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Ships and marine technology — Drainage systems on ships and marine structures —

Part 1: Sanitary drainage-system design

Navires et technologie maritime — Installations de drainage sur navires et structures maritimes —

Partie 1: Conception des systèmes d'écoulement sanitaires

Reference number
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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 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 15749-1 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 3, *Piping and machinery*.

ISO 15749 consists of the following parts, under the general title *Ships and marine technology — Drainage systems on ships and marine structures*:

— *Part 1: Sanitary drainage-system design*

— *Part 2: Sanitary drainage, drain piping for gravity systems*

— *Part 3: Sanitary drainage, drain piping for vacuum systems*

— *Part 4: Sanitary drainage, sewage disposal pipes*

— *Part 5: Drainage of decks, cargo spaces and swimming pools*

Ships and marine technology — Drainage systems on ships and marine structures —

Part 1: Sanitary drainage-system design

1 Scope

This part of ISO 15749 is valid, in conjunction with ISO 15749-2 to ISO 15749-4, for planning and designing drainage systems which evacuate wastewater from accommodation and commissary areas (sanitary drainage) on ships and marine structures.

Drainage of weather decks, cargo holds and swimming pools is covered by ISO 15749-5.

This series of standards takes into consideration the basic regulations and minimum requirements concerning hygienic requirements and the protection of the marine environment.

This part of ISO 15749 does not apply to pipe systems carrying oily, chemically contaminated wastewater capable of forming flammable gas/oxygen mixtures.

2 Normative references

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

IMO Publication MARPOL, *Protocol of 1978 relating to the international convention for the prevention of pollution from ships 1973, Annex IV/Regulations for the prevention of pollution by sewage from ships* [1)]

IMO Publication MEPC.2 (VI), *Recommendation on international effluent standards and guidelines for performance tests for sewage treatment plants, January 1977* [1)]

IMO Publication MSC/Circ. 648, *Annex Guidelines for the operation, inspection and maintenance of ship sewage systems* [1)]

IMO Resolution A.753 (18), *Guidelines for the application of plastic pipes on ships*

ISO/R 538, *Conventional signs to be used in the schemes for the installations of pipeline systems in ships*

ISO 727-1, *Fittings made from unplasticized poly(vinyl chloride) (PVC-U), chlorinated poly(vinyl chloride) (PVC-C) or acrylonitrile/butadiene/styrene (ABS) with plain sockets for pipes under pressure — Part 1: Metric series*

ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods*

1) Published by International Maritime Organization, London.
Available from IMO Secretariat, Publications Section, 101-104 Picadilly, London W1V, United Kingdom.

ISO 1964, *Shipbuilding — Indication of details on the general arrangement plans on ships*

ISO 4067-1, *Technical drawings — Installations — Part 1: Graphical symbols for plumbing, heating, ventilation and ducting*

ISO 4067-2, *Building and civil engineering drawings — Installations — Part 2: Simplified representation of sanitary appliances*

ISO 10628, *Flow diagrams for process plants — General rules*

ISO 14617-3, *Graphical symbols for diagrams — Part 3: Connections and related devices*

ISO 15749-2, *Ships and marine technology — Drainage systems on ships and marine structures — Part 2: Sanitary drainage, drain piping for gravity systems*

ISO 15749-3, *Ships and marine technology — Drainage systems on ships and marine structures — Part 3: Sanitary drainage,drain piping for vacuum systems*

ISO 15749-4, *Ships and marine technology — Drainage systems on ships and marine structures — Part 4: Sanitary drainage, sewage disposal pipes*

ISO 15749-5, *Ships and marine technology — Drainage systems on ships and marine structures — Part 5: Drainage of decks, cargo spaces and swimming pools*

3 Terms and definitions

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

3.1
wastewater
off-running water which has undergone change due to use, as for instance sewage (contaminated water), water from precipitation, seawater and condensation water that has reached the drain lines.

NOTE 1 With this type of wastewater, a distinction is made between grey water and sewage.

NOTE 2 For the classification of wastewater in accordance with origin, see Table 1 in Clause 4.

3.2
grey water
wastewater to be disposed of, excluding sewage

3.3
sewage
wastewater from water closets, urinals and bidets, including additives; medical areas (pharmacy, hospital, etc.) and from washing basins in those areas, bath tubs and water discharges; spaces housing living animals and other types of wastewater, if mixed with contaminated water already mentioned.

NOTE The definition of 'sewage' is in accordance with the definition of Annex IV of MARPOL 73/78.

3.4
pipes in sanitary drainage systems

3.4.1
drain line
general term for all pipes carrying wastewater (gravity or vacuum system) of the sanitary drainage system leading from the drain to the collector tank or sewage treatment plant

3.4.1.1
connecting line
⟨gravity system⟩ a short pipe directly linking the drain of the drained unit and the odour seal

3.4.1.2
connecting line
⟨vacuum system⟩ a short pipe directly linking the drain of the drained unit and the vacuum control valve

3.4.1.3
branch line

3.4.1.3.1
single branch
⟨gravity system⟩ part of the drain line which connects the odour seal and a line continuing, for instance, to a collecting branch

3.4.1.3.2
single branch
⟨vacuum system⟩ part of the drain line which connects either a sewage unit with an integrated vacuum mechanism or a vacuum control valve to a line continuing, for instance, to a collecting branch

3.4.1.3.3
collecting branch
line collecting the wastewater of several single branches and carrying them to a line continuing, for instance, to a gravity delivery line or a manifold

3.4.1.3.4
riser branch
a single or collective branch leading vertically upwards

NOTE Only in vacuum plants.

3.4.1.4
gravity delivery line
a vertical line with warpage, if necessary, passing through one or more decks, feeding the wastewater to a manifold

NOTE Only in gravity systems.

3.4.1.5
manifold
a line into which the wastewater from gravity and branch lines is fed

3.4.1.6
main sewer
a line into which wastewater from manifolds is fed and carried to a sewage treatment plant or a collector tank

NOTE For vacuum systems, the main sewer may also be configured as a valve manifold.

3.4.1.7
valve manifold
a short length of pipe closed at both ends with connections for drain lines (e.g. manifolds), including connections for lines to the vacuum generation plant and with pressure gauges and pressure control switches connected, as well as a connection for flushing

NOTE Only in vacuum systems.

3.4.2
vent line
designed to vent the sanitary drainage system without carrying any wastewater

3.4.3
sewage disposal pipe
a pressure pipe in the sanitary drainage system carrying wastewater to disposal points after it has passed through a sewage treatment plant or collector tank

3.5
drain
an opening via which wastewater is caught, collected and discharged into the drainage system

EXAMPLES Floor drain, in the washbasin, in the bathtub and shower basin, in the water closet and urinal.

NOTE In shipbuilding the terms “open inlet” or “opening” are used.

3.6
sewage treatment plant
serves to purify and disinfect the sewage fed into it

3.7
collector tank
a tank for temporary storage of untreated wastewater

3.8
intermediate tank
a tank in which wastewater from drain lines is collected and subsequently fed via a pressure line to a collector tank or sewage treatment plant

3.9
mixing and equalization tank
a tank in front of the wastewater for treatment plant, in which wastewater from drain lines is mixed and equalized to ensure feeding of the wastewater treatment plant without a hydraulic or pollution shock

3.10
holding tank
a tank in which treated wastewater from treatment plants is stored for a limited period of time, while the ship is in areas where drainage is not allowed

3.11
sludge storage tank
tank in which sludge from a sewage treatment plant is stored for subsequent removal to shore or aboard

3.12
vacuum generation plant
a plant for generation of the vacuum required to convey wastewater from the drains through the drain lines

3.13
disposal point
a point where the sewage disposal pipes terminate and the wastewater is passed out of the ship, as for instance an overboard wastewater discharge outlet in the shell or outlets for disposal to an external disposal unit

3.14
closing device
a pipe fitting which prevents water from entering into the ship from outboard

3.15
availability of the plant
quotient of working period and working period plus breakdown period

3.16
breakdown period
time during which the plant cannot be used due to repair or maintenance

4 Planning

4.1 General

Drainage systems shall be designed and built in accordance with the stipulations contained in this part of ISO 15749.

To get a high availability of the plant, the amount of sanitary facilities drained over one line should be limited. The maximum number of branches for each line as given in ISO 15749-3 shall not be exceeded.

4.2 Classification

Classification of wastewater according to origin is given in Table 1.

Table 1 — Classification of wastewater

Origin		Type of wastewater
Sanitary drainage		
Toilet installations	Bidets, water closets, urinals	sewage
	Water drains [a]	sewage or grey water
Hospital areas	All drainage units (including washing and bathing facilities, and water-drain discharges)	sewage
Washrooms and bathrooms	Bathtubs, showers, handbasin, washstands, water drains [a]	grey water or sewage
Galleys, pantries	Sinks, washing-up sinks, water drains, domestic appliances	grey water
Other spaces	Air conditioning centrals (if condensation water drains on deck), laundries, passageways, provisions refrigerating spaces, swimming pool, whirlpool	grey water

[a] Wastewater from water drains immediately adjacent to water closets or urinals is classified as sewage (see 3.3).

4.3 Amount of wastewater

When designing the plants, the minimum amount of wastewater in accordance with Table 2 has to be considered.

Table 2 — Minimum amount of wastewater

Ship type	Minimum amount of wastewater per person and day in litres			
	Plant without vacuum		Plant with vacuum	
	Sewage	Black and grey water	Sewage	Black and grey water
Passenger ships	70	230	25	185
Sea-ships excepting passenger-ships	70	180	25	135
Ships used near the coast can remain under these values on consultation with the responsible authorities.				
NOTE The values are recommended. Deviations due to national rules or to classification-society recommendations are to be considered				

4.4 Properties of wastewater

Drainage systems shall serve exclusively to discharge wastewater as given in 3.1.

If necessary, measures shall be taken to prevent the discharge of other substances as given in 3.1 via the drainage systems. Grinders for other kinds of waste shall not be connected to the wastewater lines.

5 Hygienic and environmental requirements

5.1 Reduction of noise and odour

5.1.1 Noise

The plant shall be designed and built in such way that it produces as little noise as possible and that the transmission of noises does not occur. If necessary, this shall be ensured by measures of acoustic insulation so that permissible sound level limits in rooms are not exceeded.

5.1.2 Odour

The plant shall be designed and built in such a way that there will be no annoyance caused by odour. Necessary ventilation shall be installed in such a way that there will be no annoyance caused by odour.

5.2 Hygienic considerations

5.2.1 Separate line routing

For hygienic reasons, sewage and grey water shall be conveyed separately. Each type of wastewater requires its own system of drain lines.

5.2.2 Discharge into collector tanks

Where wastewater is discharged into collector tanks, the drain lines for sewage and grey water may merge into a common discharge line (main sewer) immediately before reaching the tank.

In sanitary drainage systems with a common collector tank for grey water and sewage, a hydraulic seal should be provided for the grey water pipe near the tank. In this case, to ensure reliable operation of sanitary equipment, it is recommended to install a vent pipe.

5.2.3 Discharge into sewage treatment plants

Discharge of wastewater into treatment plants shall meet the requirements laid down by the manufacturer.

It is recommended to place a mixing and equalization tank in front of the wastewater treatment plant to ensure feeding of the wastewater treatment plant without shock.

6 Structure of a drainage system

6.1 Description

The wastewater is transported from the drains via drain lines.

These lines convey the wastewater to a collector tank or sewage treatment plant.

Bypass lines connected to these drain lines carry the wastewater directly to outlets in the shell in accordance with ISO 15749-4.

From the collector tank and/or sewage treatment plant, the wastewater is conveyed to a disposal point via sewage disposal pipes.

NOTE In exceptional cases, after the wastewater has been purified in the sewage treatment plant it is discharged into holding tanks and stored there before being disposed of overboard or to an external (e.g. shore-based) disposal facility, or discharged via the ballast water system.

6.2 Main system components

A drainage system may consist of the following components:

— drain lines;

— vent lines, (for drain lines, collector tanks, sewage treatment plants);

— intermediate tank (only if necessary);

— vacuum generation unit (for drain lines in a vacuum system);

— collector tank;

— mixing and equalization tank;

— sludge storage tank;

— pumps for wastewater and sludge overboard disposal or to external disposal facilities (e.g. on shore) or a sewage treatment plant;

— sewage disposal lines and a holding tank, if applicable.

6.3 Corrosion resistance

Pipes, mouldings, fittings and other system components shall be resistant to aggressive wastewater and its corrosive substances.