



Standard Specification for Sliding Watertight Door Assemblies¹

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1. Scope

1.1 This specification covers the design, manufacture, and testing of sliding watertight door assemblies intended to ensure the watertight integrity of personnel access openings in watertight bulkheads.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 ASTM Standards:

A 36/A 36M Specification for Carbon Structural Steel²

F 1197 Specification for Sliding Watertight Door Control Systems³

2.2 Military Specification:

MIL-S-901 Shock Test, H.I. (High Impact); Shipboard Machinery, Equipment and Systems, Requirements for⁴

2.3 American Bureau of Shipping:

Rules for Building and Classing Steel Vessels⁵

2.4 Code of Federal Regulations:⁶

Title 46, Part 159.010, Independent Laboratory: Acceptance, Listing and Termination

Title 46, Part 163.001, Doors, Watertight, Sliding (and Door Controls), for Merchant Vessels (through the 1991 edition)

2.5 International Maritime Organization (IMO):

International Code for the Application of Fire Test Procedures (FTP)⁷

3. Terminology

3.1 Definitions:

3.1.1 *door assembly*—a door panel and its associated panel stiffening.

3.1.2 *frame assembly*—a rigid frame designed to be attached to a watertight bulkhead. The guide tracks necessary to ensure proper door and frame alignment are also included as part of the frame assembly.

3.1.3 *horizontal sliding watertight door*—a sliding watertight door that opens and closes with a horizontal movement.

3.1.4 *opening hand*—the direction in which a horizontal sliding watertight door opens. A left-hand opening door opens to the left when viewed from the side of the bulkhead on which the door assembly is located. A right-hand opening door opens to the right when viewed from the side of the bulkhead on which the door assembly is located.

3.1.5 *pressure head*—the pressure which a sliding watertight door assembly is designed to withstand. For a door located below the bulkhead deck, it is equivalent to the pressure exerted by a column of water the height of which is equal to the vertical distance from the bulkhead deck to the door sill in its installed location. For a door located above the bulkhead deck, it is equivalent to the pressure exerted by the maximum head of water for its location, as determined in the damage stability calculations.

3.1.6 *sliding watertight door assembly*—a steel door assembly and a steel frame assembly fitted with a replaceable interface between the two that ensures watertightness between door and frame at the design pressure head.

3.1.7 *vertical sliding watertight door*—a sliding watertight door that opens and closes with a vertical movement.

4. Classification

4.1 Sliding watertight doors consist of four types:

4.1.1 *Type IA*—Horizontal doors that conform to the sizes specified in Table 1 as illustrated in Fig. 1.

4.1.2 *Type IB*—Vertical doors that conform to the sizes specified in Table 2 as illustrated in Fig. 2.

4.1.3 *Type IIA*—Horizontal doors that conform generally to the requirements of this specification, but that necessitate special requirements as indicated in Section 5.

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² *Annual Book of ASTM Standards*, Vol 01.04.

³ *Annual Book of ASTM Standards*, Vol 01.07.

⁴ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

⁵ Available from American Bureau of Shipping, ABS Plaza, 16855 Northchase Dr., Houston, TX 77060.

⁶ Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

⁷ Available from the International Maritime Organization, 4 Albert Embankment, London, SE1 7SR UK.

TABLE 1 Type IA Door Dimensions

Size	Door Size	A, in. ^A	B, in.	C, in.	D, in.	E, in.	F, in.
1	2 ft. 2 in. by 5 ft. 6 in.	26	66	64	76	17	78
2	2 ft. 6 in. by 5 ft. 0 in.	30	60	72	84	16	72
3	2 ft. 6 in. by 6 ft. 0 in.	30	72	72	84	18	84
4	3 ft. 0 in. by 5 ft. 6 in.	36	66	84	96	18	78

^A1 in. = 25.4 mm.

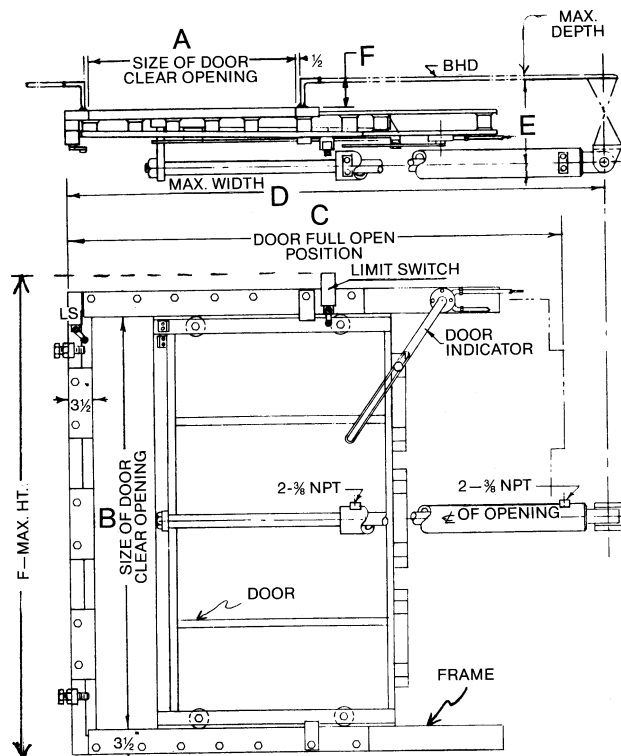


FIG. 1 Type IA Door and Frame

TABLE 2 Type IB Door Dimensions

Size	Door Size	A, in. ^A	B, in.	C, in.	D, in.	E, in.
1	2 ft. 2 in. by 5 ft. 6 in.	26	66	142	155	17
2	2 ft. 6 in. by 5 ft. 0 in.	30	60	130	143	16
3	2 ft. 6 in. by 6 ft. 0 in.	30	72	154	167	18
4	3 ft. 0 in. by 5 ft. 6 in.	36	66	142	155	18

^A1 in. = 25.4 mm.

4.1.4 *Type IIB*—Vertical doors that conform generally to the requirements of this specification, but that necessitate special requirements as indicated in Section 5.

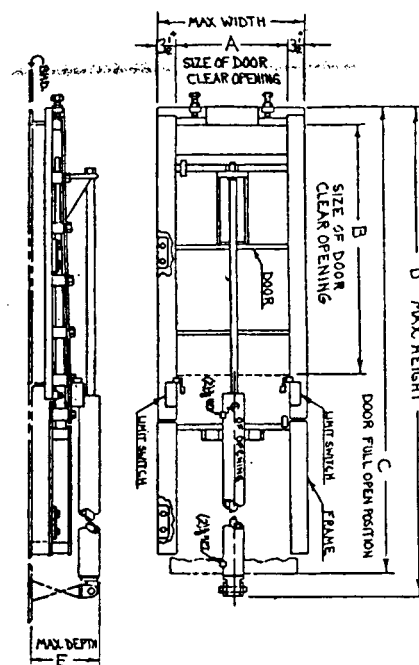
4.2 Watertight doors consist of three classes:

NOTE 1—These classifications are in agreement with those defined and accepted by the International Convention for the Safety of Life at Sea (SOLAS), regulatory bodies, and classification societies.

4.2.1 *Class 1*—Doors that are hinged and dogged. This specification is not applicable to this class of door.

4.2.2 *Class 2*—Sliding doors that are operable both locally and remotely by hand gear.

4.2.3 *Class 3*—Sliding doors that are operable both locally and remotely by hand and by power.



VERTICAL DOOR FRAME & CYL. ASSY.

FIG. 2 Type IB Door and Frame

5. Ordering Information

5.1 The following shall be specified when ordering:

- 5.1.1 Quantity,
- 5.1.2 Type,
- 5.1.3 Class,
- 5.1.4 Size,
- 5.1.5 Opening hand,
- 5.1.6 Door and frame material,
- 5.1.7 Pressure head (if other than standard),
- 5.1.8 Supplementary requirements (if any),
- 5.1.9 Additional requirements as contracted by the manufacturer and purchaser, and
- 5.1.10 ASTM specification designation.

6. Design

6.1 Sliding watertight door assemblies shall be designed to maintain watertightness within the limits set forth in this specification. Doors shall be designed to open and close within the limitations specified in Specification F 1197.

6.2 Assemblies shall be of substantial and rigid construction to ensure that doors can be closed under a static head equivalent to a water height of at least 1 m above the sill on the centerline of the door.

6.3 There shall be a replaceable interface between the door and frame assemblies, such as a brass rubbing strip or resilient gasket, to ensure watertightness between door and frame at the design pressure head.

6.3.1 The replaceable interface may be incorporated into the door assembly, the frame assembly, or both.

6.3.2 Assemblies shall be designed and constructed so as to be capable of preventing the passage of smoke and flame to the end of the 1-h standard fire test described by IMO FTP. When

specified by the purchaser, assemblies shall also be insulated to prevent the transfer of heat to at least the same degree as the adjacent bulkhead. A fire test is not required if the assembly design incorporates details that have been demonstrated such as by a fire test on a similar door with smaller dimensions, to prevent the passage of smoke and flame. Also, a separate pressure test to determine continued watertightness after the standard fire test is not required.

6.3.3 Assemblies shall be designed in such a manner that the replaceable interface will be protected from damage when the door is in the open position.

6.4 Sliding watertight door assemblies shall be designed to provide sufficient allowance or means of adjustment to maintain the original watertight integrity as the watertight joint wears through normal usage.

6.5 Means shall be provided for lubrication of all parts necessary for satisfactory operation.

6.6 Sliding watertight door assemblies shall have a maximum horizontal opening of 48 in. (122 cm).

6.7 *Door Assemblies*—Type I (standard) doors are designed for a pressure head of 20 ft (6 m) of water. Type II (nonstandard) doors shall be designed for the pressure head as specified in 3.1.5 and 5.1.7, but not less than 20 ft (6 m) for doors installed below the bulkhead deck.

6.7.1 The door panel and panel stiffener assembly shall be designed based on 40 % of the yield strength of the material used to construct the panel and its stiffeners (see 7.1).

6.7.2 The door panel and stiffener assembly shall have a maximum deflection of span/240.

6.7.3 Retaining grooves or aligning strips shall be provided at the tops and bottoms of horizontal assemblies and at the sides of vertical assemblies to maintain doors in proper alignment when they are not in the closed position.

6.8 *Frame Assemblies*—The door frame shall be continuous on all four sides. The door frame shall be of sufficient rigidity to maintain a watertight seal under the applicable operating conditions and the design head as specified in 6.7.

6.8.1 If the door frame is to be welded to the bulkhead on a reinforcing member, which acts as a secondary frame and which is continuous around the door opening, the *I* of that member may be included to obtain the required frame *I* value. (See also the Appendix X1.)

6.8.2 The frame extension for sliding watertight doors shall be made in one continuous piece, or suitable construction shall be used to ensure proper alignment.

6.8.3 Horizontal doors shall be supported by lubricated rollers to maintain alignment and minimize friction.

6.8.4 The bottom of the frame assembly shall be designed so the door will not be prevented from closing properly by lodgements of dirt or debris.

6.8.5 A sill plate of $\frac{3}{16}$ -in. (5-mm) minimum thickness may be used to cover the bottom trackway provided it is designed to retract automatically when the door closes. Sill plate hinges shall be designed and located to prevent clogging with dirt.

6.9 *Actuating Component Attachments*—Assemblies shall be fitted with the necessary attachments for actuating components and controls.

6.9.1 Door control systems shall comply with the requirements of Specification F 1197.

7. Materials and Manufacture

7.1 Materials:

7.1.1 The door panel, panel stiffness, door frame, tracks, and all attachments affecting watertight integrity shall be made of a material accepted in the Rules for Building and Classing Steel Vessels of the American Bureau of Shipping (ABS Rules) for use in the fabrication of watertight subdivision bulkheads, for example, Specification A 36/A 36M steel. Special consideration shall be given to the choice of materials for components exposed to corrosive environments such as on assemblies located in engine rooms and cargo holds.

7.1.2 All fasteners shall be brass or stainless steel suitable for the purpose intended.

7.2 Manufacture:

7.2.1 All welding of the door frame shall be continuous. Door panel stiffeners may be attached by intermittent welding. All welding shall be in accordance with the requirements of Part I, Section 30 of the ABS Rules.

7.2.2 All load-bearing main structural components of the door and frame shall have a minimum thickness of $\frac{1}{4}$ in. (7 mm).

7.2.3 The contact surfaces of the door and frame shall be finished as necessary to provide a plane surface and a joint that meets the requirements of this specification. Cast doors and frames, and doors and frames fabricated by welding, shall be thermally stress relieved before final machine work is performed.

8. Workmanship, Finish, and Appearance

8.1 All sharp and ragged edges shall be ground flush and removed.

8.2 Door, frame, and guide rail assemblies shall be abrasive blasted to “near white” metal in accordance with good commercial practice and coated with a nonhazardous primer.

9. Inspection and Testing of Doors

9.1 *Shop Tests and Inspections* (see also the *Supplementary Requirements*):

9.1.1 *Visual Examination*—Each completed door and frame shall be examined for quality workmanship and to assure conformance to design plans and this specification.

9.1.2 *Hydrostatic Test*—Each completed sliding watertight door assembly shall be subjected to a hydrostatic shop test to verify its strength, rigidity, workmanship, and watertightness.

9.1.2.1 *Hydrostatic Test Setup*—The door frame shall be mounted in either a vertical or horizontally flat position on a reinforced test plate or slab. Means shall be provided to vent air from the enclosure formed by the door, frame, and plate and to supply water, at the required test pressure, to this enclosure. Means shall also be provided for catching and measuring the amount of water that leaks between sealing surfaces of the door panel and frame. Except in the case of double-seated doors, it will only be necessary to apply pressure to that side of the door which will tend to separate the sealing surfaces.

9.1.2.2 *Hydrostatic Test Procedure*—The door shall be closed by operating equipment that restricts the amount of

closing force to that available from the operating gear to be used in the shipboard installation. The enclosure shall then be completely filled with water, the air shall be vented, and the test pressure shall be applied and held for at least 10 min during which time the leakage rate shall be determined. The test pressure shall not be less than that specified in 6.7 and 6.8. The measured leakage rate, A , shall not exceed that given by the following formula:

$$A \text{ (gal/h)} = \frac{(P + 15)}{30} \times \left(\frac{h^3}{1600} \text{ or } \frac{p^3}{130} \right) \quad (1)$$

where:

P = perimeter of door opening, ft;

h = test head, ft; and

p = pressure, lb/in.²

10. Certification

10.1 The manufacturer shall furnish to the purchaser written certification for each sliding watertight door assembly. The certification shall specify that the assembly has been manufactured, inspected, and tested in accordance with this specification and that it has been found to meet the requirements contained herein (see also S3.1.3).

11. Nameplate

11.1 *Watertight Door Nameplate*—A substantial corrosion-resistant nameplate shall be permanently attached to each

watertight door on which is legibly stamped the name of the manufacturer, manufacturer's serial number, ASTM specification designation, pressure head, the fire endurance rating in accordance with IMO FTP, and the date (see also Supplemental Requirement S4).

12. Packaging and Package Marking

12.1 Sliding watertight door assemblies shall be crated or attached to a pallet in a manner acceptable for shipment by a common carrier. The door and door frame assemblies shall be shipped as one unit.

12.2 Machined surfaces shall be coated with a preservative before shipment.

12.3 Operating controls should be packaged with the door for shipment. See Specification F 1197 for packaging requirements for controls.

12.4 *Marking*—Shipments shall be marked with the customer and purchase order, ASTM specification designation, classification, size, and other pertinent data as required by the applicable purchase order.

13. Keywords

13.1 marine; ship; shipboard equipment; watertight doors

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements shall apply only when specified by the purchaser in the contract or order.

S1. Installation Tests and Inspection

S1.1 *Visual Inspection*—The sealing surfaces of sliding watertight door assemblies shall be examined insofar as possible without dismantling the door. Surface blemishes shall be corrected by stoning or draw-filing.

S1.2 Tests for Tightness:

S1.2.1 *Feeler Gage Test*—Sliding watertight door assemblies that have a machined interface between the door and frame shall be sufficiently tight to reject the insertion of a 0.003-in. (0.076-mm) feeler gage, or its clear passage through and between the sealing surfaces, at any point around the sealing perimeter.

S1.2.2 *Hose Test*—Sliding watertight door assemblies that incorporate a nonmetallic gasket between the door and frame shall be hose tested after installation. Water at a hose pressure of 50 psi (345 kPa) shall be supplied through a smooth bore nozzle with an orifice opening of $\frac{5}{8}$ in. (15.9 mm), attached to a 1½-in. (38-mm) hose. The nozzle shall be held at a distance of no greater than 5 ft (1.5 m) from the door. The stream shall be directed at all points of the door/frame interface. No leakage shall occur.

S2. Shock Testing

S2.1 Shock testing shall be conducted in accordance with MIL-S-901.

S2.2 The purchaser shall specify the required door positions during the test (for example, open, closed, or both).

S3. Prototype Verification

S3.1 The following additional requirements must be met for a prototype of each sliding watertight door assembly to be installed in subdivision bulkheads aboard vessels inspected and certificated by the U.S. Coast Guard. Doors manufactured in accordance with 46 CFR Part 163.001 (through the 1991 edition) need only meet the additional marking requirements of S4.

S3.1.1 Plans and calculations for each assembly design shall be certified by a registered professional engineer as complying with the design requirements of Section 6 of this specification. Certified plans and calculations shall be permanently maintained by the manufacturer and made available to the Coast Guard and purchaser upon request.

S3.1.2 The inspection and testing required by Section 9 of this standard specification shall be conducted on a prototype of each sliding watertight door assembly design and witnessed by any classification society or by an organization that meets the requirements of 46 CFR Part 159.010. Test results shall be permanently maintained by the manufacturer and made available to the Coast Guard and purchaser upon request.

S3.1.3 The certification required by Section 10 of this specification shall also include the name and registration number of the professional engineer who certified the plans and calculations in accordance with S3.1.1 and the date that such certification was made. It shall also include the name of the independent third-party employee who witnessed the tests and

conducted the inspections required by S3.1.2, the testing organization for whom the inspector works, and the date on which the tests were successfully completed.

S4. Additional Marking

S4.1 For doors intended for installation aboard vessels inspected and certificated by the U.S. Coast Guard, including doors manufactured in accordance with plans previously approved under 46 CFR Part 163.001, the watertight door nameplate required by 11.1 of this specification shall include the following additional phrase: "Suitable for installation in subdivision bulkheads aboard vessels inspected and certificated by the U.S. Coast Guard."

APPENDIX

(Nonmandatory Information)

X1. INSTALLATION

X1.1 *Bulkhead Reinforcement*—Before a sliding watertight door assembly is installed in a vessel, the bulkhead in the vicinity of the door opening shall be stiffened in accordance with plans previously submitted by the shipyard or naval architect and approved by the U.S. Coast Guard and ABS. Such bulkhead stiffeners, or deck reinforcement where flush deck door openings are desired, shall not be less than 6 in. (152 mm) nor more than 12 in. (305 mm) from the door frame in order that an unstiffened diaphragm of bulkhead plating 6 to 12 in. (152 to 305 mm) wide is provided completely around the door frame. Where such limits cannot be maintained, the applicable classification society and regulatory body should be contacted for specific approval of the particular installation. In determining the scantlings of these bulkhead stiffeners, the door frame

should not be considered as contributing to the strength of the bulkhead. Provision shall also be made to support the thrust bearings and other equipment that may be mounted on the bulkhead or deck adequately.

X1.2 Sliding watertight door frames may be either bolted or welded watertight to the bulkhead.

X1.2.1 If bolted, a suitable thin heat- and fire-resistant gasket or suitable compound shall be used between the bulkhead and the frame for watertightness. The bulkhead plating shall be worked to a plane surface in way of the frame when mounting.

X1.2.2 If welded, precaution shall be exercised in the welding process so that the door frame is not distorted.

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