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Ships and marine technology — Technical requirements for "B" class fire-resistant compartment systems of composite mineral wool panel

Navires et technologie maritime — Exigences techniques pour les systèmes de compartiments résistants aux feux de classe B en panneaux composites de laine minérale

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology,* Subcommittee SC 8, *Ship design*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

“B” class fire-resistant compartment systems made of composite mineral wool panels are widely used in accommodation spaces in ships and offshore installations. Both ships and offshore installations have fire and acoustic insulation capability as required by 1974 International Convention for the Safety of Life at Sea (SOLAS 74) and its amendments.

This document is aligned with IMO documents, in particular SOLAS 74, IMO Resolution MSC.337 (91), IMO MSC/Circ.917 and the International code for application of fire test procedures (FTP Code).

Ships and marine technology — Technical requirements for "B" class fire-resistant compartment systems of composite mineral wool panel

1 Scope

This document provides requirements on fire resistance, acoustic insulation, opening and penetration for "B" class fire-resistant compartment systems made of composite mineral wool panel, which are aligned with the 2010 FTP Code and SOLAS 74 and its amendments. This document also specifies how these "B" class fire-resistant compartment systems are inspected.

This document is applicable to accommodation spaces made by "B" class composite mineral wool panels for ships and offshore installations where "B" class divisions are required.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1716, *Reaction to fire tests for products — Determination of the gross heat of combustion (calorific value)*

ISO 10140-2, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 2: Measurement of airborne sound insulation*

ISO 22262-1, *Air quality — Bulk materials — Part 1: Sampling and qualitative determination of asbestos in commercial bulk materials*

2010 FTP Code — *International code for application of fire test procedures*

SOLAS — *International Convention for the Safety of Life at Sea*

IMO Resolution MSC.337 (91) — *Code on noise levels on board ships*

IMO MSC/Circ.917 — *Guidelines on Fire Safety Construction in Accommodation Areas* – (4 June 1999)

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
"B" class
"B" class division
classification formed by bulkheads, decks, ceilings, or linings, including "B-15" and "B-0" class, constructed of approved *non-combustible materials* (3.6)

[SOURCE: SOLAS, Chapter II-2, Reg. 3.4]

3.2
"B" class composite mineral wool panel
panel composed of a metal sheet, or sheets associated with mineral wool, and which meet "B-15" and "B-0" class requirements

3.3
"B" class fire door
fixed door which has a fire resistance that is equivalent to *"B" class division* (3.1)

Note 1 to entry: See 2010 FTP Code, Annex 1, Part 3 for further details on the criteria with which a "B" class fire door must comply.

3.4
window box
connection box between the *"B" class composite mineral wool panel* (3.2) and window or side scuttle

3.5
"B" class fire-resistant compartment system
compartment system consisting of a *"B" class composite mineral wool panel* (3.2), *"B" class fire door* (3.3), *window box* (3.4), as well as any other openings and/or penetrations in the *"B" class division* (3.1)

3.6
non-combustible material
material which neither burns nor gives off flammable vapours in sufficient quantity for self-ignition when heated to approximately 750 °C

3.7
combustible material
material other than *non-combustible material* (3.6)

3.8
low flame-spread characteristic
surface material of *"B" class division* (3.1) designed to adequately restrict the spread of flame

[SOURCE: SOLAS, Chapter II-2, Reg. 3.29]

3.9
"C" class
division constructed of approved *non-combustible materials* (3.6), which does not need to meet requirements relative to the passage of smoke and flame nor limitations relative to the temperature rise

[SOURCE: SOLAS, Chapter II-2, Reg. 3.10]

4 Requirements

4.1 Materials

All materials shall be free of asbestos in accordance with SOLAS, Chapter II-1, Regulation 3-5.

Insulating materials shall be non-combustible, in accordance with SOLAS, Chapter II-2, Regulation 5.3.1.1.

Adhesives shall have low flame-spread characteristics in accordance with SOLAS II-2, Regulation 5.3.1.1.

Combustible materials which are used upon the exposed finishing surface of the "B" class fire-resistant compartment systems, such as facings, mouldings, decorations and veneers, in accommodation and service spaces on the combined area of the walls and ceiling linings, shall meet following requirements:

a) their maximum calorific value shall not exceed 45 MJ/m^2 of the area for the thickness used;

b) the total volume of the materials shall have a value not exceeding a volume equivalent to 2,5 mm veneer of the combined area of the interior surface of the "B" class fire-resistant compartment systems. Such

volume shall also include the one relevant to the combustible materials applied on the surfaces of the divisions to decorate them, such as mouldings, decorations and skirting;

c) they shall not be capable of producing excessive quantities of smoke and toxic products, as per 2010 FTP Code, Annex 1, Part 2;

d) they shall have low flame-spread characteristics, as per 2010 FTP Code, Annex 1, Part 5.

The density and thickness of composite mineral wool panel shall be within ± 10 % of the nominal values as stated by the designer.

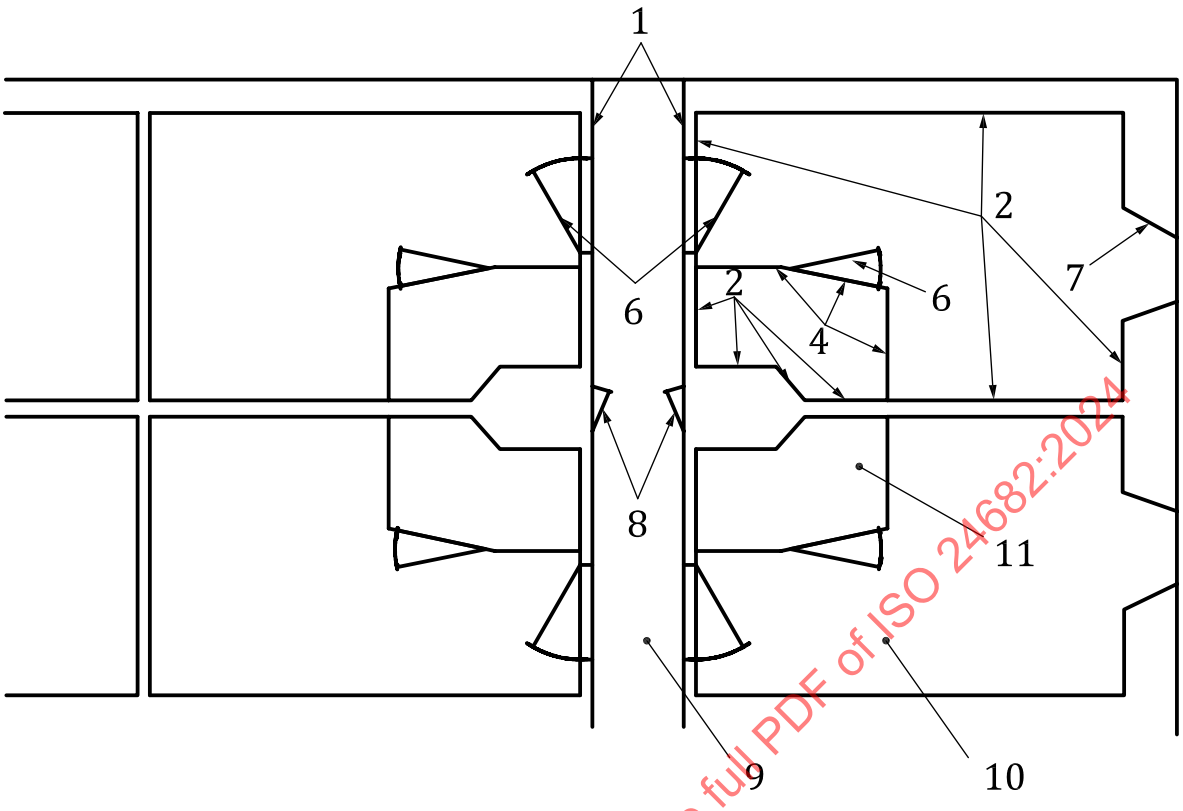
4.2 Fire resistance

"B" class fire-resistant compartment systems shall meet the requirements of SOLAS, Chapter II-2, Regulation 3, and Regulation 9.

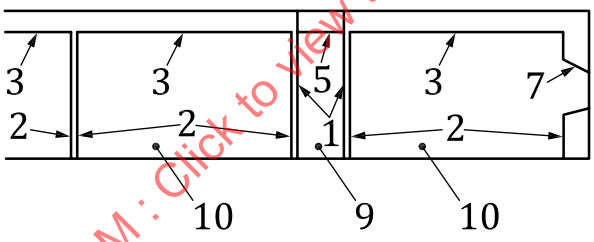
For details on the basic construction of "B" class composite mineral wool panels, see Annex A.

For the typical connection and installation details of "B" class composite mineral wool panels, see Annex B.

Arrangements of Figure 1 to Figure 8 are examples. Other arrangements that are in line with IMO MSC/Circ.917 shall be considered acceptable.



a) Top view



b) Side view

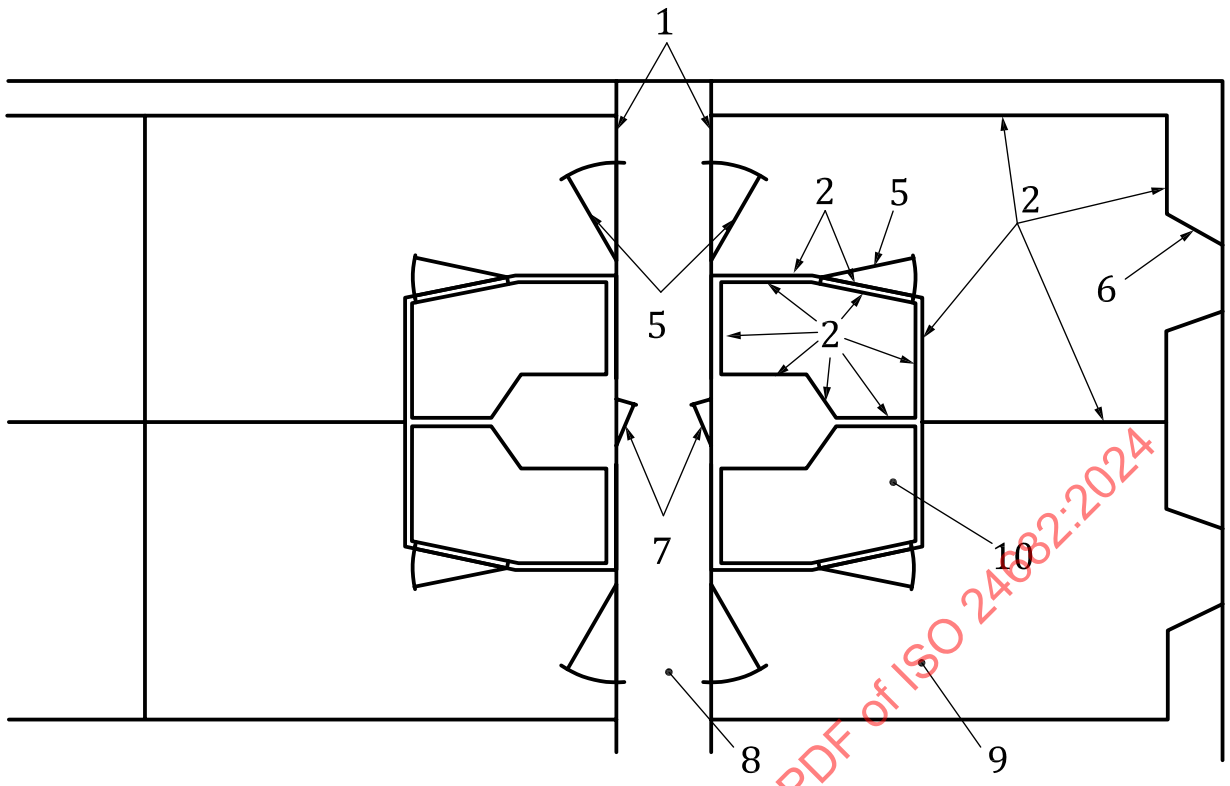
Key

1	"B-15" class bulkhead	7	window box
2	"B-0" class bulkhead	8	access door
3	"B-0" class ceiling	9	corridor
4	"C" class bulkhead	10	cabin
5	"C" class ceiling	11	toilet
6	fire door		

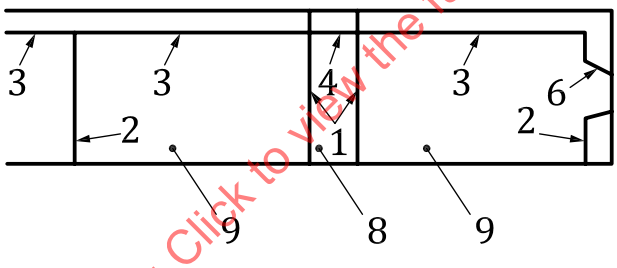
NOTE 1 The corridor has "B-15" bulkheads extending from deck to deck and "C" class ceiling (where provided). The cabin has "B-0" continuous construction. Bulkheads (except the door) between the cabin and corridor or other cabins are not common. The toilet is separated with a "C" class bulkhead from the cabin.

NOTE 2 This construction type is applicable to passenger ships and cargo ships.

Figure 1 — Construction details of "B" class fire-resistant compartment systems — Type I construction



a) Top view



b) Side view

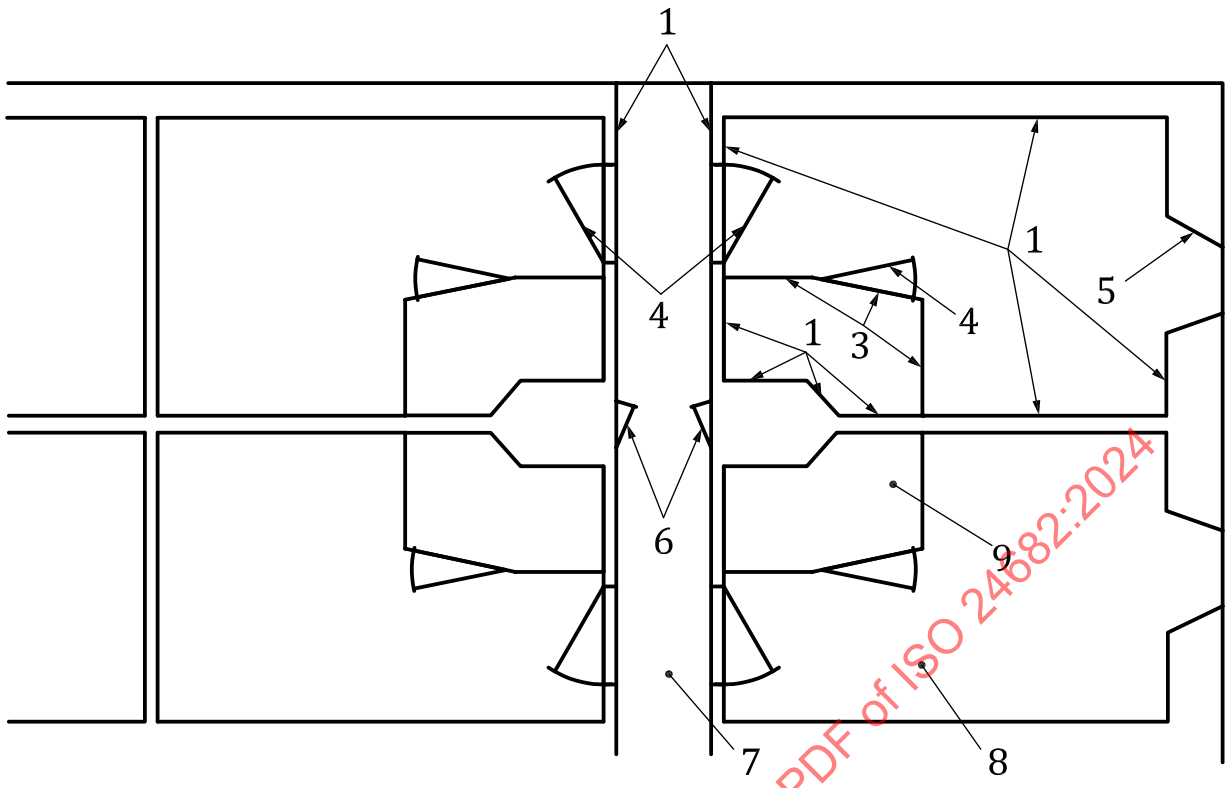
Key

1	"B-15" class bulkhead	6	window box
2	"B-0" class bulkhead	7	access door
3	"B-0" class ceiling	8	corridor
4	"C" class ceiling	9	cabin
5	fire door	10	toilet

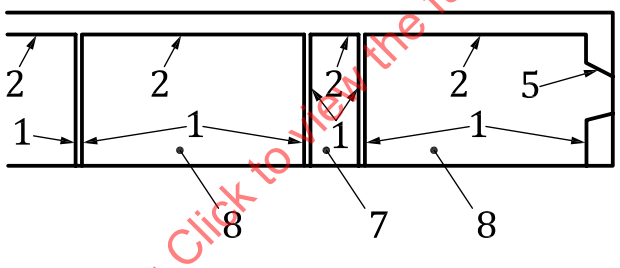
NOTE 1 The corridor has "B-15" bulkheads extending from deck to deck and "C" class ceiling (where provided). The cabin has "B-15" bulkhead against corridor and "B-0" bulkheads against other spaces, and it has a "B-0" continuous ceiling. Bulkheads are common with corridors and other cabins. The toilet unit is fully separate including the ceiling. There is a gap between the cabin and toilet unit. All bulkheads of the toilet unit are "B-0".

NOTE 2 This construction type is applied to passenger ships and cargo ships.

Figure 2 — Construction details of "B" class fire-resistant compartment systems — Type II construction



a) Top view



b) Side view

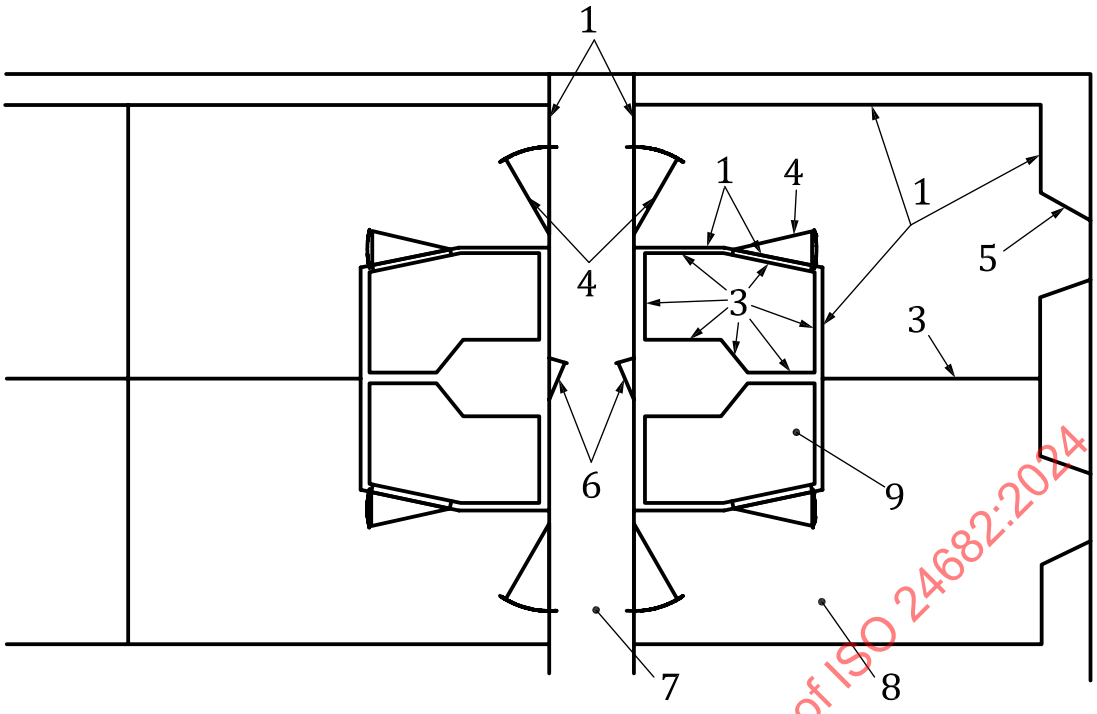
Key

1	"B-15" class bulkhead	6	access door
2	"B-15" class ceiling	7	corridor
3	"C" class bulkhead	8	cabin
4	fire door	9	toilet
5	window box		

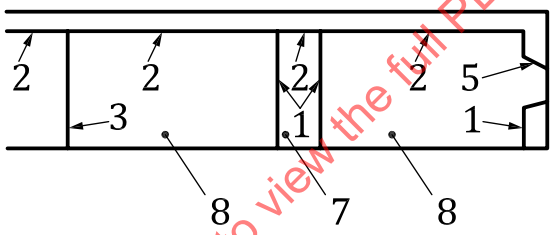
NOTE 1 The corridor has "B-15" continuous construction. The cabin has "B-15" continuous construction. Bulkheads (except the door) between the cabin and corridor or other cabins are not common. The toilet is separated with a "C" class bulkhead from the cabin.

NOTE 2 This construction type is applied to passenger ships carrying more than 36 passengers, passenger ships carrying not more than 36 passengers who are protected by sprinklers in accommodation areas, or cargo ships that adopt method IIC and method IIIC in accordance with SOLAS, Chapter II-2, Regulation 7.5.5, in accommodation areas.

Figure 3 — Construction details of "B" class fire-resistant compartment systems — Type III construction



a) Top view



b) Side view

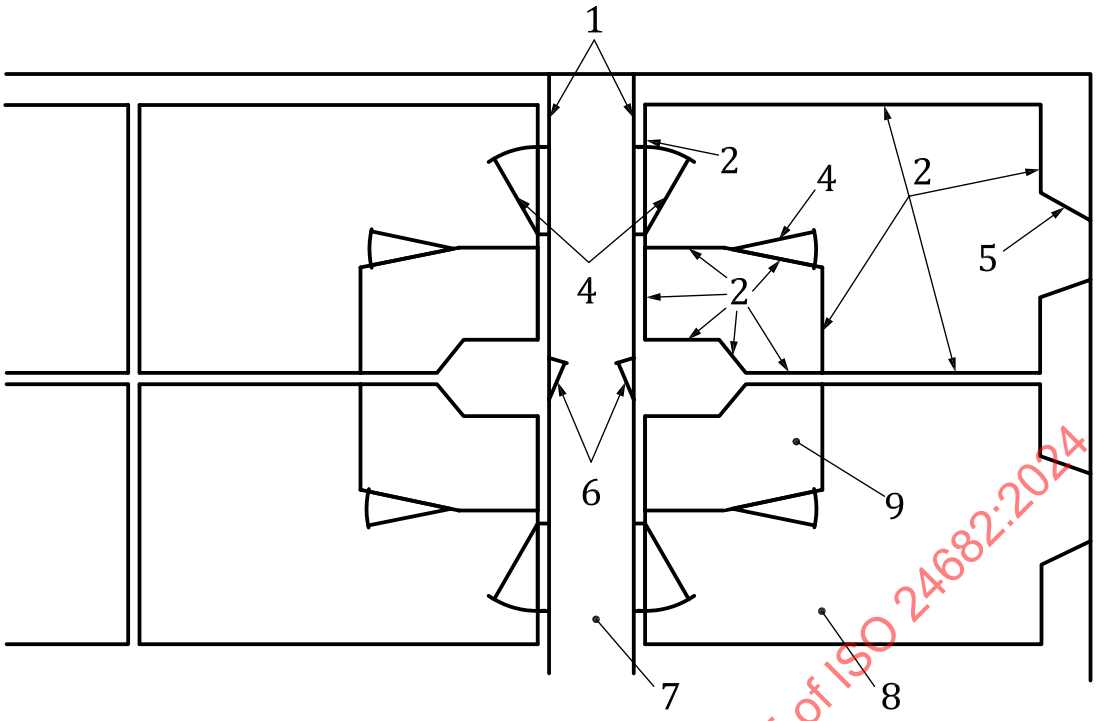
Key

1	"B-15" class bulkhead	6	access door
2	"B-15" class ceiling	7	corridor
3	"B-0" class bulkhead	8	cabin
4	fire door	9	toilet
5	window box		

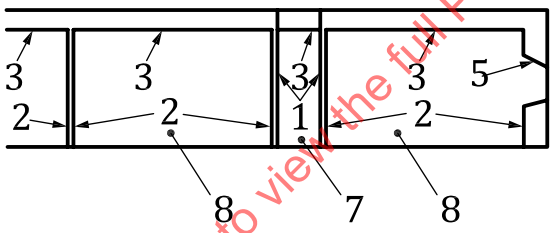
NOTE 1 The corridor has "B-15" corridor bulkheads from the deck to continuous "B-15" ceiling on both sides. The cabin has B-0 bulkheads against other cabins and "B-15" bulkhead against other spaces and it has a "B-15" continuous ceiling. Bulkheads are common with corridors and other cabins. The toilet unit is fully separate including the ceiling. There is a gap between the cabin and toilet unit. All bulkheads of the toilet unit are "B-0".

NOTE 2 This construction type is applied to passenger ships carrying more than 36 passengers, passenger ships carrying not more than 36 passengers who are protected by sprinklers in accommodation areas, or cargo ships adopting method IIC and method IIIC in accordance with SOLAS, Chapter II-2, Regulation 7.5.5, in accommodation areas.

Figure 4 — Construction details of "B" class fire-resistant compartment systems — Type IV construction



a) Top view



b) Side view

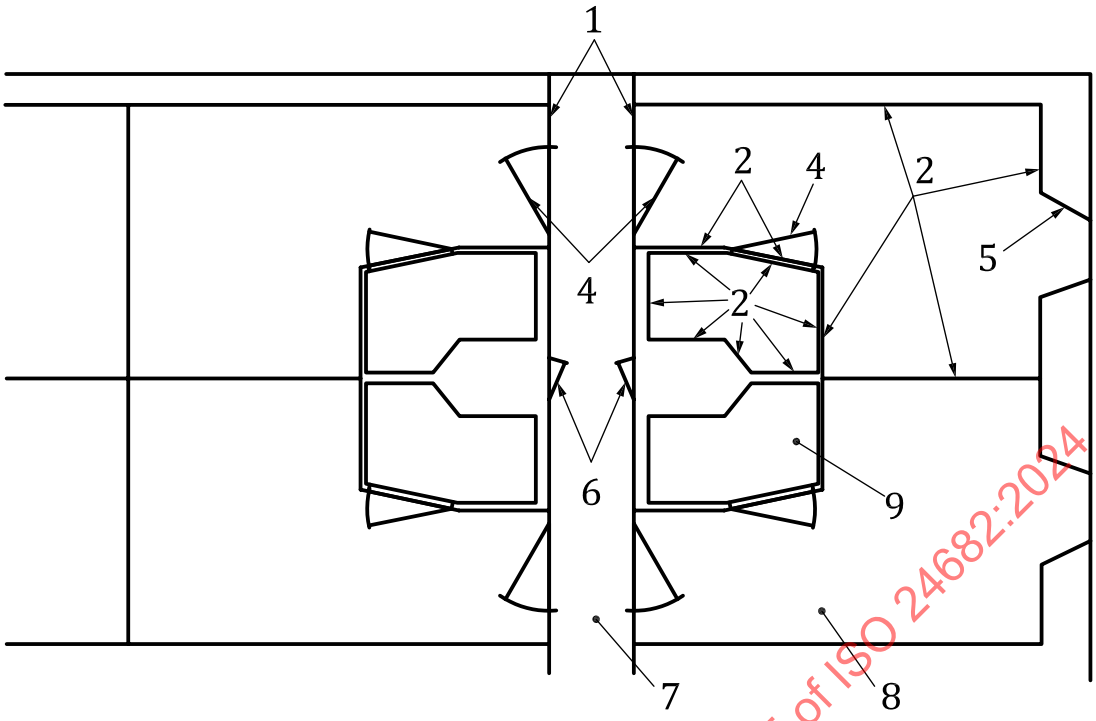
Key

1	"B-0" class bulkhead	6	access door
2	"C" class bulkhead	7	corridor
3	"C" class ceiling	8	cabin
4	fire door	9	toilet
5	window box		

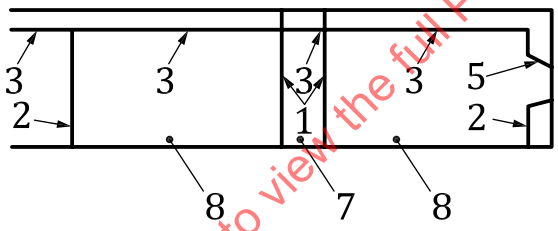
NOTE 1 The corridor has "B-0" bulkheads extending from deck to deck and "C" class ceiling (where provided). The cabin has "C" class bulkheads and ceiling. Bulkheads (except the door) between the cabin and corridor or other cabins are not common. The toilet is separated with a "C" class bulkhead from the cabin.

NOTE 2 This construction type is applied to passenger ships carrying not more than 36 passengers and cargo ships adopting method IIC and method IIIC in accordance with SOLAS, Chapter II-2, Regulation 7.5.5, in accommodation areas.

Figure 5 — Construction details of "B" class fire-resistant compartment systems — Type V construction



a) Top view



b) Side view

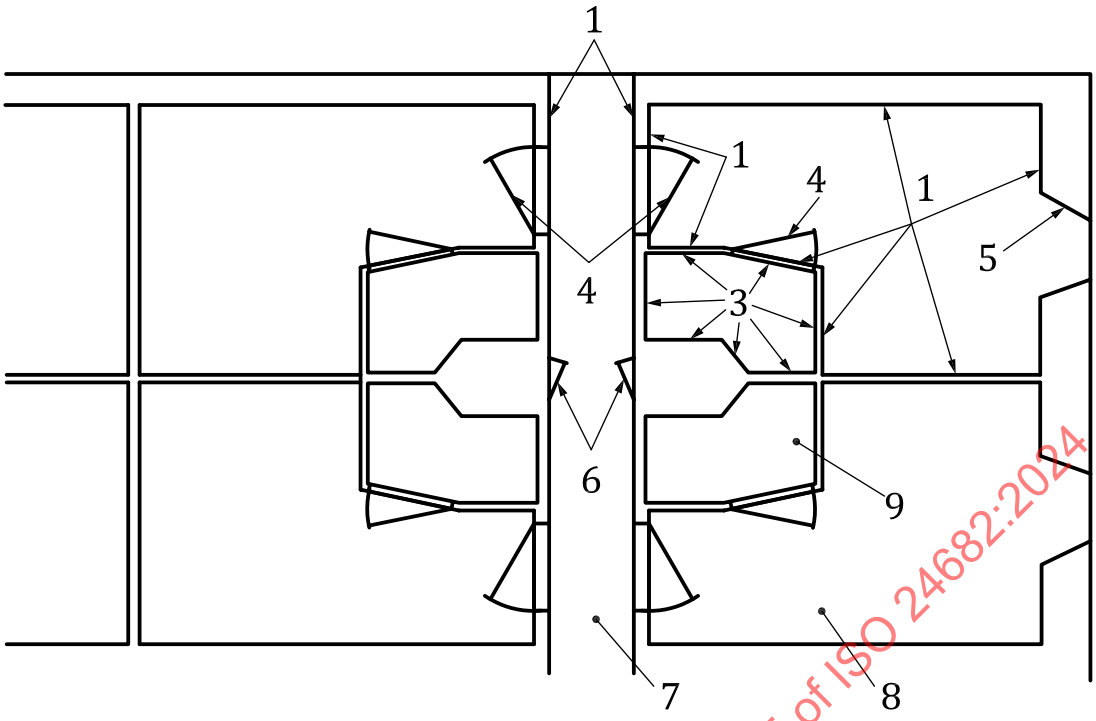
Key

1	"B-0" class bulkhead	6	access door
2	"C" class bulkhead	7	corridor
3	"C" class ceiling	8	cabin
4	fire door	9	toilet
5	window box		

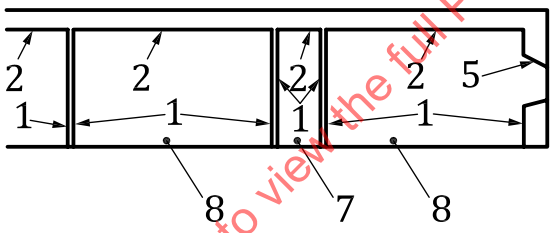
NOTE 1 The corridor has "B-0" bulkheads extending from deck to deck and "C" class ceiling (where provided). The cabin has "C" class bulkheads and ceiling. Bulkheads are common between corridors and other cabins. The toilet unit is fully separate including ceiling. There is a gap between the cabin and toilet unit. All bulkheads of the toilet unit are "C" class.

NOTE 2 This construction type is applied to passenger ships carrying not more than 36 passengers and cargo ships adopting method IIC and method IIIC in accordance with SOLAS, Chapter II-2, Regulation 7.5.5, in accommodation areas.

Figure 6 — Construction details of "B" class fire-resistant compartment systems — Type VI construction



a) Top view



b) Side view

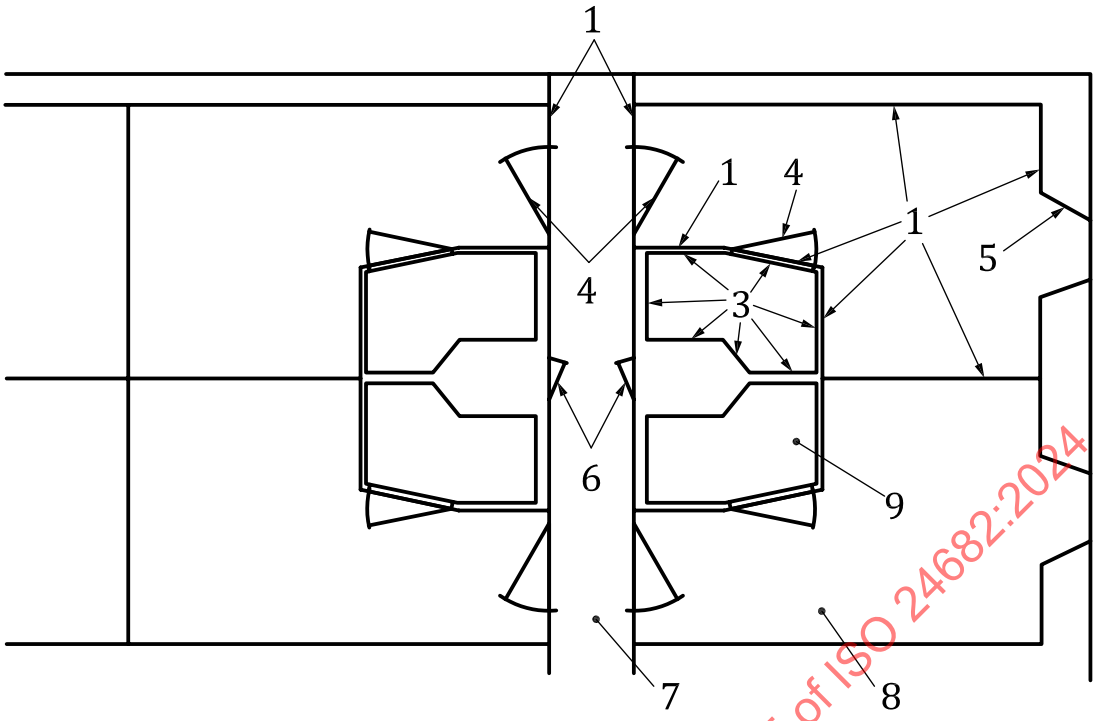
Key

1	"B-0" class bulkhead	6	access door
2	"B-0" class ceiling	7	corridor
3	"C" class bulkhead	8	cabin
4	fire door	9	toilet
5	window box		

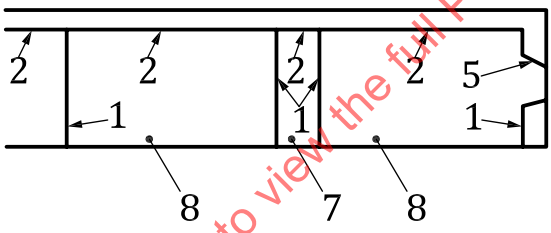
NOTE 1 The corridor has "B-0" continuous construction. The cabin has "B-0" continuous construction. Bulkheads (except the door) between the cabin and corridor or other cabins are not common. The toilet unit is fully separate including the ceiling. There is a gap between the cabin and toilet unit. All bulkheads of the toilet unit are "C" class.

NOTE 2 This construction type is applied to passenger ships carrying not more than 36 passengers and cargo ships.

Figure 7 — Construction details of "B" class fire-resistant compartment systems — Type VII construction



a) Top view



b) Side view

Key

1	"B-0" class bulkhead	6	access door
2	"B-0" class ceiling	7	corridor
3	"C" class bulkhead	8	cabin
4	fire door	9	toilet
5	window box		

NOTE 1 The corridor has "B-0" bulkheads from deck to continuous "B-0" ceiling on both sides. The cabin has "B-0" bulkhead and it has a continuous ceiling. Bulkheads are common between corridors and other cabins. The toilet unit is fully separate including the ceiling. There is a gap between the cabin and toilet unit. All bulkheads of the toilet unit are "C" class.

NOTE 2 This construction type is applied to passenger ships carrying not more than 36 passengers protected by sprinklers in accommodation areas and cargo ships.

Figure 8 — Construction details of "B" class fire-resistant compartment systems — Type VIII construction

4.3 Acoustic insulation

Acoustic insulation index of "B" class fire-resistant compartment systems within accommodation spaces shall meet the requirements of IMO Resolution MSC.337 (91).

Adjacent compartments shall be acoustically insulated with at least the acoustic reduction index (R_w) shown in Table 1, which is based on ISO 717-1.

Table 1 — R_w value of adjacent compartment

Adjacent compartment	R_w dB
Cabin to cabin	35
Mess rooms, recreation rooms, entertainment area to cabins and hospitals	45
Corridor to cabin	30
Cabin to cabin with communicating door	30

4.4 Opening in “B” class division

4.4.1 Opening for “B” class fire door

Doors in “B” class divisions and means of securing them shall have a fire-resistant method of closure, which is fire equivalent to that of the relevant divisions.

The gap between the deck and the door frame without the sill shall not exceed 25 mm.

The total net area of any ventilation opening in a “B” class fire door shall not exceed 0,05 m^2. All ventilation openings in “B” class fire doors shall be fitted with a frame and grill made of non-combustible material.

4.4.2 Opening for window or balcony door

The opening in the cabin bulkhead in way of the window or balcony door aperture of passenger ships carrying more than 36 passengers shall be boxed in with materials appropriate to the "B" class division. Any window or balcony door box, or wall panel, etc. which is part of “B” class divisions shall be in accordance with IMO MSC/Circ.917, Annex, Paragraph 5.1.

The following concerns the connection between a cabin and the ship’s side, or deckhouse side at windows or sidescuttles, on cargo ships, or passenger ships carrying not more than 36 passengers, as specified in IMO MSC/Circ.917, Annex, Paragraph 5.2:

— in case of method IC, the opening in the cabin wall in way of the window or sidescuttle aperture shall be boxed in with non-combustible materials;

— combustible window or sidescuttle boxes may be fitted internally in addition to such enclosures, provided that the surface of such a combustible material is of a low flame spread type.

4.4.3 Other openings

Access or viewing openings should be provided by means of easily opened doors, hatches or panels in “B” class composite mineral wool panels. Such doors, hatches or panels shall have a fire rating equivalent to the division in which they are fitted.

The mineral wool at opening should be smooth and compact.

4.5 Penetration

4.5.1 General

“B” class divisions penetrated for the passage of pipes, ducts, and electric cables shall meet the requirements of SOLAS, Chapter II-2, Regulation 9, to ensure that the fire resistance is not impaired.

Penetrations for the fitting of ventilation terminals, lighting fixtures and similar devices such as back box, bushing or insulation cover shall meet the requirements of “B” class divisions.

For the typical construction of penetration, see Annex C.

4.5.2 Pipes

Pipes not made by steel or copper penetrating “B” class divisions shall be protected by either:

a) a fire-tested penetration device, suitable for the fire resistance of the division pierced and the type of pipe used; or

b) a steel sleeve, having a thickness of not less than 1,8 mm, and a length of not less than 900 mm for pipe diameters of 150 mm or more, and not less than 600 mm for pipe diameters of less than 150 mm. This length is preferably divided equally between each side of the division.

The connection between pipe and sleeve shall meet one of the following requirements:

c) the pipe shall be connected to the ends of the sleeve by flanges or couplings;

d) the clearance between the sleeve and the pipe shall not exceed 2,5 mm; and,

e) any clearance between pipe and sleeve shall be made tight by means of non-combustible or other suitable materials.

Non-insulated metallic pipes penetrating “B” class divisions shall be of materials having a melting temperature which exceeds 850 °C.

4.5.3 Ventilation ducts

Ventilation ducts (with a free cross-sectional area exceeding 0,02 m^2) passing through “B” class divisions shall be lined with steel sheet sleeves of 900 mm in length, divided preferably into 450 mm on each side of the bulkheads, unless the duct of this length is made of steel.

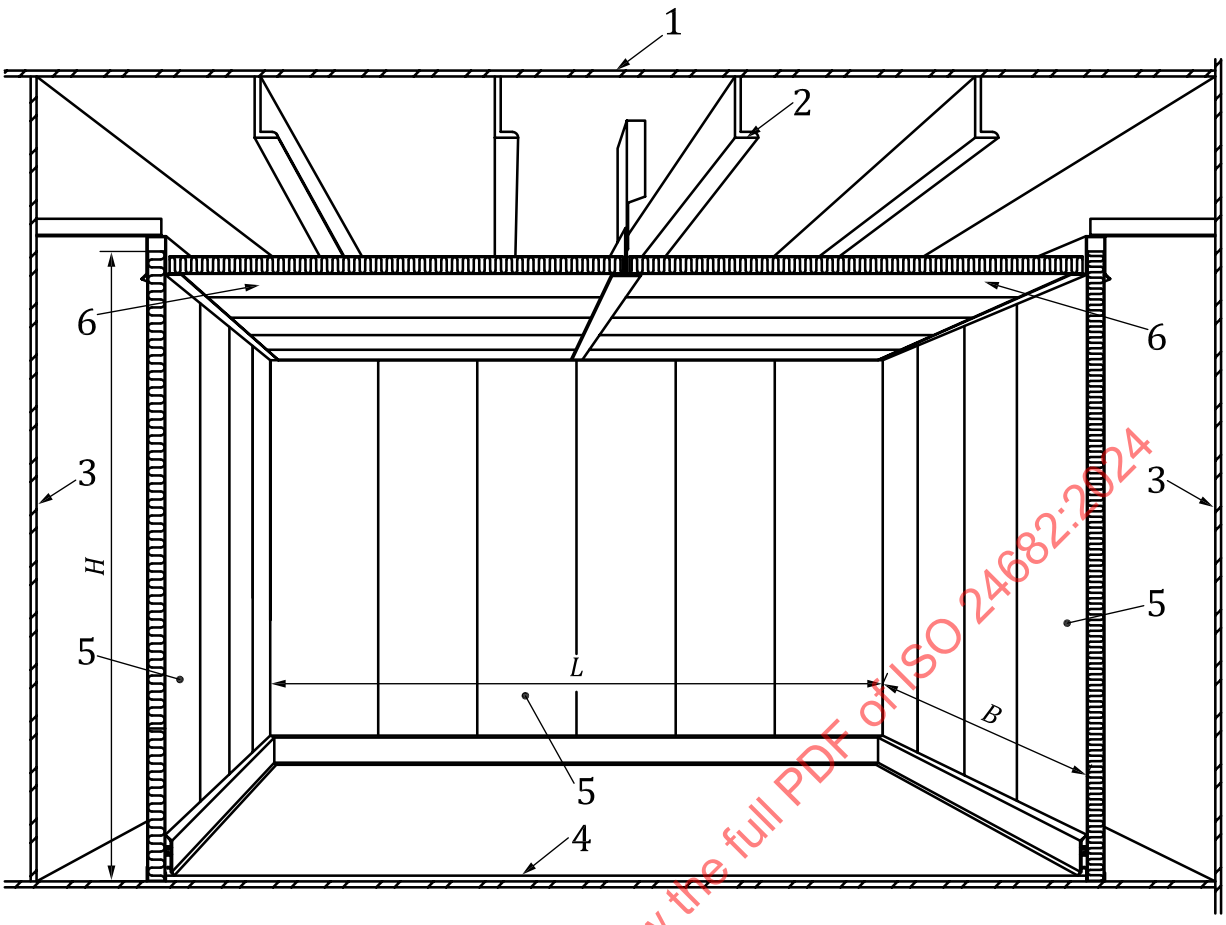
Ventilation ducts (with a free cross-sectional area not exceeding 0,02 m^2) passing through "B" class divisions shall be steel or equivalent material.

4.5.4 Electric cables

Electric cables passing through “B” class divisions shall be protected by steel sleeves filled with fireproof putty for bundled cables. Electric cables directly passing through “B” class divisions shall be protected by fire-resistant conduits for single cables.

4.6 Tolerance requirements

Figure 9 shows the spatial layout of the “B” class fire-resistant compartment system. Figure 10 shows an installation diagram of a “B” class fire-resistant panel. “B” class fire-resistant compartment systems should meet the tolerance value specified in Table 2 and Table 3.



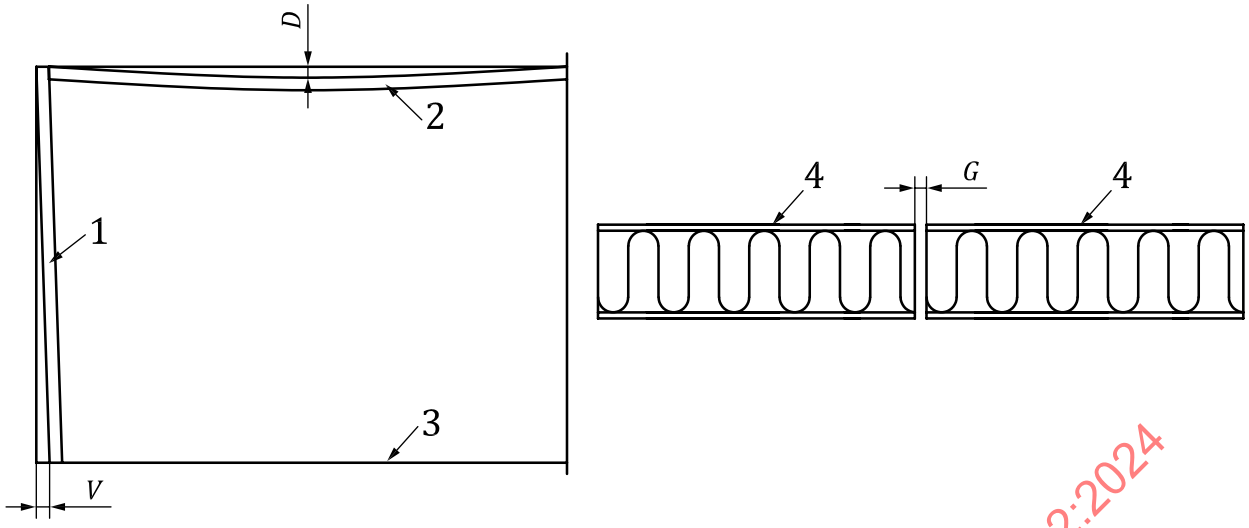
Key

1	deck	4	deck covering
2	beam	5	bulkhead
3	wall	6	ceiling

Figure 9 — Spatial layout of "B" class fire-resistant compartment system

Table 2 — Main dimension tolerance value

Symbol	Item	Tolerance mm
L	Length tolerance of "B" class compartment system space	±(0,2 % × L)
B	Breadth tolerance of "B" class compartment system space	±(0,2 % × W)
H	Height tolerance of "B" class compartment system space	0 to 10



Key

1 bulkhead
2 ceiling
D drop tolerance of ceiling
V vertical tolerance of lining or partition
G gap tolerance between panels
3 deck covering
4 panel (include bulkhead and ceiling)

Figure 10 — Installation diagram of "B" class fire-resistant panel

Table 3 — Installation tolerance value of "B" class fire-resistant panel

Symbol	Tolerance mm
D	±5
V	±6
G	0 to 0,8

4.7 Appearance

The surface of "B" class composite mineral wool panels should have no obvious colour aberration in one cabin or area.

The exposed surfaces should have no visible defects.

5 Inspection

5.1 Materials

Materials that are free of asbestos shall be tested in accordance with ISO 22262-1.

Insulating materials and adhesives shall be tested in accordance with the 2010 FTP code, Annex 1, Part 1 and Part 5, respectively.

The maximum calorific value of the combustible materials calculation shall be in accordance with ISO 1716.

The total volume of combustible materials shall be calculated in accordance with 4.1.

The smoke and toxicity test shall be carried out in accordance with the 2010 FTP code, Annex 1, Part 2.

The low flame-spread test shall be carried out in accordance with the 2010 FTP code, Annex 1, Part 5.

The density and thickness of composite mineral wool panels shall be measured against the criteria shown in 4.1.

5.2 Fire resistance

"B" class fire-resistant compartment systems shall be tested in accordance with the 2010 FTP code, Annex 1, Part 3.

5.3 Acoustic insulation

Acoustic insulation of "B" class fire-resistant compartment systems shall be tested in accordance with ISO 10140-2. The test result shall be evaluated against the values shown in Table 1.

5.4 Opening

The opening for "B" class fire door shall be measured with general measure tools and tested in accordance with 2010 FTP Code, Annex 1, Part 3.

The opening for window or balcony door shall be tested in accordance with 2010 FTP Code, Annex 1, Part 1 or Part 3, as applicable.

The opening for access or viewing openings shall be tested in accordance with 2010 FTP Code, Annex 1, Part 3.

5.5 Penetration

Penetrations for the passage of pipes, ducts and electric cables shall be tested in accordance with the 2010 FTP Code, Annex 1, Part 3.

Penetrations for the fitting of ventilation terminals, lighting fixtures and similar devices such as a back box, bushing or insulation cover shall be tested in accordance with the 2010 FTP Code, Annex 1, Part 3.

5.6 Installation tolerance

The length, width, and height of "B" class composite mineral wool space should be measured with general measure tools against the values shown in Table 2.

The dimensions of ceilings, linings or partitions should be measured with general measure tools against the values shown in Table 3.

The gap between panels should be measured with general measure tools against the values shown in Table 3.

5.7 Appearance

The colour of the "B" class composite mineral wool panel should be checked by the comparison template.

NOTE The comparison template can be provided by manufacturer.

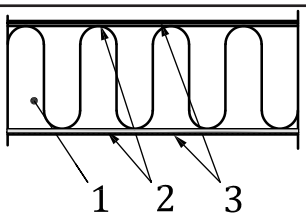
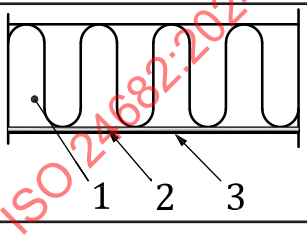
The surface of the "B" class composite mineral wool panel should be inspected visually.

Annex A
(informative)

“B” class composite mineral wool panel

The basic construction of a “B” class composite mineral wool panel is shown in Table A.1.

Table A.1 — Example of the basic construction of “B” class composite mineral wool panel

Type	Detail	Type	Detail
I		II	
Key 1 mineral wool 2 metal sheets 3 finishing material, if any			

The main materials for “B” class composite mineral wool panel are listed in Table A.2.

Table A.2 — Main materials of “B” class composite mineral wool panel

Name	Materials
Core material	Mineral wool
Metal sheets	Galvanized steel plate, stainless steel etc.
Finishing material	PVC (Polyvinyl chloride), PET (Polyethylene terephthalate), galvanized or paint etc.

Annex B
(informative)

Typical connection and installation details

Tables B.1, B.2, B.3 and B.4 and Figure B.1 a) to j) show examples of "B" class composite mineral wool panels. All connections and installation details that are in line with 2010 FTP Code, Annex 1, Part 3 should be considered acceptable.

The construction of lining, partition and ceiling is shown in Table B.1 and Table B.2.

Table B.1 — Construction of lining and partition

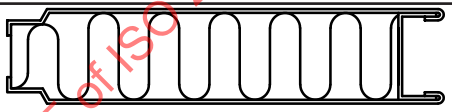
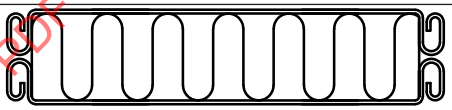
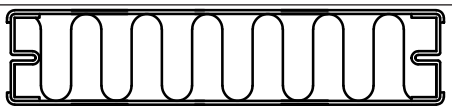
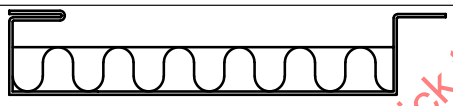
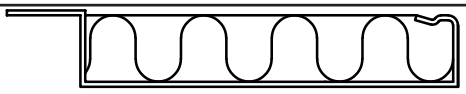
Lining		Partition	
Type	**Detail**	**Type**	**Detail**
I		I	
II		II	
III		III	
IV		—	—

Table B.2 — Construction of ceiling

Ceiling			
Type	**Detail**	**Type**	**Detail**
I		II	
III		—	—

The joining of lining, partition and ceiling is shown in Table B.3 and Table B.4.

Table B.3 — Joint of lining and partition

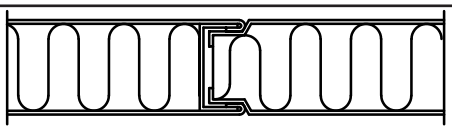
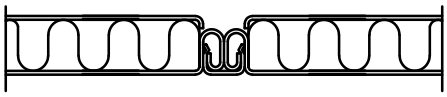
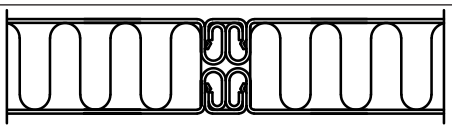
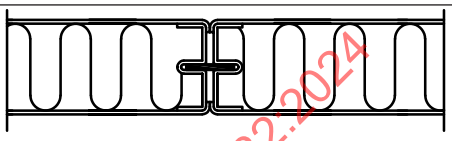
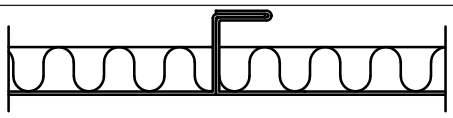
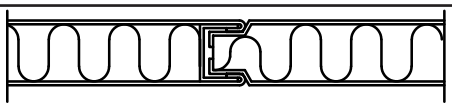
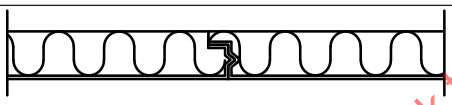
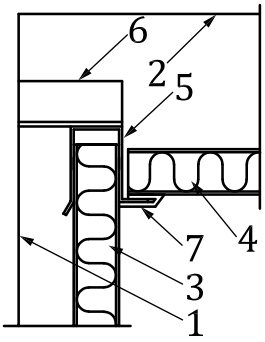
Lining		Partition	
Type	**Detail**	**Type**	**Detail**
I		I	
II		II	
III		III	
IV		—	—

Table B.4 — Joint of ceiling

Ceiling			
Type	Detail	Type	Detail
I		II	
III		—	—

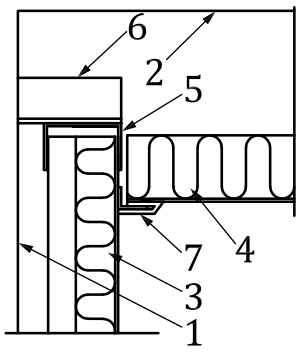
The installation details of lining, partition and ceiling are shown in Figure B.1 a) to j).



Key

1 bulkhead
2 deck
3 lining
4 ceiling
5 top profile
6 angle bar
7 strap

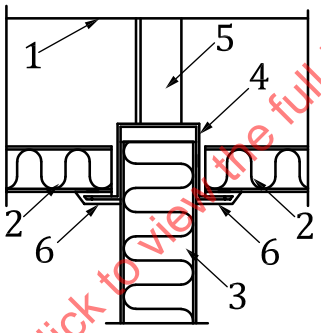
a) Lining to ceiling (double metal sheet)



Key

1	bulkhead	5	top profile
2	deck	6	angle bar
3	lining	7	strap
4	ceiling		

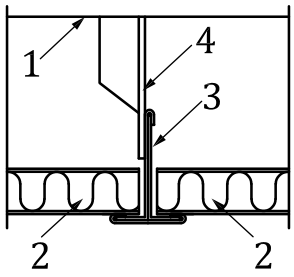
b) Lining to ceiling (single metal sheet)



Key

1	deck	4	top profile
2	ceiling	5	angle bar
3	partition	6	strap

c) Partition to ceiling



Key

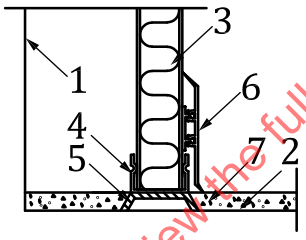
1 deck

2 ceiling

3 hanging

4 angle bar

d) Ceiling to ceiling



Key

1 bulkhead

2 deck

3 lining

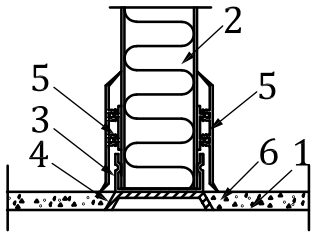
4 bottom profile

5 steel pad

6 skirting

7 deck covering

e) Lining to deck



Key

1 deck

2 partition

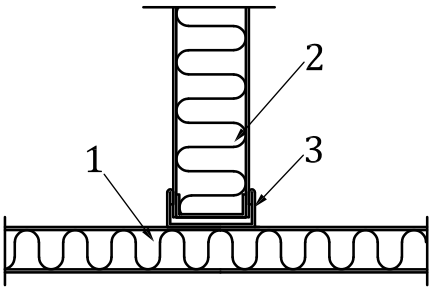
3 bottom profile

4 steel pad

5 skirting

6 deck covering

f) Partition to deck



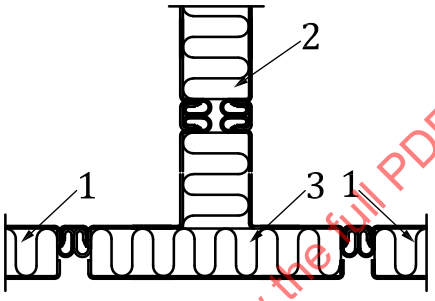
Key

1 lining

2 partition

3 U type end profile

g) Partition to lining



Key

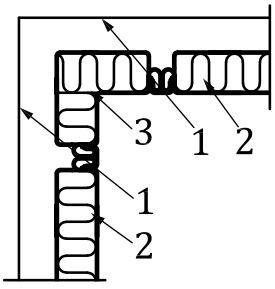
1 lining

2 partition

3 T type corner

h) T type corner to lining

NOTE Type II lining can be used as an example; details of Type I, Type III and Type IV are similar.



Key

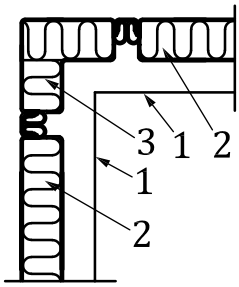
1 bulkhead

2 lining

3 internal corner

i) Internal corner to lining

NOTE Type II lining can be used as an example; details of Type I, Type III and Type IV are similar.



Key

1 bulkhead

2 lining

3 external corner

j) External corner to lining

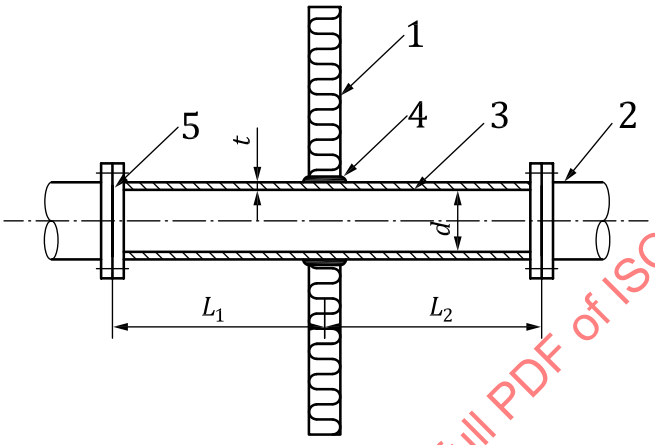
NOTE Type II lining can be used as an example; details of Type I, Type III and Type IV are similar.

Figure B.1 — Installation details of lining, partition and ceiling

Annex C
(informative)

Typical construction of penetrations

The typical construction of penetrations is shown in Figures C.1, C.2 and C.3. The materials and dimensions used for typical construction of penetrations are shown in Tables C.1, C.2 and C.3.



Key

1	"B" class divisions	4	fireproof sealant
2	pipe	5	flange
3	sleeve		
d	internal diameter of pipe		
L_1, L_2	length of pipe penetration		
t	thickness of sleeve		

a) Type I penetration