Pipes and Penetration Which Penetrate Watertight Boundaries of Passenger Ships

Amended Rules and Guidance

Rules for the Survey and Construction of Passenger Ships
Guidance for the Survey and Construction of Passenger Ships

Reason for Amendment

Regulation 13.2.3 of SOLAS Chapter II-1 specifies that "lead or other heat sensitive materials shall not be used in systems which penetrate watertight bulkheads, where deterioration of such systems in the event of fire would impair the watertight integrity of the bulkheads."

At the 98th Session of the IMO Maritime Safety Committee (MSC98), in June 2017 explanatory notes to subdivision and damage stability regulations specified in SOLAS Chapter II-1 were adopted as Resolution MSC.429(98). These explanatory notes also cover pipes and penetrations which penetrate watertight boundaries below bulkhead decks subject to Regulation 13.2.3. The explanatory notes were subsequently revised by the IMO and their latest revision was adopted as Resolution MSC.429(98)/Rev.2 at the 102nd Session of the IMO Maritime Safety Committee (MSC102) in November 2020.

At the 9th Session IMO Sub-Committee on Ship Design and Construction (SDC9) in January 2023, the meaning of the word "systems" as it used in Regulation 13.2.3 was discussed and the SDC concluded that it means heat sensitive piping systems. In addition, the SDC agreed to the implementation of watertightness tests as part of the approval process when such piping systems penetrate watertight boundaries, making reference to the watertightness test requirements specified in MSC.429(98)/Rev.2. The SDC developed a draft revision of Unified Interpretation MSC.1/Circ.1362/Rev.1 to incorporate this clarification as MSC.1/Circ.1326/Rev.2 and submitted it to the IMO Maritime Safety Committee for final approval.

At its 107h Session (MSC107) in May 2023, the MSC adopted MSC.1/Circ.1362/Rev.2.

Accordingly, all relevant requirements are amended based on MSC.1/Circ.1362/Rev.2 and Resolution MSC.429(98)/Rev.2.

Outline of Amendment

(1) Specifies requirements related to pipes and penetrations which penetrate watertight boundaries below the bulkhead decks of passenger ships.
(2) Specifies requirements related to watertightness tests for piping penetrations which penetrate watertight boundaries below the bulkhead decks of passenger ships.

“Rules for the survey and construction of passenger ships” has been partly amended as follows:

Part 3 HULL CONSTRUCTION AND EQUIPMENT

Chapter 6 WATERTIGHT BULKHEAD AND THE OPENING

Title of Paragraph 6.3.2 has been amended as follows.

6.3.2 <u>Pipes and</u> Penetrations <u></u> (*SOLAS* Chap.II-1 Reg.13.2 and 15.8.5)*

"Guidance for the survey and construction of passenger ships" has been partly amended as follows:

Part 3 HULL CONSTRUCTION AND EQUIPMENT

Chapter 6 WATERTIGHT BULKHEAD AND THE OPENING

6.3 Openings of Watertight Bulkhead

Paragraph 6.3.2 has been amended as follows.

6.3.2 Pipes and Penetrations

(-1 and -2 are omitted.)

3 ~~"Heat sensitive materials" specified in **6.3.2-3, Part 3** of the Rules means the metallic materials in which the melting point is not greater than 925℃, e.g. aluminum alloy, copper alloy and nonferrous metal such as *PVC*, *FRP* and so on.~~ The application of **6.3.2-3, Part 3 of the Rules** is to comply with the following **(1)** to **(7)**.

(1) "Heat sensitive materials" means non-metallic materials such as *PVC*, *FRP* and metallic materials for which the melting point is not greater than 925 °C, (e.g. aluminum alloys and copper alloys).

(2) "Systems" in **6.3.2-3, Part 3 of the Rules** means heat sensitive piping systems. Therefore, the requirement does not apply to cable penetrations of watertight boundaries.

(3) Closed piping systems which penetrate watertight boundaries are to be in accordance with the following **(a)** to **(c)**.

(a) "Closed piping systems" in this sub-paragraph means piping systems without openings in multiple watertight compartments.

(b) For closed piping systems, compliance with **6.3.2-3, Part 3 of the Rules** is achieved when approved pipe penetrations are fitted at the intersections of watertight boundaries to ensure that heat sensitive pipes outside the space affected by fire remain intact, and so that any flooding of fire affected spaces does not cause progressive flooding through piping or pipe penetrations.

(c) Materials used in systems are to be of sufficient strength after exposure to heat or be considered as part of the open piping systems specified in **(4)** below.

(4) Open piping systems which penetrate watertight boundaries are to be in accordance with following **(a)** to **(d)**.

(a) "Open piping systems" in this sub-paragraph means piping systems with openings in multiple watertight compartments.

(b) For open piping systems, compliance with **6.3.2-3, Part 3 of the Rules** is achieved when approved pipe penetrations are fitted at the intersections of watertight boundaries and pipe connections to watertight compartments are fitted with either isolation or non-return valves, as deemed appropriate, to prevent progressive flooding through piping systems after a fire.

(c) As an alternative to the fitting of isolation or non-return valves, pipes may be routed above damaged waterlines in such a way that progressive flooding is prevented, taking into account the dynamic movements of ships under damaged conditions.

(d) Closing devices using intumescent materials (i.e. materials that swell when exposed to heat) are not to be considered equivalent to the fitting of valves since fires might be located too far from such devices to create watertight seals.

(5) Notwithstanding **(3)** and **(4)** above, progressive flooding may be taken into account in accordance with **2.3.6-12, Part 4 of the Rules**.

(6) Penetrations used for the passage of heat sensitive piping systems through watertight boundaries are to be tested with heat sensitive piping and are to be approved in accordance with the following **(a)** to **(j)**.

(a) **Chapter 1, Part 4, Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use** applies correspondingly to procedures for approval, tests, etc. for pipe penetrations.

(b) Approval of the pipe penetrations is to be included a watertightness test which is carried out after completing fire test under provision of **Chapter 1** of **Part 4** of **the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**.

(c) Test pressures are to be 1.5 *times* design pressures of penetrations or higher. Design pressures are to be more than the maximum hydrostatic pressures acting upon the intended installation locations of penetrations, as calculated from intact stability and damage stability calculations. Pressures are to be applied to the same sides of divisions as applied during fire tests.

(d) Pipe penetrations are to be tested at test pressures for 30 *minutes*, with the test pressures being, at a minimum, 0.1 *MPa* at hydrostatic pressure. There is to be no leakage during these tests.

(e) Pipe penetrations are to be tested at the same test pressures for an additional 30 *minutes* after the tests in **(d)** above are carried out. There may be leakage during these tests, but it is not to exceed 1*l*.

(f) Watertightness tests are to be considered valid only for pipe types (e.g. thermoplastic, multilayer), pressure classes, the maximum/minimum dimensions tested as well as the types and fire ratings of the divisions tested.

(g) Watertightness tests need not be carried out on hot penetration arrangements. In addition, ample time may be given to prepare for watertightness tests (e.g. dismantling fire testing equipment, rigging pressure test equipment).

(h) Watertightness tests are to be carried out with the pipe sections used in fire tests still in place.

(i) Pipe insulation fitted for fire tests may be removed before watertightness tests.

(7) Notwithstanding **(6)** above, tests are not required when pipe penetrations comply with **9.3.1, Part R of the Rules**. However, the watertight integrity of such pipe penetrations is to be ensured.

~~**4** When carrying out watertightness tests for pipe and cable penetrations which are constructed of the "heat sensitive materials" (i.e. those specified in **6.3.2-3, Part 3 of the Rules**) under provisions **1.1.1-2 and 1.1.1-3, Chapter 1 of Part 4 of the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**, penetrations which are subjected to fire testing are to be allowed to cool to room temperature before being tested for watertightness. However, when a gas-tightness test is to be carried out at the same time as a watertightness test, the order in which the tests is carried out does not matter.~~