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NEW PAGE	DATE	SUPERSEDED PAGE	DATE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

Preparing Activity:
Navy - YD2
(Project FACR-5010)

AMSC N/A

AREA FACR

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

Table 4
Ship Sewage Discharge Rates[1]

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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Table 4 (Continued)
Ship Sewage Discharge Rates[1]

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)				

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Table 4 (Continued)
Ship Sewage Discharge Rates[1]

[1]For wastewater disposal systems aboard ships, refer to DTRC/SME-91/53, Catalog of Shipboard Pollution Abatement Systems.
[2]For more information on U.S. Naval Vessels, refer to NAVSEA S0300-A4-MAN-A1C/(U), Naval Vessel Register/Ships Data Bank.
[3]Based on maximum ship's complement at 60 gpcd (227 Lpcd). Flows raised to next highest 5 gpm (19 Lpcd).
[4]P = 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.
[5]The following ships carry additional air wing troops:

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

[6]Design 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 (NAVSEASYSCOM) 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.

Ship Type	Equivalent Ships
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

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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,

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.

NEW PAGE