INTERNATIONAL STANDARD

ISO 21070

First edition
2011-09-01

Ships and marine technology — Marine environment protection — Management and handling of shipboard garbage

Navires et technologie marine — Protection de l'environnement marin — Gestion et manutention des déchets à bord du navire

Reference number
ISO 21070:2011(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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 2.

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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 21070 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 2, *Marine environment protection*.

Introduction

The discharge of solid waste from shipping is extensively controlled by Annex V of MARPOL (under revision 2010-2011), in conjunction with other regional arrangements such as Directive 2000/59/EC of the European Parliament and of the Council of 27 November 2000 on port reception facilities for ship-generated waste and cargo residues. Additionally, states parties to the MARPOL Convention have undertaken national implementing legislation to regulate and enforce provisions for handling ships' waste and for providing adequate reception facilities at ports and terminals subject to a party's flag state and port state control authorities. There is also significant international discussion both in the International Maritime Organization (IMO) and other fora on how to manage this issue in the future and best practice has been recommended by various maritime administrations and organizations representing industry.

Present mechanisms for managing and landing the collection of garbage generated onboard ships often fail, as there are no general regulations or International Standards for ships and international ports concerning segregation, handing over procedures and reception facilities. This International Standard goes some way to address this issue, providing a standard for the minimization, management and segregation of ships' garbage, so that it can be handled onboard and landed efficiently to the relevant reception facilities onshore.

To obtain the most efficient management of waste and to reduce the time and resource burden in segregating and handling it on the ship and in the ports, the concept of waste minimization has been integrated into this International Standard by incorporating the following basic principle:

"Prevention before recycling before energy recovery before disposal"

This International Standard concentrates on:

— minimization of waste prior to sailing;

— minimization of waste at source on the ship;

— garbage collection at the source;

— waste segregation on the ship into defined categories that are recognized globally and fit into the many different waste categorization systems around the world;

— waste minimization once segregated;

— waste storage onboard ship; and

— health and safety concerns surrounding the handling, storage and landing of waste.

Both owners and coastal states are increasingly aware of the importance of well-organized and managed waste collection and its benefits, especially with respect to health and safety onboard ships, the reduction of pollution and the potential cost benefits for owners and national governments. This International Standard provides a fixed standard for segregated garbage that any harbour facility worldwide may expect when a ship arrives in port. However, this International Standard does not consider the available various (and numerous) shoreside waste-handling systems that exist, but may give the initial push to build up recycling facilities of solid waste. An International Standard is being developed for the reception of ships' waste by ports that will work in conjunction with this International Standard.

In the future, this International Standard may be expanded to include guidance for the handling of other waste.

Ships and marine technology — Marine environment protection — Management and handling of shipboard garbage

1 Scope

The requirements of MARPOL Annex V set the minimum standard for garbage management that apply to ships. Applicable national and regional regulations exceeding the requirements of MARPOL Annex V will also need to be observed. This International Standard applies to the management and handling of garbage generated onboard ships during the period the garbage will be onboard. The definition of garbage in this International Standard is as defined in MARPOL Annex V. This International Standard contains procedures for the shipboard management of garbage, including handling, collection, separation, marking, treatment and storage. It also describes the vessel-to-shore interface and the delivery of garbage from the ship to the port reception facility.

2 Normative references

The following referenced documents are indispensable for the application of this International Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL) Annex I to VI, as amended

3 Terms and definitions

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

3.1 General

3.1.1
discharge
in relation to harmful substances or effluents containing such substances, any release, howsoever caused, from a ship including any escape, disposal, spilling, leaking, pumping, emitting, or emptying

[MARPOL 1973, Article 2(3)(a)]

3.1.2
effluent
discharged liquid (that may contain harmful substances/residues in solution or suspension)

3.1.3
harmful substance
any substance which, if introduced into the sea, is liable to create hazards to human health, harm living resources and marine life, and damage amenities or interfere with other legitimate uses of the sea, and includes any substance subject to control by the MARPOL Convention

3.1.4
hazardous waste
any waste which, due to its nature, physical, chemical or infectious properties, is potentially hazardous to human health and/or the environment during use, handling, storage or transportation

NOTE It includes any material which requires special disposal techniques to eliminate or reduce the hazard.

3.1.5
port reception facility
fixed, floating or mobile port facility for the reception of ship-generated wastes

NOTE For the purposes of this International Standard, this relates to port reception facilities for garbage as defined by MARPOL Annex V, 2006.

3.1.6
recycling
reuse of waste for the same purpose as it was originally designed or as raw material for other purposes, for the production of new products or the conversion into new usable components

3.1.7
waste
useless, unneeded or superfluous matter which is to be discarded

NOTE For the purposes of this International Standard, references to wastes relate to garbage.

3.2 Garbage

3.2.1
cargo-associated waste
all materials which have become wastes as a result of use onboard a ship for cargo stowage and handling

NOTE Cargo-associated waste includes but is not limited to dunnage, shoring, pallets, lining and packing materials, plywood, paper, cardboard, wire and steel strapping.

[MARPOL Annex V Guidelines, 2006, paragraph 1.7.5]

3.2.2
cargo residues
remnants of any cargo material onboard 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 spillage)

NOTE 1 However, cargo residues are expected to be in small quantities.

NOTE 2 Cargo material contained in the cargo hold bilge water is not treated as cargo residues provided that the cargo material is not classified as a marine pollutant in the IMDG Code and the bilge water is discharged from a loaded hold through the vessel's fixed piping bilge drainage system.

[MARPOL Annex V Guidelines, 2006, paragraph 1.7.10]

3.2.3
contaminated rags
rags which have been saturated with a substance defined as a harmful substance in MARPOL annexes other than Annex I

[MARPOL Annex V Guidelines, 2006, paragraph 1.7.9]

3.2.4
domestic waste
all types of food wastes and wastes generated in the living spaces onboard the ship

[MARPOL Annex V Guidelines, 2006, paragraph 1.7.4]

3.2.5
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 other annexes to MARPOL

[MARPOL Annex V, 2006, Regulation 1.1]

3.2.6
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 sweepings, wiping wastes, rags, etc.

[MARPOL Annex V Guidelines, 2006, paragraph 1.7.6]

3.2.7
oily rags
rags which have been saturated with oil as controlled in MARPOL Annex I

3.2.8
operational waste
all cargo-associated waste and maintenance waste, and cargo residues defined as garbage in 3.2.5

[MARPOL Annex V Guidelines, 2006, paragraph 1.7.7]

3.2.9
plastic
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 of the fabrication into a finished product by heat and/or pressure

NOTE 1 Plastics have material properties ranging from hard and brittle to soft and elastic.

NOTE 2 Plastics are used for a variety of marine purposes including, but not limited to, packaging (vapour-proof barriers, bottles, containers, liners, etc.), ship construction (fibreglass and laminated structures, siding, piping, insulation, flooring, carpets, fabrics, paints and finishes, adhesives, electrical and electronic components, etc.), disposable eating utensils and cups, bags, sheeting, floats, fishing nets, strapping bands, rope and line, etc.

[MARPOL Annex V, Regulations 3(1) and 5(2) and Guidelines, 2006, paragraph 1.7.3]

3.3
medical waste
any solid waste that is generated in the diagnosis, treatment or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals, including but not limited to isolation wastes, infectious agents, human blood and blood products, pathological wastes, sharps, body parts, contaminated bedding, surgical wastes and potentially contaminated laboratory wastes and dialysis wastes

NOTE 1 Medical waste is distinguished into two categories: infectious and non-infectious.

NOTE 2 Medical waste also includes expired medicine and medical products.

3.4
quarantine waste
any solid or liquid waste determined by local or regional legislation to require special handling, segregation and disposal due to its potential to spread disease, or plant and animal pests when discharged

4 Requirements

4.1 General

This clause specifies the minimum requirements on waste treatment onboard to achieve this International Standard, including waste separation, marking, collecting, storage and handing over facilities.

While it is recognized that storage, segregation and equipment should be standardized, it shall be noted that landing procedures depend on the ports and the port reception facilities available.

4.2 Classification of garbage

The types of garbage given in Table 1 apply to this International Standard.

Table 1 — Types of garbage

Type	MARPOL Annex V category	Description [a]
Plastics	Category 1	Shall be retained onboard and disposed of ashore
Cargo-associated wastes	Category 2	Floating dunnage, lining or packaging material
Wood	Category 2	See Cargo-associated wastes
Paper products	Category 3 or 4	Includes cardboard, and paper packaging, paper products, rags, glass, metal, bottles, crockery, etc. [Category 3 refers to GROUND (shall pass through a 25 mm screen)] Category 4 includes unground materials and certain bulk cargo residues (see below)
Rags	Category 3 or 4	Not contaminated with any harmful material
Glass	Category 3 or 4	May require separation by colours
Metal	Category 3 or 4	Ideally separated into ferrous and non-ferrous
Bottles	Category 3 or 4	See Glass, above
Crockery	Category 3 or 4	Ceramics containing heavy metals or other harmful materials are excluded
Cargo residue	Category 4	See 4.3; Dry cargo residues may include deck or cargo hold sweepings and wash water containing such residues
Food waste	Category 5	Additional regional or national legislations may also apply
Incinerator ash	Category 6	See below [b]
Hazardous waste		Includes oily waste, oily rags, medical waste, batteries, fluorescent lamps, garbage contaminated with hazardous waste, and any other waste that is considered hazardous waste. Some regional or national legislations may require separate identification and handling.

[a] Garbage that is contaminated by another category of garbage shall be handled in accordance with the more stringent disposal requirements that are applicable.

[b] Incinerator ash from plastics products may contain toxic or heavy metal residues and shall be retained onboard and disposed of ashore.

4.3 Cargo residues and cargo-associated waste

Ships shall have procedures in their garbage management plan to deal with cargo residues and cargo-associated waste. There may be specific international and local legislation that has to be taken into account, and the ship shall have procedures in place to ensure that such materials are disposed of correctly.

4.4 Collection and segregation of garbage

4.4.1 General

Garbage shall be regularly collected in the areas where it is generated. At the point of collection, the garbage should be appropriately segregated into types according to Table 1. The garbage shall be transported to a storage site onboard the vessel appropriate for that category (Table 1), where it may be segregated further as necessary.

4.4.2 Collection containers

Collection containers of suitable size, design and number as appropriate for the volume and category of garbage anticipated should be available where the garbage is generated. The collection containers shall also

comply with the applicable safety requirements and shall be easy to transport manually. For hygiene reasons, the containers shall be emptied regularly.

Collection containers shall be marked to clearly identify their use (Table 1 categories) as appropriate. See examples of standardized marking/labelling of collection containers in Table 2.

4.5 Storage

4.5.1 General

Collected garbage shall be appropriately stored onboard until it is disposed of in accordance with the applicable international, regional and/or national legislation.

The capacity of the designated storage site(s) shall be commensurate with the number and size of storage containers required to accommodate shipboard garbage (4.5.2).

4.5.2 Storage containers

4.5.2.1 General

Storage container volumes shall be commensurate with the amounts and categories (Table 1) of garbage anticipated based on factors such as ship type, size and service. Taking into account any potentially hazardous characteristics, the garbage shall be stored onboard only in suitable, appropriately sized containers.

Storage containers may be either built into the ship or movable and shall be marked to clearly identify the use as appropriate. See examples of standardized marking/labelling or storage containers by waste category in Table 2.

The containers shall be marked appropriately by a relevant recognized colour-coded labelling and/or a sign depicting the garbage it contains (Table 2).

Table 2 — Colour-coding labelling system

Type	MARPOL Annex V category	Colour coding – label description [ab]
Plastics	Category 1	Yellow
Cargo-associated wastes	Category 2	Brown
Wood	Category 2	Brown
Paper products	Category 3 or 4	White with black background
Rags	Category 3 or 4	White with black background
Glass	Category 3 or 4	Blue
Metal	Category 3 or 4	Grey
Bottles	Category 3 or 4	Blue (see Glass, above)
Crockery	Category 3 or 4	Orange
Cargo residue	Category 4	No colour coding required
Food waste	Category 5	Green
Incinerator ash	Category 6	Black
Hazardous waste		Includes oily waste, oily rags, medical waste, batteries, fluorescent lamps, garbage contaminated with hazardous waste, and any other waste that is considered hazardous waste. Some regional or national legislations may require separate identification and handling.

[a] The colour-coding system in this table may not apply to all scenarios and may not be the same as used on land. Colour coding may not be required if wastes are placed directly into a pier-side reception facility.

[b] The ISO International Standard for symbols (ISO 7001:2007) may be consulted for label design. Inexpensive and readily available standard labelling software and a colour printer may be useful for creating labels/markings aboard ship, for collection and storage containers. Coloured signage/labels could be affixed to appropriate portable containers such as drums, boxing or bagging for retention and storage aboard. Such a colour-coding system would be useful for easy identification when offloading at a reception facility. Further, such a labelling scheme will facilitate efficient segregation of wastes, by category, for further handling and recycling by port reception facility operators. Additional or supplemental labels could be affixed to those categories of waste requiring special handling such as quarantine wastes or medical wastes and incinerator ash for ships equipped with such equipment. The Symbols (and abbreviated terms) clause is an optional element giving a list of the symbols and abbreviated terms necessary for the understanding of the document.

4.5.2.2 Movable storage containers

Movable storage containers shall be fit for use based on storage site, ship type and garbage category.

a) The containers shall be leakproof where appropriate and be equipped with a suitable cover. Containers arranged on deck shall be provided with securable covers.

b) SOLAS requires that the use of combustible materials be restricted; the containers should be made of non-combustible material and resistant to oil and chemicals as appropriate to the material to be stored.

c) Manually handled containers shall be fit for use and easy to transport. Containers to be lifted manually may not exceed a volume of 50 l or, depending on the density of the waste, a total weight of 35 kg. Larger containers shall be provided with rollers and more stringent restrictions regarding maximum weight may apply due to national and local legislation; these shall be followed as appropriate. Containers provided with wheels and rollers shall be equipped with locking brakes or equivalent means of securing against movement.

d) Containers to be moved mechanically shall be provided with a safe transportation means. They shall be designed so that they can be lifted safely and emptied by tilting, or opening the bottom, so as to ensure a safe and quick emptying.

4.5.2.3 Containers built into the ship

Containers built into the ship, such as tanks and silos, shall comply with applicable design and construction requirements.

4.5.3 Storage sites

4.5.3.1 Dedicated garbage storage sites

The garbage containers as described in 4.5.2.2 and 4.5.2.3 shall be located in dedicated garbage storage sites.

These spaces are to be identified by their use or signage and do not need to be reflected by name as garbage storage areas on plans.

4.5.3.2 General requirements of garbage storage sites

The locations for garbage storage onboard shall meet the following requirements.

a) Access to the site shall be free from obstructions, as far as practicable.

b) The transport route to manually land the garbage to shore shall be free from thresholds, coamings and other obstructions, as far as practicable.

c) A means for securing the storage containers against movement in the site shall be provided.

d) Storage sites, associated passageways, shafts and hatchways for vertical transport, and entrances shall be adequately sized for easy use, handling, and transport of storage containers.

e) Relevant fire protection equipment shall be provided at storage sites.

f) For internal sites, adequate ventilation (forced exhaust or natural supply) shall be provided.

g) A water connection shall be provided for wet cleaning.

h) Inside scuppers shall be provided with a strainer. Wash water and escaping liquids from inside spaces shall be directed to an appropriate waste liquid system.

Separate storage sites or rooms should be considered for hazardous waste. These spaces shall have drainage relevant to the waste being stored and shall have an eyewash station for personnel in a readily accessible location.

4.5.3.3 Additional requirements on storage sites

The garbage storage site shall be equipped in such a way that any hazards arising from the waste are minimized.

In addition to the basic outfitting detailed above, a garbage storage site should be equipped as follows:

a) suitable absorbent material for oil-containing waste;

b) temporary storage in the event of broken containers (e.g. pans and barrels);

c) broom, shovel;

d) locks, locking strips, cargo netting or other suitable protections against sliding, tilting, leaking or falling of stored garbage;

e) first aid kit;

f) sorting and handling procedures;

g) machinery operating instructions; and

h) adequate lighting.

The installed outfitting of a garbage storage site shall depend on the categories of garbage stored and the related hazards. Relevant criteria considered in selecting the outfitting shall be documented in the garbage management plan.

4.5.3.4 Additional requirements for storage sites on deck

The following additional requirements apply:

— the storage site(s) should be sheltered from the weather and seawater as much as possible;

— the deck storage site shall be permanently marked and be of sufficient size to accommodate the garbage containers; permanent marking is not required for deck storage sites used on a temporary basis;

— the location of the garbage storage site(s) shall be appropriately selected according to categories of garbage to be stored, and located so as not to interfere with normal vessel operations; and

— means for securing outside garbage containers against movement shall be provided.

4.6 Treatment (processing)

Garbage to be landed to port reception facilities should not be treated or changed in any manner that makes it impossible to recycle by shore facilities. The use of equipment such as shredders, pulpers and compactors as appropriate to reduce the volume and handling of solids is recommended. It is to be noted that the disposal of garbage through comminutors and incinerators is subject to international and regional law.

4.7 Process of landing garbage

To ensure a problem-free landing of garbage produced onboard to the shore facilities, the process shall meet the following requirements.

a) The facilities onboard to land garbage shall be arranged and operated in such a way that safe handling, movement, or emptying of garbage containers is possible in any normal loading condition of the ship.

b) The facilities to land garbage should be arranged such that manual handling of garbage containers is minimized. Mechanical handling of garbage containers is the preferred route. Direct accessibility from the storage site with the equipment used for landing garbage shall be ensured. If this is not possible for design reasons, manual horizontal transport of garbage containers greater than 10 m should be avoided.

The procedures to land garbage should take into account the type and location of the port reception facilities. International, regional and local legislation shall be followed. They should also take into account the specific port procedures for notifying and arranging for garbage to be removed.

5 Garbage management

5.1 Garbage management plans

MARPOL Annex V sets the minimum standard for garbage management plans applicable to ships. The garbage management plans applicable to this International Standard shall be developed in such a way to minimize the discharge of waste and garbage to the sea, as specified in MARPOL Annex V. This International Standard is also applicable to ships not covered by the MARPOL requirement.

The ship shall be managed, arranged and equipped with the necessary facilities and resources to implement its garbage management plan effectively. The basis of planning the garbage management plan shall take into account an estimate of the waste volume, duration of the voyage, a review of potential treatment options and their effects on shipboard garbage management, the operation of the ship, the number of persons onboard, additional applicable regulations and any other relevant considerations.

The health and safety of passengers and crew and protection of the environment shall be given priority when developing procedures and designing, constructing and sourcing equipment used for the management of

garbage. Problems such as odours, liquid residue, unnecessary grey water generation, health hazards and hygiene issues shall be considered and should be avoided by corresponding design measures. The basis of any decisions shall be appropriately documented in the garbage management plan.

5.2 Garbage volume

An estimate of the garbage volume shall be calculated using a range of factors such as persons onboard, anticipated length of voyage, the application of minimization technology, type of ship and ship operational considerations. There are many different ways and models to estimate garbage, and examples of these can be found in Annex A. Estimated volumes should be updated as found necessary.

5.3 Garbage treatment techniques

5.3.1 General

Garbage may be stored onboard either treated or untreated until a port is reached where it can be landed. However, ships should maximize the segregation of garbage into types in Table 1 in order to facilitate efficient recycling at the port reception facility, and recycling in general. When selecting onboard treatment techniques, the various onboard conditions such as space, garbage amounts and length of voyage should be taken in to account. The use of treatment technologies will affect the handling of garbage onboard by changing its characteristics and the storage capacities may be designed smaller and alternative containers utilized.

Figure 1 shows an internationally recognized onboard garbage management scheme with possible garbage treatment options.

5.3.2 Treatment for discharge into the sea

It is recognized that discharges of certain types of garbage to the sea are allowed under MARPOL Annex V; however, such discharges should be minimized and avoided where possible as part of the garbage management plan. In cases where a discharge is unavoidable (such as food waste for hygiene reasons on longer voyages), the garbage shall be processed and/or treated to applicable international and regional requirements.

5.3.3 Treatment for shore disposal

Common treatment processes include shredding, pulping, grinding, compacting and incineration, or combinations thereof. To develop and evaluate garbage management plans, it is recommended that detailed technical data be sourced on the changes in relevant garbage volume levels provided by the use of such technologies. There are many different treatment processes that can be used onboard ships to reduce the volume of garbage; examples of these can be found in Annex B.

5.4 Facilities to land garbage

The arrangements and facilities provided onboard to land garbage shall be appropriately equipped, sized and planned to move the garbage from the storage site to the port reception facility. Procedures shall be in accordance with the requirements of 4.7. The loading and unloading procedures shall ensure that the garbage landing operation and any set-down areas are readily accessible and free from obstruction.

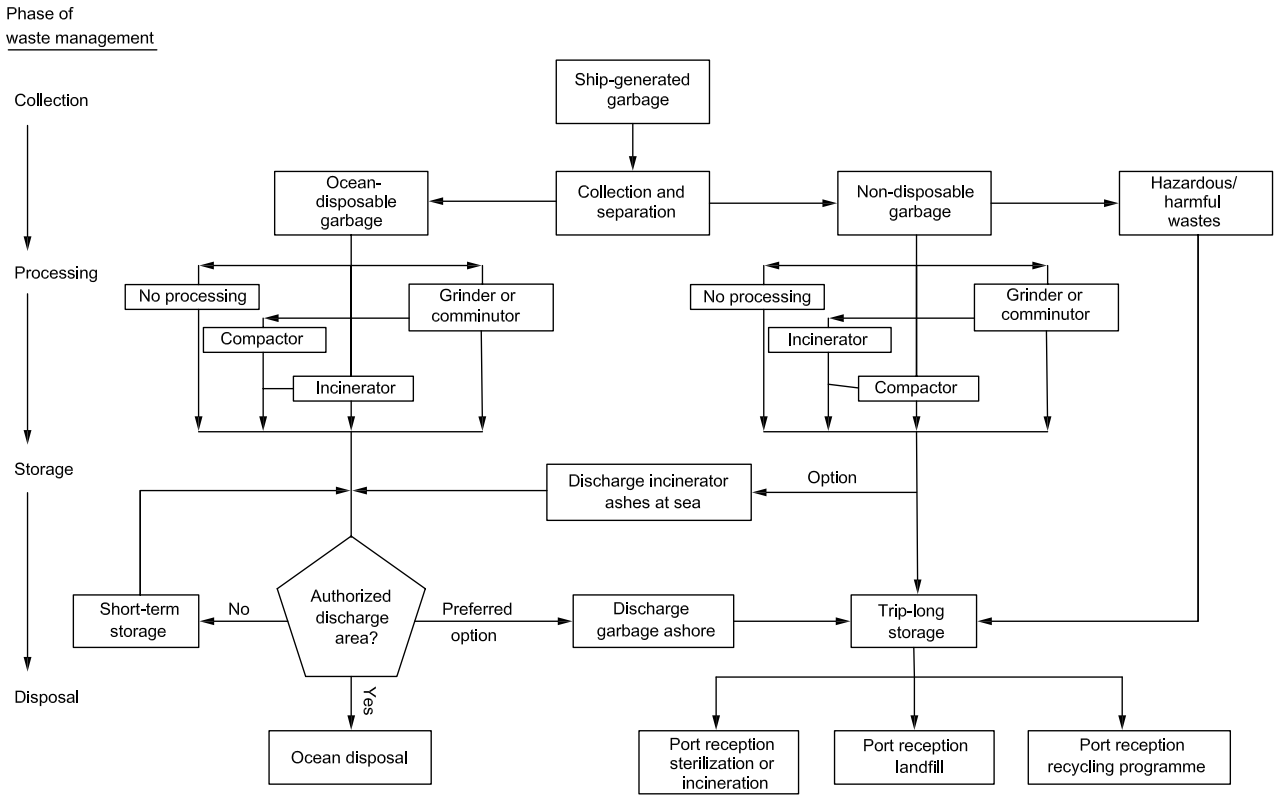

Figure 1 — Options for onboard handling and disposal of garbage in accordance with MARPOL Annex V

5.5 Documentation

The categories of garbage as well as the quantities and disposal method shall be recorded in the garbage record book as required in MARPOL Annex V. A ship's officer shall be designated responsible for the management of garbage in accordance with the garbage management plan.

Advance notification of the garbage to be landed or retained onboard, and any other required information, shall be given to the port as appropriate, and in accordance with the applicable international, regional and/or local legislation. MEPC.1/Circ. 671 "Guide to Good Practice for Port Reception Facility Providers and Users" incorporates approved forms in standard formats for advance notification and delivery receipts. A copy of the advance notification and/or the waste delivery receipts should be retained onboard the vessel.

5.6 Waste minimization

5.6.1 In accordance with the following principles, efforts shall be made to minimize the amount of garbage produced onboard the ship:

— reduction of the amount of garbage generated;

— its reuse (either for the same or a different purpose);

— segregation for recycling or composting ashore; and

— energy recovery (subject to incineration rules for ships).

5.6.2 Garbage reduction methods with respect to quantity and quality shall be identified and implemented. This could include avoiding the generation of garbage through the deliberate purchase of products that do not have excess packaging, are easily biodegradable and do not produce additional hazardous substances (e.g. toxic, corrosive or dangerous to the environment) when disposed of or recycled.

5.6.3 Information about the hazards of materials and products used on a ship can be obtained from material safety data sheets (MSDS), and information on the packaging. These inform the user about the composition of the product, the hazards, environmental characteristics and disposal options. From this information decisions on the substitution of products generating less garbage or environmental impact can be made.

5.6.4 Measures to minimize garbage quantities could include:

— selection of suppliers whose products minimize waste;

— selection of suppliers who provide a refill or replacement service for their products;

— purchase of products in larger packing units;

— removal of excess packaging before loading;

— returning old and out-of-date unused equipment (e.g. time-expired pyrotechnics and pharmaceuticals) to the manufacturers or sellers for reuse, recycling, refilling or disposal as appropriate;

NOTE It is preferred that pyrotechnics and pharmaceutical products be returned to the manufacturer or supplier prior to expiration dates, as permitted.

— complete emptying of containers and full use of the contents;

— optimization of waste-producing processes so as to reduce waste;

— evaluation of product-specific waste quantities to identify means to reduce waste;

— use of products with a long lifespan and/or shelf life;

— use of equipment that can be repaired; and

— repairing rather than replacing equipment.

5.6.5 To optimize garbage management onboard, the crew should be actively engaged in the process as the success of any measures put in place depends to a large extent on their acceptance and implementation by the crew. Means to achieve effective crew involvement may include:

— a definition and allocation of responsibilities;

— training of personnel; and

— regular information briefings for all crew members.

5.6.6 Effective procedures should include:

— the description of the reason for the procedure;

— the scope of application (entire ship or only specific areas);

— naming of responsible persons;

— description of the garbage management process (e.g. process chart); and

— auditing and reassessment provisions.

5.7 Garbage management audits

The efficient implementation of garbage management procedures will require regular auditing and quantification of waste. A regular assessment (at least once a year) of the garbage record book will provide an opportunity to analyse waste-related issues. An example is the identification of significant quantities of waste, the production of which could be assessed with the aim of reducing the amount and cost of garbage disposal.

A well-prepared garbage management plan will serve as the basis for assessment. It is recommended that a garbage data sheet be prepared for each category of garbage as part of any audit. Such a data sheet should provide information about the area where this category of garbage is produced, the source (e.g. packing), the garbage characteristics, the disposal methods, disposal costs and the disposal quantities. An example of such a data sheet can be found in Annex C.

The document summarizing the garbage audit should be in a form that can serve as a basis for the development of future waste minimization procedures and methods.

Annex A
(informative)

Examples of calculating the expected amount of waste

A.1 Calculation basis

A.1.1 General

The calculation formulas mentioned here are based on empirical values and are estimates only. There is the possibility that severe deviations may occur depending on the type of ship, application, operating area, crew, size of crew, environmental regulations and many other factors.

The kinds of waste mentioned in Clause 4 can be estimated observing the above-mentioned and difficult to assess using the following factors.

The following formula is used for the calculation:

$$V_{\text{type of waste}} = \text{factor} \times d \times P = V$$

where

V is the volume of the relevant type of waste in dm^3;

d is the duration of the voyage in days (at least 30 days);

P is the number of persons onboard.

A.1.2 Glass

$$V_{\text{glass}} = 1{,}84 \times d \times P$$

where the density in tonnes/m^3 for waste glass ≈ 1,2.

NOTE Data according to Landesumweltamt NRW (Germany), density table of LAGA kinds of waste.

A.1.3 Paper, cardboard, cartons

$$V_{\text{paper}} = 1{,}05 \times d \times P$$

where the density in tonnes/m^3 for waste paper ≈ 0,5.

NOTE Data according to Landesumweltamt NRW (Germany), density table of LAGA kinds of waste.

A.1.4 Packaging, plastics

$$V_{\text{plastics}} = 1{,}0 \times d \times P$$

where the density in tonnes/m^3 for plastic containers ≈ 0,2.

NOTE Data according to Landesumweltamt NRW (Germany), density table of LAGA kinds of waste.

A.1.5 Wood

As waste wood is normally a result of cargo residues, no general quantity calculation can be made.

The density in tonnes/m^3 for waste wood ≈ 0,48.

NOTE Data according to Landesumweltamt NRW (Germany), density table of LAGA kinds of waste.

A.1.6 Metal, scrap

$$V_{\text{metal}} = 0{,}55 \times d \times P$$

where the density in tonnes/m^3 for scrap iron ≈ 2,0.

NOTE Data according to Landesumweltamt NRW (Germany), density table of LAGA kinds of waste.

$$V_{\text{special waste}} = 1{,}84 \times d \times P$$

A.1.7 Organic waste

$$V_{\text{organics}} = 1{,}02 \times d \times P$$

A.2 Other calculations/examples

Shipmasters should review the required garbage record book to get a better idea of the quantities of waste generated onboard their specific vessel. This information may be used to calculate the required storage space needed onboard for incorporation into the ship's garbage management plan when retention onboard and discharge of all ship's wastes to port reception facilities is contemplated.

One report received by the subcommittee during the development of this International Standard indicated that typical volumes generated onboard a medium-sized (cargo) ship are in the ranges shown in Table A.1.

Daily domestic waste per person, per day	Maintenance waste per day
	Soot and machinery deposits: 4 kg
Wet garbage: 1,4 kg to 2,4 kg	Paint scraping waste: 3 kg
Dry garbage: 0,5 kg to 1,5 kg	Wiping wastes and rages: 3 kg
	Sweepings: 1 kg

Table A.1 — Typical volumes of garbage generated onboard a medium-sized cargo ship

Annex B
(informative)

Examples of treatment processes used onboard ships to reduce garbage volume

B.1 Shredders

A dry garbage shredder is used to increase the density of the garbage by shredding the waste components. The volume reduction depends on the material to be shredded. The garbage is commonly shredded to grain-sized elements. For storage onboard, shredded garbage may be compacted and the liquid extracted so as to avoid odour and hygiene problems. Subsequent management of the extracted liquid is necessary.

B.2 Pulpers

Pulpers are equipment for processing food waste and other garbage by reducing it to small particles ($<$ 25 mm) for discharge as a waterborne slurry (garbage disposal units are also referred to as pulpers). Wet garbage pulpers are often located where the waste is generated, for instance, in the galley. Pulping increases the surface area, therefore accelerating decay.

B.3 Compactors

During compaction, an average reduction of up to approximately 25 % of the original volume can be achieved. Compacted garbage is normally processed in the form of bales for easy handling. Most dry compactors or hand presses are bale presses and a previous separation of wet garbage is required.

Wet compactors reduce the recycling capability of the garbage when dry and wet garbage is treated simultaneously. Any liquid extracted during compaction shall be collected or cleaned appropriately to avoid odour and hygiene problems. Subsequent management of extracted liquid is necessary. Compacting in liquid-tight containers with a later discharge to the grey water tank is the most common form.

B.4 Garbage comminutors

A piece of equipment that uses a low-speed revolving cutter which requires a head of fluid to induce flow through the cutting mechanism and reduces the size of food waste and/or all other garbage to fragments capable of passing through a screen with openings no greater than 25 mm.

B.5 Incinerators

Garbage may be incinerated onboard in type-approved incinerators. Depending on the garbage composition, the volume is greatly reduced. Garbage is sterilized by incineration.

The technical requirements regarding the incineration plants for garbage are detailed in Annex VI to MARPOL and MEPC 76(40), as amended. In accordance with MARPOL Annex VI, cargo residues falling under Annexes I, II and III to MARPOL, PCBs (polychlorinated biphenyls), garbage as defined in Annex V containing more than traces of heavy metals, and refined petroleum products containing halogen shall not be incinerated. It is to be noted that additional restrictions may also apply. The resulting ashes shall be landed to port reception facilities for disposal. Legal restrictions apply to incinerated plastic products. It is to be noted that the use of incinerators is further restricted by international, regional and national legislation.

It is recommended to fully assess the need, application, costs and benefits of incineration before inclusion as a garbage management measure. If it is deemed necessary or desirable to utilize an incinerator, the incinerator's efficiency should be maximized and its optimal operation should be considered.

B.6 Plasma arc destruction systems

This technology is becoming an accepted means of garbage destruction. Commercial systems are available.

B.7 New technologies

New technologies should be considered as they become available. They can replace current technologies used after confirmation of availability, reliability and general acceptability for maritime purposes.

Annex C
(informative)

An example of a garbage data sheet for use in waste auditing

Garbage data sheet			
Category of garbage			
Places of collection		Volumes	
Quantity and where collected		Disposal costs: *(Entry after each disposal)* Disposal methods	
Avoidance suggestions		Quantity in t/a	
		Place of disposal *(Entry after each disposal)*	

Bibliography

[1] ISO 7001:2007, *Graphical symbols — Public information symbols*

[2] International Maritime Organization. *Guidelines for the Implementation of Annex V of MARPOL, 2006 Edition,* London, 2006

[3] International Maritime Organization. *International Convention for the Safety of Life at Sea (SOLAS),* London, 1974

[4] International Maritime Organization. *MEPC.1/Circ.671 — Guide to good practice for port reception facility providers and users* (http://www.imo.org/OurWork/Environment/PollutionPrevention/PortReceptionFacilities/Documents/671.pdf)

ICS 13.020.99; 47.020.99

Price based on 18 pages