Designation: ~~F1323 – 08~~ F1323 – 14

An American National Standard

Standard Specification for Shipboard Incinerators[1]

This standard is issued under the fixed designation F1323; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the design, manufacture, performance, operation, functioning, and testing of incinerators intended to incinerate garbage and other shipboard wastes generated during the ship's normal service (that is, maintenance, operational, domestic, and cargo-associated wastes).

1.2 This specification is a companion document to Guide F1322.

1.3 This specification applies to those incinerator plants with capacities up to ~~1500~~4000 kW per unit.

1.4 Additional information is given in Appendix X1 – Appendix ~~X9~~X8.

1.5 This specification does not apply to systems on special incinerator ships, for example, for burning industrial wastes such as chemicals, manufacturing residues, and so forth.

1.6 This specification does not address the electrical supply to the unit nor the foundation connections and stack connections.

1.7 *~~This standard may~~It is possible that this standard will involve hazardous materials, operations, and equipment. 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 and health practices and determine the applicability of regulatory limitations prior to use. If an incinerator is to be operated in ~~littoral~~coastal regions, the strictest governing regulations for those countries in which the incinerator ~~may~~ would potentially operate would form the requirement basis. ~~See 5.11~~.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

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

F1322 Guide for Selection of Shipboard Incinerators

2.2 *~~ANSI~~ASME Standard:*[3]

B31.1 Power Piping

~~ANSI/NFPA No. 70~~B31.3 ~~National Electrical Code~~Process Piping

~~NEC Article 430-7~~[3]

2.3 *ASME Boiler and Pressure Vessel Code:*[4]

Section ~~I,~~ I Power Boilers

Section ~~IX,~~IX Welding and Brazing Qualifications

2.4 *~~Safety of Life at Sea Convention:~~IMO Conventions:*[5]

SOLAS 74 International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended

MARPOL 74 International Convention for the Prevention of Pollution from Ships (MARPOL), 1973, as amended

2.5 *Underwriter's Laboratory Standards:*[6]

UL 506 Standard for Specialty Transformers

UL 814 Standard for Gas-Tube Signs and Ignition Cables

[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.

Current edition approved ~~Nov. 1, 2008~~Nov. 1, 2014. Published ~~November 2008~~January 2015. Originally approved in 1990. Last previous edition approved in ~~2001~~2008 as ~~F1323 - 01.~~F1323 – 08. DOI: ~~10.1520/F1323-08.~~10.1520/F1323-14.

[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.

[3] Available from American ~~National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor,~~ Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY ~~10036, http://www.ansi.org.~~10016-5990, http://www.asme.org.

[4] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, http://www.asme.org.

[5] Available from the International Maritime Organization, 4 Albert Embankment, London SE1 7SR, UK.

[6] Available from Underwriters Laboratories (UL), 333 Pfingsten Rd., Northbrook, IL 60062-2096, http://www.ul.com.

2.6 *Other Documents:*[7]

~~International Convention for the Preventing of Pollution from Ships (1973), as modified by the Protocols of 1978 (73/78) and 1997 and associated Annexes~~NFPA No. 70

~~NOTE 1—Incinerators designed and manufactured in accordance with alternative standards must show compliance with this specification.~~National Electrical Code (NEC)

NOTE 1—Incinerators designed and manufactured in accordance with alternative standards must show compliance with this specification.

3. Terminology

3.1 *Definitions:*

3.1.1 ~~*cargo-associated*~~*administration,* ~~*waste*—~~*n—*~~all materials that have become waste as a result of use on board a ship for cargo stowage and handling. Cargo-associated waste includes but is not limited to dunnage, shoring pallets, lining and packing materials, plywood, paper, cardboard, wire, and steel strapping.~~means the Government of the State whose flag the ship is entitled to fly.

3.1.2 *cargo* ~~*residues*—~~*residues, n—*~~for the purposes of this specification,~~means the ~~the~~ remnants of any cargo ~~material on board that cannot be placed in proper cargo holds (loading excess and spillage) or which remain in cargo holds and elsewhere after unloading procedures are completed (unloading residual and spillage). However, cargo residues are expected to be in small quantities.~~which are not covered by Annexes to MARPOL and which remain on the deck or in holds following loading or unloading, including loading and unloading excess or spillage, whether in wet or dry condition or entrained in wash water but does not include cargo dust remaining on the deck after sweeping or dust on the external surfaces of the ship.

3.1.3 *domestic* ~~*waste*—~~*waste, n—*all types of ~~food waste, sewage, and waste~~ wastes not covered by Annexes to MARPOL that are generated in the ~~living~~accommodation spaces on board the ship.

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

3.1.3.1 *Discussion—*

Domestic wastes does not include grey water.

3.1.4 *fishing* ~~*gear*—~~*gear, n—*any physical device or part thereof or combination of items that may be placed on or in the water or on the sea-bed with the intended purpose of capturing, or controlling for subsequent ~~capture, living~~ capture or harvesting marine or ~~freshwater~~ fresh water organisms.

3.1.5 *food* ~~*wastes*—~~*wastes, n—*any spoiled or unspoiled ~~victual substances, such as~~food substances and includes fruits, vegetables, dairy products, poultry, meat ~~products, food scraps, food particles, and all other materials contaminated by such waste, generated aboard ship, principally in the galley and dining areas.~~ products and food scraps generated aboard ship.

3.1.6 *garbage*—all kinds of ~~victual, domestic, and operational waste excluding fresh fish and parts thereof,~~food wastes, domestic wastes and operational wastes, all plastics, cargo residues, incinerator ashes, cooking oil, fishing gear, and animal carcasses generated during the normal operation of the ship and liable to be disposed of continuously or ~~periodically. Those~~ periodically except those substances which are defined or listed in ~~Annexes, other than Annex V, to the International Convention for the Preventing of Pollution From Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78) are excluded.~~Annexes to MARPOL.

3.1.6.1 *Discussion—*

Garbage does not include fresh fish and parts thereof generated as a result of fishing activities undertaken during the voyage, or as a result of aquaculture activities which involve the transport of fish including shellfish for placement in the aquaculture facility and the transport of harvested fish including shellfish from such facilities to shore for processing.

3.1.7 ~~*graywater*—~~*graywater, n—*drainage from ~~galleys, pantries,~~ dishwater, galley sink, showers, laundries, baths, and handbasins as long as it is not mixed with sewage.

3.1.8 ~~*incinerator*—~~*incinerator or shipboard incinerator, n—*~~shipboard facilities for incinerating solid wastes approximating in composition to household waste and liquid wastes arising from the operation of the ship, for example, domestic waste, cargo-associated waste, maintenance waste, operational waste, cargo residues, fishing gear, and so forth. These facilities may be designed to use or not to use the heat energy produced.~~a shipboard facility designed for the primary purpose of incineration.

~~3.1.9 *maintenance waste*—materials collected by the engine department and the deck department while maintaining and operating the ship, such as soot, machinery deposits, scraped paint, deck sweeping, wiping wastes, oily rags, and so forth.~~

3.1.9 *oily ~~rags~~—rags, n*—rags that have been saturated with oil as controlled in Annex I to ~~the Convention. Contaminated rags are rags that have been saturated with a substance defined as a harmful substance in the other Annexes to the Convention.~~MARPOL.

3.1.9.1 *Discussion*—

Contaminated rags are rags that have been saturated with a substance defined as a harmful substance in Annexes to MARPOL.

3.1.10 *oil residue (sludge), n*—the residual waste oil products generated during the normal operation of a ship such as those resulting from the purification of fuel or lubricating oil for main or auxiliary machinery, separated waste oil from oil filtering equipment, waste oil collected in drip trays, and waste hydraulic and lubricating oils.

3.1.11 *operational ~~wastes~~—wastes, n*—all ~~cargo-associated wastes and maintenance waste (including ash and clinkers) and cargo residues defined as garbage in~~ solid wastes (including slurries) not covered by Annexes to MARPOL that are collected on board during normal maintenance or operations of a ship, or used for cargo stowage and handling. ~~3.1.6.~~

3.1.11.1 *Discussion*—

Operational wastes also include cleaning agents and additives contained in cargo hold and external wash water. Operational wastes do not include grey water, bilge water or other similar discharges essential to the operation of a ship.

3.1.12 *~~plastic~~—plastic, n*—a solid material that contains as an essential ingredient one or more ~~synthetic organic high~~high molecular mass polymers and which is formed (shaped) during either manufacture of the polymer or the fabrication into a finished product by heat ~~or pressure, or both. Plastics have material properties ranging from hard and brittle to soft and elastic. Plastics are used for a variety of marine purposes including, but not limited to, packaging (vapor-proof barriers, bottles, containers, liners), ship construction (fiberglass and laminated structures, siding, piping, insulation, flooring, carpets, fabrics, paints and finishes, adhesives, electrical and electronic components), disposable eating utensils and cups, bags, sheeting, floats, fishing nets, strapping bands, rope, and line.~~and/or pressure.

3.1.12.1 *Discussion*—

Plastics have material properties ranging from hard and brittle to soft and elastic. For the purpose of this standard, plastic means all garbage that consists of or includes plastic in any form, including synthetic ropes, synthetic fishing nets, plastic garbage bags and incinerator ashes from plastic products.

3.1.13 *recognized classification society, n*—American Bureau of Shipping (ABS) or other classification society that is a participating member of the International Association of Classification Societies (IACS).

3.1.14 *~~sewage~~—sewage, n*—~~human body waste and the waste from toilets and other receptacles intended to receive or retain body wastes. Sewage is~~ drainage and other ~~waste from toilets, urinals, and water closet scuppers as well as~~ wastes from any form of toilets and urinals; drainage from medical premises ~~and~~ (dispensary, sick bay etc.) via wash basins, wash tubs and scuppers located in such premises; drainage from spaces containing living ~~animals.~~animals; or other waste waters when mixed with drainages defined as sewage.

3.1.15 *~~ship~~—ship, n*—a vessel of any type operating in the marine environment and includes hydrofoil boats, air-cushion vehicles, submersibles, floating craft, and fixed or floating platforms.

~~3.1.15 *sludge oil*—residues from fuel and lubricating oil separators, waste lubricating oil from main and auxiliary machinery, waste oil from bilge water separators, drip trays, and so forth.~~

3.1.16 *waste*—useless, unneeded, or superfluous matter which is to be discarded.

4. Ordering Information

4.1 Orders shall include the following information, in accordance with Guide F1322:
4.1.1 Sizing requirements.
4.1.2 Processing rate requirements.
4.1.3 Additional control requirements.
4.1.4 All applicable requirements contained in the supplemental requirements section.
4.1.5 Any additional requirements required by the purchaser to meet special needs.

5. Materials and Manufacture

5.1 Metal parts of the incinerator exposed to the combustion process shall be made of materials listed in Section I of the ASME Boiler and Pressure Vessel Code.

5.2 Where welded construction is used, welded joint design details, welding, and nondestructive testing of the combustion chamber shall be in accordance with Section I of the ASME Code. Welders and weld procedures shall be qualified in accordance with Section IX of the ASME Code. Alternatively, design, welding (including welders and weld procedures), and testing are permitted to be in accordance with rules of a recognized classification society.

5.3 Piping and piping components associated with incinerators for fuel, sludge, and liquid cargo residues shall comply with ~~ANSI B31.1~~ ASME B31.1 or ASME B31.3 for design and material requirements. ~~Fuel oil pressure piping between service pumps and burners shall have a relief valve fitted which will discharge into the suction line or back into the tank. Pressure piping shall be of seamless steel with a thickness of at least Schedule 80. Short lengths of steel, or annealed copper nickel, nickel copper, or copper pipe and tubing may be used at the burners. The use of nonmetallic materials for fuel lines is prohibited. Valves and fittings may be threaded in sizes up to and including 2-in. normal pipe size (NPS) (60-mm outside diameter), but threaded unions are not to be used on pressure lines in sizes 1-in. NPS (33-mm outside diameter) and over.~~

5.3.1 Fuel oil pressure piping between service pumps and burners shall have a relief valve fitted which will discharge into the suction line or back into the tank.

5.3.2 Pressure piping shall be of seamless steel with a thickness of at least Schedule 80. Short lengths of steel tubing, or annealed copper nickel, nickel copper, or copper pipe and tubing are acceptable for use at the burners for flexibility.

5.3.3 The use of nonmetallic materials for fuel lines is prohibited.

5.3.4 Valves and fittings shall not be threaded in sizes over 2-in. nominal pipe size (NPS) (60-mm outside diameter).

5.3.5 Threaded unions shall not be used on pressure lines in sizes 1-in. NPS (33-mm outside diameter) and over.

5.3.6 Gaskets in fuel piping shall be fire resistant and suitable for the fuel type

5.4 If equipped with an electrically, hydraulically, or pneumatically activated valve, the valve shall be designed to fail closed or in the safe position on loss of power whichever is more appropriate to the applicable system.

5.5 All rotating or moving mechanical and exposed electrical parts shall be protected against accidental contact. All electrical devices shall be enclosed in drip-proof or watertight enclosures.

5.6 The coatings or paints shall not contain any heavy metals, such as, chromium, lead, tin, and so forth, or other materials banned by federal, state, or local authorities.

5.7 Asbestos, mercury, cadmium, polychlorinated biphenyls (PCBs), and chlorinated plastics shall not be used in the construction of the incinerator or any subsystem, including gaskets or lagging materials.

5.8 Refractory shall be resistant to thermal shocks and resistant to normal ship's vibration. The refractory design temperature shall be equal to the combustion chamber design temperature plus 20 % (see 6.1).

5.9 Incinerating systems shall be designed such that corrosion will be minimized on the inside of the systems.

5.10 In systems equipped for incinerating liquid wastes, safe ignition and maintenance of combustion shall be ensured, for example, by a supplementary burner using gas oil/diesel oil or equivalent.

5.11 The incinerating furnace ~~may be~~ shall be designed so that when it is charged with solid waste either by hand or ~~automatically. In every case,~~ automatically, the fire dangers ~~must~~shall be avoided and charging ~~must be possible~~ is performed without danger to the operating personnel.

5.11.1 For instance, where charging is carried out by hand, except as provided for in 5.11.2, a charging lock ~~may~~shall be provided which ensures that the charging space is isolated from the fire box as long as the filling hatch is open.

5.11.2 Where charging is not affected through a charging lock, an interlock shall be installed to prevent the charging door from opening while the incinerator is in operation or while the furnace temperature is above 220°C (428°F).

5.12 Incinerators equipped with a feeding sluice shall ensure that the material charged will move from the sluice to the combustion chamber. Examples for accomplishing this are the use of a clear path down or a mechanical pusher.

5.13 Interlocks shall be installed to prevent ash removal doors from opening while burning is in progress or while the furnace temperature is above 220°C (428°F).

5.14 The incinerator shall be provided with a safe observation port of the combustion chamber to provide visual control of the burning process and waste accumulation in the combustion chamber. Neither heat, flame, nor particles shall be able to pass through the observation port. An example of a safe observation port is high-temperature glass with a metal closure.

5.15 The outside surface of the combustion chamber(s) shall be shielded from contact such that people would not be exposed to extreme heat (maximum 20°C (68°F) above ambient temperature) or direct contact of surface temperatures exceeding 60°C (140°F). Examples for alternatives to accomplish this are a double jacket with airflow in between or an expanded metal jacket.

5.16 Safety interlocks shall be provided to ensure that the incinerator cannot be operated if the shock cooling subsystem is not functioning properly.

5.17 *Electrical Requirements:*

5.17.1 *General*—Installation requirements shall apply to controls, safety devices, and burners on incinerators.

5.17.1.1 A disconnecting means capable of being locked in the open position shall be installed at an accessible location at the incinerator so that the incinerator can be disconnected from all sources of electrical potential. This disconnecting means shall be an integral part of the incinerator or adjacent to it (see 7.1).

5.17.1.2 All rotating or moving parts that ~~may~~ have the potential to cause injury shall be guarded to avoid accidental contact.

5.17.1.3 The electrical equipment shall be so arranged so that failure of this equipment will cause the fuel supply to be shut off.

5.17.1.4 The power supply to the electrical control system shall be from a two-wire branch circuit that has a grounded conductor; otherwise, an isolation transformer with a two-wire secondary shall be provided. When an isolation transformer is provided, one side of the secondary winding shall be grounded.

5.17.1.5 One side of all coils shall be electrically located in the grounded side of the circuit. All switches, contacts, and overcurrent devices shall be electrically located in the ungrounded or "hot" side of the circuit. All electrical contacts of every safety device installed in the same control circuit shall be electrically connected in series. However, special consideration shall be given to arrangements when certain devices are wired in parallel.

5.17.1.6 All electrical components and devices shall have a voltage rating commensurate with the supply voltage of the control system.

5.17.1.7 All electrical devices shall be at least NEMA Type 2 (Drip tight). Electric equipment exposed to the weather shall be at least NEMA Type 4.

5.17.1.8 All electrical and mechanical control devices shall be of a type tested and accepted by a nationally recognized testing agency.

5.17.1.9 The design of the control circuits shall be such that limit, and primary safety controls shall directly open a circuit that functions to interrupt the supply of fuel to combustion units.

5.17.2 *Overcurrent Protection:*

5.17.2.1 Conductors for interconnecting wiring that is smaller than the supply conductors shall be provided with overcurrent protection based on the size of the smallest interconnecting conductors external to any control box.

5.17.2.2 Overcurrent protection for interconnecting wiring shall be located at the point where the smaller conductors connect to the larger conductors. However, overall overcurrent protection is acceptable if it is sized on the basis of the smallest conductors of the interconnecting wiring.

5.17.2.3 Overcurrent protection devices shall be accessible and their function shall be identified.

5.17.3 *Motors:*

5.17.3.1 Motors exposed to dripping or spraying oil or water shall be of drip-proof construction. All motors shall be fully guarded as installed.

5.17.3.2 Motors shall be provided with a corrosion-resistant nameplate specifying information in accordance with ~~NEC,~~ NFPA No. 70, Article 430-7.

5.17.3.3 Motors shall be provided with running protection by means of integral thermal protection, or by overcurrent devices, or a combination thereof, in accordance with the manufacturer's instructions that shall be based on the requirements of ~~National Electrical Code, ANSI/NFPA~~ NFPA No. 70.

5.17.3.4 Motors shall be rated for continuous duty and shall be designed for an ambient temperature of 50°C (122°F) or higher.

5.17.3.5 All motors shall be provided with terminal leads or terminal screws in terminal boxes integral with, or secured to, the motor frames.

5.17.4 *Ignition System:*

5.17.4.1 When automatic electric ignition is provided, it shall be accomplished by means of either a high-voltage electric spark, a high-energy electric spark, or a glow coil.

5.17.4.2 Ignition transformers shall conform to requirements of the UL ~~Standard~~ 506.

5.17.4.3 Ignition cable shall conform to requirements of the UL ~~Standard~~ 814.

5.17.5 *Wiring:*

5.17.5.1 All wiring for incinerators shall be rated for the maximum operating temperature to which it ~~may~~ will potentially be exposed. Such wiring shall be in accordance with ~~ANSI/NFPA~~NFPA No. 70. All wiring between components shall have copper conductors and be constructed in accordance with the ~~ANSI/NFPA~~NFPA No. 70.

5.17.5.2 All electrical wiring shall have a voltage rating commensurate with the voltage of the power supply.

5.17.5.3 Conductors shall be protected from physical damage where appropriate.

5.17.5.4 Conductors shall be sized on the basis of the rated current of the load they supply.

5.17.6 *Bonding and Grounding:*

5.17.6.1 Means shall be provided for grounding the major metallic frame or assembly of the incinerators.

5.17.6.2 Noncurrent carrying enclosures, frames, and similar parts of all electrical components and devices shall be bonded to the main frame or assembly of the ~~boiler.~~incinerator. Electrical components that are bonded by their installation do not require a separate bonding conductor.

5.17.6.3 When an insulated conductor is used to bond the grounding system for electrical components and devices, it shall show a continuous green color, with or without a yellow stripe.

5.18 Fasteners for components susceptible to vibration shall use self-locking nuts.

5.19 Shredder Requirements (if shredder is used):

5.19.1 The shredder and downstream conveyor/stoker system shall have access ports to enable the operator to access areas where trash is likely to jam.

5.19.2 Interlocks shall be installed on the access ports that enable them to be opened only when the shredder and conveyor/stoker system is de-energized. Access ports that have an open path to the furnace shall be interlocked to prevent them from being opened when the furnace temperature is above 220°C (428°F)

5.19.3 The shredder and downstream conveyor system (if there is no open path from the conveyor to the furnace) ~~can be~~ shall be capable of being de-energized independently for routine maintenance without having to ~~shut down~~ de-energize the entire incinerator system. The shredder and downstream conveyor system ~~can~~shall be isolated by separate power switches so that they can be locked opened without having to access any other control panel that would have to remain energized to maintain incinerator operation.

6. Operating Requirements

6.1 The incinerator system shall be designed and constructed for operation with the following conditions:

Maximum combustion chamber temperature	1200°C (2158°F)
Minimum combustion chamber temperature	850°C (1560°F)
Preheat temperature of combustion chamber	650°C (1200°F)

For batch-loaded incinerators, there are no preheating requirements. However, the incinerator shall be so designed that the temperature in the actual combustion space shall reach 600°C (1110°F) within 5 min after start.