



Standard Guide for Selection of Shipboard Incinerators¹

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1. Scope

- 1.1 This guide covers selection criteria to assist procurers in selecting the appropriate incinerator for their needs.
- 1.2 This guide is a companion document to Specification **F1323**.
- 1.3 This guide does not apply to incinerator systems on special incinerator ships, for example, for burning industrial wastes such as chemicals, manufacturing residues, and so forth.
- 1.4 The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.

2. Referenced Documents

- 2.1 *ASTM Standards:*²
F1323 Specification for Shipboard Incinerators
- 2.2 *Other Document:*³
MARPOL 73/78

3. Terminology

3.1 Definitions:

- 3.1.1 *batch feeding, n*—non-continuous feeding incinerator where the combustion chamber shall be cooled down between placing solid waste into the combustion chamber.
- 3.1.2 *continuous feeding, n*—pump transfer of sludge oil into the incinerator combustion chamber on a continuous basis; also, the feeding of solid waste into the combustion chamber by a screw conveyor or sluice system.
- 3.1.3 *sludge oil, n*—residual from fuel and lubricating oil separators, oily waste from machinery and hydraulic power units, drip trays, and oil-water separators.
- 3.1.4 *sluice system, n*—trap door system, whereby it is possible in a safe manner to feed solid waste into the combustion chamber while the incinerator is operating at high temperature.
- 3.1.5 *solid waste, n*—combustible trash, garbage, and rubbish (see also 7.4).
- 3.1.6 *waste, n*—unneeded or useless matter which is to be discarded.

4. Selecting the Incinerator Size and Installed Location

- 4.1 A number of factors will govern the selection of the size and type of shipboard incinerator and full consideration must be given to each. The installed operating location of the unit is of equal importance to ensure low-cost operating, ease of charging, ease of cleaning, and so forth. Consideration should be given to the following:
 - 4.1.1 Maximum amount of each type of waste that will be incinerated each ~~day~~ day (see Section 5).
 - 4.1.2 The normal number of hours per day that the incinerator will be in ~~operation: loading procedure batch/continuous over operating hours:operation.~~

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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 the International Maritime Organization, 4 Organization (IMO), 4, Albert Embankment, London SE1 7SR, UK; London, UK, SE1 7SR, <http://www.imo.org>.

4.1.3 Loading procedure (batch/continuous) over operating hours.

4.1.4 Can wet and dry material be loaded into the incinerator so that a large volume of auxiliary fuel is not required?

4.1.5 Can the incinerator be installed on the ship in a location near the major source of refuse so as to minimize the manpower requirements during loading operations?

4.1.6 ~~Will ashes be able to be removed easily?~~ Ash removal, if the incinerator is installed in the machinery space or on a lower deck? Will ash removal be manual (shoveling) or semiautomatic (plow)? deck.

4.1.7 Will ash removal be manual (shoveling) or semiautomatic (plow)?

5. Estimating Daily Quantities of Waste to Be Incinerated

5.1 Size of Ship's Crew:

4.1.1 Galley waste estimate: 2 lb per crew member per day.

5.1.1 Crews Galley and crew quarters waste estimate: 1.5 lb per room kg (3.3 lb) per crew member per day.

5.2 Number of Passengers Carried:

4.2.1 Galley waste estimate: ¾ lb per meal served.

5.2.1 Passenger Galley and passenger quarters waste estimate: 1.5 lb per room 2.5 kg (5.5 lb) per passenger per day.

5.3 Stores—Including Estimated amount of packages and packages that would add to the ship's garbage. packaging for food and other items that, during the underway period, will become waste in the form of rubbish or trash; 0.5 kg (1.1 lb) per crew member or passenger per day.

5.4 ~~Spent oil.~~ Sludge oil generation (see 8.3).

6. Other Factors for Selection

6.1 Type of Unit—Unit ~~Two-stage controlled air, or single-stage, compact high-temperature cyclone incinerator.~~ (for example: solid waste only, solid waste and sludge oil).

6.2 Size of unit (number of people on board). Capacity of unit in kW or BTU/hr (based on waste generation estimate, heat content of waste, and operating hours).

6.3 Loading considerations (manual loader) (batch or continuous). Sludge oil capacity.

6.4 Auxiliary liquid waste capability (sludge oil/waste oil). Loading considerations (batch loading or continuous feed).

6.5 Installation considerations (indoor/outdoor).

6.6 Environmental considerations (in port usage). (incinerators are normally required to meet the emission limits specified in IMO MARPOL 73/78, Annex VI).

6.7 Heat recover options (amount of steam or hot water).

6.8 Ash removal.

6.9 Induced draft fan requirements.

6.10 ~~Modular/package.~~ Modular/package construction.

6.11 Dimensions/weight.

7. Classification of Shipboard Wastes and Incinerators

7.1 The basis for satisfactory incinerator operation is the proper analysis of the waste to be destroyed and the selection of proper equipment to best destroy that particular waste.

7.2 As a guide, mixtures of waste most commonly encountered have been classified into types of waste, together with the British Thermal Unit (Btu) values and moisture contents of the mixtures.⁴ A concentration of one specific waste in the mixture may change the Btu value or the moisture content, or both, of the mixture. A concentration of more than 10 % by weight of catalogs, magazines, or packaged paper will change the density of the mixture and affect burning rates.

7.3 Similarly, incinerators have been classified by their capacities and by the types of wastes they are capable of incinerating.

7.4 Classification of Shipboard Wastes—The following classification of shipboard wastes differs from the definition of garbage as found in Annex V of MARPOL 73/78, which includes all of the types listed on this page.

7.4.1 Type 0—Trash, a mixture of highly combustible waste, such as paper, cardboard, cartons, wood boxes, and combustible floor sweepings from commercial and industrial activities. The mixtures contain up to 10 % by weight of plastic bags, coated paper, laminated paper, treated corrugated cardboard, oil rags, and plastic or rubber scraps.

⁴ The original source of data for these classifications is the Incinerator Institute of America Waste Classification, available from the Incinerator Institute of America, 60 E. 42nd St., New York, NY 10017.