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

Part 4: Sanitary drainage, sewage disposal pipes

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

Partie 4: Drainage sanitaire, tuyaux d'évacuation des eaux usées

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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 15749-4 was prepared by Technical Committee ISO/TC 8, *Ships and marine techology*, 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 4: Sanitary drainage, sewage disposal pipes

1 Scope

This part of ISO 15749 applies to the design of sewage disposal pipes within the framework of sanitary drainage on ships and marine structures.

For planning and basic requirements, see ISO 15749-1.

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.

ISO 4200, *Plain end steel tubes, welded and seamless — General tables of dimensions and masses per unit length*

ISO 9329-1, *Seamless steel tubes for pressure purposes — Technical delivery conditions — Part 1: Unalloyed steels with specified room temperature properties*

ISO 9330-1, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 1: Unalloyed steel tubes with specified room temperature properties*

ISO 15749-1, *Ships and marine technology — Drainage systems on ships and marine structures — Part 1: Sanitary drainage-system design*

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 terms and definitions given in ISO 15749-1 apply.

4 Disposal

4.1 General

For the disposal of wastewater from sanitary drainage systems, a distinction is made between:

— overboard wastewater disposal via a wastewater storage unit and disposal pipes overboard or to a connection from where it is transferred to an external disposal point (see 4.2);

NOTE Wastewater storage units according to this part of ISO 15749 are collector tanks, sewage treatment plants, or vacuum generating units for the respective facilities

— discharge directly overboard via gravity drain lines (see 4.4).

4.2 Disposal points with storage units

4.2.1 Disposal piping system

Disposal lines from storage units to disposal points shall be designed as pressure lines; for details see Figure 1.

Figure 1 shows a simplified example of routing of disposal lines within the framework of a sanitary drainage system, leading from the storage unit (e.g. collector tank, sewage treatment plant) to the disposal points.

4.2.2 Discharge over the side

4.2.2.1 Closing devices

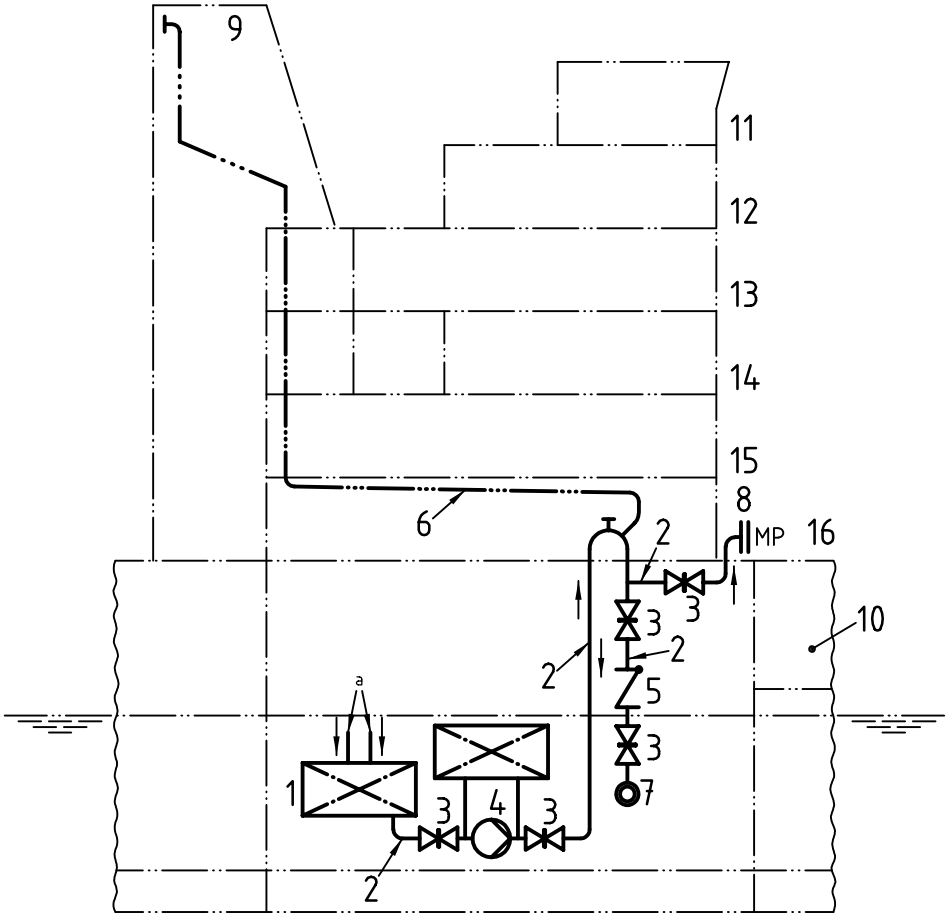
As closing devices, fittings shall be installed in the disposal piping section between the wastewater pump and the wastewater outlet (piping section Z); see Figure 2. Closing devices shall be certified by the classification societies.

The arrangement, number, and type of fittings depends on the vertical distance from the summer loadline/bulkhead deck of the lowest opening (drain).

NOTE Such openings (drains) also include, for example, emergency overflows of sewage treatment plants or openings for dosing of chemicals.

4.2.2.2 Drains

4.2.2.2.1 In the disposal pipe, a screw-down non-return valve shall be installed at the shell. If it is not possible to place the shutoff fitting directly at the shell, the pipe from the shell to the shutoff fitting has to be designed thick-walled, see 6.1 and Figure 3.

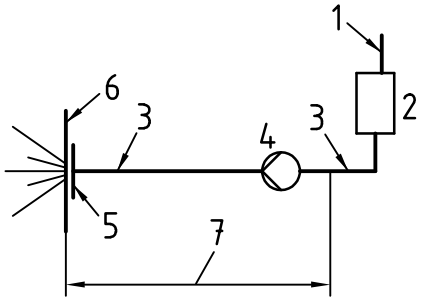


Key

1 sewage treatment plant, collector tank or vacuum generating unit for these installations
2 disposal pipe
3 valve
4 wastewater pump
5 non-return valve
6 vent line
7 wastewater outlet in the shell
8 international wastewater shore connection (MARPOL-flange)
9 funnel
10 cargo space
11 bridge
12 4th superstructure deck
13 3rd superstructure deck
14 2nd superstructure deck
15 1st superstructure deck
16 freeboard/bulkhead deck

a Wastewater from accommodation areas and service spaces.

Figure 1 — Example of a sewage disposal system with storage unit upstream of the discharge point

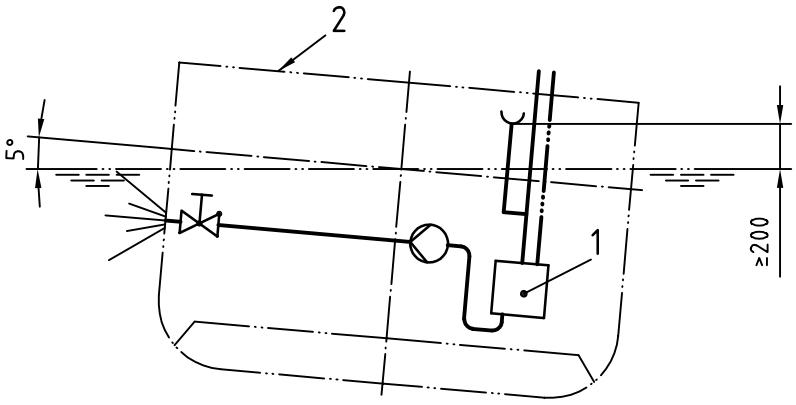


Key

1 drain line
2 storage unit (e.g. collector tank or sewage treatment plant)
3 sewage disposal pipe
4 pump
5 wastewater outlet
6 shell
7 piping section Z

Figure 2 — Piping section Z

Dimensions in millimetres



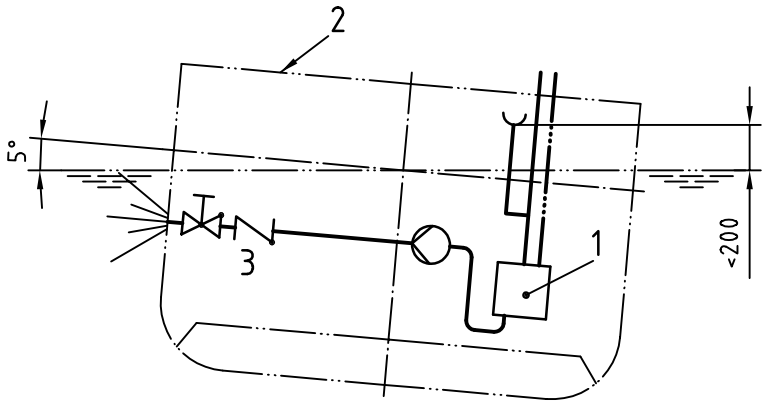
Key

1 wastewater storage unit
2 freeboard deck

Figure 3 — Example to 4.2.2.2.1

4.2.2.2.2 When, in the case of a 5° list of the ship to port or starboard, the lowest inner opening of the drainage system is less than 200 mm above the summer load line, then a further non-return fitting shall be provided in the suction or pressure line of wastewater pumps of wastewater tanks or sewage treatment plants (see Figure 4).

Dimensions in millimetres



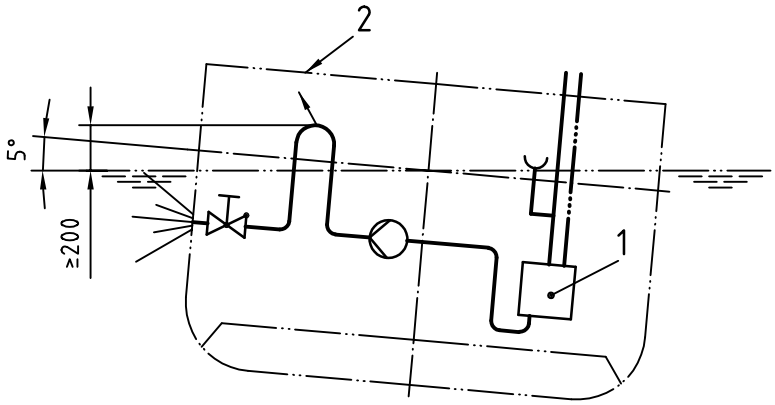
Key

1 wastewater storage unit
2 freeboard deck
3 to be installed upstream or downstream of the pump

Figure 4 — Example to 4.2.2.2.2

4.2.2.2.3 A pipe loop can be applied as a second non-return fitting, provided that its crest overflow is at least 200 mm above the waterline with the ship on summer loadline draft and when the ship has a 5° list (see Figure 5).

Dimensions in millimetres



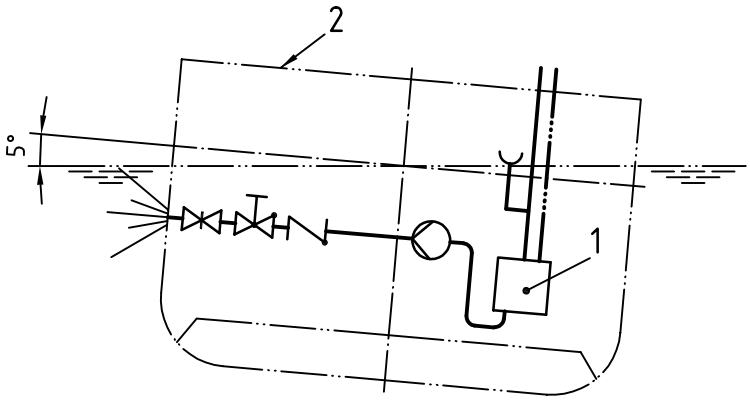
Key

1 wastewater unit
2 freeboard deck

Figure 5 — Example to 4.2.2.2.3

5

4.2.2.2.4 When, in the case of a 5° list of the ship loaded to the summer loadline, the deepest inner opening of the drainage system lies on the waterline or lower, a gate valve at the outlet of the pipe at the shell shall be provided in addition to the second non-return fitting mentioned in 4.2.2.2.2. In this case, the non-return valve need not be provided with a means of closing (see Figure 6).



Key

1 storage unit or sewage treatment plant
2 freeboard deck

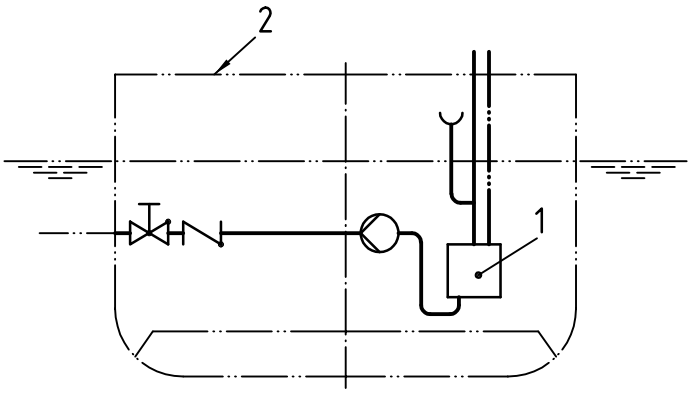
Figure 6 — Example to 4.2.2.2.4

4.2.2.2.5 When, on passenger ships, the deepest inner opening of the wastewater system is below the bulkhead deck, a shutoff non-return valve and a second non-return fitting shall be provided in the disposal pipe of sewage treatment plants (see Figure 7). In such a case, a gate valve, as well as two non-return fittings, shall be provided for the disposal pipe of wastewater collector tanks (see Figure 8).

A second non-return fitting may be substituted with a pipe loop, the crest of which shall be at least 200 mm above the bulkhead deck.

On condition that, on passenger ships, drains are located above the bulkhead deck only, and on condition that no wastewater can leak from the collector tank or the sewage treatment plant into spaces below the bulkhead deck, Figure 7 may be followed. Piping section Z shall be fitted with a shutoff fitting at the shell and a self-closing non-return valve.

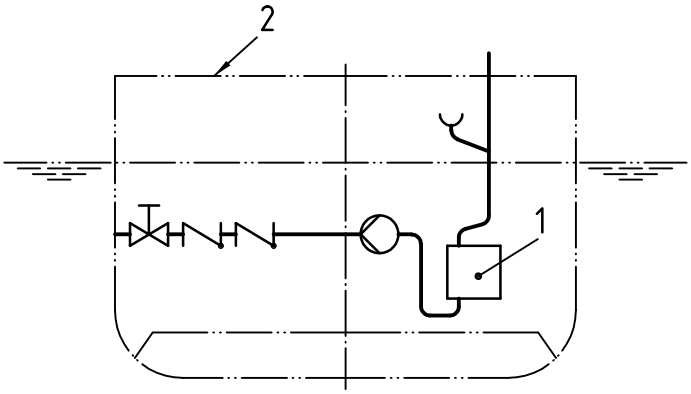
In the case of pumps installed in parallel, a shutoff fitting shall be provided at the discharge side of each pump.



Key

1 sewage treatment plant
2 bulkhead deck

Figure 7 — Example 1 to 4.2.2.2.5



Key

1 wastewater unit
2 bulkhead deck

Figure 8 — Example 2 to 4.2.2.2.5

4.2.3 Discharge to an external disposal point (shore connection)

4.2.3.1 General

The wastewater disposal pipe shall be routed to wastewater discharge connections that are sited on deck such that the wastewater can be disposed of over the port or starboard side.

4.2.3.2 Wall thickness of piping

Type N steel pipes according to Table 1 are sufficient for the disposal piping in the entire area.

4.2.3.3 Wastewater discharge connection

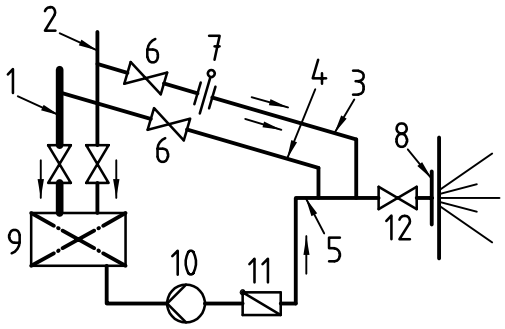
The wastewater discharge connection shall have a flange for the international wastewater shore connection (MARPOL flange).

4.3 Discharge via a bypass line

4.3.1 General

In areas where the disposal of sewage to sea is permitted, it may be discharged directly overboard through a by-pass line. Figure 9 shows an example of such an arrangement.

7



Key

1 sewage water drain line
2 grey water drain line
3 bypass line for sewage
4 bypass line for grey water
5 sewage disposal line
6 shutoff gate valve
7 shutoff by means of spectacle flange, optional
8 wastewater discharge in shell
9 storage unit (e.g. collector tank)
10 pump
11 non-return valve
12 closing device at shell

Figure 9 — Bypass line

4.3.2 Pipe routing

In gravity drain piping, the bypass line connects the main sewer for sewage directly with the wastewater disposal pipe, which leads from the wastewater unit to a discharge outlet in the shell.

At the inlet of this line, a shutoff gate valve shall be fitted, followed by an additional shutoff device.

In the direction of flow, the bypass line should feed into the sewage disposal pipe at a point as close to the closing device fittings at the shell as possible.

Closing devices in the bypass line shall be fitted in accordance with 4.4.

4.3.3 Closing devices

In gravity drain piping, the closing devices at the shell shall meet the minimum requirements specified in Clause 5.

4.4 Discharge directly over the side from closed spaces via drain lines

4.4.1 Basic considerations

Drain lines leading from spaces below the freeboard deck/bulkhead deck, or from closed, weathertight spaces on the freeboard deck/bulkhead deck, shall be fitted with closing devices in accordance with 4.4.2, to be installed with respect to the ratio between the distance F and the ship's length L.

On passenger ships, drain lines from spaces below the margin line shall be provided with screw-down, non-return valves at the shell fitted with an operating device.

The operating device shall be installed at a point above the bulkhead deck which is accessible at all times and equipped with a device clearly indicating the “open/closed” position.

Spaces that are located above the first deck above the freeboard deck/bulkhead deck, or higher, may be considered to be open spaces, despite weathertight doors and closures that might be fitted. Piping leading from these spaces directly overboard shall be configured in accordance with ISO 15749-5.

4.4.2 Configuration of closing devices

4.4.2.1 General

Figures 10 to 19 are examples of possible configurations of closing devices at the shell and in the pipeline.

NOTE Configurations according to Figures 10 to 16 may not to be used in drain lines from spaces below the limiting draft on passenger ships. On other ships that are subject to damage stability requirements, these configurations may only be provided if the drains (open drains) are located above the damage waterline.

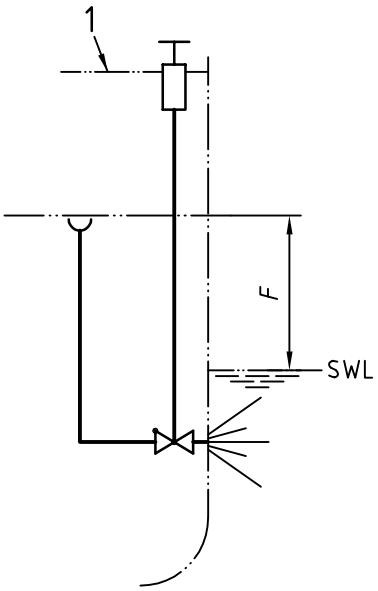
In Figures 10 to 19:

— F is the vertical distance between the drain (inner opening) and the summer loadline/summer timber loadline;

— L is the length of the ship between the perpendiculars.

4.4.2.2 F up to 0,01 L

A screw-down non-return valve at the shell, capable of being closed from an operating point located above the freeboard deck with an indicator, as shown in Figure 10, may be used.



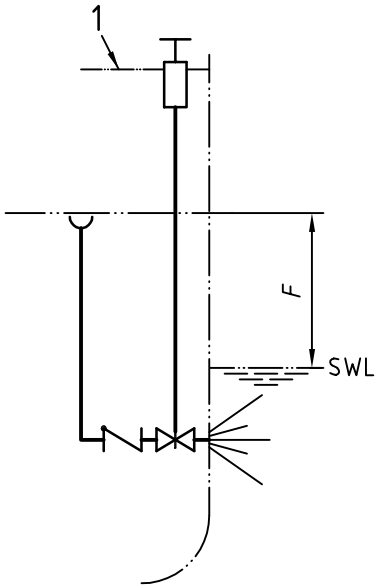
Key

1 freeboard deck or bulkhead deck

Figure 10 — Screw-down non-return valve

or

Alternatively, a shutoff gate valve at the shell capable of being closed from an operating point located above the freeboard deck with an indicator and a self-closing non-return fitting in the line, as shown in Figure 11, may be used.

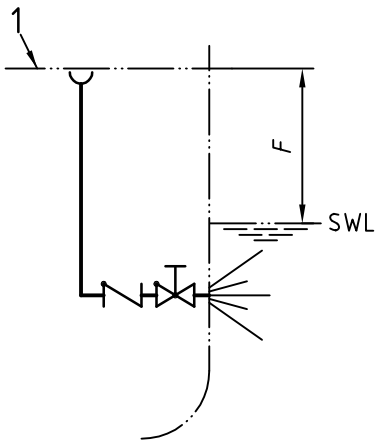


Key

1 freeboard deck or bulkhead deck

Figure 11 — Shutoff gate valve

In machinery spaces, a locally operable shutoff gate valve at the shell and a non-return fitting in the line (see Figure 12) may be fitted.



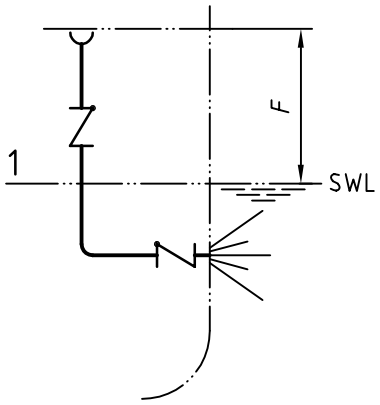
Key

1 freeboard deck or bulkhead deck

Figure 12 — Locally operable shutoff gate valve

4.4.2.3 *F* over 0,01 *L* up to 0,02 *L*

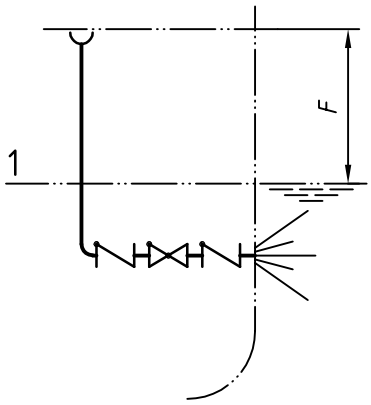
Two non-return fittings: one at the shell and one in the pipeline above the summer loadline/limiting draft to be accessible at all times (see Figure 13) or, if a configuration in accordance with Figure 13 is not possible, a readily accessible shutoff gate valve may be connected between, or downstream of, two non-return fittings (see Figures 14 and 15).



Key

1 summer loadline/limiting draft on passenger ships

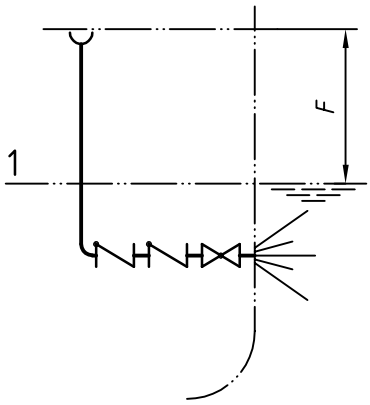
Figure 13 — Example 1



Key

1 summer loadline/limiting draft on passenger ships

Figure 14 — Example 2

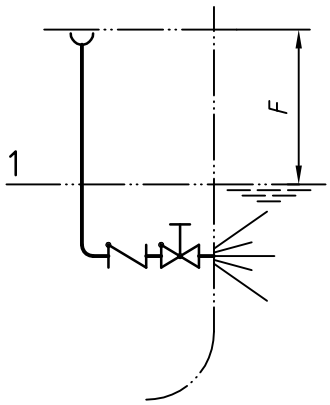


Key

1 summer loadline/limiting draft on passenger ships

Figure 15 — Example 3

Alternatively, one non-return fitting and one screw-down non-return valve at the shell may be applied (see Figure 16).



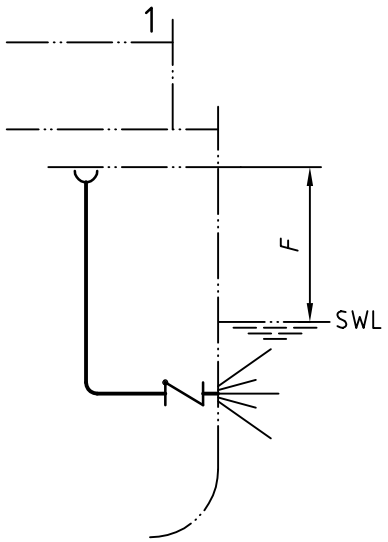
Key

1 summer loadline/limiting draft on passenger ships

Figure 16 — Screw-down non-return valve

4.4.2.4 *F* over 0,02 *L*

A non-return fitting at the shell as shown in Figure 17 may be used.



Key

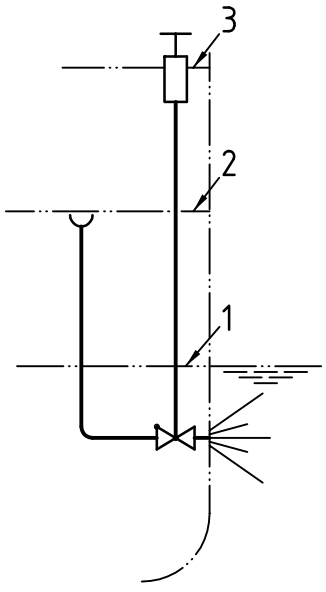
1 superstructure deck

Figure 17 — Non-return fitting

4.4.2.5 Drains from spaces below the margin line on passenger ships

A screw-down non-return valve at the shell, capable of being closed from an operating point located above the bulkhead deck with an indicator, as shown in Figure 18, may be used.

Alternatively, two non-return fittings, one at the shell and one in the piping above the subdivision loadline, which shall be accessible at all times may be used (see Figures 18 and 19).



Key

1 subdivision loadline
2 limiting draft
3 bulkhead deck

Figure 18 — Example 1 of non-return fitting

Key

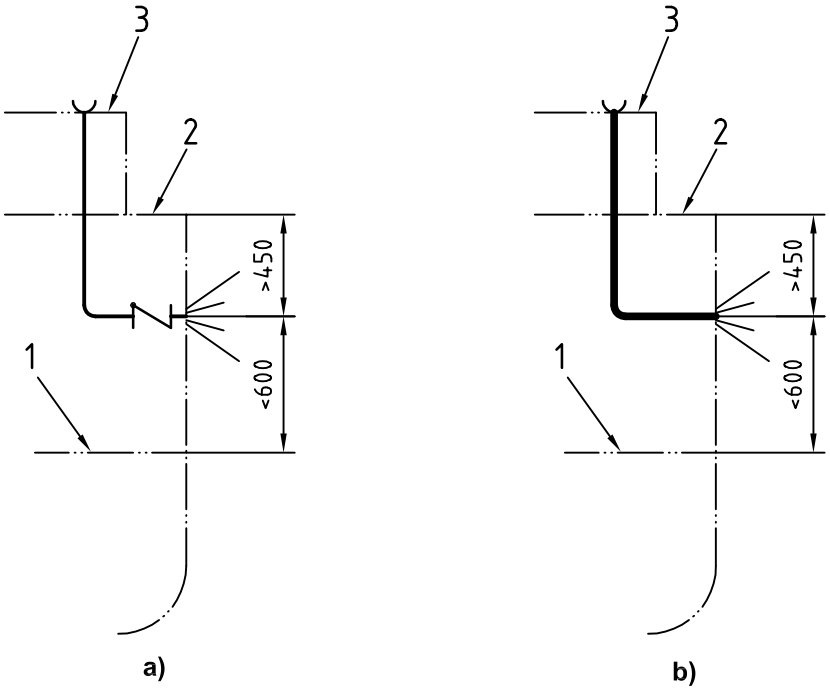
1 subdivision loadline
2 limiting draft
3 bulkhead deck

Figure 19 — Example 2 of non-return fitting

4.4.3 Configuration of closing devices and wastewater outlets in the shell

Wastewater outlets of pipes, originally at any level, arranged either more than 450 mm below the freeboard deck, or less than 600 mm above the summer loadline, shall be provided with a non-return fitting at the shell. This non-return fitting, unless required in 4.4.2, may be omitted if the piping is of thickness-type B in accordance with Table 1. See Figure 20.

Dimensions in millimetres



Key

1 summer loadline
2 freeboard
3 superstructure deck
4 thick walled pipe
5 non-return fitting

a Example 1.
b Example 2.

Figure 20 — Examples to 4.4.3

5 Wastewater outlets

5.1 Location

Outlet openings in the shell may not be located in the vicinity of gangways and in areas where lifeboats are launched.

Wastewater outlets shall be located as far from seawater inlets as possible, seen in the direction of travel.

Sewage outlets shall be located below the summer loadline, if possible.

5.2 Configuration

Sewage outlets shall have a welded flange for overboard connections.

6 Pipework

6.1 Pipes

For sewage disposal pipes (pressure lines), bypass lines, and drain lines leading to sewage outlets in the shell, steel pipes shall be used.

The following types of pipes, with dimensions as listed in Table 1, are applicable:

— seamless steel pipes, in accordance with ISO 4200 and ISO 9329-1, of St 37,0;

— welded steel pipes in accordance with ISO 4200 and ISO 9330-1, of St 37,0.

For minimum wall thickness the following applies.

— Type A to be selected for sewage disposal pipes, drain lines, bypass lines leading to wastewater outlets in the shell.

— Type B to be selected for the piping section between the outboard wastewater outlet in the shell and the shutoff fitting located before the shell, if this fitting is not mounted directly at the shell, as well as for pipe loops in accordance with 4.2.2.2.3.

— Type N to be selected for sewage disposal pipes (pressure lines) leading from the wastewater storage unit to the wastewater discharge connection (MARPOL flange) in accordance with 4.2.3.

Table 1 — Dimensions of steel pipes

Nominal bore	**Outside diameter**	**Wall thickness, s_{min} with wall thickness type** mm			
NB	d mm	A	B	N D[a]	N E[b]
65	76,1	4,5	7,1	2,6	2,9
80	88,9	4,5	7,1	2,9	3,2
100	114,3	4,5	8	3,2	3,6
125	139,7	4,5	8	3,6	4
150	168,3	4,5	8,8	4	4,5

[a] For pipes in accordance with ISO 4200, thickness range D.
[b] For pipes in accordance with ISO 4200, thickness range E.

6.2 Pumps

The pumps employed shall be suitable for operation with the drain lines configured in accordance with this part of ISO 15749.

6.3 Fittings

The fittings to be installed as closing devices, as well as for other switching functions, in the wastewater disposal pipes shall preferably be shutoff gate valves and non-return fittings.

Fittings to serve as closing devices shall have housings manufactured from a ductile material approved by the relevant classification societies.

Bibliography

[1] ISO 7608, *Shipbuilding — Inland navigation — Couplings for disposal of oily mixture and sewage water*

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