



Standard Specification for Sewage and Graywater Flow Through Treatment Systems¹

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INTRODUCTION

Shipboard treatment of wastewater has evolved over the years from systems using maceration and chlorination techniques to more advanced biological systems that are designed to treat a single wastestream of sewage followed more recently by complex bio-reactor systems employing advanced oxidation and high-powered UV systems that are designed to remove organic and inorganic materials from a combined wastestream of sewage and graywater.

Advancements in treatment technologies have been fueled, in part, by shipping companies wanting to adopt more environmentally friendly practices as well as by regulatory bodies imposing more stringent standards on wastewater discharges from ships.

This standard is a consolidated source of sewage and graywater treatment system requirements that combines international requirements in MARPOL Annex IV with requirements of other regulatory bodies and overlays industry best practices.

1. Scope

1.1 This specification covers the design, manufacture, performance, operation, and testing of flow through treatment systems intended to process sewage or graywater, or both, generated during a ship's normal service. This specification is intended for use by designers, manufacturers, purchasers, and operators of shipboard environmental pollution control equipment to determine the requirements for equipment design, manufacture, purchase, and in-service operation.

1.2 The treatment system shall be capable of meeting the effluent requirements detailed in Section 4 with respect to a ship's operational area.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

¹ This specification is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.06 on Marine Environmental Protection.

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1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- A307 Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
- A563 Specification for Carbon and Alloy Steel Nuts (Metric) A0563_A0563M
- B117 Practice for Operating Salt Spray (Fog) Apparatus
- B165 Specification for Nickel-Copper Alloy Seamless Pipe and Tube
- D1253 Test Method for Residual Chlorine in Water
- E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves
- F906 Specification for Letters and Numerals for Ships
- F992 Specification for Valve Label Plates
- F993 Specification for Valve Locking Devices
- F998 Specification for Centrifugal Pump, Shipboard Use
- F1030 Practice for Selection of Valve Operators
- F1098 Specification for Envelope Dimensions for Butterfly

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

Valves—NPS 2 to 24

F1122 Specification for Quick Disconnect Couplings (6 in. NPS and Smaller)

F1155 Practice for Selection and Application of Piping System Materials

F1166 Practice for Human Engineering Design for Marine Systems, Equipment, and Facilities

F1298 Specification for Flexible, Expansion-Type Ball Joints for Marine Applications

F1323 Specification for Shipboard Incinerators

F1387 Specification for Performance of Piping and Tubing Mechanically Attached Fittings

F1510 Specification for Rotary Positive Displacement Pumps, Ships Use

F1511 Specification for Mechanical Seals for Shipboard Pump Applications

F2044 Specification for Liquid Level Indicating Equipment, Electrical

2.2 ASME Standards:³

B16.1 Gray iron pipe flanges and flanged fittings: Classes 25, 125, and 250

B16.5 Pipe flanges and flanged fittings: NPS ½ through NPS 24 metric/inch standard

B16.11 Forged fittings, socket-welding and threaded

B16.24 Cast copper alloy pipe flanges and flanged fittings: Classes 150, 300, 600, 900, 1500, and 2500

B16.34 Valves flanged, threaded, and welding end

2.3 IMO Regulations:⁴

MARPOL Annex IV Regulations for the prevention of pollution by sewage from ships

MEPC.227(64)(2012) Guidelines on implementation of effluent standards and performance tests for sewage treatment plants

2.4 ISO Standards:⁵

ISO 5815-1 Water quality—Determination of biochemical oxygen demand after n days (BOD_n)—Part 1: Dilution and seeding method with allylthiourea addition

ISO 15705 Water quality—Determination of the chemical oxygen demand index (ST-COD)—Small-scale sealed-tube method

2.5 U.S. Laws and Regulations:⁶

33 CFR Part 159 Marine sanitation devices

33 CFR 159.301 Subpart E—Discharge of effluents in certain Alaskan waters by cruise vessel operations

40 CFR Part 136 Guidelines establishing test procedures for the analysis of pollutants

2.6 Other Standards:

ANSI/ASSE 1001 Performance requirements for atmospheric type vacuum breakers⁵

ANSI/ASSE 1013 Performance requirements for reduced pressure principle backflow preventers and reduced pressure principle fire protection backflow preventers⁵

ANSI/ISA 60079-1 Explosive atmospheres—Part 1: Equipment protection by flameproof enclosures *d*⁵

ANSI/ISA 60079-11 Explosive atmospheres—Part 11: Equipment protection by intrinsic safety *i*⁵

ANSI/NEMA 250 Enclosures for electrical equipment (1000 Volts Maximum)⁵

ANSI/NEMA MG 1 Motors and generators⁵

DoD 4715.6-R1 Regulations on vessels owned or operated by the Department of Defense⁷

IEC 60079-1 Explosive atmospheres—Part 1: Equipment protection by flameproof enclosures *d*⁸

IEC 60079-11 Explosive atmospheres—Part 11: Equipment protection by intrinsic safety *i*⁸

IEC 60085 Electrical insulation—Thermal evaluation and designation⁸

IEC 60092-350 Electrical installations in ships—Part 350: General construction and test methods of power, control, and instrumentation cables for shipboard and offshore applications⁸

IEC 60092-353 Electrical installations in ships—Part 353: Single and multicore non-radial field power cables with extruded solid insulation for rated voltages 1 kV and 3 kV⁸

IEC 60529 Degrees of protection provided by enclosures (IP Code)⁸

IEEE 1580 Recommended practice for marine cable for use on shipboard and fixed or floating platforms⁹

MIL-S-167-1 Test method standard for mechanical vibrations of shipboard equipment¹⁰

MIL-S-901 Requirements for shock tests: High-impact shipboard machinery, equipment, and systems¹⁰

NFPA 70 National Electrical Code¹¹

SNAME T&R Bulletin 3-37 Design guide for shipboard airborne noise control¹²

SM 4600-Cl Chlorine (residual)—Standard methods for the examination of water and wastewater¹³

UL 913 Intrinsically safe apparatus and associated apparatus for use in class I, II, and III, division 1, hazardous (classified) locations¹⁴

UL 1203 Explosion-proof and dust-ignition-proof electrical

⁷ Available from the Under Secretary of Defense (AT&L), Department of Defense, 3400 Defense Pentagon, Washington, DC 20301-3400, USA, <http://www.dtic.mil/whs/directives/corres/pub1.html>.

⁸ Available from the International Electrotechnical Commission, 3 rue de Varembe, PO Box 131, CH-1211 Geneva 20, Switzerland, <http://www.iec.ch>.

⁹ Available from Institute of Electrical and Electronics Engineers, Inc. (IEEE), 445 Hoes Ln., Piscataway, NJ 08854, <http://www.ieee.org>.

¹⁰ Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, <http://quicksearch.dla.mil>.

¹¹ Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, <http://www.nfpa.org>.

¹² Available from the Society of Naval Architects and Marine Engineers, 601 Pavonia Ave, Jersey City, NJ 07306, USA, www.sname.org.

¹³ Available from American Public Health Association, 800 I St N.W., Washington, DC 20001-3710, USA, www.standardmethods.org.

¹⁴ Available from Underwriters Laboratories (UL), 2600 N.W. Lake Rd., Camas, WA 98607-8542, <http://www.ul.com>.

³ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁴ Available from the International Maritime Organization, 4 Albert Embankment, London SE1 7SR, United Kingdom, <http://www.imo.org>.

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁶ Available from U.S. Government Printing Office, Superintendent of Documents, 732 N. Capitol St., NW, Washington, DC 20401-0001, <http://www.access.gpo.gov>.