INTERNATIONAL STANDARD

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Ships and marine technology — Shipboard incinerators — Requirements

Navires et technologie maritime — Incinérateurs de bord pour navires — Exigences

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 13617 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 3, *Piping and machinery*.

This second edition cancels and replaces the first edition (ISO 13617:1995). It was revised for continued consistency with International Maritime Organization provisions for shipboard incinerators.

Annexes A, B and D form a normative part of this International Standard. Annex C is for information only.

Ships and marine technology — Shipboard incinerators — Requirements

1 Scope

This International Standard 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 (i.e. maintenance, operational, domestic and cargo associated wastes).

This International Standard applies to incinerator plants with capacities up to 1 500 kW per unit.

This International Standard does not apply to systems on special incinerator ships, e.g. for burning industrial wastes such as chemicals, manufacturing residues, etc.

It does not address the electrical supply to the unit, nor the foundation connections and stack connections.

This International Standard provides emission requirements in annex A, and fire protection requirements in annex B. Provisions for incinerators integrated with heat recovery units and provisions for flue gas temperatures are given in informative annex C and normative annex D, respectively.

This International Standard may involve hazardous materials, operations, and equipment. It does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this International Standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

International Maritime Organization, *International Convention on the Safety of Life at Sea, 1997 (SOLAS),* Chapter II-2, Regulations 3, 26, and 44.

International Maritime Organization, *International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78).*

IEC 92, *Electrical installations in ships*

IEC 60092-201:1980, *Electrical installations in ships — Part 201: System design — General*

IEC 60092-202:1994, *Electrical installations in ships — Part 202: System design — Protection*

IEC 60092-301:1980, *Electrical installations in ships — Part 301: Equipment — Generators and motors*

IEC 60092-352:1997, *Electrical installations in ships — Part 352: Choice and installation of cables for low-voltage power systems*

IEC 60092-503:1975, *Electrical installations in ships — Part 503: Special features — A.C. supply systems with voltages in the range above 1 kV and up to and including 11 kV*

IEC 60529:2001, *Degrees of protection provided by enclosures (IP Code)*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
cargo-associated waste
all materials which have become wastes as a result of use on board a ship for cargo stowage and handling, including, but not limited to, dunnage, shoring pallets, lining and packing materials, plywood, paper, cardboard, wire, and steel strapping

3.2
cargo residues
remnants of any cargo material on board that cannot be placed in proper cargo holds (loading excess and spillage) or which remains in cargo holds and elsewhere after unloading procedures are completed (unloading residual and spillage)

3.3
contaminated rags
rags that have been saturated with a substance defined as a harmful substance in certain annexes to MARPOL 73/78

3.4
domestic waste
all types of food wastes, sewage and wastes generated in the living spaces on board the ship

3.5
fishing gear
any physical device or part thereof or combination of items that may be placed on or in the water with the intended purpose of capturing, or controlling for subsequent capture, living marine or freshwater organisms

3.6
food wastes
any spoiled or unspoiled victual substances, such as fruits, vegetables, dairy products, poultry, meat products, food scraps, food particles, and all other materials contaminated by such wastes, generated aboard ship, principally in the galley and dining areas

3.7
garbage
all kinds of victual, domestic and operational waste excluding fresh fish and parts thereof, generated during the normal operation of the ship and liable to be disposed of continuously or periodically, except those substances which are defined or listed in certain annexes to MARPOL 73/78

3.8
incinerators
shipboard facilities for incinerating solid wastes approximating in composition to household waste and liquid wastes arising from the operation of the ship, e.g., domestic waste, cargo-associated waste, maintenance waste, operational waste, cargo residues, and fishing gear, etc.

NOTE These facilities may be designed to use or not to use the heat energy produced.

3.9
maintenance waste
materials collected by the engine department and the deck department while maintaining and operating the vessel, such as soot, machinery deposits, scraped paint, deck sweeping, wiping wastes, oily rags, etc.

3.10
operational wastes
all cargo-associated wastes and maintenance waste (including ash and clinkers), and cargo residues defined as **garbage** (3.7)

3.11
oily rags
rags which have been saturated with oil as controlled in annex I to MARPOL 73/78

3.12
plastic
a solid material which contains, as an essential ingredient, one or more synthetic organic high polymers and which is formed (shaped) during either manufacture of the polymer or the fabrication into a finished product by heat and/or pressure

NOTE 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 (vapour-proof barriers, bottles, containers, liners), ship construction (fibreglass 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.

3.13
ship
a vessel of any type whatsoever operating in the marine environment and including hydrofoil boats, air-cushioned vehicles, and submersibles, floating craft and fixed or floating platforms

3.14
sludge oil
sludge from fuel and lubricating oil separators, waste lubricating oil from main and auxiliary machinery, waste oil from bilge water separators, drip-trays, etc.

3.15
waste
useless, unneeded or superfluous matter, which is to be discarded

4 General design requirements

4.1 Piping

Piping for fuel and sludge oil shall be constructed of seamless steel of adequate strength and to the satisfaction of the Administration. Short lengths of steel, or annealed copper nickel, nickel copper, or copper pipe and tubing may be used at the burners. The use of non-metallic materials for fuel lines is prohibited. Valves and fittings may be threaded in sizes up to and including 60 mm outer diameter, but threaded unions are not to be used on pressure lines in sizes 33 mm outer diameter and over.

4.2 Rotating parts

All rotating or moving mechanical and exposed electrical parts shall be protected by guards or shields against accidental contact by personnel in the vicinity of the incinerator.

4.3 Insulation and cooling

4.3.1 Incinerator walls are to be protected with insulated fire bricks/refractory and a cooling system. The outside surface temperature of the incinerator casing being touched during normal operations shall not exceed 20 °C above the ambient temperature.

4.3.2 The 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 4.12).

4.3.3 The outside surface of combustion chamber(s) shall be shielded from contact such that personnel will not be exposed to extreme heat of more than 20 °C above the ambient temperature, or direct contact with surface temperatures exceeding 60 °C.

EXAMPLE 1 Double jacketing with an air space between jackets

EXAMPLE 2 Expanded metal jacketing

4.4 Corrosion

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

4.5 Liquid waste incineration

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

4.6 Combustion chamber

The combustion chamber(s) shall be designed for easy maintenance of all internal parts including the refractory and insulation.

4.7 Combustion pressure

The pressure in the furnace under all circumstances shall be lower than the ambient pressure in the space where the incinerator is installed to ensure that the combustion process takes place under negative pressure. A flue gas fan may be fitted to provide negative pressure.

4.8 Charging solid waste

The incinerating furnace may be charged with solid waste either by hand or automatically. In every case, fire dangers shall be avoided and charging shall be possible without danger to the operating personnel.

EXAMPLE 1 Where charging is carried out by hand, a charging lock could be provided which ensures that the charging space is isolated from the fire box as long as the filling hatch is open.

EXAMPLE 2 Where charging is not effected through a charging lock, an interlock could be installed to prevent the charging door from opening while the incinerator is in operation with burning of garbage in progress, or while the furnace temperature is above 220 °C.

4.9 Feeding system

Incinerators equipped with a feeding sluice or system shall ensure that the material charged will move to the combustion chamber. Such systems shall be designed such that both the operator and environment are protected from hazardous exposure.

4.10 Ash removal

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.

4.11 Observation port

The incinerator shall be provided with a safe observation port of the combustion chamber in order 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.

EXAMPLE An example of a safe observation port is high-temperature glass with a metal closure.

4.12 Design temperature values

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

— maximum flue-gas-outlet temperature of combustion chamber: 1 200 °C;

— minimum flue-gas-outlet temperature of combustion chamber: 850 °C;

— preheat temperature of combustion chamber: 650 °C.

Preheating is not required in batch-loaded incinerators. However, in batch-loaded incinerators without preheating, the incinerator shall be so designed that the temperature in the actual combustion space reaches 600 °C within 5 min after starting.

4.13 Prepurging and post-purging

Incinerator controls shall include the following purge cycles.

— Prepurge, before ignition: at least four air changes in the chamber(s) and stack, but not less than 15 s.

— Time between restarts: at least four air changes in the chamber(s) and stack, but not less than 15 s.

— Post-purge, after shut-off of fuel oil: not less than 15 s after the closing of the fuel-oil valve.

4.14 Volume fraction of oxygen in discharge gas

Incinerators shall be designed so that incineration produces a minimum of 6 % mass fraction of oxygen (measured in dry flue gas) in the discharge gases.

4.15 Warning plate(s)

The incinerator shall have warning plates attached in a prominent location on the unit, warning against unauthorized opening of doors to combustion chamber(s) during operation and against overloading the incinerator with garbage.

4.16 Instruction plate(s)

The incinerator shall have (an) instruction plate(s) attached in a prominent location on the unit that clearly explain(s) the procedures for the following operations:

— cleaning ashes and slag from the combustion chamber(s) and cleaning of combustion air openings before starting the incinerator (where applicable);

— operating procedures and instructions, including proper start-up procedures, normal shut-down procedures, emergency shutdown procedures, and procedures for loading garbage (where applicable).

4.17 Flue-gas cooling

To avoid building up of dioxins, the flue gas shall be shock-cooled to a maximum (350 °C) within 2,5 m from the flue-gas outlet of the combustion chamber.

5 Electrical requirements

5.1 General requirements

Incinerator electrical components and installations, including controls, safety devices, cables, and burners, shall comply with International Electrotechnical Commission (IEC) Standards, particularly IEC 92.

5.2 Disconnects

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 potential. This disconnecting means shall be an integral part of the incinerator or adjacent to it (see 7.1).

5.3 Live parts

All uninsulated live metal parts shall be guarded to avoid accidental contact.

5.4 Failure design

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

5.5 Control-circuit connections

All electrical contacts of every safety device installed in the control circuit shall be electrically connected in series. However, special consideration shall be given to arrangements when certain devices are wired in parallel.

5.6 Component voltage ratings

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

5.7 Weather endurance

All electrical devices and electric equipment exposed to the weather shall be designed and installed according to IEC 92-201:1980, Table V.

5.8 Control device testing and acceptance

All electrical and mechanical control devices shall be of a type tested and accepted by a nationally recognized testing agency, according to International Standards.

5.9 Control-circuit design

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.

5.10 Overcurrent protection

5.10.1 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, according to IEC 92-202 (1980 edition with amendment).

5.10.2 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, or according to IEC 92-202.

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

5.11 Motors

5.11.1 All electric motors shall have enclosures corresponding to the environment where they are located. At least IP 44, according to IEC 60-529.

5.11.2 Motors shall be provided with a corrosion-resistant nameplate specifying information in accordance with IEC 92-301.

5.11.3 Motors shall be provided with running protection by means of integral thermal protection, by overcurrent devices, or a combination of both in accordance with a manufacturer's instruction that shall be in accordance with IEC 92-202.

5.11.4 Motors shall be rated for continuous duty and shall be designed for an ambient temperature of 45 °C or higher.

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

5.12 Ignition systems

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

5.12.2 Ignition transformers shall have an enclosure corresponding to the environment where they are located. At least IP 44 according to IEC 529.

5.12.3 The ignition cable shall conform to the requirements of IEC 92-503.

5.13 Wiring

All wiring on shipboard incinerators shall be rated and selected in accordance with IEC 92-352.

5.14 Bonding

5.14.1 Means shall be provided for grounding the major metallic frame or assembly of the incinerators. Noncurrent carrying enclosures, frames, and similar parts of all electrical components and devices shall be bonded to the main frame or assembly of the incinerator. Electrical components that are bonded by their installation do not require a separate bonding conductor.

5.14.2 When an insulated conductor is used to bond electrical components and devices, it shall show a continuous green colour, with or without a yellow stripe.