

NOTICE OF CHANGE

INCH-POUND

MIL-HDBK-1005/16
NOTICE 1
15 May 1999

DEPARTMENT OF DEFENSE
HANDBOOK

WASTEWATER TREATMENT SYSTEM DESIGN
AUGMENTING HANDBOOK

TO ALL HOLDERS OF MIL-HDBK-1005/16:

1. THE FOLLOWING PAGES OF MIL-HDBK-1005/16 HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
vii	31 October 1997	vii	15 May 1999
viii	31 October 1997	viii	Reprinted without change
37	31 October 1997	37	Reprinted without change
38	31 October 1997	38	15 May 1999
39	31 October 1997	39	15 May 1999
40	31 October 1997	40	15 May 1999
40a	15 May 1999	New Page	

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-HDBK-1005/16 will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the handbook is completely revised or canceled.

Custodian:
Navy - YD2

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MIL-HDBK-1005/16

3.3.2.9	Ship Discharges	36
3.3.2.10	Flow Rate Variations	36
3.3.3	Wastewater Loadings	40
3.3.3.1	Domestic Wastes	40
3.3.3.2	Industrial Wastes	40a
3.3.3.3	Ship Sewage	40a
3.3.3.4	Effect of Wastewaters with High Seawater Content	41
Section 4	NAVY WASTEWATER COLLECTION AND TRANSMISSION SYSTEMS	
4.1	Introduction	43
4.2	Pier and Wharf Systems	43
4.2.1	Layout/Location	43
4.2.2	Utility Connections	46
4.2.3	Environmental Considerations (Corrosion, Freeze Protection)	51
4.2.4	Odor/Septicity Control	53
4.2.5	Structures and Appurtenances	53
4.2.6	Pump Stations	53
4.2.7	Pipe	53
4.2.8	Sewage Transfer Hoses	56
4.3	Drydock Facilities	56
4.3.1	Layout	60
4.3.2	Pump Station Features	60
4.3.3	Sewage Receiving Connections and Transfer Hoses	60
4.3.4	Special Structures and Appurtenances	60
Section 5	OIL/WATER SEPARATORS	
5.1	Section Overview	65
5.2	Oil Classification	65
5.2.1	Free Oil	65
5.2.2	Emulsified Oil	65
5.2.3	Oily Wastes	65
5.3	Basis for Considering Oil/Water Separators	66
5.3.1	Regulatory Compliance	66
..... 5.3.2	Related Impacts on Collection/Treatment Systems	67

SUPERSEDES PAGE VII OF MIL-HDBK-1005/16.

MIL-HDBK-1005/16

		<u>Page</u>
5.4	Evaluating the Need for Oil/Water Separators	67
5.5	Treatment Technology..	70
5.5.1	Gravity Separation.	70
5.5.1.1	Conventional Gravity Separators.	71
5.5.1.2	Parallel Plate Separators.	73
5.5.2	Air Flotation Separators..	74
5.5.3	Treatment of Emulsified Oil	75
5.5.3.1	Destabilization.	75
5.5.3.2	Chemical Processes..	75
5.5.3.3	Mechanical Impingement and Filtration Processes.	77
5.5.4	Treatment of Dissolved Oil..	77
5.6	Design of OWSS..	77
5.6.1	Wastewater Characterization..	78
5.6.2	Site Considerations	78
5.6.3	Establishing the Design Flow	78
5.6.4	Design Criteria for Conventional Separators	79
5.6.5	Design Criteria for Parallel-Plate Separators.	80
5.7	Oil/Sludge Removal and Disposal.	81
5.8	Guidance Documents..	81
Section 6	PACKAGE PLANTS AND SMALL FLOW TREATMENT SYSTEMS	
6.1	General	83
6.1.1	Types of Small Flow Treatment Systems	83
6.1.2	Unique Characteristics of Small Flow Treatment Systems	83
6.2	Package Plant Systems	84
6.2.1	Types of Treatment Processes	84
6.2.2	Evaluation of Particular Packages	84
6.2.3	Performance Certification	84
6.2.4	Capacity Ranges	84
6.3	Septic Tank Systems	89
6.3.1	Size	89
6.3.2	Detention Time	91
6.3.3	Effluent Disposal	91
6.3.3.1	Subsurface Absorption	91
6.3.3.2	Leaching Wells	92
6.3.3.3	Subsurface Sand Filters	92
6.3.3.4	Percolation Tests	94

REPRINTED WITHOUT CHANGE.

MIL-HDBK-1005/16

Table 4
Ship Sewage Discharge Rates¹

Ship Type ²	Maximum Ship's Complement	Average 24-Hour Flow ³ (gpm [L/s])	Maximum Discharge of One Pump (gpm [L/s])	No. of Pumping Stations	Total Number of Pumps	Number and Location of Discharge Connections ⁴
AD 37, 38	1350 1680 + 340 = 2020	85 (5.4)	225 (14.2)	4	8	2 (1P, 1S)
AD 40, 41, 43	1680 + 340 = 2020	85 (5.4)	225 (14.2)	5	10	3 (1P, 1S, 1A)
AD 44	1680 + 340 = 2020	85 (5.4)	225 (14.2)	3	6	2 (1P, 1S)
AE	383	20 (1.3)	150 (9.46)	1	2	2 (1P, 1S)
AGF	440	20 (1.3)	150 (9.46)	3	6	2 (1P, 1S)
AO	225	10 (0.6)	100 (6.31)	1	2	2 (1P, 1S)
AOE	667	30 (1.9)	100 (6.31)	2	4	2 (1P, 1S)
ARS	100	5 (0.3)	100 (6.31)	1	2	2 (1P, 1S)
AS 33	915	40 (2.5)	100 (6.31)	3	6	1 (1A)
AS 36	915	40 (2.5)	100 (6.31)	3	6	1 (1A)
AS 39	915	40 (2.5)	100 (6.31)	5	10	3 (1P, 1S, 1A)
CG	358	15 (1.0)	100 (6.31)	3	6	4 (2P, 2S)
CGN	625	30 (1.9)	100 (6.31)	2	4	4 (2P, 2S)
CV	3000 ⁵	125 (7.9)	150 (9.46)	8	16	4 (2P, 2S)

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MIL-HDBK-1005/16

Table 4 (Continued)
Ship Sewage Discharge Rates¹

Ship Type ²	Maximum Ship's Complement	Average 24-Hour Flow ³ (gpm [L/s])	Maximum Discharge of One Pump (gpm [L/s])	No. of Pumping Stations	Total Number of Pumps	Number and Location of Discharge Connections ⁴
CVN ⁶ 68-71	3300 ⁵	125 (7.9)	500 (31.54)	3	6	6 (3P, 3S)
CVN ⁶ 72-76	3300 ⁵	125 (7.9)	500 (31.54)	2	4	4 (2P, 2S)
DD & DDG 993	340	15 (1.0)	9 (0.57)	2	2	2 (1P, 1S)
DDG	323	8	9	2	2	2
DDG 51	341	15 (1.0)	40 (2.52)	2	8	4 (2P, 2S)
DDG 52-78	341	15 (1.0)	40 (2.52)	2	4	4 (2P, 2S)
DDG 79	380	20 (1.3)				
FFG	210	10 (0.6)	100 (6.31)	1	2	2 (1P, 1S)
LCC	1010 ⁵	45 (2.9)	150 (9.46)	2	4	4 (2P, 2S)
LHA	937 ⁵	40 (2.5)	100 (6.31)	3	6	6 (2P, 2S)
LHD	1104 ⁵	50 (3.2)	20 (1.26)	2	4	4 (2P, 2S)
LPD 4	510 ⁵	25 (1.6)	150 (9.46)	3	6	4 (2P, 2S)
LPD 17	165	20 (1.3)				
LPH	1420 ⁵	60 (3.8)	100 (6.31)	3	6	6 (3P, 3S)
LSD	375 ⁵	20 (1.3)	100 (6.31)	2	4	2 (1P, 1S)
MCM, MHC	81	5 (0.3)				
SSBN	155	10				
SSN	133	10 (0.6)				

SUPERSEDES PAGE 38 OF MIL-HDBK-1005/16.

MIL-HDBK-1005/16

Table 4 (Continued)
Ship Sewage Discharge Rates¹

¹For wastewater disposal systems aboard ships, refer to DTRC/SME-91/53, Catalog of Shipboard Pollution Abatement Systems.

²For more information on U.S. Naval Vessels, refer to NAVSEA S0300-A4-MAN-A1C/(U), Naval Vessel Register/Ships Data Bank.

³Based on maximum ship's complement at 60 gpcd (227 Lpcd).
Flows raised to next highest 5 gpm (19 Lpcd).

⁴P = discharge connection on the port side of the ship;
S = discharge connection on the starboard side of the ship;
A = discharge connection on the stern side of the ship.

⁵The following ships carry additional air wing troops:

CV: 2500	LPD: 930
CVN: 2800	LPH: 1560
LHA: 1700	LSD: 450
LHD: 1900	LCC: 700

⁶Design pumping system for 1350 gpm, three pumps working simultaneously, two pumps in series, parallel with a third pump.

The following revised list of equivalent ships was established by the Naval Sea Systems Command (NAVSEASYS COM) for shore collection of ship sewage (ship types are as listed in Secretary of the Navy Instruction (SECNAVINST) 5030.1L, Classification of Naval Ships and Craft).

<u>Ship Type</u>	<u>Equivalent Ships</u>
DD	CGN, CG, DDG, FF, AGFF, FFG
LPD	AGF, LCC
AFS	AOR
AO	AOE
ASR	ATF, ATS
SS	SSN, SSBN

NOTES: Abbreviations for commissioned ship types:

AD-Destroyer Tender, AE-Ammunition Ship, AGF-Miscellaneous Command Ship, AO-Oiler, AOE-Fast Combat Support Ship, ARS-Salvage Ship, CG-Guided Missile Cruiser, CGN-Guided Missile Cruiser (Nuclear Propulsion), CV-Aircraft Carrier, CVN-Aircraft Carrier (Nuclear Propulsion), DD-Destroyer, DDG-Guided Missile Destroyer, FFG-Guided Missile Frigate, LCC-Amphibious Command Ship, LHA-Assault Ships, Landing Amphibious, LHD-Large

SUPERSEDES PAGE 39 OF MIL-HDBK-1005/16.

MIL-HDBK-1005/16

Helicopter, Dock Ship, Amphibious, LPD-Amphibious Transport Dock, LPH-Amphibious Assault Ship, LSD-Dock Landing Ship, MCM-Mine Countermeasure Ship, MHC-Mine Hunters, SSBN-Fleet Ballistic Missile Submarine (Nuclear Propulsion), SSN-Submarine (Nuclear Propulsion).

c) Intermittent periods of increased use because of training activities or other personnel mobilization exercises common to military installations. Training activities or other mobilization exercises will create short-term increases in domestic wastewater and, potentially, industrial flows. These intermittent activities may result in the peak wastewater flows and loads. Facilities should be designed to handle routine variations in flow and load from training and other routine exercises in a manner to ensure acceptable performance and reasonable O&M costs. For example, an equalization system may provide flow and load dampening to accommodate these significant variations. Facilities will not be designed to accommodate peak surges resulting from emergency mobilizations.

d) Intermittent periods of reduced use. Low flows can also be a problem. Therefore, design the wastewater facility to operate efficiently over a range of flows (for example, provide parallel trains that can be taken out of service, etc.).

e) Changes in requirements or the installation's mission. Designs should include provisions for expansion, contraction, or other modification because of more stringent effluent requirements or installation mission changes. Make efforts to maximize operational flexibility.

3.3.3 Wastewater Loadings. Wastewater loadings are typically calculated based on the projected flows and wastewater pollutant concentrations and are expressed in pounds per day (lb/d) (kilograms per day [kg/d]). Where possible, determine loadings by analyzing the wastewater to be treated or similar wastewater.

3.3.3.1 Domestic Wastes. Every effort should be made to use measured data in planning and designing for wastewater flows. As a last resort, if no wastewater data are available, use the typical concentrations for domestic wastewater from WEF MOP 8,

SUPERSEDES PAGE 40 OF MIL-HDBK-1005/16.

MIL-HDBK-1005/16

Volume I. Note, however, that these are average data; make adjustments for regional weather effects and collection system I/I before using these values.

3.3.3.2 Industrial Wastes. Determine industrial wastewater characteristics used in design from a survey of the actual wastes involved, or from knowledge of wastes at similar facilities. For additional information on industrial waste characteristics, refer to MIL-HDBK-1005/9 and MIL-HDBK-1005/17.

3.3.3.3 Ship Sewage. Ship sewage settles well and is amenable to biological treatment, but it may be septic. Table 5 presents typical concentrations (wastes from shipboard industrial activities are not included).

The high dissolved solids, chloride, sulfates, and sodium concentrations apply when seawater flushing or ballast systems are used. For more information on ship sewage, see NAVSEA S9086-T8-STM-010/CH-593, Naval Ships' Technical Manual.

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