SC156 (June 2002) Doors in watertight bulkheads of cargo ships and passenger ships

This unified interpretation pertains to doors[1] located in way of the internal watertight subdivision boundaries and the external watertight boundaries necessary to ensure compliance with the relevant subdivision and damage stability regulations.

This unified interpretation does not apply to doors located in external boundaries above equilibrium or intermediate waterplanes.

The design and testing requirements for watertight doors vary according to their location relative to the equilibrium waterplane or intermediate waterplane at any stage of assumed flooding.

Members agreed that the scope of an IACS interpretation in this context shall not be limited to watertight doors covered by SOLAS. Watertight doors required by other statutory damage stability requirements, e.g. MARPOL, the IBC and IGC Codes are covered as well. Small cargo vessels not subject to damage stability requirements are not required to comply with the full scheme.

1. Definitions

For the purpose of this UI the following definitions apply:

Watertight: Capable of preventing the passage of water in any direction under a design head. The design head for any part of a structure shall be determined by reference to its location relative to the bulkhead deck or freeboard deck, as applicable, or to the most unfavourable equilibrium/intermediate waterplane, in accordance with the applicable subdivision and damage stability regulations, whichever is the greater. A watertight door is thus one that will maintain the watertight integrity of the subdivision bulkhead in which it is located.

Equilibrium Waterplane: The waterplane in still water when, taking account of flooding due to an assumed damage, the weight and buoyancy forces acting on a vessel are in balance. This relates to the final condition when no further flooding takes place or after cross flooding is completed.

Intermediate Waterplane: The waterplane in still water, which represents the instantaneous floating position of a vessel at some intermediate stage between commencement and completion of flooding when, taking account of the assumed instantaneous state of flooding, the weight and buoyancy forces acting on a vessel are in balance.

Sliding Door or Rolling Door: A door having a horizontal or vertical motion generally parallel to the plane of the door.

Hinged Door: A door having a pivoting motion about one vertical or horizontal edge.

Footnote:

1 Doors in watertight bulkheads of small cargo ships, not subject to any statutory subdivision and damage stability requirements, may be hinged quick acting doors arranged to open out of the major space protected. They shall be constructed in accordance with the requirements of the classing society and have notices affixed to each side stating, "To be kept closed at sea". This UI shall not apply to HSCs pending completion of revision of the HSC Code by IMO and consideration of same by the applicable IACS WPs.

Note: 1. This UI SC 156 is to be uniformly implemented by IACS Members and Associates from 1 January 2003. ▶

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2. Structural Design

Doors shall be of approved design and substantial construction in accordance with the requirements of the classing society and shall be of a strength equivalent to that of the subdivision bulkheads in which they are fitted.

3. Operation Mode, Location and Outfitting

Doors shall be fitted in accordance with all requirements regarding their operation mode, location and outfitting, i.e. provision of controls, means of indication, etc., as shown in Table 1 below. This table is to be read in conjunction with the following general notes: For passenger ships the watertight doors and their controls are to be located in compliance with SOLAS II-1/15.6.3 and II-1/15.7.1.2.2.

3.1 Frequency of Use whilst at sea

Normally Closed
Kept closed at sea but may be used if authorised. To be closed again after use.

Permanently Closed
The time of opening such doors in port and of closing them before the ship leaves port shall be entered in the log-book. Should such doors be accessible during the voyage, they shall be fitted with a device to prevent unauthorised opening.

Normally Open
May be left open provided it is always ready to be immediately closed.

Used
In regular use, may be left open provided it is ready to be immediately closed.

3.2 Type

Power operated, sliding or rolling[2]	POS
Power operated, hinged	POH
Sliding or Rolling	S
Hinged	H

3.3 Control

3.3.1 Local

All doors, except those which are to be permanently closed at sea, are to be capable of being opened and closed by hand, (and by power, where applicable[3]) locally, from both sides of the doors, with the ship listed to either side.

For passenger ships, the angle of list at which operation by hand is to be possible is 15 degrees or 20 degrees if the ship is allowed to heel up to 20 degrees during intermediate stages of flooding.
For cargo ships, the angle of list at which operation by hand is to be possible is 30 degrees.

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[2] Rolling doors are technically identical to sliding doors.

[3] Arrangements for passenger ships shall be in accordance with SOLAS II-I/15.7.1.4

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3.3.2 Remote

Where indicated in Table 1, doors are to be capable of being remotely closed by power from the bridge [4]. Where it is necessary to start the power unit for operation of the watertight door, means to start the power unit is also to be provided at remote control stations. The operation of such remote control is to be in accordance with SOLAS II-1/15.8.1 to 15.8.3.

3.4 Indication

Where shown in Table 1, position indicators are to be provided at all remote operating positions[5] as well as locally, on both sides of the doors[6], to show whether the doors are open or closed and, if applicable, with all dogs/cleats fully and properly engaged.

The door position indicating system is to be of self-monitoring type and the means for testing of the indicating system are to be provided at the position where the indicators are fitted.

An indication (i.e. red light) should be placed locally showing that the door is in remote control mode ("doors closed mode"). Ref. also SOLAS Reg. 15-8.1. Special care should be taken in order to avoid potential danger when passing through the door. Signboard/instructions should be placed in way of the door advising how to act when the door is in "doors closed" mode.

3.5 Alarms

Doors which are to be capable of being remotely closed are to be provided with an audible alarm, distinct from any other alarm in the area, which will sound whenever such a door is remotely closed. For passenger ships the alarm shall sound for at least 5 s but not more than 10 s before the door begins to move and shall continue sounding until the door is completely closed. In the case of remote closure by hand operation, an alarm is required to sound only while the door is actually moving.
In passenger areas and areas of high ambient noise, the audible alarms are to be supplemented by visual signals at both sides of the doors.

3.6 Notices

As shown in Table 1, doors which are normally closed at sea but not provided with means of remote closure, are to have notices fixed to both sides of the doors stating, To be kept closed at sea. Doors which are to be permanently closed at sea are to have notices fixed to both sides stating, Not to be opened at sea .

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[4] Arrangements for passenger ships shall be in accordance with SOLAS II-1/15.7.1.5
[5] Indication at all remote control positions (SOLAS II-I/15.6.4)
[6] refer to SOLAS II-1/25-9.3

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4. Fire Doors

Watertight doors may also serve as fire doors but need not be fire-tested when intended for use below the bulkhead deck. Where such doors are used at locations above the bulkhead deck they shall, in addition to complying with the provisions applicable to fire doors at the same locations, also comply with means of escape provisions of SOLAS II-2/13 (2000 Amendments, MSC Res. 99 (73).
Where a watertight door is located adjacent to a fire door, both doors shall be capable of independant operation, remotely if required by SOLAS II-1/15.8.1 to 15.8.3 and from both sides of the each door.

5. Testing

5.1 Doors which become immersed by an equilibrium or intermediate waterplane, are to be subjected to a hydrostatic pressure test.

5.1.1 For large doors intended for use in the watertight subdivision boundaries of cargo spaces, structural analysis may be accepted in lieu of pressure testing. Where such doors utilise gasket seals, a prototype pressure test to confirm that the compression of the gasket material is capable of accommodating any deflection, revealed by the structural analysis, is to be carried out.

5.2 Doors which are not immersed by an equilibrium or intermediate waterplane but become intermittently immersed at angles of heel in the required range of positive stability beyond the equilibrium position are to be hose tested.[7]

For clarification purposes it shall be noted that even though these doors are covered by the text in this UI, in accordance with the practice of LL, SOLAS and MARPOL Conventions such hose testing usually is related to weathertight doors rather than to watertight doors.

5.3 Pressure Testing

5.3.1 The head of water used for the pressure test shall correspond at least to the head measured from the lower edge of the door opening, at the location in which the door is to be fitted in the vessel, to the bulkhead deck or freeboard deck, as applicable, or to the most unfavourable damage waterplane, if that be greater. Testing may be carried out at the factory or other shore based testing facility prior to installation in the ship.

5.3.2 Leakage Criteria

5.3.2.1 The following acceptable leakage criteria should apply to

Doors with gaskets	No leakage
Doors with metallic sealing	Max leakage 1 liter/min.

[7] Additionally, such doors may need to be pressure tested to a head as specified by a National standard or regional agreement

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5.3.2.2 Limited leakage may be accepted for pressure tests on large doors located in cargo spaces employing gasket seals or guillotine doors located in conveyor tunnels, in accordance with the following[8]:

$$\text{Leakage rate(liter/min)} = \frac{(P + 4.572) \bullet h^3}{6568}$$

where: P = perimeter of door opening (metres)
h = test head of water (metres)

5.3.2.3 However, in the case of doors where the water head taken for the determination of the scantling does not exceed 6.10 m, the leakage rate may be taken equal to 0.375 liter/min if this value is greater than that calculated by the above-mentioned formula.

5.3.3 For doors on passenger ships which are normally open and used at sea or which become submerged by the equilibrium or intermediate waterplane, a prototype test shall be conducted, on each side of the door, to check the satisfactory closing of the door against a force equivalent to a water height of at least 1m above the sill on the centre line of the door[9].

5.4 Hose Testing

5.4.1 All watertight doors shall be subject to a hose test in accordance with UR S 14.2.3 after installation in a ship. Hose testing is to be carried out from each side of a door unless, for a specific application, exposure to floodwater is anticipated only from one side. Where a hose test is not practicable because of possible damage to machinery, electrical equipment insulation or outfitting items, it may be replaced by means such as an ultrasonic leak test or an equivalent test.

[8] published in the ATM F 1196, Standard Specification for Sliding Watertight Door Assemblies and referenced in the Title 46 US Code of Federal Regulations 170.270 Door design, operation installation and testing

[9] Arrangements for passenger ships shall be in accordance with SOLAS Reg. II-1/15.6.2

Table 1.
Internal Doors in Watertight Bulkheads in Cargo Ships and Passenger Ships

Position relative to equilibrium or intermediate waterplane	1. Frequency of Use whilst at sea	2. Type	3. Remote Control[6]	4. Indication locally and on Bridge[6]	5. Audible Alarm[6]	6. Notice	7. Comments	8. Regulation
I. Passenger Ships								
A. At or below	Norm. Closed	POS	Yes	Yes	Yes	No	Certain doors may be left open, see SOLAS II-1/15.9.3	SOLAS II-1/ 15.9.1,2 & 3
	Perm. Closed	S, H	No	No	No	Yes	see Notes 1 + 4	SOLAS II-1/ 15.10.1 & 2
B. Above	Norm. open	POS, POH	Yes	Yes	Yes	No		SOLAS II-1/ 15.9.3 SOLAS II-1/20.1 MSC/Circ.541
	Norm. Closed	S, H	No	Yes	No	Yes	see Note 2	
		S, H	No	Yes	No	Yes	Doors giving access to Ro-Ro Deck	SOLAS II-1/20-2
II. Cargo Ships								
A. At or below	Used	POS	Yes	Yes	Yes	No		SOLAS II-1/ 25-9.2
	Norm. Closed	S, H	No	Yes	No	Yes	see Notes 2 + 3 + 5	SOLAS II-1/ 25-9.3
	Perm. Closed	S, H	No	No	No	Yes	see Notes 1 + 4	SOLAS II-1/ 25-9.4 SOLAS II-1/ 25-10
B. Above	Used	POS	Yes	Yes	Yes	No		SOLAS II-1/ 25-9.2
	Norm. closed	S, H	No	Yes	No	Yes	See Notes 2 + 5	SOLAS II-1/ 25-9.3 SOLAS II-1/ 25-10

Notes:
1. Doors in watertight bulkheads subdividing cargo spaces.
2. If hinged, this door shall be of quick acting or single action type
3. "ICLL66+A.320" or "1988 Protocol to ICLL66", SOLAS, MARPOL, IGC and IBC- Codes require remotely operated watertight doors to be sliding doors.
4. The time of opening such doors in port and closing them before the ship leaves port shall be entered in the logbook.
5. The use of such doors shall be authorised by the officer of the watch.
6. Cables for control and power systems to power operated watertight doors and their status indication should comply with the requirements of UR E15.