Observe the following general precautions for used/excess HM stowage:

1. 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.

2. Store incompatible used/excess HM (Appendix C) in separate compartments or lockers whenever possible. Mixing 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** . Containment barriers are discussed in paragraph 593–5.7.3.3.
3. 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.
4. Stow empty gas cylinders according to **NSTM Chapter 550** .
5. 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 may be 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, issue rooms, or the NAVSEA flammable liquids locker (NAVSEA drawing 803-5000995) when authorized by NAVSEA.

6. Store corrosives in acid stowage compartments or lockers onboard ship. Store acid containers on lead-lined or acid-resistant shelves or on acid-resistant decks.
7. Store containers with closures up; inspect for leaks, especially at bungs, plugs, edges, and seams, according to **NSTM Chapter 670** . Nonsparking metal faucets installed in drums will be considered plugs.
8. 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. Use drum venting safety procedures according to OPNAVINST 5100.19C.
9. Store used/excess HM containers so that the container labels are highly visible (for example, labels facing aisle).
10. Label empty HM containers as used/excess HM and control with the same precautions as applied to all other HM. Stow in a compartment with compatible substances. Keep containers closed to avoid release of toxic or irritating vapors.
11. Store rags or absorbent contaminated with HM (for example, rags used to wipe solvents) in tightly sealed, steel containers in a compartment containing compatible substances. Label as used/excess HM.
12. Consider contaminated protective clothing to be used/excess HM if it cannot be readily decontaminated. Containerize and stow in compartments with similar used/excess HM.

593-5.8.4 HOUSEKEEPING. Used/excess HM stowage and handling areas shall be clean, dry, uncluttered, and free from combustible refuse to prevent container corrosion, prevent fires, and facilitate emergency access. Inspect these areas weekly and correct any problems. Replace damaged or leaking containers immediately. Damaged PCB containers shall be packaged in an approved tightly sealed container as described in paragraph 593–5.5.2.1. Clean up used/excess HM spills immediately. Correct slippery conditions promptly. Remove any water that has collected in the stowage area or on used/excess HM containers; for example, water on the top of an upright drum could corrode the lid.

593-5.8.5 FIRE PREVENTION. Many used/excess HMs are flammable. Inspect fire extinguishing systems and equipment 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** . Also inspect portable fire extinguisher according to PMS instructions or at least monthly. Replace extinguisher 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 (for example, following an used/excess HM spill or during acid drum venting); portable explosion-proof ventilation units may be used in such situations.

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 blowers 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 noncollapsible 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 noncollapsible hose. This nonelectric 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 such a space was checked 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 plate 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 plate is presented in Figure 593-5-2. The letters on this plate shall be 3/8 inch high.

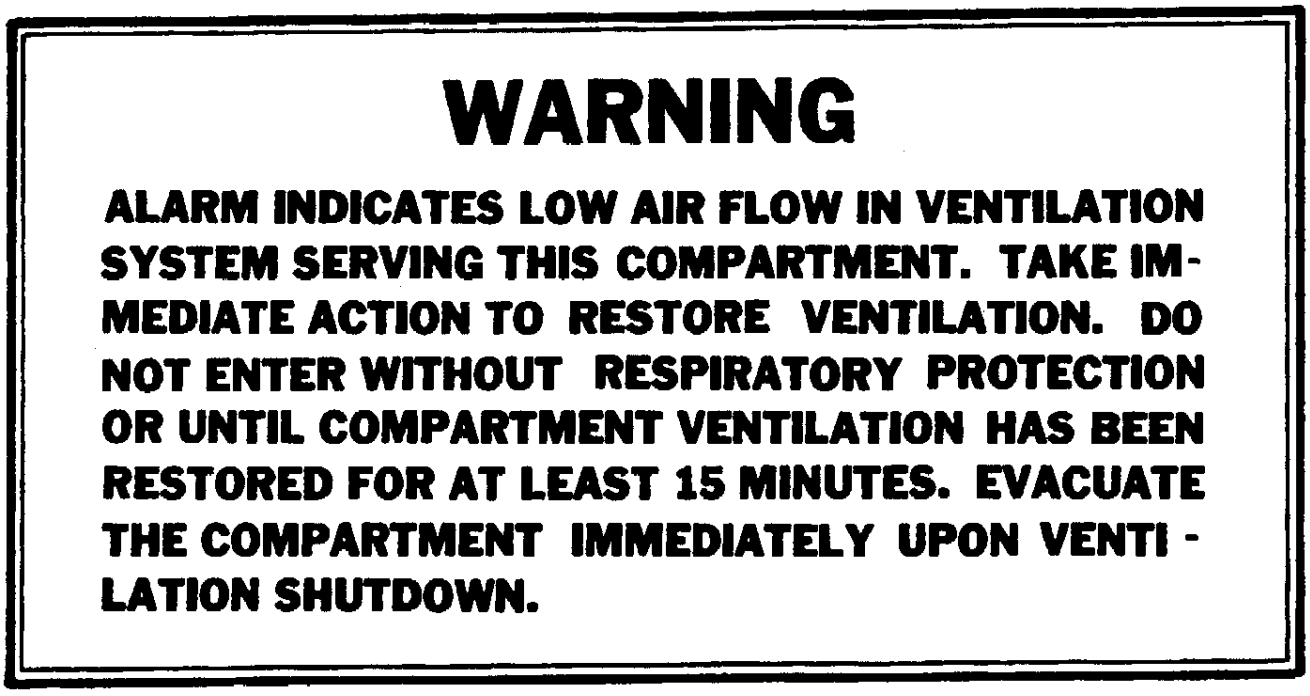


Figure 593-5-2 Sample Ventilation Warning Plates

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 compartments 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 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.

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 plates 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 plates are presented in Figure 593-5-3. Place warning plates 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.

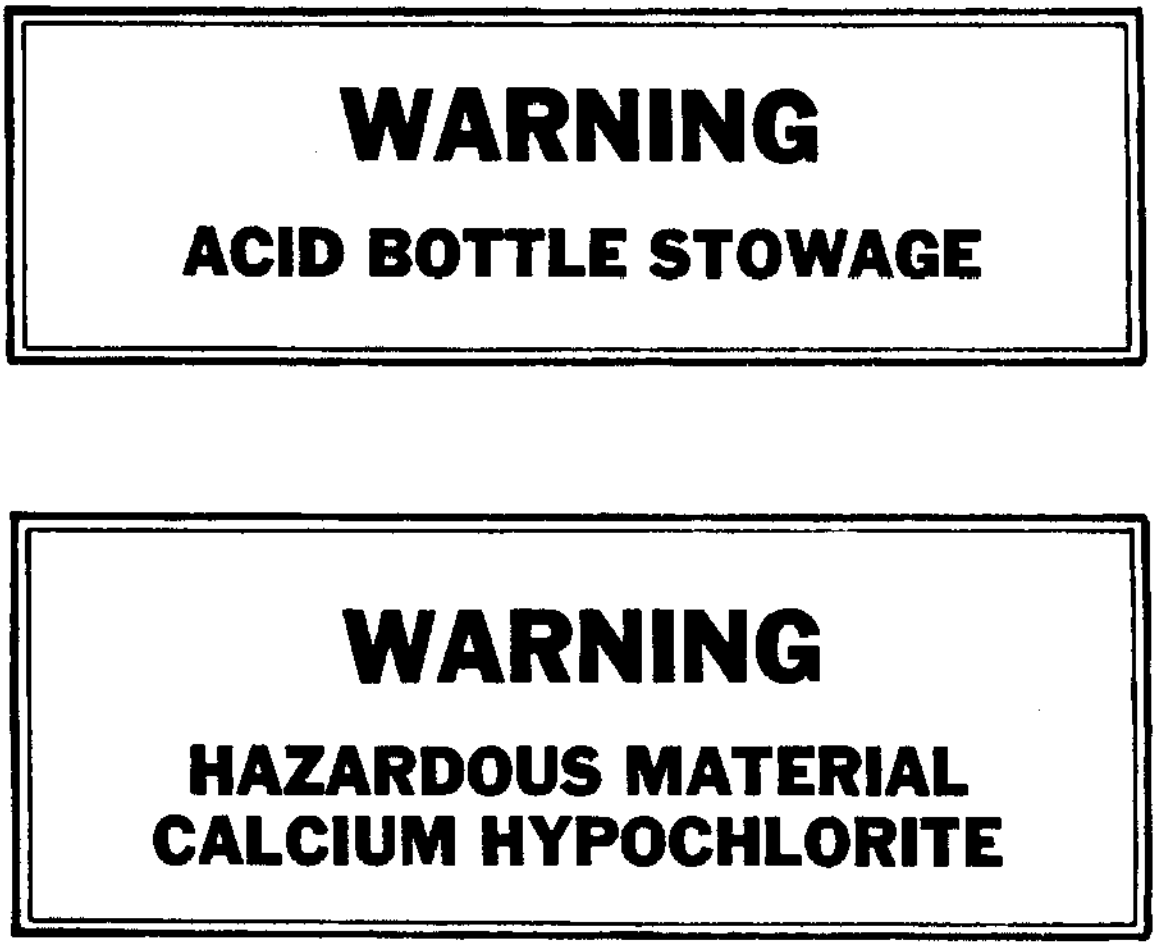


Figure 593-5-3 Sample Storage Area Warning Plates

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 5090.1B, Appendix L, identifies these HMs and also types of used/excess HM which are to be retained under certain operating conditions (see paragraphs 593–5.10.5 through 593–5.10.17). 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 5100.19C; 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. Put incompatible used/excess HM in separate containers. The potential consequences of mixing incompatible wastes or dissimilar wastes are presented in paragraphs 593–5.1.5 and 593–5.1.6.

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). Used HM that is collected shall be segregated. 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 may be discharged in the open ocean can be temporarily stowed with similar HM in shop areas or within appropriate stowage areas before disposal; 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. Harmless 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. 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 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 NAVSEASYSCOM approved aerosol puncturing/draining device, puncture and drain the exhausted aerosol containers. The aerosol containers shall be marked empty and treated as any other

empty HM container. If the ship is not equipped with a NAVSEASYSCOM approved aerosol puncturing/draining device, aerosol containers shall be retained aboard until the ship is in port and 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. PCBs are highly toxic chemicals used mainly as insulating fluids. The primary PCB articles onboard ship are electrical capacitors, transformers, reactors, cables, and ventilation system felt gaskets.

WARNING

At no time should PCBs be allowed to contact the skin.

1. **Consult the shipboard Safety Officer/Medical Officer before the collection of PCB articles or PCB-contaminated articles.**
2. **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.**
3. **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.**
4. **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:**
   a **Respirator. Half face respirator with HEPA cartridges. Personnel using respirators must be trained, medically qualified and fit-tested in accordance with OPNAVINST 5100.19C.**
   b **Disposable coverall, tyvek with attached hood and booties.**
   c **Gloves. Latex gloves inside, followed by butyl rubber, neoprene, viton, or nitrile gloves outside tape to the coveralls to provide a seal.**
   d **Safety goggles or face shields.**

The requirements for handling and control of PCBs shipboard are further discussed in OPNAVINST 5100.19C, Change 1 (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 5090.1B, 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 5090.1B, 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. Contact the shipboard HM Coordinator or HAZMINCEN Supervisor for guidance before any used/excess HM off-loading. 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. It is imperative that all used/excess HM offload operations be authorized by the shipboard HM Coordinator or HAZMINCEN Supervisor. Guidance for transferring used/excess HM ashore is provided in OPNAVINST 5100.19C, section B0307.

593-5.10.3 DISCHARGING HM OVERBOARD. Afloat Navy discharge policy is summarized as follows:

a. Navy ships shall not discharge untreated used/excess HM overboard within 200 NM of land. To the maximum extent practicable, ships shall retain used/excess HM on board for shore disposal.

b. While underway, Navy ships are permitted to discharge certain used/excess HM into ocean waters. Such waste shall have been generated aboard ship; onloading waste from a shore side facility or from other ships in order to discharge the waste at sea is strictly prohibited. OPNAVINST 5090.1B, Appendix L, and CNO Policy Guide For Shipboard Hazardous Material Container Disposal, OPNAV P-45-114-95, provide detailed guidance for HM discharges.

c. When operating in foreign territorial waters or visiting foreign ports, Navy ships shall abide by environmental provisions contained in port visit clearances and/or in status of forces agreements (SOFA). The shipboard HMC shall be consulted for information about proper used/excess HM discharge.

d. In MARPOL special areas, hold all used/excess HM for shore disposal.

e. 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 5090.1B, **Environmental and Natural Resource Program Manual** , Chapter 19 and Appendix L.

593-5.10.4 PROTECTING DRAINAGE SYSTEMS. If discharged through the ship's drainage system, caustic or corrosive used/excess HM may damage the ship's piping. Additionally, the discharged waste may react violently with incompatible residues present in the piping. Therefore, all industrial waste water (for example, metal plating, acid cleaning, photo processing, solvent cleaning, and painting materials) shall not be disposed of through ship's sewage or graywater systems. If used/excess HM is discharged overboard through the drainage system first dilute with large amounts of seawater. Acids and alkalies shall be neutralized as described in paragraph 593–5.10.10 before dilution. All drains shall be rinsed to remove any residues of the disposed waste after discharge.

593-5.10.5 CONTAMINATED ITEMS. When contaminated with a hazardous substance, rags, cloths, sorbents, unrecoverable protective clothing, and empty HM containers are considered used HM and shall be stored as

directed in paragraph 593–5.8. If contaminated with a HM that may be discharged overboard, these materials may also be discharged, provided they are made negatively buoyant and jettisoned at least 25 NM from shore. But these materials must be containerized for shore disposal if they are contaminated with HM whose overboard discharge is prohibited (see Appendix D and OPNAVINST 5090.1B, Appendix L, for disposal guidance for individual HM and empty HM containers).

593-5.10.6 SOLVENTS. Various shipboard solvents (for example, acetone, toluene) evaporate during use, leaving no used/excess HM except the rag or cloth contaminated during use. Some solvents, however, evaporate slowly (for example, ethylene glycol, xylene) and leave substantial amounts of liquid material. Shipboard personnel shall follow the disposal guidelines in OPNAVINST 5090.1B, Appendix L, when discarding these 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 P-D-680, Type III.

593-5.10.7 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 5100.19C, 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.

593-5.10.7.1 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.

593-5.10.7.2 The containers used to store defective wet-cell batteries shall be periodically vented to release any accumulated hydrogen gas.

593-5.10.8 SPENT ACID. Spent acid shall be neutralized and diluted before discharge overboard through the drainage system. To neutralize acid, slowly add sodium bicarbonate or a weak alkaline (basic) solution to the acid (see paragraphs 593–5.10.10 through 593–5.10.10.2 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 flushed overboard through the drainage system. Guidance for the overboard discharge of neutralized spent acid is provided in OPNAVINST 5090.1B, Appendix L. In port, contact the local environmental coordinator or Public Works Center/Public Works Department for local authorized disposal procedures. The overboard discharge of neutralized acid solution from a HM spill is permitted if the acid solution cannot be contained safely for later disposal.

593-5.10.9 SPENT ALKALI. Spent alkali (base) shall be neutralized before being diluted and discharged overboard through the drainage system. 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 flushed overboard through the drainage system. Guidance for the overboard discharge of neutralized spent alkali is provided in OPNAVINST 5090.1B, Appendix L. In port, contact the local environmental coordinator or

Public Works Center/Public Works Department for local authorized disposal procedures. The overboard discharge of neutralized alkaline solution from a HM spill is permitted if the alkaline solution cannot be contained safely for later disposal.

593-5.10.10 NEUTRALIZATION. Neutralization is a chemical interaction between an acid and an alkali that reduces the corrosiveness of the acid and alkali, allowing their discharge after dilution. Detailed information on the neutralization process is presented in **NSTM Chapter 220, Volume 1, Boiler Water/Feedwater, Water Chemistry** , and paragraphs 593–5.10.8 and 593–5.10.9.

593-5.10.10.1 For safety reasons, shipboard personnel must be able to determine when the neutralization reaction is complete. Extent of neutralization can be tested using a multi-range pH paper with color comparitor chart (NSN 6640-00-442-9005 and test paper refills NSN 6630-00-442-9015 or 6630-00-442-9025) which is specially treated paper used to identify acidic or alkaline solutions. To test a solution, carefully dip the edge of the litmus paper into the solution; for the time period listed in instructions on the pH paper package. Compare the color change with the package color chart. The pH of a waste solution shall be between 6.0 and 8.0 before it can be diluted and discharged into ship's drains. The neutralization procedures outlined in paragraphs 593–5.10.8 and 593–5.10.9 can then be used. After neutralization is complete, the waste will not cause a significant change in the color of the pH paper.

593-5.10.10.2 An alternate method for measuring the neutralization reaction is through the use of a pH meter. Instructions for the use of this meter can be found in **NSTM Chapter 220, Volume 2, Boiler Water/Feedwater, Test and Treatment** . The pH of a waste solution shall be between 6.0 and 8.0 before it can be diluted and discharged into ship's drains.

593-5.10.11 SODIUM CHROMATE SOLUTIONS. Sodium chromate is added to closed loop cooling water, locked-in ballast, and fuel ballast to control corrosion and bacterial growth. Sodium chromate solutions may be discharged overboard beyond 50 NM of shore, but must be containerized for shore disposal within 50 NM. Excess quantities of stock treatment sodium chromate must also be containerized for shore disposal.

593-5.10.12 HEAVY METALS. During the course of normal shipboard operations, wastes (for example, metal plating solutions, painting wastes, and batteries) are produced that contain various heavy metals that are 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.

593-5.10.13 PHOTOGRAPHIC AND X-RAY PROCESSING WASTES. Ships with photographic and X-ray facilities are being 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 and X-ray film fixer solutions. The recovery unit effluent may be discharged beyond the 12 NM contiguous zone. 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.

593-5.10.13.1 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, X-ray continuous processor, and color film processing wastes shall never be discharged into drains that lead to the CHT tank, because of their corrosive effects on sewage collection tanks. This and all other photo wastes may be discharged beyond 12 NM of shore.

593-5.10.14 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.

593-5.10.14.1 OBA canisters, after use or when they fail inspection, should be returned for shore disposal as used/excess HM. Handle OBA canisters according to **NSTM Chapter 077 Personnel Protection Equipment** .

593-5.10.15 EMERGENCY ESCAPE BREATHING DEVICE. Emergency Escape Breathing Device (EEBD) are for escape from spaces with life-threatening atmospheres. The EEBD will 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. EEBDs, after use or when it fails inspection, should be returned for shore disposal as used/excess HM. Expired EEBDs have the potential of use as training aids. Do not immerse EEBD into water as this will create a very caustic solution. Label and handle EEBD in accordance with **NSTM Chapter 077** and applicable Maintenance Requirement Card (MRC) guidance.

593-5.10.16 HYDRAZINE/MORPHOLINE AND SODIUM NITRITE BOILER WASTE. Hydrazine/morpholine and sodium nitrite are the primary chemicals used for layup of conventional idle boilers. Sodium nitrite is also used for waterjet and hydrostatic test processes. Hydrazine is classified as a reducing agent. Sodium nitrite is classified as an oxidizing agent. These two chemicals are incompatible. Mixing of these two boiler layup solutions would result in a violent reaction and for this reason is forbidden. Hydrazine/morpholine and sodium nitrite layup solutions may be discharged overboard in accordance with the guidelines provided in OPNAVINST 5090.1B, Appendix L. Inport disposal of either of these two layup solutions requires containerization and proper disposal in accordance with local, state, and federal regulations. Ships with boilers under hydrazine/morpholine layup inport are urged to dispose of this layup 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.

593-5.10.16.1 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 5090.1B (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 5090.1B, 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 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 inport disposal requires that the bottle has been flushed in the chelant treatment continuous injection system as detailed in the operating procedures of **NSTM Chapter 220** . Further purging of the hydrazine bottle is not required.

593-5.10.16.2 Boiler waterjet wastewater. Sodium nitrite treated water generated during high pressure waterjet cleaning of boilers can be recycled using a wastewater recycling unit in accordance with NAVSEA Technical Manual S6300-AE-MMA-010 **(Technical Manual for Waterjet)** .

593-5.10.17 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 use of calcium hypochlorite includes 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 are to 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 THERMAL POLLUTION. Thermal pollution is thermal (heat) discharge or pollution to the water by sources utilizing heat for energy.

593-6.1.2 AIR POLLUTION. Air pollution is the introduction into the atmosphere of materials which are harmful to the environment.

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). A listing of Class I ODSs is included in Table 6.1 of OPNAVINST 5090.1B. Table 6.2 is a listing of Class II ODS. As of the issuance of OPNAVINST 5090.1B, 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.

593-6.2 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), hydrochlorof-

lourocarbons (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 5100.19C.

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 noncomplying 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 (for example, diesel engine operators, boilermen 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), Phildelphia 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 incinerator exhaust contamination of air compressor or ventilation intakes shall be surveyed and corrected, if necessary. Incinerator operational guidance is available in paragraph 593-2.4.2.1. All personnel operating the incinerators shall be thoroughly familiar with OPNAVINST 5090.1B, Chapter 19, **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 with 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. territorial waters. See OPNAVINST 5100.19C, 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 5090.1B, 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 perform-

ing 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 5090.1B, Chapter 6.

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 with the OPNAVINST 5100.19 and 5090.1 series instructions.

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 5090.1B 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 reradiation, 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 5090.1B and 5100.19C 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.

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, 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 (TM)	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)	Tin can; steel drum, bung and vent
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 drum3, 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 either liquid, semi-solid, or solid. Some materials (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	Item Description	Applicable Specifications (DOT, Mil, Fed)1
Bag	8105-00-848-9631	Polyolefin, single wall, 5 mil, 36-min by 54-in flat, wire tire	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, 34-in by 26-in by 16-in, burst-strength 400 lb	DOT 2C PPP-B-636
Tin can with screw cap closure[3]	8110-00-879-7182	Tin, 1 gal, oblong, enamel outside surface treatment	DOT 2F PPP-C96 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
	8110-00-400-5748[4]	Steel, 24 gauge, 5 gal, screw cap with neoprene liner closure, epoxy resin interior lining	DOT 17C PPP-P-704 TY 1 CL4, 11
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 17H
	8110-00-951-9728	Bolting ring set for 55 gal drum	None
	8110-00-823-8121	Steel, 18 gauge, 55 gal, removable cover with lock ring, enamel outside surface treatment	DOT 17H PPP-D-729 TY 4
	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
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	None
	8110-01-016-7362	Bolt ring set for 30 gal. drum	None
	8110-00-082-2625	Steel, 18 gauge, 27 gal., removable cover with lock ring, enamel inside/outside treatment	None

	8110-00-044-2984	Steel, 18 gauge, 20 gal., removable cover with lock ring, enamel inside/outside treatment	None
	8110-00-254-5716	Steel, 20 gauge, 12 gal., removable cover with lock ring, enamel inside/outside treatment	None
	8110-00-254-5715	Steel, 29 gauge, 9 gal., removable cover with lock ring, enamel inside/outside treatment	None
	8110-00-254-5713	Steel, 22 gauge, 6 gal., removable cover with lock ring, enamel inside/outside treatment	None
	8110-01-254-5722	Steel, 22 gauge, 4 gal., removable cover with lock ring, enamel inside/outside treatment	None
	8110-01-101-4056	Hazardous material recovery 85 gal, open head	None
Steel drum with bung and vent[3]	8110-00-282-2520[4]	Steel, 5 gal, enamel exterior treatment, spout	PPP-D-704 TY 1 CL 8
	8110-00-292-9783[4]	Steel, 18 gauge, 55 gal with bung and vent, enamel outside surface treatment	DOT 17E PPP-D-729 TY 2
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
Plastic Liner	8115-00-145-0038[4]	Liner, polyethylene, 5 gal to be used with 5 gal steel drum	DOT 25 MIL-D-40030 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″ width x 24″ height	A-A-1668C
	8105-01-086-5053	Red plastic bag, single wall, labeled with CONTAINS ASBESTOS FIBERS	

1. 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 (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.

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 Safestep (TM), 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 alpha-numeric 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	HCC
1. Radioactive Materials	
a. Licensable	A1
b. Licensable Low Risk (encapsulated sources)	A2
c. License Exempt	A3
d. License Exempt, Authorized	A4
2. Corrosive Liquids	
a. Corrosive, DOT, Acid	C1
b. Corrosive, DOT, Alkali	C2
c. Acid, Low Risk (2 < pH < 7)	C3
d. Alkali, Low Risk (7 < pH < 12.5)	C4
3. Oxidizers	
a. Oxidizer (explosive reaction or causes a severe increase in burning rate)	D1
b. Oxidizer, Low Risk (increases burning rate of combustibles)	D2
c. Oxidizer (HCC D1) and Poison (HCC T1, T2, T3, T4, T5, or T6)	D3
d. Oxidizer (HCC D1) and Corrosive (HCC C1 or C2)	D4
4. Explosives (See OP4, OP5, and OP2165)	
a. Explosives, Military	E1
b. Explosives, Low Risk (small hazard in event of ignition or initiation during transport)	E2
5. Flammable/combustible liquids	
a. Flammable, Aerosol	F1
b. Flammable (flashpoint (fp) < 0°F)	F2
c. Flammable (0°F < fp < 73°F)	F3
d. Flammable (73°F < fp < 141°F)	F4
e. Flammable (HCCs F2, F3, or F4) and Poison (HCCs T1, T2, T3, T4, or T6)	F5
f. Flammable (HCCs F2, F3, or F4) and Corrosive (HCCs C1 or C2)	F6
g. Flammable solid (excludes explosives and HCCs R1 and R2)	F7
h. Combustible, Liquid (141°F < fp < 200°F)	F8
6. Compressed Gases	

a.	Gas (Nonflammable) Poison	G1
b.	Gas, Flammable, Non Toxic	G2
c.	Gas, Nonflammable, Non Toxic	G3
d.	Gas, Nonflammable, Oxidizer (requires oxidizer label)	G4
e.	Gas, Nonflammable, Corrosive (C1 or C2)	G5
f.	Gas, Nonflammable, Poison, Corrosive (C1 or C2)	G6
g.	Gas, Nonflammable, Poison, Oxidizer	G7
h.	Gas, Flammable, Poison	G8
i.	Gas Nonflammable, Poison, Corrosive, Oxidizer	G9

7. Miscellaneous Materials (present minimal hazard during transport or storage

a.	Miscellaneous Flammable Materials	J1
b.	Miscellaneous Flammable Solids	J2
c.	Miscellaneous Oxidizing Materials	J3
d.	Miscellaneous Organic Peroxides	J4
e.	Miscellaneous Poisonous Materials	J5
f.	Miscellaneous Corrosive Materials	J6
g.	Miscellaneous Class 9 (anesthetic, noxious, or other similar properties which could cause discomfort to flight crews. Formerly called Irritants)	J7 J8
h.	Miscellaneous ORM-E (hazardous under CERCLA but not classed under other HCC)	

8. Medical Substances

a.	Infectious Materials (Micro-organism or its toxin)	K1
b.	Cytotoxic Drugs	K2

9. Magnetized Material	M1
10. Nonhazardous (material which by chemical name may be perceived to be hazardous)	N1

11. Peroxides

a.	Peroxide, Organic (present deflagration, severe fire hazard, or fire hazard)	P1
b.	Peroxide, Organic Low Risk (burns as an ordinary combustible, but with minimal reactivity hazard)	P2

12. Reactive Chemicals

a.	Reactive Chemical, Flammable (spontaneously combustible)	R1
b.	Water Reactive Chemical (spontaneously combustible when wet)	R2

13. Toxic Chemicals

a.	DOT Poison - Inhalation Hazard	T7
b.	UN Poison, Packing Group I (Great Danger)	T2
c.	UN Poison, Packing Group II (Medium Danger)	T3
d.	Poison, Food Contaminant (Minor Danger)	T4
e.	Pesticide, Low Risk	T5
f.	Health Hazard (hazardous, not classified elsewhere)	T6
g.	Carcinogen	T1

14. Marine Pollutant	W1

HCC CODES	**SHIPBOARD STORAGE COMPARTMENTS** (Not applicable to submarines)
C1, C3	ACID STOREROOM
C1, C3	ACID LOCKER (ORGANIC) - SPECIAL DESIGN LOCATED INSIDE FLAMMABLE LIQUID STOREROOM

C1, C3	ACID LOCKER (INORGANIC) - SPECIAL DESIGN LOCATED INSIDE FLAMMABLE LIQUID STOREROOM
C1, C3	ACID LOCKER (MEDICAL)
C1	STORAGE BATTERY SHOP (LEAD ACID)
C2, C4	BASES (ORGANIC) LOCKER - LOCATED WITHIN DRY GENERAL STORAGE
C2, C4	BASES (INORGANIC) LOCKER - LOCATED WITHIN DRY GENERAL STORAGE
C2, C4	STORAGE BATTERY SHOP (ALKALINE) OR AVIATION ALKALINE BATTERY SHOP
F1 thru F6, F8	ALCOHOL STOREROOM
F1 thru F6, F8	ALCOHOL LOCKER
F1 thru F6, F8	FLAMMABLE LIQUID LOCKER
F1 thru F6, F8	FLAMMABLE LIQUID CABINET
F1 thru F8	FLAMMABLE LIQUID STOREROOM
F1 thru F6, F8	FLAMMABLE LIQUID READY SERVICE STOREROOM
F1 thru F6, F8	FLAMMABLE LIQUID ISSUE ROOM
F1 thru F6, F8	AVIATION FLAMMABLE LIQUID READY ISSUE ROOM
F1 thru F6, F8	AVIATION PAINT AND FLAMMABLE LIQUID READY ISSUE ROOM
F1 thru F6, F8	AVIATION STOREROOM (FLAMMABLES)
F8	AVIATION STOREROOM (LUBRICANTS)
F1 thru F6, F8	PAINT MIXING AND ISSUE ROOM/LOCKER
F1 thru F6, F8	PAINT AND REFINISHING ROOM
F1 thru F6, F8	SUPPLY DEPARTMENT STOREROOM (FLAMMABLE LIQUIDS)
F8	SUPPLY DEPARTMENT STOREROOM (AVIATION LUBRICATION OIL)
G3, G4	SUPPLY DEPARTMENT GAS CYLINDER STOREROOM
G8	SUPPLY DEPARTMENT GAS CYLINDER STOREROOM (ACETYLENE)
G2, G8	SUPPLY DEPARTMENT GAS CYLINDER STOREROOM (FLAMMABLE)
G1, G3	SUPPLY DEPARTMENT GAS CYLINDER STOREROOM (CO_2 AND HALON)
G3	SUPPLY DEPARTMENT GAS CYLINDER STOREROOM (HELIUM)
G4, G5	SUPPLY DEPARTMENT GAS CYLINDER STOREROOM (OXYGEN AND CHLORINE)
G3	SUPPLY DEPARTMENT GAS CYLINDER STOREROOM (INERT)
G3, G4	SUPPLY DEPARTMENT GAS CYLINDER STOREROOM (OXYGEN AND NITROGEN)
G2, G8	SUPPLY DEPARTMENT GAS CYLINDER STOREROOM (WEATHER STOWAGE)
C1, C3	CARGO STOREROOM (BULK ACID AND CHEMICAL)
F1 thru F8	CARGO STOREROOM (FLAMMABLE LIQUIDS)
G2, G8	CARGO STOREROOM (FLAMMABLE GAS CYLINDERS)
G3	CARGO STOREROOM (INERT GAS CYLINDERS)
F8	CARGO STOREROOM (LUBRICATING OIL)
J6	CARGO STOREROOM (DRY CELL BATTERY)
J1 thru J8	CARGO STOREROOM (MEDICAL SUPPLIES)
	GENERAL STORAGE AREAS
VARIOUS CODES;	SUPPLY DEPARTMENT STOREROOMS (BULK) ITEMS STORED BY COMPATIBLE GROUP (including remainder of HCC Codes)
	MISCELLANEOUS STORAGE COMPARTMENTS
D1	SUPPLY DEPARTMENT CALCIUM HYPOCHLORITE STOREROOM/LOCKER
F1 thru F6, F8, C3, C4	CLEANING GEAR LOCKER/ROOM
D1	BROMINE FEEDER CARTRIDGE LOCKER
J6, T1	MERCURY LOCKER
J1 thru J8	POISON ANTIDOTE LOCKER
D1	SODIUM NITRATE LOCKER

J1 thru J8	MEDICAL LOCKER
D1	CHLORATE CANDLE LOCKER
F7	LITHIUM BATTERIES LOCKER
F1 thru F6, F8	PAINT LOCKER
F1 thru F6, F8	PAINT STOREROOM
A1 thru A4	RADIOACTIVE MATERIAL AREA (in accordance with NAVSUP Manual 485, Afloat Supply Procedures and NAVSUP Manual 284, Storage and Materials Handling)

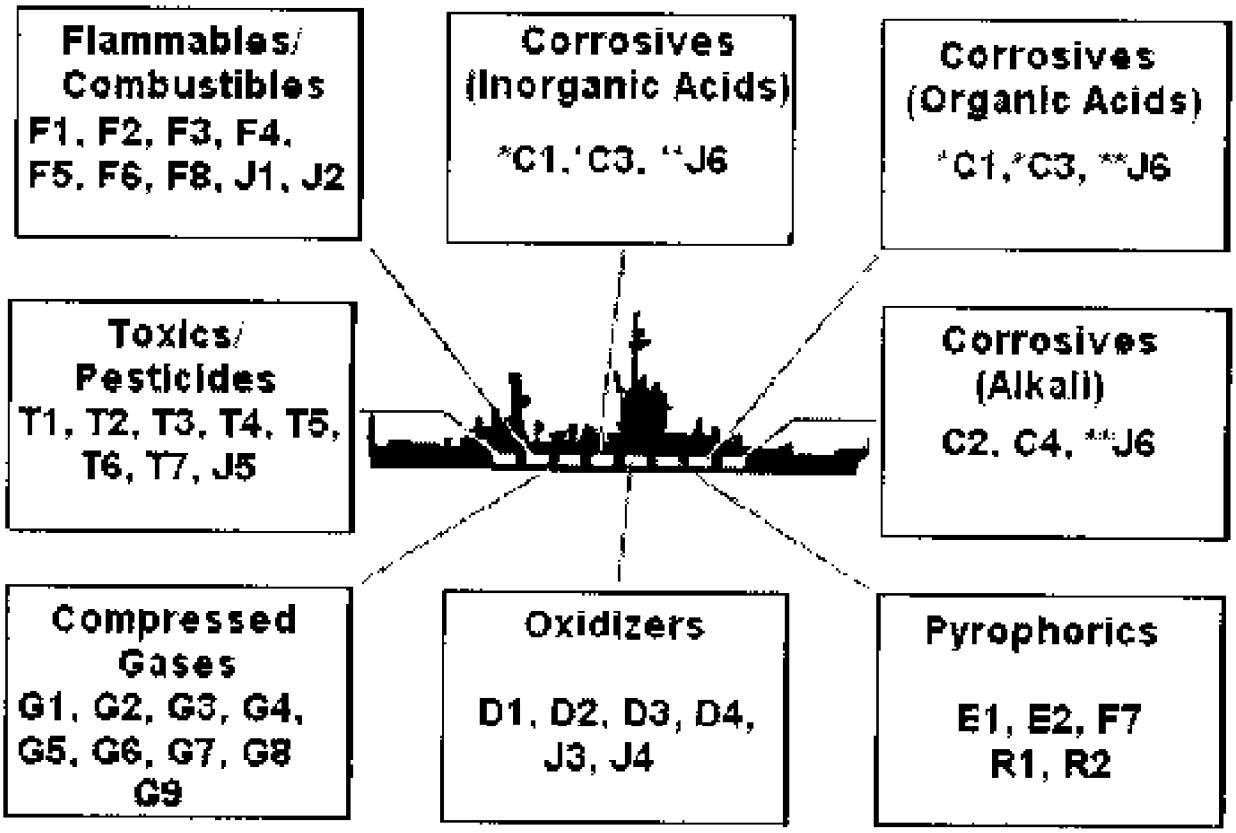
SHIPBOARD STORAGE EXCEPTIONS

1. Materials not to be used or stored aboard ships . The following materials are prohibited from use or storage aboard all ships except where authorized in medical department pharmacies, clinical and chemical laboratories, and as cargo.
2. Trichlorethylene (to be used only by ships having equipment designed for its use)
3. Benzene (Benzol)
4. Beta Naphthylamine
5. Carbon Tetrachloride
6. DDT Xylene Emulsion
7. Hydrocyanic Gas
8. Insecticides, DDT (prohibited items)
9. Methyl Bromide
10. Plastic Trash Cans
11. Dry Cleaning Solvent(Stoddard Solvent) Type I of FEDSPEC P-D-680
12. Tetrachloroethane

2. Materials not to be used or stored aboard submarines . See NAVSEA S9510-AB-ATM-010/(U), the Nuclear Powered Submarine Atmosphere Control Manual, for restrictions on materials which can be used or stored aboard submarines.
3. Materials not to be used or stored aboard ships and submarines . The following materials are prohibited from storage aboard ships and submarines.Gasoline (except that carried topside in a suitable jettison rack) Sulfuric acid, electrolyte - storage batteries - class 1 minimum specific gravity 1.8354 (except for tenders that have fresh water deluge showers)

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 5100.19C, Volume I, Appendix B3–E.



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. Generally, materials with different codes will not be stowed together unless specified below:
   a Inorganic acids may be stowed in a flammable liquid storeroom inside a designated locker, separated by at least three feet from all other material.
   b Organic acids may be stowed in a flammable liquid storeroom inside a designated locker, separated by at least three feet from all other material.
   c. NOTES:
   *C1, C3 — HM identified with the C1 or C3 code may be either an inorganic or an organic acid. See the following table for examples of inorganic acids.
   ** J6 — HM identified with J6 may be an inorganic acid, organic acid, or alkali. See the following table for examples of inorganic/organic acids and alkalies.
2. All aerosol containers shall be stowed as flammable material.

ACID AND ALKALI EXAMPLES

Inorganic acid (C1, C3, J6)	**Organic acid (C1, C3, J6)**	**Alkali (C2, C4, J6)**
Alodine	Acetic acid	Ammonia

ACID AND ALKALI EXAMPLES - Continued

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	Lithium hydroxide
Oil of Vitriol	acid	Monoethanolamine
(sulfuric acid)	Vinegar	Morpholine
Orthotolidine		Potassium carbonate
solution		Potassium hydroxide
Phosphoric acid		Soda lime
Sodium bisulfate		Sodium sulfide
Sulfamic acid		Sodium hydroxide
Sulfuric acid		Sodium metasilicate
		Sodium phosphate
		Sodium silicate
		Sodium hypochlorite
		Tetraethylenepentamine

APPENDIX D.

EMPTY HAZARDOUS MATERIAL CONTAINER MANAGEMENT GUIDANCE

D.1 Shipboard Procedures[1]

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.

For the HM item in a aerosol container, the following guidance applies:

a. If the ship is equipped with a NAVSEASYSCOM approved aerosol puncturing/draining device, puncture and drain the exhausted aerosol container. The container shall be marked empty and treated as any other empty HM container.

b. If the ship is not equipped with a NAVSEASYSCOM approved aerosol puncturing/draining device, it shall be retained aboard until the ship is in port and disposed of as used HM.

WARNING

Do not attempt to open aerosol containers to determine if they are empty.

2. Determine if the HM Container is Trash or Used HM After confirming the HM item is in the SHML, use either the HM name in Appendix A[2] or the NSN in Appendix B[2] to determine if the HM is listed.

a. If the material is listed in either Appendix A[2] or B[2] and the container is classified as empty, the container should be treated as trash rather than used HM.

b. If the material is not listed in Appendix A[2] or B[2] , it shall not be disposed of as trash. Instead, it must be retained aboard until the ship is in port and disposed of as used HM in accordance with **Naval Ships Technical Manual, Chapter 593** .

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 containers of materials listed in either Appendix A[2] or B[2] shall be crushed and disposed of overboard at sea as trash if the ship is greater than 25 nautical miles from land. (This is not applicable in MARPOL Special Areas as defined in OPNAVINST 5090.1 Series “ENVIRONMENTAL AND NATURAL RESOURCES PROGRAM MANUAL”, Chapter 19). Prior to disposal of “empty” HM containers as trash, authorization from the ship’s HM Coordinator is required. Containers to be disposed of overboard shall be made negatively buoyant to ensure they sink.

NOTE

Containers which 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.

4. Container Disposal Ashore

a **While in port, empty containers of materials listed in either Appendix A[2] or B[2] shall be disposed of as trash. Prior to disposal of “empty” HM containers as trash, authorization from the ship’s HM Coordinated 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.**

b **Empty containers which held material not listed in either Appendix A[2] or B[2] shall be turned over to the PWC as used HM.**

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[3]

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 possible 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 5100.19C "NAVOSH PROGRAM MANUAL FOR FORCES AFLOAT".
3. Compatible hazardous materials should be consolidated prior to air drying, in accordance with chapter B3 of OPNAVINST 5100.19C, 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.

[1] CNO Policy Guide For Shipboard Hazardous Material Container Disposal, OPNAV P-45–114–95.[2] Appendices A and B referred to in the above shipboard empty hazardous material container management guidance are found in OPNAV P-45–114–95, "CNO Policy Guide For Shipboard Hazardous Material Container Disposal".[3] NAVAL MESSAGE (NAVSURFWARCEN SHIPSYSENGSTA PHILADELPHIA 171600Z JAN 95)

APPENDIX E.

GUIDELINES FOR SELECTING GARBAGE DISPOSAL MACHINES

Classification : Shipboard garbage disposal 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 alkalies 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	Dripproof 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 noncorrosive metal.

Instruction plate : A noncorrosive 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 garbage disposal 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.

REAR SECTION

NOTE

TECHNICAL MANUAL DEFICIENCY/EVALUATION REPORT (TMDER) Forms can be found at the bottom of the CD list of books. Click on the TMDER form to display the form.