RULES

PUBLICATION 22/P

FIRE TESTS OF STRUCTURES AND EQUIPMENT OF SHIPS' SPACES, BASED ON THE FTP CODE

March
2025

Publications P (Additional Rule Requirements) issued by Polski Rejestr Statków
complete or extend the Rules and are mandatory where applicable.

GDAŃSK

Publication 22/P – Fire tests of structures and equipment of ships' spaces, based on the FTP Code – March 2025 is an extension of the requirements contained in *Part I – Classification Regulations of the Rules for the Classification and Construction of Sea-Going Ships*.

This Publication was approved by PRS Board on 27 March 2025 and enters into force on 31 March 2025

This Publication also applies to other PRS regulations if it is mentioned there.

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PRS/RP, 03/2025

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1 GENERAL REQUIREMENTS

1.1 Introduction

1.1.1 This *Publication* has been developed based on the requirements of the *Fire Test Procedures Code (FTP Code)*. The layout and numbering of the annexes to the *Publication* reflects the layout of the *FTP Code*, to which references should be made in test reports and approval certificates.

1.1.2 The *Publication* is intended for use by manufacturers/suppliers/PRS surveyors when approving products intended for use on ships and high-speed craft, in accordance with the fire safety requirements of the *International Convention for the Safety of Life at Sea, SOLAS*, 1974, as amended.

1.1.3 The *Publication* contains requirements concerning the scope of product approval, list of documentation to be considered, preparation of test samples, construction of the test stand/test furnace, assembly of test samples on the test stand, recording of parameters during testing, evaluation of results and scope of entries in test reports.

1.1.4 This *Publication* should be used by testing laboratories when testing and assessing products for which is required to be fire tested in accordance with *FTP Code*.

1.1.5 In the case of application of type approval procedures by PRS as an organisation recognised by the Administration, the comments in this *Publication* concerning the acceptance of a given solution/ assessment of the test result related to the Administration, should be considered as satisfactory to the PRS Surveyor supervising the tests.

1.2 Scope of application

1.2.1 The following structures/materials/equipment elements (generally "products") intended for use on ships are subject to fire tests in order to issue a type approval certificate for the product:

.1 Non-combustible materials;
.2 Structures of vertical divisions of "A", "B" and "C" class;
.3 Structures of "A" and "B" class decks;
.4 Continuous "B" class divisions;
.5 "B" class ceilings;
.6 Continuous "B" class ceilings;
.7 "A" and "B" class fire doors;
.8 Fire door control systems components;
.9 "A" and "B" class fire proof windows and side scuttles;
.10 Thermal and acoustic insulation materials;
.11 Partial divisions;
.12 Ventilation flaps;
.13 Penetrations through "A" class divisions: penetrations for electric cables, pipes, ventilation ducts, trunks, etc., bus duct systems;
.14 Penetrations through "B" class divisions: penetrations for electric cables, pipes, ventilation ducts, etc.;
.15 Ventilation ducts;
.16 Adhesives (for vertical bulkheads, decks, doors and other bulkheads;
.17 Exterior painted surfaces;
.18 Materials characterized by resistance to the generation of smoke and toxic gases;

.19 Surface materials and deck coverings with slow flame spread properties: decorative veneers, paint kits, floor coverings, pipe insulation coatings, adhesives used in "A", "B" and "C" class divisions, flammable duct membranes;
.20 Primary deck coverings;
.21 Curtains, drapes and other suspended textile materials and films;
.22 Upholstered furniture: complete furniture (including covering material, filling material and non-flammable frame), covering material for any filling material, covering material for flame retardant filling material (tested in a specific combination according to the intended use), flame retardant filling material;
.23 Bedding components.

1.2.2 The following structures/ materials/ equipment elements of the rooms, intended for use on high-speed crafts, are subject to fire tests for the purpose of issuing a type approval certificate:
.1 Non-combustible materials;
.2 Structures of fire-resistant divisions;
.3 Fire doors;
.4 Fire doors control systems items;
.5 Materials restricting passage of fire (except furniture);
.6 Materials restricting passage of fire for furniture;
.7 Primary deck coverings;
.8 Surface materials and floor coverings with low flame-spread characteristics: decorative veneers, paint systems, floor coverings, as well as pipe insulation covers, adhesives used in fire-resisting divisions, combustible ducts membrane;
.9 Draperies, curtains and other suspended textiles and films;
.10 Upholstered furniture: complete piece of furniture (including cover material, filling material and non- combustible rack), cover material for any filling material, cover material for flame-retardant filling material (tested in specific combination as intended for further application), flame-retardant filling material;
.11 Bedding components;
.12 Fire (ventilation) dampers;
.13 Penetrations through fire-resisting divisions of: electric cables, pipelines, ventilation ducts, trunks, etc.;.
.14 Materials other than steel for pipes conveying oil or fuel oil: plastic pipes and fittings, valves, flexible pipe assemblies and compensators, metallic pipe components with resilient elastomeric seals.

1.2.3 The list of required tests for individual structures/ materials/ equipment elements of the spaces, in relation to the requirements of the *SOLAS Convention* - for ships and the *HSC Code* - for high-speed craft, is given in the tables in Annex 3 of this *Publication*.

1.2.4 Examples of the use of structures/ materials/ equipment elements of the spaces in the ship's spaces are given in Annex 4 of this *Publication*.

1.3 Definitions

.1 ***Administratio***n means the Government of the State whose flag the ship is entitled to fly.

.2 ***Approval expiry date*** means the last date on which the subsequent approval is valid as proof of meeting the fire safety requirements of the Convention.

.3 ***Competent authority*** means an organization authorized by the Administration to perform functions required by this *Publication* (FTP Code).

.4 ***Convention*** means the International Convention for the Safety of Life at Sea, SOLAS, 1974, as amended.

.5 ***Fire Test Procedures Code*** means the International Code for Application of Fire Test Procedures as defined in chapter II-2 of the 1974 SOLAS Convention, as amended.

.6 ***High-Speed Craft Code 2000 (2000 HSC Code)*** means the International Code of Safety for High-Speed Craft adopted by the Maritime Safety Committee of IMO by resolution MSC.97(73), as amended.

.7 ***Laboratory recognized by the Administration*** means a testing laboratory which is acceptable to the Administration concerned. Other testing laboratories may be recognized on a case-by-case basis for specific approvals as agreed upon by the Administration concerned.

.8 ***Standard fire test*** means a test in which specimens are exposed in a test furnace to temperatures corresponding approximately to the standard time-temperature curve.

.9 ***Sustained flaming*** means a presence of flames on or over any part of a specimen lasting 5 s or longer.

.10 ***Test expiry date*** means the last date on which the given test procedure may be used to test and subsequently approve any product under the Convention.

.11 ***The standard time-temperature curve*** means the time-temperature curve defined by the formula:

$$T = 345 \log10(8t + 1) + 20$$

where:
T is the average furnace temperature (°C)
t is the time (min).

1.4 Testing

1.4.1 Fire test procedures

1.4.1.1 Annex 1 of this *Publication* presents the required test procedures which shall be used in testing products as a basis for approval (including renewal of approval).

1.4.1.2 The test procedures identify the test methods and the acceptance and classification criteria.

1.4.2 Testing laboratories

1.4.2.1 The tests shall be carried out in testing laboratories recognized by the Administrations concerned. *

* *Refer to the list of testing laboratories recognized by the Administrations - see IMO SSE.1/Circ.3/Rev.2, as amended.*

1.4.2.2 When recognizing a laboratory, the Administration shall consider the following criteria:

.1 that the laboratory is engaged, as a regular part of its business, in performing inspections and tests that are the same as, or similar to, the tests as described in the applicable part of *Publication*;

.2 that the laboratory has access to the apparatus, facilities, personnel, and calibrated instruments necessary to perform these tests and inspections; and

.3 that the laboratory is not owned or controlled by a manufacturer, vendor or supplier of the product being tested.

1.4.2.3 The testing laboratory shall use a quality control system audited by the competent authority based on standard ISO/IEC 17025.

1.4.2.4 The testing laboratory applying for PRS recognition should meet the applicable requirements specified in *Publication 56/P – Procedural Requirements for Laboratories*.

1.4.3 Test reports

1.4.3.1 In general, the test reports shall be in accordance with standard ISO/IEC 17025.

1.4.3.2 The fire test procedures in annex 1 state the required contents of the test reports.

1.4.3.3 In general, a test report is the property of the sponsor of the test.

1.5 Approval

1.5.1 General

1.5.1.1 The Administration shall approve products in accordance with their established approval procedures by using the type approval procedure (see paragraph 1.5.2) or the case-by-case approval (see paragraph 1,5.3).

1.5.1.2 The Administration may authorize competent authorities to issue approvals on their behalf.

1.5.1.3 An applicant who seeks approval shall have the legal right to use the test reports on which the application is based (see paragraph 1.4.3.3).

1.5.1.4 The Administration may require that the approved products are provided with special approval markings.

1.5.1.5 The approval shall be valid when the product is installed on board a ship. If a product is approved when manufactured, but the approval expires before the product is installed on the ship, the product may be installed as approved material, provided that the criteria have not changed since the expiry date of the approval certificate.

1.5.1.6 The application for approval shall be sought from the Administration or competent authority. The application shall contain at least the following:

.1 the name and address of the applicant and of the manufacturer;
.2 the name or trade name of the product;
.3 the specific qualities for which approval is sought;
.4 drawings or descriptions of the assembly and materials of the product as well as instructions, where applicable, for its installation and use;
.5 a report on the fire test(s); and
.6 for cases where an unsuccessful test had been conducted prior to the final approval test, a description of the modifications made to the test specimen that resulted in the successful test.

1.5.1.7 Any significant alteration to a product shall make the relevant approval cease to be valid. To obtain a new approval, the product shall be retested.

1.5.2 Type approval

1.5.2.1 Type approval certificates shall not be issued on the basis of test reports which are more than 5 years old when submitted to the Administration. If the approval depends on several test reports with different dates, the date of the oldest report governs. However, the Administration may renew a type approval of a product without retesting provided that the test report is not more than 15 years old and that no alteration of components or construction has been made to the product.

1.5.2.2 The Administration shall require that the manufacturers have a quality control system audited by a competent authority to ensure continuous compliance with the type approval conditions. Alternatively, the Administration may use final product verification procedures where the compliance with the type approval certificate is verified by a competent authority before the product is installed on board ships.

1.5.2.3 The type approval certificates shall be valid for no more than 5 years from the date of issue.

1.5.2.4 Type approval certificates shall include at least the following:

.1 identification (name or trade name and description) of the product;
.2 type approval certificates for surface materials shall state what substrate was applied for the test. The restriction of the base materials, which products would be applied on, shall be considered (see annex 1, part 5, appendix 4, paragraph 3);
.3 type approval certificates for surface materials shall state the specimen information such as the colour, organic contents and thickness of the products. The restriction of the products shall be considered by that information (see annex 1, part 5, appendix 4, paragraph 3);
.4 type approval certificates for "A", "B" and "F" class divisions shall state the detail information for the thickness and density of the insulation materials, how to fix the materials to the division, and how to insulate to the stiffener in ships. The restriction of the products shall be considered by that information;
.5 type approval certificates for non-combustible materials shall state the organic content;
.6 classification and any restrictions in the use of the product;
.7 name and address of the manufacturer and applicant;
.8 fire test procedure(s) used in test(s);
.9 identification of the test report(s) and applicable statements (including date of issue, possible file number and the name and address of the testing laboratory);
.10 date of issue and possible number of the type approval certificate;
.11 expiration date of the certificate;
.12 name of the issuing body (competent authority) and, if applicable, authorization;
.13 type approval certificates for windows shall state which side of the window was exposed to the heating condition during the test;
.14 the certificate shall include a reference to optional test(s) such as hose stream test and/or thermo radiation test; and
.15 information required in subparagraphs .2 to .5 may be specified in a manual/booklet of the product which shall be clearly referred to in the certificate.

1.5.2.5 In general, the type approved products may be installed for their intended use on board ships flying the flag of the approving Administration.

1.5.3 Case-by-case approval*

1.5.3.1 The case-by-case approval means approval where a product is approved for installation on board a specific ship without using a type approval certificate.

1.5.3.2 The Administration may approve products using the applicable test procedures for specific ship applications without issuing a type approval certificate. The case-by-case approval is only valid for the specific ship.

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* *See interpretations for fire door testing - IACS UI FTP3 Rev.3.*

1.6 Products which may be installed without testing and/or approval

Annex 2 to this *Publication* specifies the groups of products, which (if any) are considered to comply with the specific fire safety regulations of the Convention and which may be installed without testing and/or approval.

1.7 Use of equivalents and modern technology

1.7.1 To allow modern technology and development of products, the Administration may approve products to be installed on board ships based on tests and verifications not specifically mentioned in this *Publication* but considered by the Administration to be equivalent with the applicable fire safety requirements of the Convention.

1.7.2 The Administration shall inform IMO of approvals referenced in paragraph 7.1 in accordance with regulation I/5 of the Convention and follow the documentation procedures as outlined below:

- **.1** in the case of new and unconventional products, a written analysis as to why the existing test method(s) cannot be used to test this specific product;
- **.2** a written analysis showing how the proposed alternative test procedure will prove performance as required by the Convention; and
- **.3** a written analysis comparing the proposed alternative test procedure to the required procedure in the *Publication* (*FTP* Code).

1.8 Period of grace for type approvals issued in accordance with the previous FTP Code

The requirements of *FTP Code* for this section do not apply.

1.9 List of references

The following ISO and IEC standards are referred to in this *Publication*. Wherever a reference is made to ISO or IEC standards, the year of publication shall be understood as specified below:

- **.1** ISO 834-1: 1999, Fire resistance tests – Elements of building construction – Part 1: General requirements;
- **.2** ISO 1182: 2010, Reaction to fire tests for building and transport products – Non-combustibility test;
- **.3** ISO 1716: 2010, Reaction to fire tests for building products – Determination of the heat of combustion;
- **.4** ISO 5658-2: 2006, Reaction to fire tests – Spread of Flame – Part 2: Lateral spread on building and transport products in vertical configuration;
- **.5** ISO 5659-2: 2006, Plastics, Smoke generation – Part 2: Determination of optical density by a single chamber test;
- **.6** ISO 5660-1: 2002, Reaction-to-fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method);

.7 ISO 5660-2: 2002, Reaction-to-fire tests – Heat release, smoke production and mass loss rate – Part 2: Smoke production rate (dynamic measurement);
.8 ISO 9705: 1993, Fire tests – Full-scale room test for surface products;
.9 ISO 13943: 2008, Fire safety – Vocabulary;
.10 ISO 14934-3: 2006, Fire tests – Calibration and use of heat flux meters – Part 3: Secondary calibration method;
.11 ISO/IEC 17025: 2005, General requirements for the competence of testing and calibration laboratories;
.12 ISO 19702: 2006, Toxicity testing of fire effluents – Guidance for analysis of gases and vapours in fire effluents using FTIR gas analysis;
.13 ISO 291: 2005; Plastics – Standard atmosphere for conditioning and testing;
.14 ISO 554: 1976; Standard atmosphere for conditioning and/or testing – Specifications;
.15 ISO 14697: 2007; Reaction to fire test – Guidance on the choice of substrates for building and transport products; and
.16 IEC 60584-1: 1995, Thermocouples – Part 1: reference tables.

ANNEXES

The Annexes to this *Publication* reflect the layout and numbering of the *FTP Code*.

ANNEX 1
FIRE TEST PROCEDURES

PREAMBLE

1 This annex contains the fire test procedures which shall be used for verifying that the products comply with the applicable requirements. For other test procedures, the provisions in paragraphs 1.7 and 1.8.2 of this *Publication* shall apply.

2 Reference to the test procedures of this annex shall be made (e.g., in the test report and in the type approval certificate) by referring to the applicable part number or numbers as follows:

Example: Where a primary deck covering has been tested in accordance with parts 2 and 5 of annex 1, the reference shall be "IMO 2010 FTP Code parts 2 and 5".

3 Some products or their components are required to be tested in accordance with more than one test procedure. For this purpose, references to other parts are given in some parts of this annex. Such references are here for information only, and the applicable guidance shall be sought in the relevant requirements of the *Convention*.

4 For products which may be installed without testing and/or approval, refer to annex 2 to this *Publication*.

ANNEX 1 – PART 1
NON-COMBUSTIBILITY TEST

1 APPLICATION

1.1 Where a material is required to be non-combustible, it shall be determined in accordance with this part.

1.2 If a material passes the test as specified in paragraph 3, it shall be considered as "non-combustible" even if it consists of a mixture of inorganic and organic substances.

2 FIRE TEST PROCEDURES

The non-combustibility shall be verified in accordance with the test procedure in the appendix to this part (ISO 1182). However, the test exposure need not exceed 30 min duration.

3 ACCEPTANCE CRITERIA OF NON-COMBUSTIBILITY

Materials to be classified as non-combustible shall satisfy the following criteria:

- **.1** the average furnace thermocouple temperature rise as calculated in paragraphs 8.4 and 8.5 of the appendix does not exceed 30°C;
- **.2** the average specimen surface thermocouple temperature rise as calculated in paragraphs 8.4 and 8.5 of the appendix does not exceed 30°C;
- **.3** the average duration of sustained flaming as calculated in paragraph 8.3 of the appendix does not exceed 10 s; and
- **.4** the average mass loss as calculated in paragraph 8.2 of the appendix does not exceed 50%.

4 TEST REPORT

The test report shall include the information in paragraph 9 of the appendix and classification of the material according to the test criteria specified in paragraph 3 above.

5 REFERENCE DOCUMENT

ISO 1182, Reaction to fire tests for building and transport products - Non-combustibility test.

ANNEX 1 – PART 1 – APPENDIX
FIRE TEST PROCEDURES FOR NON-COMBUSTIBILITY TEST

INTRODUCTION

This fire test is for identification of products which produce only a very limited amount of heat and flame when exposed to temperatures of approximately 750°C.

SAFETY WARNING

The attention of all persons concerned with managing and carrying out this test is drawn to the fact that fire testing may be hazardous and that there is a possibility that toxic and/or harmful smoke and gases may be evolved during the test. Operational hazards may also arise during the testing of specimens and the disposal of test residues.

An assessment of all potential hazards and risks to health shall be made and safety precautions shall be identified and provided. Written safety instructions shall be issued. Appropriate training shall be given to relevant personnel. Laboratory personnel shall ensure that they follow written safety instructions at all times.

1 SCOPE

1.1 This appendix specifies test procedures for determining the non-combustibility.

1.2 Information on the precision of the test method is given in annex A of standard ISO 1182.

2 NORMATIVE REFERENCES

The following normative documents contain provisions which constitute provisions of this appendix.

.1 ISO 1182, Reaction to fire tests for building and transport products – Non-combustibility test; and

.2 ISO 13943, Fire safety – Vocabulary.

3 TERMS AND DEFINITIONS

For the purpose of this appendix, the terms and definitions given in Fire safety – Vocabulary (ISO 13943), together with the following, apply:

3.1 ***Homogeneous product*** is a product, consisting of a single material, having uniform density and composition throughout the product.

3.2 ***Loose fill material*** is a material without any physical shape.

3.3 ***Material*** is a single basic substance or uniformly dispersed mixture of substances, e.g., metal, stone, timber, concrete, mineral wool with uniformly dispersed binder, polymers.

3.4 ***Non-homogeneous product*** is a product that does not satisfy the requirements of a homogeneous product. It is a product composed of more than one component, substantial and/or non-substantial.

3.5 ***Product*** is material, element or component about which information is required.

3.6 ***Sustained flaming*** shall be taken as the persistence of flames on or over any part of the visible part of the specimen lasting 5 s or longer.

3.7 Moisture content

3.7.1 The specimen for determining the moisture content and organic contents shall not be used for the non-combustibility test.

3.7.2 The moisture content (W_1-W_2) of each specimen shall be calculated using the following method, and indicate a percentage of the dry weight (W2), and which information is required.

3.7.3 In the following, W_1, W_2 and W_3 are mean values of three weight measurements. W_1 shall be higher than 25 g. Three specimens of each material, taken in the width of the production's direction and measuring width x minimum 20 mm x thickness of the material, shall be weighed (initial conditioned weight W_1) and then heated in a ventilated oven at a temperature of 105 ± 2°C for 24 h and reweighed when cooled (W_2). However, gypsum-based, cementations and similar materials shall be dried at a temperature of 55 ± 5°C to constant weight (W_2).

3.7.4 The moisture content (W_1-W_2) of each specimen shall be calculated as a percentage of the dry weight (W_2).

3.8 Organic content

3.8.1 The information of organic content is required. After the percentage moisture contents have been calculated as specified above, the three specimens shall be further heated in an oven at a temperature of 500 ± 20°C for 2 h and again weighed (W_3). The organic content (W_2-W_3) shall be calculated as a percentage of the dry weight (W_2).

3.8.2 The organic content of each material used in the test specimen shall be within ± 0.3% absolute of the value stated as the nominal organic content.

Note:A bigger tolerance can be accepted as long as the tested specimen represents the upper limit of the tolerance. In this case, it shall be specified in the test report and in the type approval certificate.

4 TEST APPARATUS

The test apparatus including thermocouples, specimen holders and other necessary peripherals shall be in accordance with *Reaction to fire tests for building and transport products – Non-combustibility test* (ISO 1182). Calibration of the test apparatus shall be conducted in accordance with the ISO standard.

5 TEST SPECIMEN

5.1 General

5.1.1 The test specimen shall be taken from a sample which is sufficiently large to be representative of the product.

5.1.2 The test specimens shall be cylindrical and each shall have a diameter of 43 mm to 45 mm and a height of 50 ± 3 mm.

5.2 Preparation

5.2.1 If the thickness of the material is different from 50 ± 3 mm, specimens of the height of 50 ± 3 mm shall be made by using a sufficient number of layers of the material and/or by adjustment of the material thickness.

5.2.2 For non-homogeneous materials, the specimen of height of 50 ± 3 mm shall be constructed such that all layers are represented in the specimen in proportion to their presence, by volume, in the original specimen.

5.2.3 The layers shall occupy a horizontal position in the specimen holder and shall be held together firmly, without significant compression, by means of two fine steel wires, of maximum diameter 0.5 mm, to prevent air gaps between layers. The specimens of loose fill materials shall be representative in appearance, density, etc., as in use.

Note: When a specimen is composed of a number of layers, the overall density should be as close as possible to that of the product provided by the manufacturer.

5.3 Number

For homogeneous products, five specimens shall be made. For non-homogeneous products, 10 specimens shall be made.

6 CONDITIONING

The test specimens shall be dried in a ventilated oven maintained at 60 ± 5°C, for between 20 h and 24 h, and cooled to ambient temperature in a desiccator prior to testing. The mass of each specimen shall be determined to an accuracy of 0.01 g prior to test.

7 TEST PROCEDURE

7.1 Test environment

The apparatus shall not be exposed to draughts or any form of strong direct sunlight or artificial illumination which would adversely affect the observation of flaming inside the furnace. The room temperature shall not change by more than 5°C during a test.

7.2 Setting up procedure

7.2.1 Specimen holder

Remove the specimen holder and its support from the furnace.

7.2.2 Thermocouple

7.2.2.1 Furnace thermocouple

The furnace thermocouple shall be located with its hot junction 10 ± 0.5 mm from the furnace tube wall and at a height corresponding to the geometric centre of the furnace tube.

7.2.2.2 Specimen surface thermocouple

The specimen surface thermocouple shall be positioned so that its hot junction is in contact with the specimen at mid-height of the specimen at the start of the test and shall be located diametrically opposite the furnace thermocouple.

7.2.3 Electricity supply

Connect the heating element of the furnace either to the voltage stabilizer, variable transformer and the electrical input monitor or the power controller. Automatic thermostatic control of the furnace shall not be used during testing.

Note 1: The heating element should normally draw a current of between 9 A and 10 A at approximately 100 V under steady state conditions. In order not to overload the winding, it is recommended that the maximum current does not exceed 11 A.

Note 2: A new furnace tube should be subjected to slow heating initially. A suitable procedure has been found to be to increase the furnace temperature in steps of approximately 200°C, allowing 2 h heating at each temperature.

7.2.4 Furnace stabilization

Adjust the power input to the furnace so that the average furnace temperature, as indicated by the furnace thermocouple, is stabilized for at least 10 min at 750 ± 5°C. The drift (linear regression) shall not be more than 2°C during these 10 min and there shall be a maximum deviation from the average temperature of not more than 10°C in 10 min.

Note: An example of furnace temperature stabilization is given in annex D of standard ISO 1182.

7.3 Standard test procedure

7.3.1 Stabilize the furnace as described in paragraph 7.2.4. If the recorder used does not allow a real-time calculation, the temperature stabilization shall be checked afterwards. If the conditions specified in paragraph 7.2.4 were not satisfied, the test shall be repeated.

7.3.2 Before starting the test, ascertain that the whole equipment is in good working order, for example, that the stabilizer is clean, the specimen insertion device is working smoothly and the specimen holder exactly occupies the required position in the furnace.

7.3.3 Insert one specimen prepared and conditioned as specified in paragraph 6 into the specimen holder suspended on its support.

7.3.4 Place the specimen holder in the furnace in the position taking not more than 5 s for this operation. The position of the specimen shall be such that the geometric centre of the specimen is located rigidly at the geometric centre of the furnace during the test.

7.3.5 Start observation of flaming before the specimen is lowered into the furnace.

7.3.6 Start the timing device immediately following the insertion of the specimen into the furnace.

7.3.7 Record in intervals not longer than 1 s, throughout the test, the temperature measured by the furnace thermocouple and the specimen surface thermocouple.

7.3.8 Carry out the test for a period of 30 min.

7.3.9 After cooling the specimen to ambient temperature in a desiccator, weigh the specimen. Recover any char, ash or other debris which breaks off the specimen and falls down the tube, either during or following the test, and include this as a part of the unconsumed specimen.

7.3.10 For homogeneous products, test five specimens as described in paragraphs 7.3.1 to 7.3.9.

7.3.11 For non-homogeneous products, test five specimens oriented with one surface on the top of the test specimen as described in paragraphs 7.3.1 to 7.3.9. Repeat with the remaining five specimens oriented with that surface on the bottom.

7.4 Observations during test

7.4.1 Record the mass, in g, before and after the test for each specimen tested according to paragraph 7.3, and note any observations relating to the behaviour of the specimen during the test including during insertion into the apparatus.

7.4.2 Note the occurrence of any sustained flaming and record the duration of such flaming in seconds.

Note: Some specimens exhibit only a steady blue-coloured luminous gas zone; this shall not be considered as flaming but be noted under "observations during test" in the test report.

7.4.3 Record the following temperatures, in °C, as measured by the thermocouples:

.1 the initial furnace temperature, Ti(furnace) which is the average temperature over the final 10 min of the stabilization period as defined in paragraph 7.2.4;

.2 the maximum furnace temperature Tm(furnace) and the maximum specimen surface temperature Tm(surface), which are the discrete values at maximum temperature anywhere over the entire test period; and

.3 the final furnace temperature Tf(furnace) and the final specimen surface temperature Tf(surface), which is the average temperature over the final 1 min of the test period as defined in paragraph 7.3.8.

8 EXPRESSION OF RESULTS

8.1 Calculation of averages

8.1.1 For homogeneous products, calculate the averages for paragraphs 8.2 (Mass loss) to 8.5 (Average temperature rise) for the five specimens.

8.1.2 For non-homogeneous products, calculate the averages for paragraphs 8.2 (Mass loss) to 8.5 (Average temperature rise) for each set of five specimens in the same orientation. The results for each orientation shall be presented separately, but they shall not be combined. Classification shall be based on the most onerous orientation such that all the averages for each set of five specimens shall meet the requirements in paragraph 3 of part 1.

8.2 Mass loss

8.2.1 Calculate and record the mass loss in percentage for each of the five specimens, expressed as a percentage of the initial mass of the specimen, measured as specified in paragraph 7.4.1.

8.2.2 Calculate the average mass loss in percentage, which is the average of mass loss of the five specimens.

8.3 Flaming

8.3.1 Calculate and record the total duration of sustained flaming, in seconds, for each of the five specimens measured as specified in paragraph 7.4.2.

8.3.2 Calculate the average duration of sustained flaming, which is the average of total duration of sustained flaming of the five specimens.

8.4 Temperature rise

Calculate and record the following temperature rise in °C for each of the five specimens recorded by the thermocouples as specified in paragraph 7.4.3:

.1 furnace temperature rise: *Tr* (furnace) = *Tm* (furnace) – *Tf* (furnace); and
.2 specimen surface temperature rise: *Tr* (surface) = *Tm* (surface) – *Tf* (surface).

8.5 Average temperature rise

Calculate the average furnace temperature rise Tave r(furnace) and the average specimen surface temperature rise Tave r(surface) from the values obtained by paragraph 8.4.

9 TEST REPORT

The test report shall include the following information as a minimum. A clear distinction shall be made between the data provided by the sponsor and data determined by the test:

.1 reference that the test was carried out in accordance with part 1 of the 2010 FTP Code (see also subparagraph .2);
.2 any deviations from the test method;
.3 name and address of the testing laboratory;
.4 date and identification number of the report;
.5 name and address of the sponsor;
.6 name and address of the manufacturer/supplier, if known;
.7 name and/or identification of the product tested;
.8 description of the sampling procedure, where relevant;
.9 description of the product tested including density, mass per unit area and thickness, together with details of the construction, moisture content and organic content of the product;
.10 description of the specimen including dimensions, orientations and construction;
.11 date of sample arrival;
.12 details of specimen conditioning;
.13 date of test;
.14 test results expressed in accordance with paragraph 8;
.15 observations made during the test;
.16 classification of the material; and
.17 the statement:

"The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use."

ANNEX 1 – PART 2
SMOKE AND TOXICITY TEST

1 APPLICATION

Where a material is required not to be capable of producing excessive quantities of smoke and toxic products or not to give rise to toxic hazards at elevated temperatures, the material shall comply with this part 2.

2 FIRE TEST PROCEDURES

2.1 General

Smoke generation tests shall be conducted in accordance with *appendix 1*, and the gas measuring method shall be in accordance with *appendix 2* to this part, and additional test procedures as described in this part of this *Publication*. To carry out the tests in accordance with this part, modifications of the arrangements and procedures of the ISO standard 5659-2 shall be made, if necessary for toxic gas measurement.

2.2 Test specimen

Preparation of test specimen shall be in accordance with the practice outlined in appendix 4 to part 5 of this *Publication* (*FTP* Code). If the product has two faces and either face is likely to be exposed to a fire condition when in use, then both faces shall be evaluated.

2.3 Test results

2.3.1 The maximum specific optical density of smoke (Ds max) shall be obtained for each test in accordance with paragraph 9 of *Appendix 1* to this part.

2.3.2 When making toxicity measurements, the sampling of fumes shall be made during the testing of the second and the third specimen at each test condition, from the geometrical centre of the chamber at the time when the maximum specific optical density of smoke is reached. The concentration of each toxic gas shall be determined as parts per million (ppm) in the chamber volume.

2.4 Classification criteria

2.4.1 Smoke

An average (Dm) of the maximum specific optical density of smoke (Ds max) of three tests at each test condition in paragraph 8.8.1 of appendix 1 shall be calculated:

.1 for materials used as surface of bulkheads, linings or ceilings, the Dm shall not exceed 200 in any test condition;

.2 for materials used as primary deck coverings, the Dm shall not exceed 400 in any test condition;

.3 for materials used as floor coverings, the Dm shall not exceed 500 in any test condition; and

.4 for plastic pipes, the Dm shall not exceed 400 in any test condition.

2.4.2 Toxicity

The average value of the maximum value of the gas concentration measured at each test condition of paragraph 8.8.1 of *Appendix 1* shall not exceed the following limits:

CO	1,450 ppm	HBr	600 ppm
H*Cl*	600 ppm	HCN	140 ppm
HF	600 ppm	SO_2	120 ppm (200 ppm for floor coverings)
NOx	350 ppm		

3 ADDITIONAL REQUIREMENTS

Part 5 of this annex is also applicable to paints, floor coverings, primary deck coverings, varnishes and other finishes used on exposed interior surfaces.

4 TEST REPORT

The test report shall include the following information as a minimum. A clear distinction shall be made between the data provided by the sponsor and data determined by the test.

- **.1** reference that the test was carried out in accordance with part 2 of the 2010 FTP Code (see also subparagraph .2);
- **.2** any deviations from the test method;
- **.3** name and address of the testing laboratory;
- **.4** date and identification number of the report;
- **.5** name and address of the sponsor;
- **.6** name and address of the manufacturer/supplier, if known;
- **.7** type of the material, i.e. surface finish, floor covering, primary deck covering, pipes, etc.;
- **.8** name and/or identification of the product tested;
- **.9** description of the sampling procedure, where relevant;
- **.10** description of the product tested including density and/or mass per unit area, thickness and dimensions, colour, quantity and number of any coating, together with details of the construction of the product;
- **.11** description of the specimen including density and/or mass per unit area, thickness and dimensions, colour, quantity and number of any coating, orientations tested and face subject to the test, and construction;
- **.12** date of sample arrival;
- **.13** details of specimen conditioning;
- **.14** date of test;
- **.15** test conditions (see appendix 1, paragraph 8.8);
- **.16** test results:
  - **.1** for the smoke test:
    - **.1** Ds max for each test (paragraph 9 of the appendix 1);
    - **.2** Dm for each test conditions (paragraph 2.4.1 above); and
    - **.3** Dc for each test (paragraph 9.2 of appendix 1); and
  - **.2** for the toxicity tests, the values listed in paragraph 10 of appendix 2;
- **.17** observations made during the test; and
- **.18** classification of the material.

5 REFERENCE DOCUMENTS *

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* Method of measurement of gases using Fourier transform infrared spectroscopy (FTIR) in cumulative smoke test is being developed by ISO/TC92/SC1.

ISO 5659-2, Plastics - Smoke generation, Part 2: Determination of optical density by a single chamber test.

ISO 13943, Fire safety - Vocabulary.

ISO 19702, Toxicity testing of fire effluents - Guidance for analysis of gases and vapours in fire effluents using FTIR gas analysis.

ANNEX 1 – PART 2 – APPENDIX 1
FIRE TEST PROCEDURES FOR SMOKE GENERATION

See *FTP Code.*

ANNEX 1 – PART 2 – APPENDIX 2
FIRE TEST PROCEDURES FOR TOXIC GAS GENERATION

See *FTP Code.*

ANNEX 1 – PART 3
TEST FOR "A", "B" AND "F" CLASS DIVISIONS

1 APPLICATION

Where products (such as decks, bulkheads, doors, ceilings, linings, windows, fire dampers, pipe penetrations and cable transits) are required to be "A" or "B" or "F" class divisions *, they shall comply with this part**.

* As defined in the International Convention for the Safety of Life at Sea (SOLAS), 1974, chapter II-2, part A, and the Torremolinos Protocol of 1993 relating to the Torremolinos International Convention for the Safety of Fishing Vessels, 1977, chapter V. "F" class divisions are defined only in the latter Convention.

** *Products tested for use in buildings have similar classification markings. However, they do not correspond to the classes in marine use. (IACS UI FTP/Rev.3)*

2 FIRE TEST PROCEDURES

The products shall be tested and evaluated in accordance with the fire test procedures specified in appendices 1 and 2 to this part. Appendix 2 contains test procedures for windows, fire dampers and pipe and duct penetrations in its appendices.

3 PERFORMANCE CRITERIA

3.1 Insulation

3.1.1 "A" class divisions, including "A" class doors

The average unexposed-face temperature rise as determined in accordance with paragraph 8.4.1 of appendix 1 shall not be more than l40°C, and the temperature rise recorded by any of the individual unexposed-face thermocouples shall not be more than l80°C during the periods given below for each classification:
class "A-60"60 min
class "A-30" 30 min
class "A-15"15 min
class "A-0"0 min.

3.1.2 "B" and "F" class divisions, including "B" and "F" class doors

The average unexposed-face temperature rise as determined in accordance with paragraph 8.4.1 of appendix 1 shall not be more than 140°C, and the temperature rise recorded by any of the individual unexposed-face thermocouples shall not be more than 225°C during the periods given below for each classification:
class "B-15"15 min
class "B-0"0 min
class "F-15" 15 min
class "F-0"0 min.

3.2 Integrity

For all "A", "B" and "F" class divisions, including "A", "B" and "F" class doors, the following requirements shall be satisfied for the minimum test duration relevant to the classification (see paragraph 8.5 of appendix 1):

.1 flaming: there shall be no flaming on the unexposed face;

.2 cotton-wool pad: there shall be no ignition, i.e. flaming or glowing, of the cotton-wool pad when applied in accordance with paragraph 8.4.3 of appendix 1 or when used to assist evaluation of flaming (see paragraph 8.4.2 of appendix 1); and

.3 gap gauges: it shall not be possible to enter the gap gauges into any opening in the specimen in the manner described in paragraph 8.4.4 of appendix 1.

"A", "B" and "F" class doors are not required to be able to be opened or closed, during or after the specified test duration.

3.3 Structural core temperature

In the case of load-bearing divisions of aluminium alloy, the average temperature of the structural core obtained by the thermocouples described in paragraph 7.7 of appendix 1 shall not rise more than 200°C above its initial temperature at any time during the minimum test duration relevant to the classification (see paragraph 8.5 of appendix 1). Where the structural core is of a material other than steel or aluminium alloy the Administration shall decide the rise in temperature which shall not be exceeded during the test duration.

3.4 Continuous "B" class ceilings and linings

Where ceilings or linings are required to be continuous "B" class ceilings or linings, they may be tested and evaluated in accordance with appendix 4 to this part.

3.5 Additional requirements

3.5.1 The specimen of the "A" and "B" class constructions shall be constructed from non-combustible materials. The following exceptions are permissible:

.1 adhesives and vapour barriers used in the construction of the specimen are not required to be non-combustible; however, they shall have low flame-spread characteristics;

.2 sealing materials used in penetration systems;

.3 seals for gas-, water- and weather-tight doors;

.4 seals for windows; and

.5 filling material within glazing systems.

Adhesives and sealing materials used in testing of penetration systems shall be used in the actual structure. Materials mentioned in paragraphs 3.5.1.3 to 3.5.1.5 may be installed in constructions of the specimen. Such inclusions shall be stated in the test report. The material used in the test shall not be replaced by any other materials that have not been tested in accordance with this *Publication* (*FTP* Code) and/or accepted by the Administration.

3.5.2 Thermal radiation through windows

3.5.2.1 Where thermal radiation through windows is required to be limited by an Administration, the window assembly may be tested and evaluated in accordance with appendix 3 to this part.

3.5.2.2 The cotton-wool pad need not be used on the unexposed face after the period relevant to the insulation classification of the product.

4 OTHER REFERENCES

4.1 The non-combustibility of materials used in "A" and "B" class divisions shall be verified in accordance with part 1.

4.2 Where combustible veneers are allowed to be provided in "A" and "B" class divisions, the low flame-spread characteristics of such veneers, if required, shall be verified in accordance with part 5.

4.3 If an aluminium deck is tested with insulation installed below the deck, then the result will apply to decks which are bare on the top. Aluminium decks shall not be provided with deck coverings or insulation on the top unless tested with the deck covering or insulation included, to verify that the 200°C temperature of the aluminium is not exceeded.

5 TEST REPORT

The test report shall include the information contained in paragraph 9 of appendix 1.

6 REFERENCE DOCUMENTS

ISO834-1 - Fire-resistance tests – Elements of building construction - Part 1: General requirements.
IEC 60584-1 – Thermocouples – Part 1 Reference tables.

ANNEX 1 – PART 3 – APPENDIX 1
FIRE RESISTANCE TEST PROCEDURES FOR "A", "B" AND "F" CLASS DIVISIONS

1 GENERAL

1.1 Approval of constructions will be restricted to the orientation in which they have been tested; therefore, bulkheads, linings and doors shall be tested vertically mounted and decks and ceilings shall be tested horizontally mounted. It is only necessary to test decks with the underside exposed to the heating conditions, and "B" and "F" class ceilings and linings are required only to be tested from the side incorporating the ceiling or the lining.

1.2 For "A" class bulkheads and doors for "general application", i.e. for use of the insulation material on either side of the structural core, and also for "B" class bulkheads and doors, approval usually requires that the construction has been tested from each side separately, using two separate specimens, unless the Administration considers that only a single test to one side, that being the side expected to provide a performance inferior to the other side, is appropriate.

1.3 In tests for "A" class bulkheads for "general application" it may be possible for approval to be granted on the basis of a single test only, provided that the bulkhead has been tested in the most onerous manner, which is considered to be with the insulation on the unexposed face and the stiffeners also on that side.

1.4 In tests for "A" class bulkheads for "restricted application", i.e. where the fire hazard has been identified as being from the insulated side only, the bulkhead can be tested with the insulation on the exposed face and with the stiffeners also on that side.

1.5 If approval of an "A" class bulkhead is being sought involving the use of "double-sided application" of the insulation, the thickness of the insulation being equal on both sides of the structural core, it shall be tested with the stiffeners on the unexposed side of the bulkhead, otherwise it shall be tested with the side with the thinnest thickness of insulation on the exposed face.

1.6 The thickness of insulation on the stiffeners need not be same as that of the steel plate.

1.7 If insulation of an "A" class division is to be provided by membrane protection, i.e. by a "B" class ceiling to a structural steel core or a "B" class lining to a structural steel core, the distance between the membrane, i.e. the ceiling or the lining, and the structural core shall be the minimum for which approval is being sought. For "A" class bulkheads, the division is required to be tested both from the structural core side, and from the "B" class lining side. For both ceilings and linings which may form part of such deck or bulkhead constructions, they shall satisfy at least "B-0" classification.

1.8 When the insulation of an "A" class division is provided by membrane protection, the stiffeners of the structural core shall be positioned in the cavity between the steel plate of the structural core and the membrane protection. For an "A" class bulkhead the Administration may accept or require the stiffeners to be on the opposite side of the steel plate of the structural core to enable the distance between the membrane protection and the structural core to be reduced to a minimum.

1.9 The dimensions of the structural cores of the test specimens given in paragraph 2 are intended for structural cores of stiffened flat plates of steel or aluminium alloy. The Administration may require tests to be carried out on specimens having structural cores of materials other than steel or aluminium alloy if such materials are more representative of the construction to be used on board ships.

1.10 "A" class divisions which consist of an uninsulated steel bulkhead or deck of suitable scantlings and without openings can be deemed to satisfy the requirements for class "A-0" divisions, i.e. to satisfy the requirements for the passage of smoke and flame, without the need for testing. All other divisions, including class "A-0" divisions with a structural core of aluminium, are required to be tested.

1.11 Results obtained on an insulating material used in conjunction with an "A" class division may be applied to constructions incorporating heavier scantlings than those tested and providing the orientation of the construction is the same, i.e. results from bulkhead tests shall not be applied to decks and vice versa.

1.12 The construction to be tested shall be, as far as possible, representative of that to be used on board ships, including the materials and method of assembly*.

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* *Interpretation:*
To demonstrate that the tested "A" class assemblies are representative of that used on board ships, the following details should, as a minimum, when applicable, be clearly indicated in test reports and included in type approvals:

.1 type, thickness, density and number of layers of insulation material;
.2 size, types, materials and fixing methods of pins and washers;
.3 spacing between pins;
.4 maximum spacing between pins and adjacent joints;
.5 stepping of joints for multi-layers if applicable;
.6 insulation and pinning details on and around stiffeners;
.7 details of wire mesh, aluminium tape, etc., if used in the test;
.8 type approval test report should contain the information required by paragraphs 2.1.3, 2.2.3, 6.1 and 10.4 of resolution A.754(18); and
.9 type approval certificate should refer to drawing numbers of the test sample. (MSC.1/Circ.1435) and (IACS UI FTP5/Corr.1)

1.13 The designs of the specimens proposed in this appendix are considered to reflect the worst case situations in order to provide maximum usefulness of the classifications to end-use applications. However, the Administration may accept or request special test arrangements which provide additional information required for approval, especially of those types of constructions which do not utilize the conventional components of horizontal and vertical divisions, e.g., where cabins may be of a modular type construction involving continuous connections between bulkheads, decks and ceilings*.

---

* *Interpretation:*

1 Arrangement

1.1 "A" class pipe penetrations and cable transits that are:

.1 constructed without structural sleeves of minimum 3 mm thickness and minimum 60 mm length welded or bolted to the division; and/or

.2 constructed with removable, soft or intumescent filling material, are "those types of constructions which do not utilize conventional components of horizontal and vertical divisions" (appendix 1, paragraph 1.13) and are to be subject to additional testing and/or design criteria as described below.

2 Additional testing/design criteria

2.1 Filling materials should be adequately secured by bonded materials or mechanical means that cannot be removed without the use of tools in order to prevent damage by normal ship vibrations and pressures.

2.2 The pipe penetration/cable transit should not have any visible openings. It should not be possible to manually penetrate any part of the penetration with a 6 mm gap gauge, as described in paragraph 7.10 of annex 1 to part 3 of the 2010 FTP Code.

3 Approval

3.1 Penetrations in structural divisions should not impair the structural strength of the division. The structural make-up of the penetration is to be fully described so that its use and the need for additional stiffening for the division can be fully assessed. (MSC.1/Circ.1488) and (IACS UI FTP6/Rev.1)

1.14 Doors, windows and other division penetrations intended to be installed in fire divisions made of material other than steel shall correspond to prototype(s) tested on a division made of such material, unless the Administration is satisfied that the construction, as approved, does not impair the fire resistance of the division regardless of the division construction.

1.15 Constructions shall be tested without paint or other superimposed finish, provided that where they are only produced with a superimposed finish, and subject to the agreement of the Administration, they may be tested as produced. Such constructions may be required to be tested with a superimposed finish if such a finish is considered by the Administration to have a detrimental effect on the performance of the construction in the test.

1.16 "B" class constructions shall be tested without finishes. For constructions where this is not possible, the finishes may be included in the "B" class test specimen, and shall be included in the non-combustibility test of the construction.

2 NATURE OF TEST SPECIMENS

2.1 "A" class bulkheads

2.1.1 Dimensions

2.1.1.1 The minimum overall dimensions of the test specimen, including the perimeter details at the top, bottom and vertical edges, are 2440 mm width and 2500 mm height. When the maximum overall height in practice is less than that given above, then the test specimen shall be of the maximum height to be used in practice.

2.1.1.2 The minimum bulkhead panel height shall be a standard height of the manufactured panel with a dimension of 2400 mm.

2.1.1.3 The overall dimensions of the structural core shall be 20 mm less in both the width and the height than the overall dimensions of the specimen, and the other dimensions of the structural core shall be as follows:

– thickness of plating:	steel	4.5 ± 0.5 mm
	aluminium	6.0 ± 0.5 mm
– stiffeners spaced at 600 mm:	steel	(65 ± 5) x (65 ± 5) x (6 ± 1) mm
	aluminium	(100 ± 5) x (75 ± 5) x (9 ± 1) mm

2.1.1.4 The width of the structural core may be greater than the specified dimensions providing that the additional width is in increments of 600 mm to maintain the stiffener centres and the relationship between the stiffeners and the perimeter detail.

2.1.1.5 Any joints in the plating shall be fully welded, at least from one side.

2.1.1.6 The construction of a structural steel core having the recommended dimensions is shown in figure 1; the thickness of the plating and dimensions of the stiffeners shown are nominal dimensions. Irrespective of the dimensions of the structural core and the material of manufacture, the details around the perimeter shall be as illustrated in figure 3.

2.1.2 Design

2.1.2.1 Where insulation is provided by panels (e.g., a "B" class lining), then the test specimen shall be such that at least one of the panels is of full width and this, or these, shall be positioned such that both its/their longitudinal edges are jointed to an adjacent panel and are not secured to the restraint frame.

2.1.2.2 The overall dimensions of the panel insulation system, including the perimeter details at all the edges, shall be 20 mm greater in each direction than the equivalent dimensions of the structural core.

2.1.2.3 If the insulation system is a lining which may incorporate electrical fittings, e.g., light fittings and/or ventilation units, it is necessary that initially a test is performed on a specimen of the lining itself, without the incorporation of these units, to establish the basic performance. A separate test(s) shall be performed on a specimen(s) with the units incorporated to ascertain their influence on the performance of the lining.

2.1.2.4 Where the insulation consists of blankets, the blankets shall be arranged so that not less than two transverse joints between blankets are included. The joints shall be located not less than 600 mm from the edges of the bulkhead.

2.1.3 Description

2.1.3.1 The applicant shall provide full constructional details of the test specimen in the form of drawings (including a detailed schedule of components) and method of assembly, such that the laboratory is able to confirm agreement between the actual specimen and the drawings and specifications prior to the test. The drawings shall include dimensions and details of the thicknesses of insulation used in way of the plating and the stiffeners, the method of securing the insulation system and details of the components used for this purpose, details of joints, connections, air gaps and all other details.

2.1.3.2 Where insulation is provided by panels, the manufacturer shall provide the information required in paragraphs 2.4.3 (bulkheads), 2.7.3 (linings) or 2.8.3 (ceilings). The distance between the steel bulkhead/deck and the insulating membrane shall be stated.

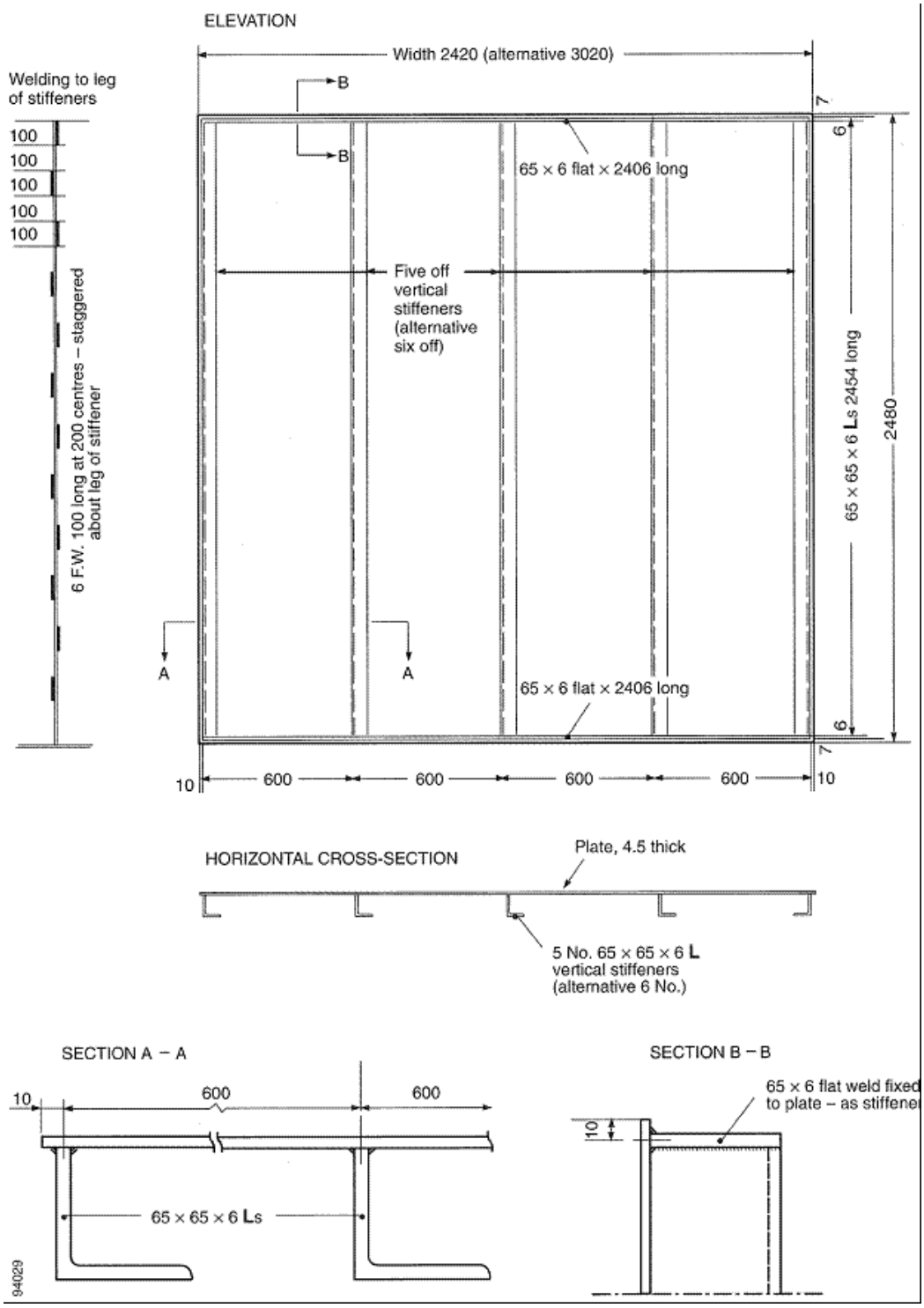

Figure 1 – Structural steel core for "A" class bulkhead and "B" class lining

2.2 "A" class decks

2.2.1 Dimensions

2.2.1.1 The minimum overall dimensions of the test specimen, including the perimeter details at all the edges, are 2440 mm width and 3040 mm length.

2.2.1.2 The overall dimensions of the structural core shall be 20 mm less in both the width and length than the overall dimensions of the specimen, and the other dimensions of the structural core shall be as follows:

– thickness of plating:	steel	4.5 ± 0.5 mm
	aluminium	6.0 ± 0.5 mm
– stiffeners spaced at 600 mm:	steel	(100 ± 5) x (70 ± 5) x (8 ± 1) mm
	aluminium	(150 ± 5) x (100 ± 5) x (9 ± 1) mm

2.2.1.3 The width of the structural core may be greater than the specified dimensions providing that the additional width is in increments of 600 mm to maintain the stiffener centres and the relationship between the stiffeners and the perimeter detail.

2.2.1.4 Any joints in the plating shall be fully welded, at least from one side.

2.2.1.5 The construction of a structural steel core having the recommended dimensions is shown in figure 2; the thickness of the plating and dimensions of the stiffeners shown are nominal dimensions. Irrespective of the dimensions of the structural core and the material of manufacture, the details around the perimeter shall be as illustrated in figure 3.

2.2.2 Design

2.2.2.1 Where insulation is provided by panels (e.g., a "B" class ceiling), then the test specimen shall be designed such that at least one of the panels is of full width and this, or these, shall be positioned such that both its/their longitudinal edges are jointed to an adjacent panel and are not secured to the restraint frame. The overall dimensions of the panel insulation system, including the perimeter details at all the edges, shall be 20 mm greater in each direction than the equivalent dimensions of the structural core.

2.2.2.2 If the ceiling incorporates panels, the specimen shall include examples of both the lateral and longitudinal joints between the panels. If the specimen is to simulate a ceiling where the maximum length of the panels is greater than the length of the specimen, then a joint shall be positioned at a distance of approximately 600 mm from one of the shorter ends of the test specimen.

2.2.2.3 If the insulation system is a ceiling which may incorporate electrical fittings, e.g., light fittings and/or ventilation units, it is necessary that initially a test is performed on a specimen of the ceiling itself, without the incorporation of these units, to establish the basic performance. A separate test(s) shall be performed on a specimen(s) with the units incorporated to ascertain their influence on the performance of the ceiling.

2.2.2.4 Where the insulation consists of blankets, the blankets shall be arranged so that not less than two transverse joints between blankets are included. The joints shall be located not less than 600 mm from the edges of the deck.

2.2.3 Description

2.2.3.1 The applicant shall provide full constructional details of the test specimen in the form of drawings (including a detailed schedule of components) and method of assembly, such that the laboratory is able to confirm agreement between the actual specimen and the drawings and specifications prior to the test. The drawings shall include dimensions and details of the thicknesses of insulation used in way of the plating and the stiffeners, the method of securing the insulation system and details of the components used for this purpose, details of joints, connections, air gaps and all other details.

2.2.3.2 Where insulation is provided by panels, the manufacturer shall provide the information required in paragraph 2.8.3 (ceilings). The distance between the steel deck and the insulating membrane shall be stated.

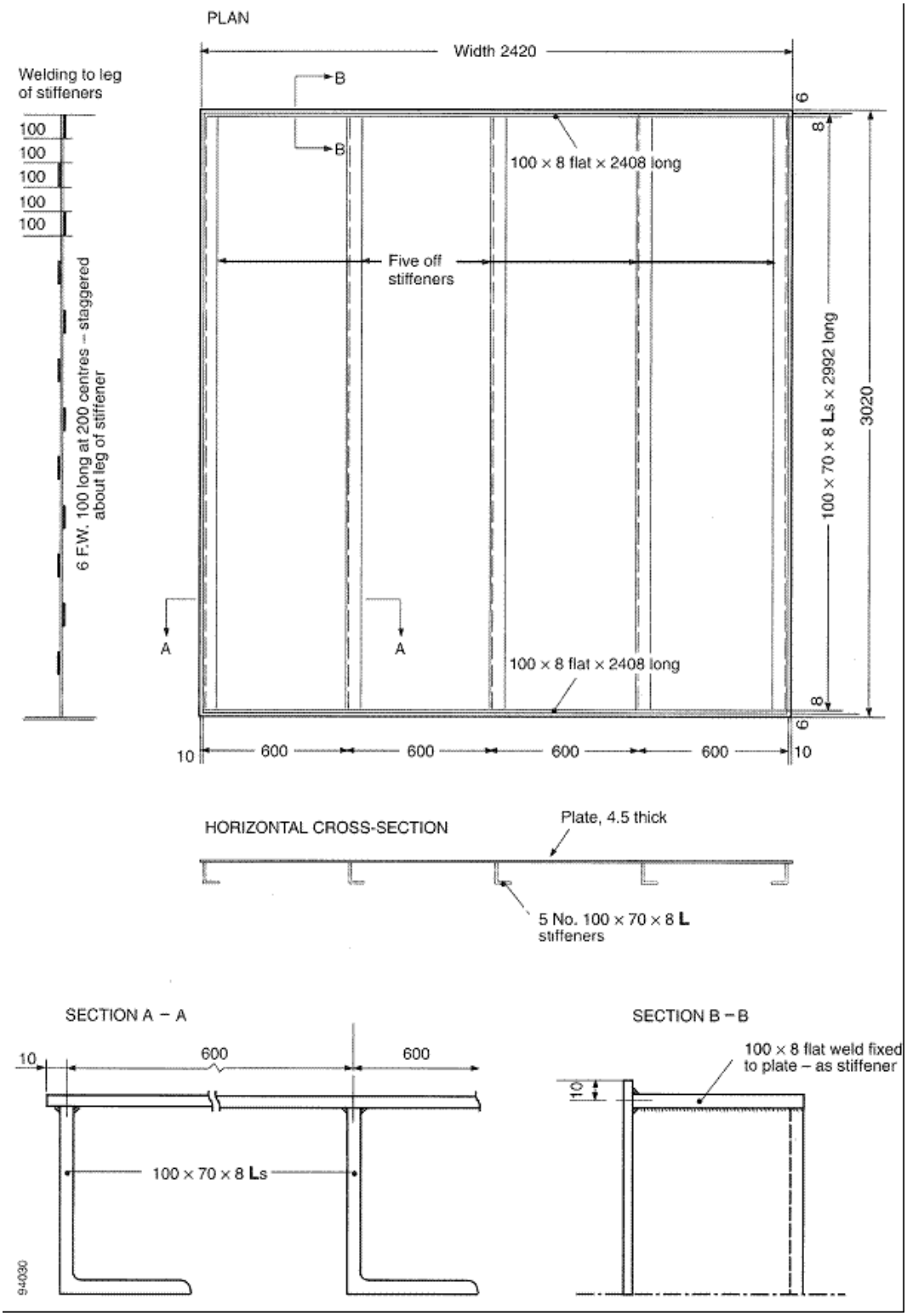

Figure 2 – Structural steel core for "A" class deck and "B" class ceiling

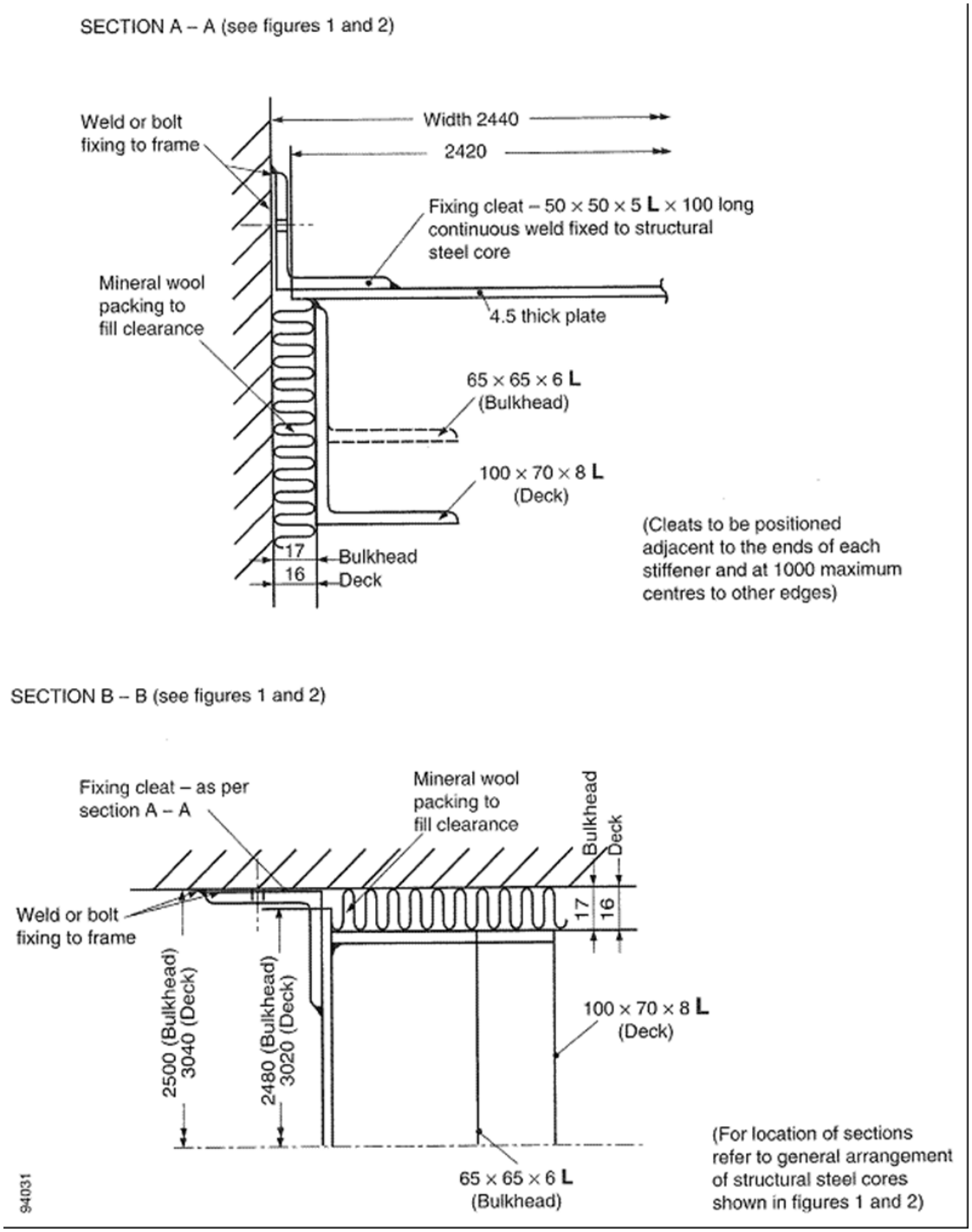

Figure 3 – Connection between restraint frame and structural steel core

2.3 "A" class doors*

2.3.1 Dimensions

The test specimen shall incorporate the maximum size (in terms of both the width and the height) of door leaf or leaves for which approval is to be sought. The maximum size of a door which can be tested will be determined by the requirement to retain certain dimensions of the structural core (see paragraph 2.3.2.4 below).

2.3.2 Design

2.3.2.1 The door leaf and frame shall be constructed of steel or other equivalent material and insulated as necessary to achieve the desired standard of insulation.

2.3.2.2 Door furniture such as hinges, locks, latches, shoot bolts, handles, etc., shall be constructed of materials having melting points of not less than 950°C unless it can be shown by the fire test that materials having melting points below 950°C do not adversely affect the performance of the door.

2.3.2.3 The door leaf and frame shall be mounted into a structural core constructed in accordance with paragraph 2.1.1.

2.3.2.4 An opening to accommodate the door assembly shall be provided in the structural core; the maximum dimensions of the opening will be determined by a requirement to retain a minimum width of the structural core of 300 mm to each vertical side of the opening and a minimum distance of 100 mm from the top edge of the structural core.

2.3.2.5 No additional stiffening shall be provided to the structural core unless provided as part of the door frame.

2.3.2.6 The method of fixing the door frame into the opening in the structural core shall be as used in practice. If the method of fixing the door frame in a test is made by bolts, the Administration may also accept welding as a method of fixing the door frame without further tests.

2.3.2.7 For doors mounted in a three-sided frame, the door shall be mounted with a bottom gap of between 12 mm and 25 mm between the bottom of the door and the test frame.

2.3.2.8 The structural core shall be mounted such that the stiffeners are on the unexposed face and the insulating system shall be on the exposed face.

2.3.2.9 The insulation system shall be approved by the Administration to at least the same standard as that which the door is intended to achieve. If the insulation performance of the door is unknown the structural core shall be insulated to "A-60" standard. The insulation of the structural core shall not be extended beyond the outer web of the door frame.

2.3.2.10 The door shall be mounted into the structural core such that the side expected to give the inferior performance will be exposed to the heating conditions of the test.

2.3.2.11 A hinged door shall be tested with the door leaf opening away from the heating conditions unless the Administration deems otherwise.

2.3.2.12 For sliding doors it is not possible to state generally from which side the door shall be tested to give the inferior performance. It will, therefore, be necessary to conduct two separate tests, one with the door mounted to the exposed face and one with the door mounted to the unexposed face of the bulkhead. If, for practical reasons, a sliding door cannot be fixed to the stiffened face of the structural core, then, subject to the agreement of the Administration, the stiffeners may be positioned on the exposed face.

2.3.2.13 Lift landing doors can be expected to be exposed to fire from the corridor side only, and they shall be exposed to fire test heating conditions from that side only.

2.3.2.14 Tests performed with double leaf doors will not be accepted as approval documentation for single leaf doors.

2.3.2.15 Double leaf doors should be tested with equally sized door leaves unless the door is intended to have unequally sized leaves.

2.3.3 Description

The applicant shall provide full constructional details of the test specimen in the form of drawings (including a detailed schedule of components) and method of assembly, such that the laboratory is able to confirm agreement between the actual specimen and the drawings and specifications prior to the test. The drawings shall include dimensions and details of the following:

.1 the bulkhead;
.2 the door leaf and frame construction, including the clearances between the door leaf and the frame;
.3 the connection of the door frame to the bulkhead;
.4 the method of securing insulation and details of components used for this purpose (e.g., the type and rate of application of any adhesive); and
.5 fittings such as hinges, shoot bolts, latches, locks, etc.

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* *Interpretation:*

1 Methods of evaluation and testing

For doors larger than those which can be accommodated in the standard specimen size (e.g., 2,440 mm wide and 2,500 mm high), as specified in part 3 of the FTP Code,

1. *if such doors can be accommodated into a larger test furnace, it is recommended to conduct a test with the full size specimen of the door; or*
2. *it is recommended to use the following method for evaluation of the fire performance of the door and approval of the door.*

2 Doors of marginally larger dimensions

2.1 A fire door of marginally larger dimensions than a fire-tested fire door may be individually assessed and accepted for a specific project with the same classification, provided all of the following is met:

1. *dimensions (width, height) are not more than 15% above those of the tested door;*
2. *the surface area of the door is not more than 10% above that of the tested door*
3. *the door design does not deviate in any other aspect from the one tested; and*
4. *the tested door has successfully satisfied both insulation and integrity criteria for the following times, as appropriate:*
   "B-0" 0 min insulation 36 min integrity
   "B-15" 18 min insulation 36 min integrity
   "A-0" 0 min insulation 68 min integrity
   "A-15" 18 min insulation 68 min integrity
   "A-30" 36 min insulation 68 min integrity
   "A-60" 68 min insulation 68 min integrity.

2.2 If the door to be approved is larger than stated above and complies with the size requirements stated under section 3 below, the test shall also include additional instrumentation as specified in paragraph 3.4.2 below, or equivalent arrangement.

3 Doors larger than those in section 1 above, but not exceeding 50% in surface area

3.1 An engineering assessment can be used to extrapolate the fire test results of a door having a larger geometry than the tested door.

3.2 Such an assessment shall be used for verification only if the dimensions of the actual door are greater than the maximum permitted by the furnace (considering a furnace with an aperture of 2,440 mm width x 2,500 mm height) and the door involved has already been tested, with such dimensions, with satisfactory results in accordance with section 1 above, and the actual door does not exceed 50% in surface area.

3.3 The methodology used to extrapolate the fire tests results shall consider the following three steps:

1. *standard fire test of the "specimen" to obtain reference temperature and structural displacements. Such a "specimen" may be either:*
   1.1 a door already certified through the fire test which is identical in design to the door to be analysed (fire test to include additional instrumentation as per paragraph 3.4.2; or equivalent arrangement); or

1.2 a specially-built specimen where the finite element method is to be performed to extrapolate the results of a specimen of an actual door having a size exceeding the maximum size allowed by the furnace of the testing laboratory; the specimen shall be a mock-up of the actual door, but having a size that fits in the furnace;

2. finite element analysis in paragraph 3.6, of the "specimen" to calibrate the thermal and mechanical boundary conditions of the FEM model, which are adjusted until the numerical and experimental temperature and displacement distribution compare satisfactorily; and

3. finite element analysis in paragraph 3.5, of the actual door carried out using the model calibrated as per paragraph 3.7, assuming that the differences in the geometry and dimensions between the actual door and the specimen door do not significantly influence the results.

3.4 Data to be submitted

3.4.1 In order for the analysis to be carried out, the following information shall be submitted:

1. detailed drawings of the door, the door frame and the closure and locking devices including the indications of clearances and interferences;

2. test report of the prototype used to extrapolate the results.

In this respect, additional instrumentation shall consist of two sets of three 1.6 mm diameter thermocouples fitted through the thickness of the leaf, at depths of 1/3 t, 1/2 t, 2/3 t. Such sets shall be fitted, on the upper part of the door, within a circle of 100 mm in diameter whose centre is 150 mm aside of the surface thermocouples fitted in the centre of the top quarters;

3. mechanical characteristics of all materials used for the construction of the door and its insulation:
3.1 Young's module;
3.2 yield strength; and
3.3 density; and

4. thermal properties:
4.1 thermal expansion coefficient;
4.2 thermal conductivity; and
4.3 specific heat.

3.4.2 Since all these properties are temperature dependent, it is necessary that the required data be given as a function of the temperature range foreseen for the fire tests. Where it is not possible to obtain experimental data, an engineering evaluation shall be submitted with the supporting considerations for the proposed curves of variation of mechanical and thermal characteristics as a function of the temperature in the considered range.

3.5 Method of analysis

The comparison of the fire resistance of doors having larger geometry shall be considered in two steps:

1. evaluation of the heat transmission through the specimen thickness and of the temperature on the unexposed specimen surface; and

2. evaluation of the strength characteristics and of the displacements of the structural members of the specimen.

3.6 Heat transmission analysis

3.6.1 By carrying out finite element calculations, the histories over time of the heat transmission within the structural assembly are computed and the temperature is compared with the temperature experienced by the assembly represented in the standard fire test.

3.6.2 Based on suitable data for the temperature-dependent variables, an iterative procedure is used for the evaluation of thermal-mechanic properties.

3.6.3 The thermal boundary conditions of convecting and radiative type are:

$q_c = h_c\ (T_s - T_\infty)$

and

$q_r = \sigma_\varepsilon (T_s^4 - T_\infty^4)$

where:

q_c *and* q_r *: Convective and radiative heat flux, respectively*

h_c *: Convective heat transfer coefficient*

σ*: Stefan-Boltzmann constant*

ε*: Emissivity coefficient*

T_s *: Surface temperature*

T_∞*: Furnace or ambient temperature.*

3.6.4 The two equations can be included in an equivalent boundary condition:

$q = H_{eq}\ (\sigma, \varepsilon, T_s, T_\infty)\ (T_s - T_\infty)$

where:
the equivalent coefficient H_{eq} depends on the unknown surface temperature.

However, it can be calculated as part of the finite element analysis using an emissivity coefficient appropriately calibrated with the fire test results.

3.6.5 The equivalent heat transfer coefficient can be assumed to be constant on the single exposed surface, as the furnace assembly built in accordance with the FTP Code gives uniformity of the temperature and heat flux within the furnace.

3.6.6 Alternatively, the temperature distribution measured on the specimen of the standard fire test can be directly applied on the finite element structural model taking into account the same time histories.

3.7 Structural analysis

3.7.1 Using the results of the heat transmission analysis and information on temperature- dependent material properties, the thermal stresses and deformations on the geometry are evaluated. When modelling the structural assembly, attention shall be paid to using a sufficient number of elements to account for the non-uniform temperature distribution within the member and to catch the non-linear temperature-dependent behaviour.

3.7.2 Once the model is prepared, the analysis is to be carried out stepwise. For each element, the incremental strain or deformation caused by a temperature increase is calculated and a new stress level is obtained based on the stress-strain relationship applicable for that particular temperature increase.

3.7.3 The mechanical boundary conditions are to be congruent in order to represent the real interaction of the door with the external frame for the overall length of the test.

4 Larger doors exceeding 50% in surface area

4.1 For larger doors exceeding 50% in surface area, a full analysis based on SOLAS regulation II-2/17 shall be performed to assess the safety of the vessel.

4.2 The approach shall be based on the results of the fire test of the door having the maximum dimensions permitted by the furnace (considering a furnace with an aperture of 2,440 mm width x 2,500 mm height) according to the procedure described under section 3. (IACS UI FTP3/Rev.3) and (MSC.1/Circ.1319)

2.4 "B" and "F" class bulkheads

2.4.1 Dimensions

2.4.1.1 The minimum overall dimensions of the test specimen, including the perimeter details at the top, bottom and vertical edges, are 2,440 mm width and 2,500 mm height. When the maximum overall height in practice is to be less than that given above, then the test specimen shall be of the maximum height to be used in practice.

2.4.1.2 The minimum bulkhead panel height shall be a standard height of the manufactured panel with a dimension of 2,400 mm.

2.4.2 Design

2.4.2.1 Where the construction incorporates panels, the specimen shall be constructed such that at least one of the panels is of full width and this, or these, shall be positioned such that both its/their longitudinal edges are jointed to an adjacent panel and are not secured to the restraint frame.

2.4.2.2 If the bulkhead may incorporate electrical fittings, e.g., light fittings and/or ventilation units, it is necessary that initially a test is performed on a specimen of the bulkhead itself, without the incorporation of these units, to establish the basic performance. A separate test(s) shall be performed on a specimen(s) with the units incorporated to ascertain their influence on the performance of the bulkhead.

2.4.3 Description

The applicant shall provide full constructional details of the test specimen in the form of drawings (including a detailed schedule of components) and method of assembly, such that the laboratory is able to confirm agreement between the actual specimen and the drawings and specifications prior to the test. The drawings shall include dimensions and details of the thicknesses of materials used in the insulation system (e.g., of any panels), the method of securing the panels and details of the components used for this purpose, details of joints, connections, air gaps and all other details.

2.5 "B" and "F" class decks

2.5.1 Dimensions

2.5.1.1 The minimum overall dimensions of the test specimen, including the perimeter details at all the edges, are 2,440 mm width and 3,040 mm length.

2.5.1.2 When the maximum dimensions in practice are less than that given above, the test specimen shall be of the maximum size to be used in practice and the tested width shall be reported.

2.5.2 Design

Where the construction incorporates panels, the specimen shall be constructed such that at least one of the panels is of full width and this, or these, shall be positioned such that both its/their longitudinal edges are jointed to an adjacent panel and are not secured to the restraint frame.

2.5.3 Description

The applicant shall provide full constructional details of the test specimen in the form of drawings (including a detailed schedule of components) and method of assembly, such that the laboratory is able to confirm agreement between the actual specimen and the drawings and specifications prior to the test. The drawings shall include dimensions and details of the thicknesses of materials used in the insulation system (e.g., of any panels), the method of securing the insulation system and details of the components used for this purpose, details of joints, connections, air gaps and all other details.

2.6 "B" and "F" class doors

2.6.1 Dimensions

The test specimen shall incorporate the maximum size (in terms of both the width and the height) of the door leaf or leaves for which approval is to be sought. The maximum size of a door which can be tested will be determined by the requirement to retain certain dimensions of the bulkhead (see paragraph 2.6.2.6).

2.6.2 Design

2.6.2.1 Door furniture such as hinges, locks, latches, shoot bolts, handles, etc., shall be constructed of materials having melting points of not less than 850°C unless it can be shown by the fire test that materials having melting points below 850°C do not adversely affect the performance of the door.

2.6.2.2 The door leaf and frame shall be mounted as appropriate into a "B" or "F" class bulkhead of compatible construction, thereby reflecting an actual end-use situation. The bulkhead shall have dimensions as prescribed in paragraph 2.4.1.

2.6.2.3 The bulkhead shall be of a construction approved by the Administration as having at least a similar classification to that required by the door, and approval shall be limited to the type of construction in which the door was tested.

2.6.2.4 The method of fixing the door frame to the bulkhead shall be as used in practice. If the method of fixing the door frame in a test is made by bolts, the Administration may also accept welding as a method of fixing the door frame without further tests.

2.6.2.5 For doors mounted in a three-sided frame, the door shall be mounted with a bottom gap of between 12 mm and 25 mm between the bottom of the door and the test frame.

2.6.2.6 The door shall be positioned such that there is a minimum width of the bulkhead of 300 mm to each vertical side of the door and a minimum distance of 100 mm from the top edge of the bulkhead.

2.6.2.7 The door shall be mounted into the bulkhead such that the side expected to give the inferior performance will be exposed to the heating conditions of the test.

2.6.2.8 A hinged door shall be tested with the door leaf opening away from the heating conditions unless the Administration deems otherwise.

2.6.2.9 For sliding doors it is not possible to state generally from which side the door shall be tested to give the inferior performance. It will, therefore, be necessary to conduct two separate tests, one with the door mounted to the exposed face and one with the door mounted to the unexposed face of the bulkhead.

2.6.2.10 For a door which incorporates a ventilation opening within its construction, the ventilation grille(s) shall be open at the commencement of the test.

2.6.3 Description

The applicant shall provide full constructional details of the test specimen in the form of drawings (including a detailed schedule of components) and method of assembly, such that the laboratory is able to confirm agreement between the actual specimen and the drawings and specifications prior to the test. The drawings shall include dimensions and details as follows:

- **.1** the bulkhead;
- **.2** the door leaf and frame construction, including the clearances between the door leaf and the frame;
- **.3** the connection of the door frame to the bulkhead;
- **.4** the method of securing insulation and details of components used for this purpose (e.g., the type and rate of application of any adhesive); and
- **.5** fittings such as hinges, shoot bolts, latches, locks, handles, ventilation louvres, escape panels, etc.

2.7 "B" and "F" class linings

Linings shall be tested as bulkheads and they shall be exposed to the fire test heating conditions from the side intended to face the cabin.

2.7.1 Dimensions

2.7.1.1 The minimum overall dimensions of the test specimen, including the perimeter details at the top, bottom and vertical edges, are 2,440 mm width and 2,500 mm height. When the maximum overall height in practice is to be less than that given above, then the test specimen shall be of the maximum height to be used in practice.

2.7.1.2 The minimum bulkhead panel height shall be a standard height of the manufactured panel with a dimension of 2,400 mm.

2.7.2 Design

2.7.2.1 The lining shall be positioned alongside a structural core constructed in accordance with paragraph 2.1.1. The design of the lining shall be such that it facilitates its assembly with the limited access provided by the proximity of the structural core, i.e. it shall be mounted with the structural core in place.

Note: Viewing and access openings on an "A" class bulkhead may be provided for the determination of the integrity of the lining, and they should be located corresponding to joints of panels of the lining and away from thermocouples on an "A" class bulkhead. They should normally be sealed with mineral wool insulation slabs except when viewing or access to the lining is needed.

2.7.2.2 During a test on an "A" class bulkhead which utilizes membrane protection along its exposed side, e.g., a "B" class lining, it is possible also to evaluate the performance of the lining with a view to classification providing that the necessary thermocouples are attached to the lining and providing that the necessary integrity measurements are made.

2.7.2.3 The specimen shall be constructed such that at least one of the panels is of full width and this, or these, shall be positioned such that both its/their longitudinal edges are jointed to an adjacent panel and are not secured to the restraint frame.

2.7.2.4 If the lining may incorporate electrical fittings, e.g., light fittings and/or ventilation units, it is necessary that initially a test is performed on a specimen of the lining itself, without the incorporation of these units, to establish the basic performance. A separate test(s) shall be performed on a specimen(s) with the units incorporated to ascertain their influence on the performance of the lining.

2.7.3 Description

The applicant shall provide full constructional details of the test specimen in the form of drawings (including a detailed schedule of components) and method of assembly, such that the laboratory is able to confirm agreement between the actual specimen and the drawings and specifications prior to the test. The drawings shall include dimensions and details of the thicknesses of materials used in the insulation system (e.g., of any panels), the method of securing the insulation system and details of the components used for this purpose, details of joints, connections, air gaps and all other details.

2.8 "B" and "F" class ceilings

2.8.1 Dimensions

2.8.1.1 The minimum overall dimensions of the test specimen, including the perimeter details at all the edges, are 2,440 mm width and 3,040 mm length.

2.8.1.2 When the maximum dimensions in practice are less than those given above then the test specimen shall be of the maximum size to be used in practice, and the tested width shall be reported.

2.8.2 Design

2.8.2.1 The ceiling shall be positioned below a structural core constructed in accordance with paragraph 2.2.1. The design of the ceiling shall be such that it facilitates its assembly with the limited access provided by the proximity of the structural core, i.e. it shall be mounted with the structural core in place.

Note: Viewing and access openings on an "A" class deck may be provided for the determination of the integrity of the ceiling, and they should be located corresponding to joints of panels of the ceiling and away from thermocouples on an "A" class deck. They should normally be sealed with mineral wool insulation slabs except when viewing or access to the ceiling is needed.

2.8.2.2 During a test on an "A" class deck which utilizes membrane protection along its underside, e.g., a "B" class ceiling, it is possible also to evaluate the performance of the ceiling with a view to classification providing that the necessary thermocouples are attached to the ceiling and providing that the necessary integrity measurements are made.

2.8.2.3 If the ceiling incorporates panels, the specimen shall include examples of both the lateral and longitudinal joints between the panels. If the specimen is to simulate a ceiling where the maximum length of the panels is greater than the length of the specimen, then a joint shall be positioned at a distance of approximately 600 mm from one of the shorter ends of the test specimen.

2.8.2.4 The specimen shall be constructed such that at least one of the panels is of full width and this, or these, shall be positioned such that both its/their longitudinal edges are jointed to an adjacent panel and are not secured to the restraint frame.

2.8.2.5 If the ceiling may incorporate electrical fittings, e.g., light fittings and/or ventilation units, it is necessary that initially a test is performed on a specimen of the ceiling itself, without the incorporation of these units, to establish the basic performance. A separate test(s) shall be performed on a specimen(s) with the units incorporated to ascertain their influence on the performance of the ceiling.

2.8.2.6 Where testing is conducted on a perforated ceiling system, equally constructed non-perforated ceilings and ceilings with a lesser degree of perforations (in terms of size, shape, and perforations per unit area) may be approved without further testing.

2.8.3 Description

The applicant shall provide full constructional details of the test specimen in the form of drawings (including a detailed schedule of components) and method of assembly, such that the laboratory is able to confirm agreement between the actual specimen and the drawings and specifications prior to the test. The drawings shall include dimensions and details of the thicknesses of materials used in the insulation system (e.g., of any panels), the method of securing the insulation system and all relevant details including, in particular, the components used for this purpose, joints, connections and air gaps.

3 MATERIALS FOR TEST SPECIMENS

3.1 Specifications

Prior to the test, the following information, if applicable, shall be submitted to the laboratory by the applicant for each of the materials used in the construction:

.1 the identification mark and trade name;
.2 principal details of composition;
.3 nominal thickness;

.4 nominal density (for compressible materials this shall be related to the nominal thickness);
.5 nominal equilibrium moisture content (at relative humidity of 50% and a temperature of 23°C);
.6 nominal organic content;
.7 specific heat at ambient temperature; and
.8 thermal conductivity at ambient temperature.

3.2 Control measurements

3.2.1 General

3.2.1.1 The testing laboratory shall take reference specimens of all those materials whose characteristics are important to the performance of the specimen (excluding steel and equivalent material). The reference specimens shall be used for the non-combustibility test, if appropriate, and for the determination of the thickness, the density and, where appropriate, the moisture and/or organic content.

3.2.1.2 The reference specimens for sprayed materials shall be made when the material is sprayed on the structural core and they shall be sprayed in a similar manner and in the same orientation.

3.2.1.3 The laboratory shall conduct the following control tests, as appropriate to the type of material and the proposed classification, on the reference specimens after they have been conditioned as specified in paragraph 4.

3.2.1.4 For the determination of the thickness, the density and the moisture and/or organic content three specimens shall be used, and the value quoted as the mean of the three measurements.

3.2.2 Encapsulated materials

3.2.2.1 When an insulation material is encapsulated within the construction and it is not possible for the laboratory to take specimens of the material prior to the test for conducting the control measurements, the applicant shall be requested to provide the requisite samples of the material. In these cases it shall be clearly stated in the test report that the measured properties were determined from samples of the material provided by the applicant for the test.

3.2.2.2 Notwithstanding the above, the laboratory shall attempt, wherever possible, to verify the properties by using samples which may be cut from the specimen before test or by checking against similar properties determined after test. When samples of the material are cut from the test specimen before test, the specimen shall be repaired in a manner such that its performance in the fire test is not impaired.

3.2.3 Non-combustibility

Where materials used in the construction of the specimen are required to be non-combustible, i.e. for "A" and "B" classes, evidence in the form of test reports in accordance with the test method in part 1 of this annex, and from a testing laboratory recognized by the Administration and independent of the manufacturer of the material shall be provided. These test reports shall indicate that the non-combustibility tests were conducted not more than 24 months prior to the date of the performance of the fire resistance test. If such reports cannot be provided then tests in accordance with part 1 of annex 1 to the *Publication* (*FTP* Code) shall be conducted. When the material has a type approval certificate for non-combustible material valid at the performance of the fire resistance test, non-combustibility test reports may not be required.

3.2.4 Low flame-spread characteristics

3.2.4.1 Where materials used in the construction of the specimen are required to have low flame-spread characteristics, evidence in the form of test reports in accordance with part 5 of this annex, and from a testing laboratory recognized by the Administration and independent of the manufacturer of the material shall be provided. These test reports shall indicate that the low flame-spread tests were conducted not more than 24 months prior to the date of the performance of the fire resistance test. If such reports cannot be provided then tests in accordance with part 5 of this annex shall be conducted. When the material has a type approval certificate for low flame-spread characteristics valid at the performance of the fire resistance test, low flame-spread test reports may not be required.

3.2.4.2 Adhesives used in the construction of the specimen are not required to be non-combustible; however, they shall have low flame-spread characteristics.

3.2.5 Thickness

3.2.5.1 The thickness of each material and combination of materials shall be ± 10% of the value stated as the nominal thickness when measured by using a suitable gauge or callipers.

3.2.5.2 The thickness of a sprayed insulation material shall be measured using a suitable probe at positions adjacent to each of the unexposed-face thermocouples.

3.2.6 Density

3.2.6.1 The density of each material shall be determined from measurement of the weight and the dimensions.

3.2.6.2 The density of mineral wool or any similar compressible material shall be related to the nominal thickness and the density of each material used in the test specimen shall be ± 10% of the value stated as the nominal density.

3.2.7 Moisture content

3.2.7.1 The moisture content (W_1-W_2) of each non-combustible material used in the specimen shall be calculated using the following method, and indicate a percentage of the dry weight (W_2), and which information is required.

3.2.7.2 In the following, W_1, W_2 and W_3 are mean values of three weight measurements. W_1 shall be higher than 25 g. Three specimens of each material, taken in the width of the production's direction and measuring width x minimum 20 mm x thickness of the material, shall be weighed (initial conditioned weight W_1) and then heated in a ventilated oven at a temperature of 105 ± 2°C for 24 h and reweighed when cooled (W_2). However, gypsum-based, cementations and similar materials should be dried at a temperature of 55 ± 5°C to constant weight (W_2).

3.2.7.3 The moisture content (W_1-W_2) of each specimen shall be calculated as a percentage of the dry weight (W_2).

3.2.8 Organic content

3.2.8.1 The information of organic content of non-combustible materials used in the specimen is required. After the percentage moisture contents have been calculated as specified in paragraph 3.2.7, the three specimens should be further heated in an oven at a temperature of 500 ± 20°C for

2 h and again weighed (W_3). The organic content (W_2-W_3) shall be calculated as a percentage of the dry weight (W_2).

Note: A bigger tolerance can be accepted as long as the tested specimen represents the upper limit of the tolerance. In this case, it should be specified in the test report and in the type approval certificate.

3.2.8.2 The organic content of each material used in the test specimen should be within ± 0.3% absolute of the value stated as the nominal organic content.

4 CONDITIONING OF THE TEST SPECIMENS

4.1 General

4.1.1 The test specimen should be protected against adverse environmental conditions until the time of the test. The test specimen shall not be tested until it has reached an equilibrium (constant weight), air-dry condition under the laboratory's normal ambient condition. The equilibrium condition shall be obtained according to paragraph 4.2 below.

4.1.2 Accelerated conditioning is permissible provided the method does not alter the properties of component materials. In general, high-temperature conditioning shall be below temperatures critical for the materials.

4.2 Verification

4.2.1 The condition of the test specimen can be monitored and verified by use of special samples for the determination of moisture content of constituent materials, as appropriate. These samples shall be so constructed as to represent the loss of water vapour from the specimen by having similar thicknesses and exposed faces. They shall have minimum linear dimensions of 300 mm by 300 mm and a minimum mass of 100 g. Constant weight shall be considered to be reached when two successive weighing operations, carried out at an interval of 24 h, do not differ by more than 0.3% of the mass of the reference specimen or 0.3 g, whichever is the greater.

4.2.2 Other reliable methods of verifying that the material has reached equilibrium moisture content may be used by the testing laboratory.

4.3 Encapsulated materials

4.3.1 When the test specimen incorporates encapsulated materials it is important to ensure that these materials have reached an equilibrium moisture content prior to assembly, and special arrangements shall be made with the applicant for the test to ensure that this is so.

4.3.2 When the test specimen, such as doors, incorporates encapsulated materials, the requirement relevant to equilibrium moisture in paragraph 4.2 shall apply.

5 MOUNTING OF THE TEST SPECIMENS

5.1 Restraint and support frames

5.1.1 All test specimens shall be mounted within substantial concrete, or concrete- or masonry-lined frames, which are capable of providing a high degree of restraint to the expansion forces generated during the tests. The concrete or the masonry shall have a density between 1600 kg/m^3 and 2400 kg/m^3. The concrete or masonry lining to a steel frame shall have a thickness of at least 50 mm.

5.1.2 The rigidity of the restraint frames shall be evaluated by applying an expansion force of 100 kN within the frame at mid-width between two opposite members of the frame and measuring the increase in the internal dimensions at these positions. This evaluation shall be conducted in the direction of the bulkhead or deck stiffeners, and the increase of the internal dimension shall not exceed 2 mm.

5.1.3 For frames which are to be used to evaluate "A" class divisions which incorporate "B" class ceilings or linings, the frames shall be provided with at least four viewing and access openings, notionally one to each quarter of the test specimen. These openings shall facilitate access to the cavity for the determination of the integrity of the ceiling or lining during the test on the deck or bulkhead. The access/viewing openings shall normally be sealed with mineral wool insulation slabs except when viewing or accessing to the ceiling or lining is needed.

5.2 "A" class divisions

5.2.1 The structural core to an "A" class division shall be fixed into the restraint frame and sealed around its perimeter as shown in figure 3. Steel spacers, with an approximate thickness of 5 mm, may be inserted between the fixing cleats and the restraint frame if the laboratory finds this necessary.

5.2.2 When the structural core of an "A" class division is to be exposed to the heating conditions of the test, i.e. when the fixing cleats are on the exposed side of the structural core, then a 100 mm wide perimeter margin adjacent to the restraint frame shall be insulated such that the fixing cleats and the edges of the structural core are protected from direct exposure to the heating conditions. In no other situations, irrespective of the type of test specimen, shall the perimeter edges be protected from direct exposure to the heating conditions.

5.3 "B" and "F" class divisions

5.3.1 For a "B" or "F" class bulkhead or lining, the specimen shall be supported at the top and secured on the vertical sides and at the bottom in a manner representative of the conditions in service. The support provided at the top of a bulkhead or lining shall allow for the appropriate expansion or clearance to be used as in practice. At the vertical edges lateral expansion towards the vertical edges of the restraint frame shall be prevented by ensuring a tight fit of the specimen within the frame which may be achieved by inserting a rigid packing between the vertical edges and the frame. If provision for movement at the edges of a bulkhead or lining is made for a particular construction in service, the specimen shall simulate these conditions.

5.3.2 For a "B" or "F" class ceiling, expansion of the ceiling members shall be prevented at the perimeter edges since the specimen is intended to simulate a part of a ceiling removed from a much greater area. Expansion shall be prevented by ensuring a tight fit of the specimen within the frame which may be achieved by inserting a rigid packing between the ends or edges of ceiling members and the restraint frame. Only if the ceiling is being tested at full size in one or more directions is it allowed to incorporate the expansion allowance at the perimeter edges in the appropriate direction or directions.

6 EXAMINATION OF THE TEST SPECIMENS

6.1 Conformity

6.1.1 The laboratory shall verify the conformity of the test specimen with the drawings and method of assembly provided by the applicant (see paragraph 2), and any area of discrepancy shall be resolved prior to commencement of the test.

6.1.2 On occasion it may not be possible to verify the conformity of all aspects of the specimen construction prior to the test and adequate evidence may not be available after test. When it is necessary to rely on information provided by the applicant then this shall be clearly stated in the test report. The laboratory shall nevertheless ensure that it fully appreciates the design of the test specimen and shall be confident that it is able to accurately record the constructional details in the test report.

6.2 Door clearances

Following mounting of the door and immediately prior to test, the laboratory shall measure the actual clearances between the door leaf and the door frame, and additionally for a double leaf door between the adjacent door leaves. The clearances shall be measured for each door leaf at two positions along the top and bottom edges and at three positions along each vertical edge.

6.3 Door operation

Similarly, immediately prior to test, the laboratory shall check the operability of the door by opening the door leaf by a distance of at least 300 mm. The door leaf shall then be closed, either automatically, if such a closing device is provided, or manually. The door may be latched for the test but shall not be locked, and no devices for latching or locking shall be included which are not normally incorporated in practice.

7 INSTRUMENTATION

7.1 General

7.1.1 The furnace

The instrumentation of the furnace and the instrumentation of the test specimen shall generally be in accordance with the standard ISO 834-1, Fire resistance tests – Elements of building construction - Part 1: General requirements; except where amended by this section. The details given in the following paragraphs are supplementary to, an elaboration of, or a deviation from the ISO requirements.

7.2 Ambient temperature thermocouple

A thermocouple shall be used to indicate the ambient temperature within the laboratory in the vicinity of the test specimen both prior to and during the test period. The thermocouple shall be nominally of 3 mm diameter, mineral insulated, stainless steel type K. The measuring junction shall be protected from radiated heat and draught. The ambient temperature shall be monitored at a distance of between 1 m and 3 m horizontally away from the unexposed face of the test specimen.

7.3 Furnace temperature thermocouples

7.3.1 Design

7.3.1.1 The furnace thermocouples shall be plate thermometers, which comprise an assembly of a folded steel plate, a thermocouple fixed to it and containing insulation material as described in standard ISO 834-1.

7.3.1.2 The plate part shall be constructed from 150 ± 1 mm long by 100 ± 1 mm wide by 0.7 ± 0.1 mm thick nickel alloy sheet strips folded to the design as shown in figure 4.

7.3.1.3 The measuring junction shall consist of nickel chromium/nickel aluminium (type K) wire as defined in standard IEC 60584-1, contained within mineral insulation in a heat-resisting steel alloy sheath of nominal diameter 1 mm, the hot junctions being electrically insulated from the sheath. The thermocouple hot junction shall be fixed to the geometric centre of the plate in the position shown in figure 4 by a small steel strip made from the same material as the plate. The steel strip can be welded to the plate or may be screwed to it to facilitate replacement of the thermocouple. The strip shall be approximately 18 mm by 6 mm if it is spot welded to the plate, and nominally 25 mm by 6 mm if it is to be screwed to the plate. The screws shall be 2 mm in diameter.

7.3.1.4 The assembly of plate and thermocouple shall be fitted with a pad of inorganic insulation material nominally 97 ± 1 mm by 97 ± 1 mm by 10 ± 1 mm thick, density 280 ± 30 kg/m3.

7.3.1.5 Before the plate thermometers are first used, the complete plate thermometer shall be aged by immersing in a pre-heated oven at 1,000°C for 1 h.

Note: Exposure in a fire-resistance test furnace for 90 min under the standard temperature/time curve is considered to be an acceptable alternative to using an oven.

7.3.1.6 When a plate thermometer is used more than once, a log of its use shall be maintained indicating, for each use, the checks made and duration of use. The thermocouple and the insulation pad shall be replaced after 50 h exposure in the furnace.

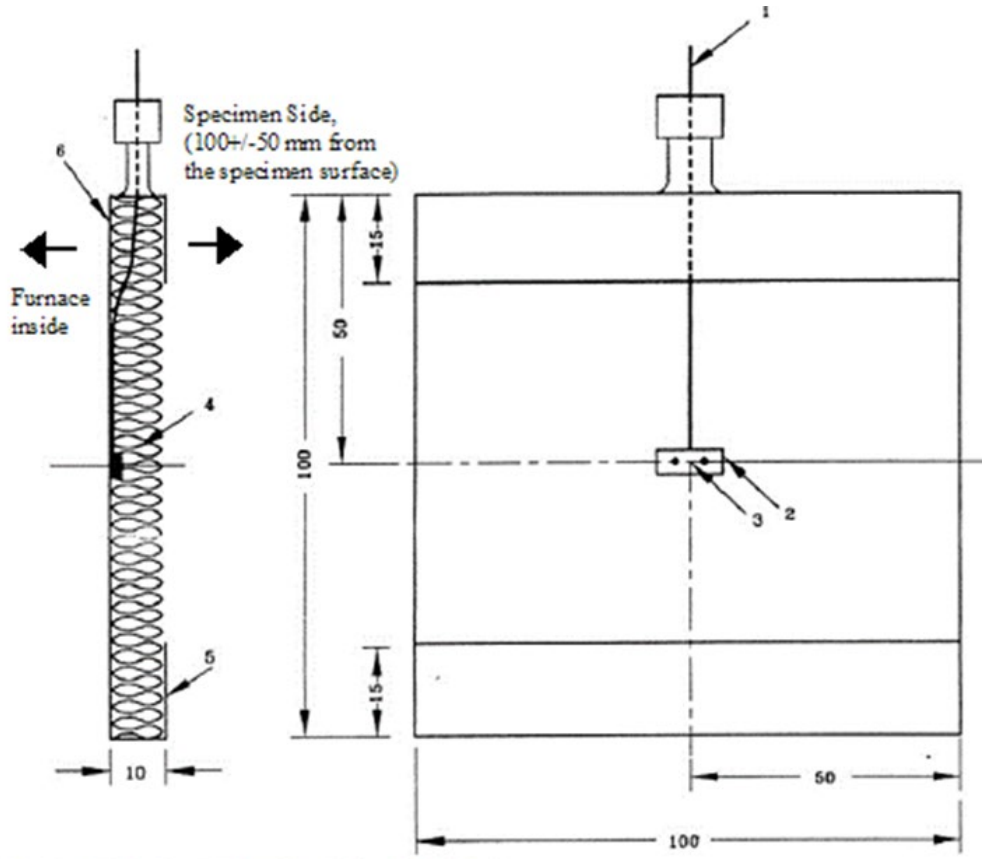
7.3.2 Number

At least six furnace thermocouples shall be provided for the specimens given in paragraph 2. For specimens larger than those specified in paragraph 2, additional thermocouples shall be provided in the proportion of one per 1.5 m2 of the specimen area. In case of a door assembly, specimen area refers to the entire bulkhead construction with the door fitted. This principle shall be used also for the other assemblies (e.g., windows, ducts and penetrations) installed in bulkheads or decks.

7.3.3 Positioning

7.3.3.1 The thermocouples employed to measure the temperature of the furnace shall be uniformly distributed so as to give a reliable indication of the average temperature in the vicinity of the specimen. At the commencement of the test the measuring junctions shall be 100 mm from the face of the specimen and they shall be maintained at a distance of 50 mm to 150 mm during the test. The method of support shall ensure that thermocouples do not fall away or become dislodged during the test. Where it is convenient to pass thermocouple wires through the test construction, then the steel support tube shall not be used. The plate thermometers shall not be located at positions within the furnace where they are subject to direct flame impingement.

7.3.3.2 The plate thermometer shall be orientated so that side A faces the back wall of the wall furnace and the floor of the horizontal furnace.



1 sheathed thermocouple with insulated hot junction
2 spot welded or screwed steel strip
3 hot junction of thermocouple
4 insulation material
5 nickel alloy strip (0,7 ± 0,1) mm thick
6 face 'A'

Figure 4 – Furnace thermocouple assembly

7.3.4 Connection

The thermocouple wire shall be either continuous to the recording instrument or suitable compensating wire shall be used with all junctions maintained as near as possible at ambient temperature conditions.

7.4 Furnace pressure sensors

The mean value of the furnace pressure shall be measured using one of the designs of sensing heads described in figure 5.

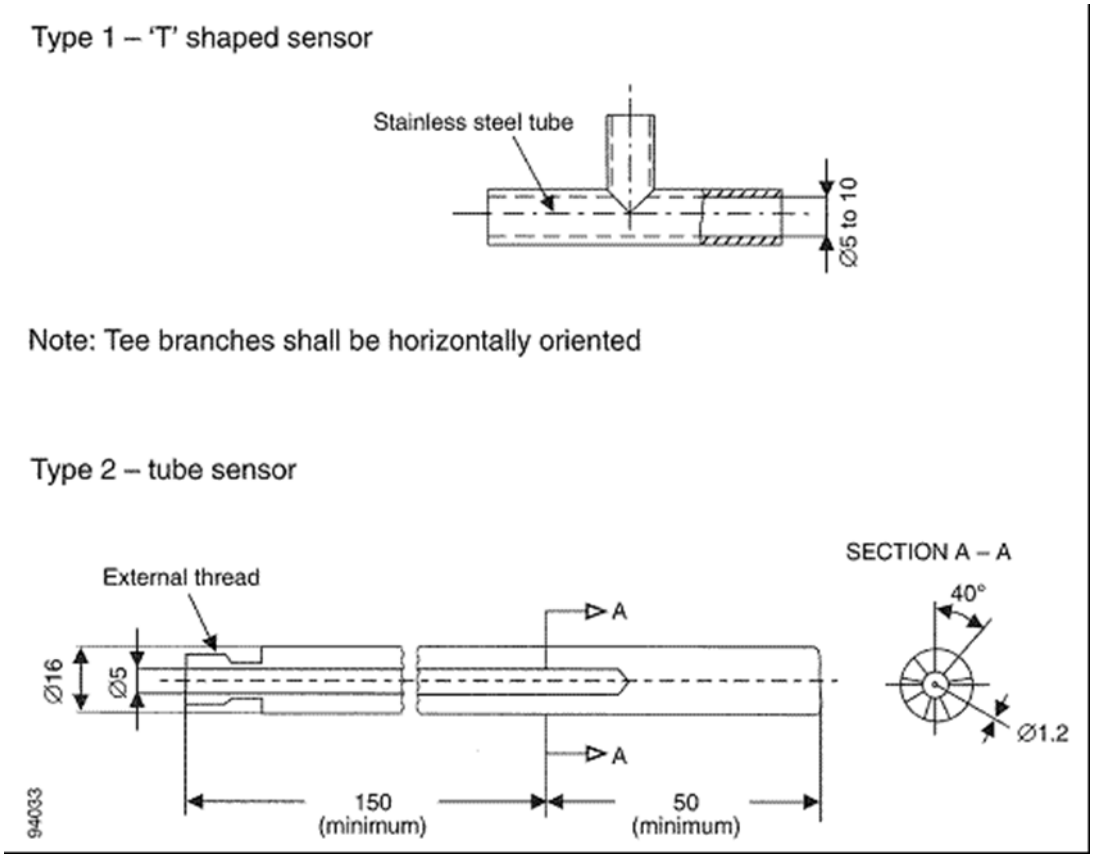


Figure 5 – Pressure-sensing heads

7.5 Unexposed-face temperature thermocouples

7.5.1 Design

The temperature of the unexposed surface shall be measured by means of disc thermocouples of the type shown in figure 6. Thermocouple wires, 0.5 mm in diameter, shall be soldered to a 0.2 mm thick by 12 mm diameter copper disc. Each thermocouple shall be covered with a 30 mm square x 2.0 ± 0.5 mm thick non-combustible insulating pad. The pad material shall have a density of 900 ± 100 kg/m3.

7.5.2 Connection

Connection to the recording instrument shall be by wires of similar or appropriate compensating type.

7.5.3 Preparation of surfaces to receive thermocouples

7.5.3.1 Steel - Surface finishes shall be removed and the surface cleaned with a solvent. Loose rust and scale shall be removed by wire brush.

7.5.3.2 Irregular surfaces - A smooth surface, not greater than 2500 mm2, to provide adequate adhesive bond shall be made for each thermocouple by smoothing the existing surface with a suitable abrasive paper. The material removed shall be the minimum to provide an adequate bonding surface. Where the surface cannot be smoothed, fillings shall be used of minimum quantity to provide a suitable surface. The filling shall comprise a ceramic cement and when the filled surface is dry it shall be smoothed, if necessary, with abrasive paper.

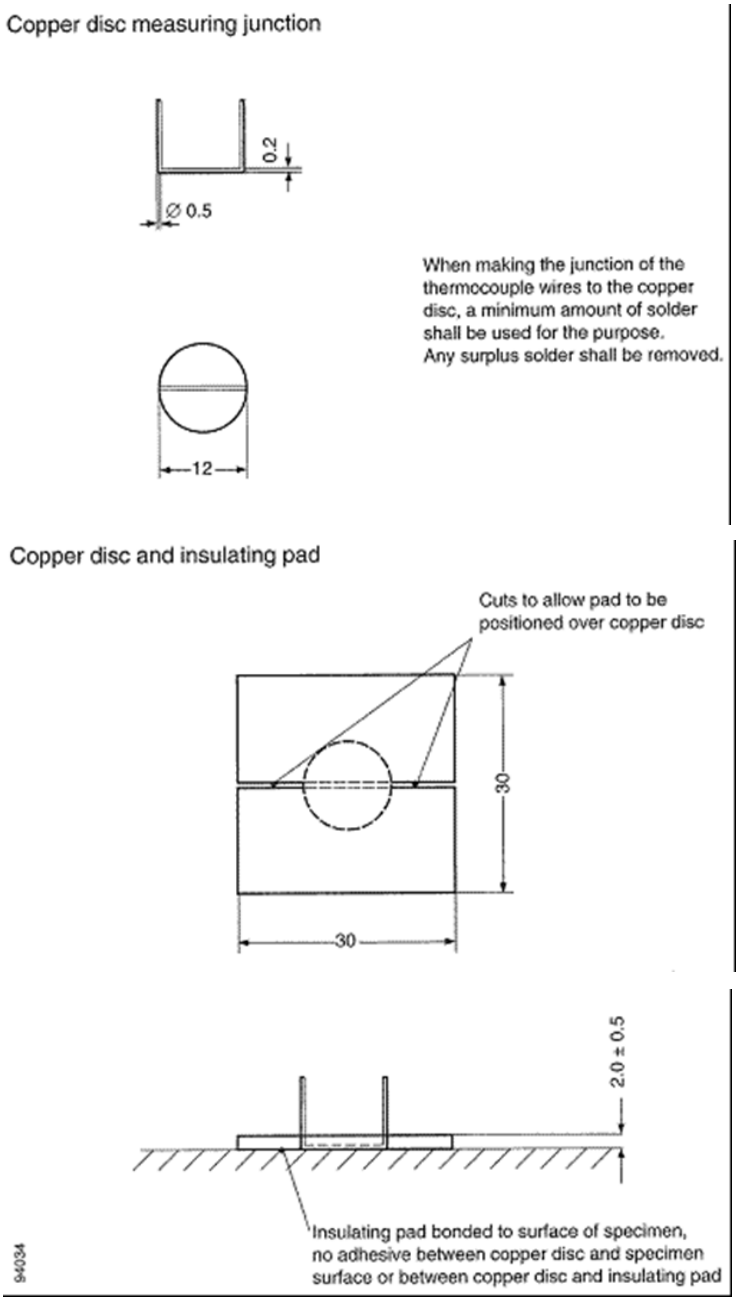


Figure 6 – Unexposed-surface thermocouple junction and insulating pad

7.5.4 Fixing of thermocouples

7.5.4.1 Steel - The insulating pad with the thermocouple fitted shall be bonded to the cleaned surface of the steel using a "water-based ceramic cement" produced by integrating the components to form a high-temperature-resistant adhesive. The adhesive shall be of such a consistency that no mechanical aid is necessary for retention purposes during the drying process, but, where difficulty in bonding is experienced, retention by adhesive tape may be employed provided that the tape is removed sufficiently long in advance of the test to allow complete drying of the adhesive. Care is required in the removal of the tape to ensure that the insulating pad is not damaged. If the thermocouple pad is damaged when the tape is removed then the thermocouple shall be replaced.

7.5.4.2 Mineral wool - The thermocouples with insulating pads fitted shall be arranged in such a way that if a surface wire mesh is present it may aid retention, and in all cases the bond to the fibrous surface shall be made using a "contact adhesive". The nature of the adhesive necessitates a drying time before mating surfaces are put together, thus obviating the need for external pressure.

7.5.4.3 Where gluing is not possible, pins, screws or clips which are only in contact with those parts of the pad which are not over the (copper) disc shall be used. (Example: U-shaped clips approximately 30 x 15 x 30 x 0.5 mm, which are in contact only with the extreme corners of the pad. Heat transfer to the copper disc is negligible.)

7.5.4.4 Mineral fibre spray - Thermocouples shall not be fitted until the insulation has reached a stable moisture condition. In all cases the bonding technique for steel shall be used and where a surface wire mesh is present the thermocouples shall be affixed to the insulation in such a way that the wire mesh aids retention.

7.5.4.5 Vermiculite/cement type spray - The technique specified for wet fibrous spray shall be employed.

7.5.4.6 Boards of fibrous or mineral aggregate composition - The bonding technique for steel shall be used.

7.5.4.7 In all cases of adhesive bonding, the adhesive shall be applied in a thin film sufficient to give an adequate bond and there shall be a sufficient lapse of time between the bonding of the thermocouples and the test for stable moisture conditions to be attained in the case of the ceramic adhesive and evaporation of the solvent in the case of the "contact adhesive".

7.5.4.8 For "A" and "B" class divisions the insulation performance of a construction shall be given by that part of the construction which is manufactured from non-combustible materials only. However, if a material or panel is only produced with a superimposed finish, or if the Administration considers that the addition of a superimposed finish may be detrimental to the performance of the division, the Administration may allow, or may require, the finish to be incorporated during the test. In these cases, the superimposed finish shall be removed locally over an area as small as possible to allow fixing of the thermocouples to the non-combustible part, e.g., a deck provided with overlaid non-combustible insulation (a floating floor) shall have any combustible top surface finish removed locally to the thermocouples to allow them to be fixed to the insulation material.

7.6 Positioning of thermocouples on the specimen

7.6.1 "A" class divisions, excluding doors*

The surface temperatures on the unexposed face of the test specimen shall be measured by thermocouples located as shown in figures 7 and 8:

- **.1** five thermocouples, one at the centre of the test specimen and one at the centre of each of the four quarters, all positioned at least 100 mm away from the nearest part of any joints and/or at least 100 mm away from the welds to any stiffeners;
- **.2** two thermocouples, one placed over each of the central stiffeners and for a bulkhead at 0.75 height of the specimen and for a deck at mid-length of the deck;
- **.3** two thermocouples, each placed over a vertical (longitudinal) joint, if any, in the insulation system and positioned for a bulkhead at 0.75 height of the specimen and for a deck at mid-length of the deck;

.4 when a construction has two differently orientated joint details, for example normal to each other, then two thermocouples additional to those already described in paragraph 7.6.1.3 above shall be used, one on each of two intersections;

.5 when a construction has two different types of joint detail, then two thermocouples shall be used for each type of joint;

.6 additional thermocouples, at the discretion of the testing laboratory or Administration, may be fixed over special features or specific construction details if it is considered that temperatures higher than those measured by the thermocouples listed above may result; and

.7 the thermocouples specified in subparagraphs .4 to .6 above for measurements on bulkheads, e.g., over different joint types or over joint intersections, shall, where possible, be positioned in the upper half of the specimen.

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* *Interpretation:*
To demonstrate that the tested "A" class assemblies are representative of that used on board ships, the following details should, as a minimum, when applicable, be clearly indicated in test reports and included in type approvals:

.1 type, thickness, density and number of layers of insulation material;
.2 size, types, materials and fixing methods of pins and washers;
.3 spacing between pins;
.4 maximum spacing between pins and adjacent joints;
.5 stepping of joints for multi-layers if applicable;
.6 insulation and pinning details on and around stiffeners;
.7 details of wire mesh, aluminium tape, etc., if used in the test;
.8 type approval test report should contain the information required by paragraphs 2.1.3, 2.2.3, 6.1 and 10.4 of resolution A.754(18); and
.9 type approval certificate should refer to drawing numbers of the test sample. (MSC.1/Circ.1435) and (IACS UI FTP5/Corr.1)

7.6.2 "B" and "F" class divisions, excluding doors

The surface temperatures on the unexposed face of the test specimen shall be measured by thermocouples located as shown in figure 9:

.1 five thermocouples, one at the centre of the test specimen and one at the centre of each of the four quarters, all positioned at least 100 mm away from the nearest part of any joints;

.2 two thermocouples, each placed over a vertical (longitudinal) joint, if any, in the division/insulation system and positioned for a bulkhead at 0.75 height of the specimen and for a deck/ceiling at mid-length of the deck/ceiling; and

.3 additional thermocouples, as required by paragraphs 7.6.1.4 to 7.6.1.7 above.

7.6.3 "A", "B" and "F" class doors

The surface temperatures on the unexposed face of the test specimen shall be measured by:

.1 five thermocouples, one at the centre of the door leaf and one at the centre of each of the four quarters of the door leaf, all positioned at least 100 mm away from the edge of the door leaf, from any stiffeners, from any door furniture and from any special features or specific constructional details;

.2 if the door leaf incorporates stiffeners, two additional thermocouples, one placed over each of two stiffeners in the central portion of the door;

.3 additional thermocouples, at the discretion of the testing laboratory or Administration, may be fixed over special features or specific constructional details if it is considered that temperatures higher than those measured by the thermocouples listed above may result. Any additional thermocouples fixed to the door frame, or to any part of the door leaf, which is closer than a distance of 100 mm from the gap between the edge of the door leaf and the frame shall not be used for the purpose of classification of the test specimen, and if provided are for information only;

.4 the thermocouples specified in paragraphs 7.6.3.2 and 7.6.3.3 above shall, where possible, be positioned in the upper half of the specimen;

.5 additional thermocouples on the grille of a "B" class door are not to be placed over the perforated area and in a 100 mm wide zone around it;

.6 temperature measurements on a door which incorporates a ventilation opening within its construction shall not be made over the face of the ventilation grille(s);

.7 the door constructions, which incorporate a top panel, shall always be tested with thermocouples on the unexposed face of the top panel and on the joints and/or joining profiles at a level 125 mm above the top of the door leaf. Height of the top panel in the test specimen should be equal or greater than 225 mm; and

.8 when testing double-leaf door assemblies, the requirements shall be applied to each door leaf separately.

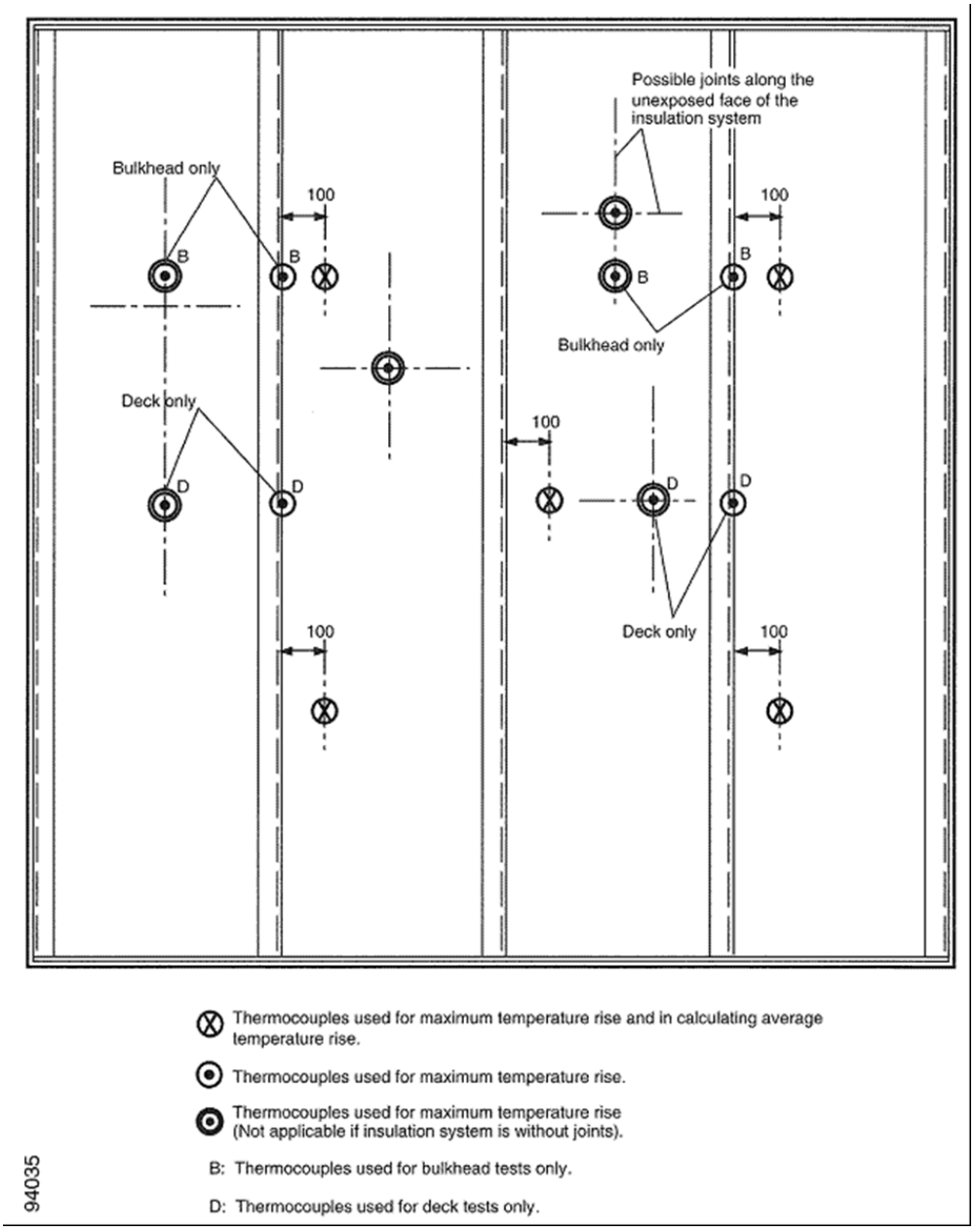


Figure 7 – Position of unexposed-face thermocouples for "A" class division: insulated face to the laboratory

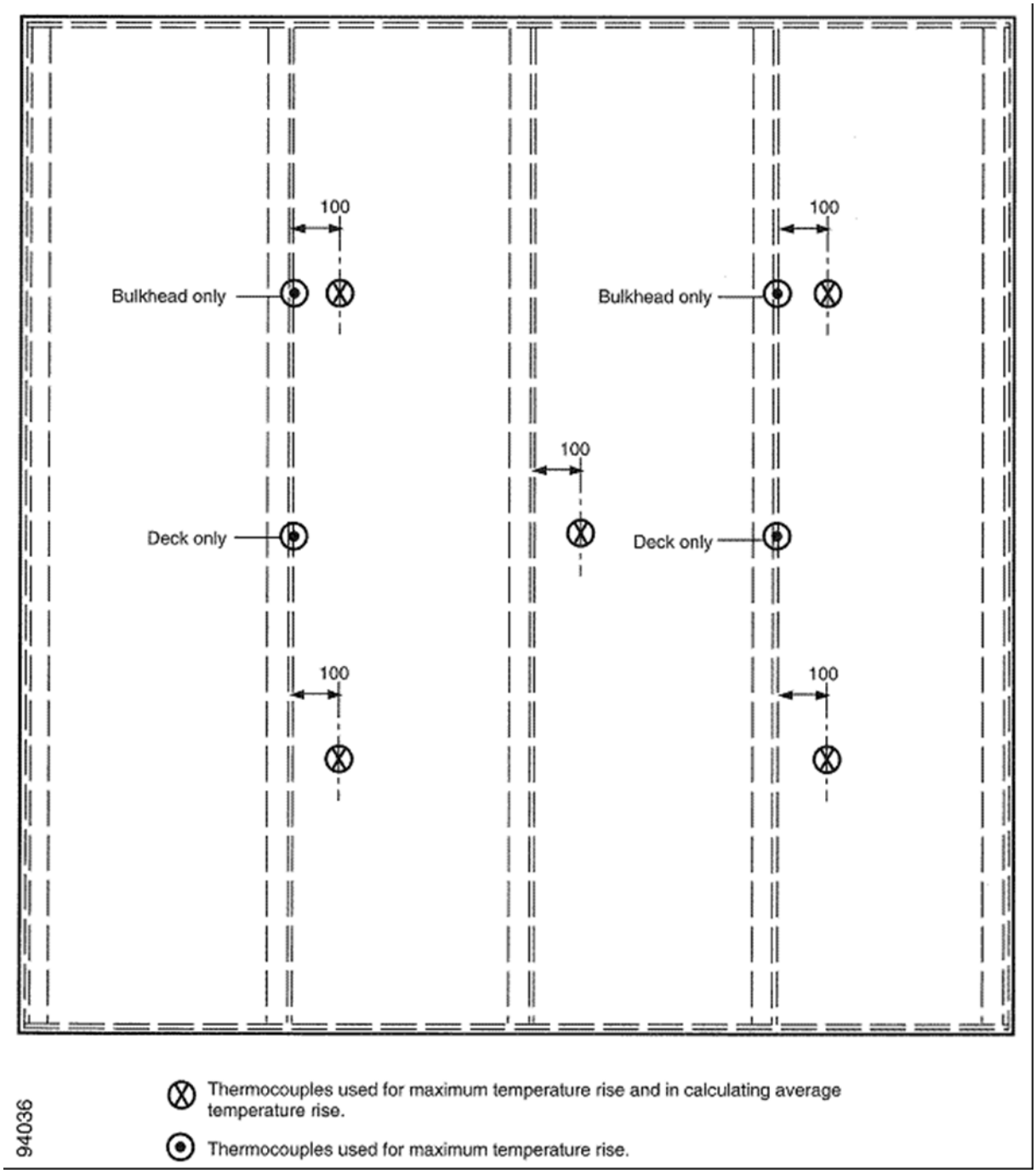


Figure 8 – Position of unexposed-face thermocouples for "A" class division: flat face of structural steel core to the laboratory

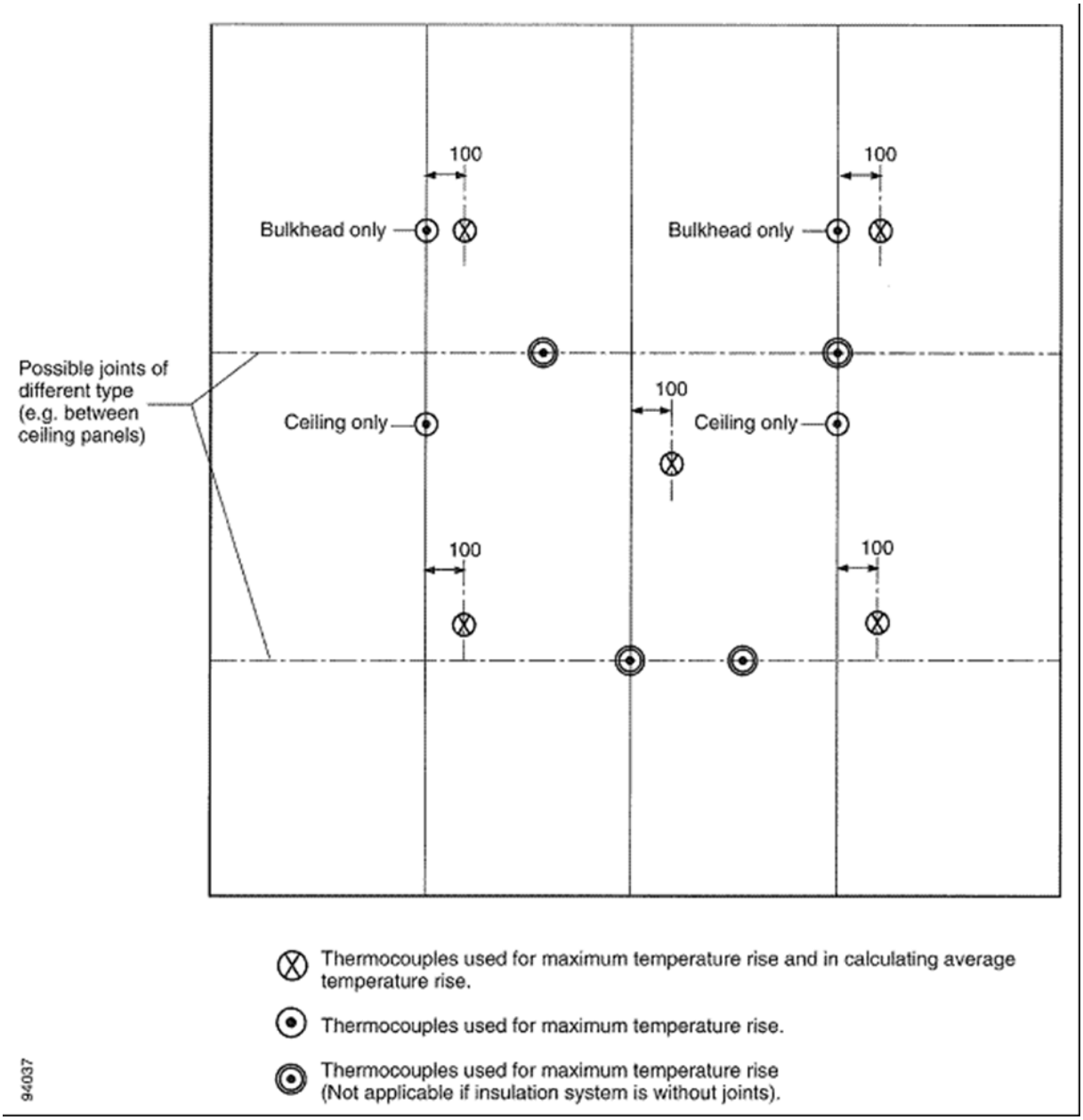


Figure 9 – Position of unexposed-face thermocouples for "B" and "F" class divisions

7.7 Structural core temperature thermocouples

7.7.1 When testing a specimen with a structural core other than steel, thermocouples shall be fixed to the core material in positions corresponding to the surface thermocouples mentioned in paragraph 7.6.1.1.

7.7.2 The thermocouples shall be fixed so that their hot junctions are attached to the appropriate positions by suitable means, including peening into the structural core. The wires shall be prevented from becoming hotter than the junction. The first 50 mm shall be in an isothermal plane.

7.8 Measuring and recording equipment for thermocouples

The measuring and recording equipment shall be capable of operating within the limits specified in standard ISO 834-1.

7.9 Cotton-wool pads

The cotton-wool pad employed in the measurement of integrity shall consist of new, undyed and soft cotton fibres, 20 mm thick x 100 mm square, and shall weigh between 3 g and 4 g. It shall be conditioned prior to use by drying in an oven at 100 ± 5°C for at least 30 min. After drying, it shall be allowed to cool to ambient temperature within a desiccator, where it may be stored until needed to be used. For use it shall be mounted in a wire frame, as shown in figure 10, provided with a handle.

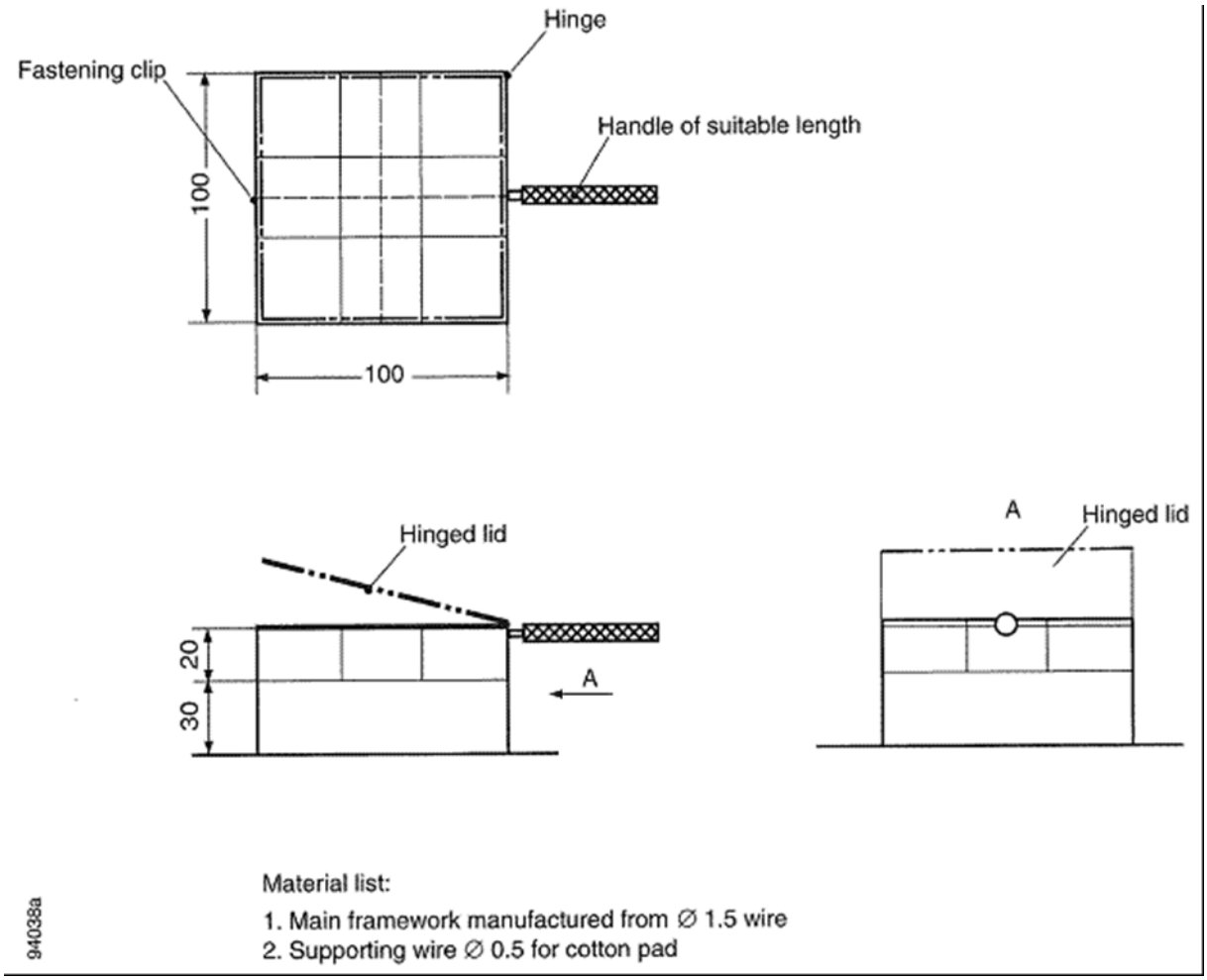
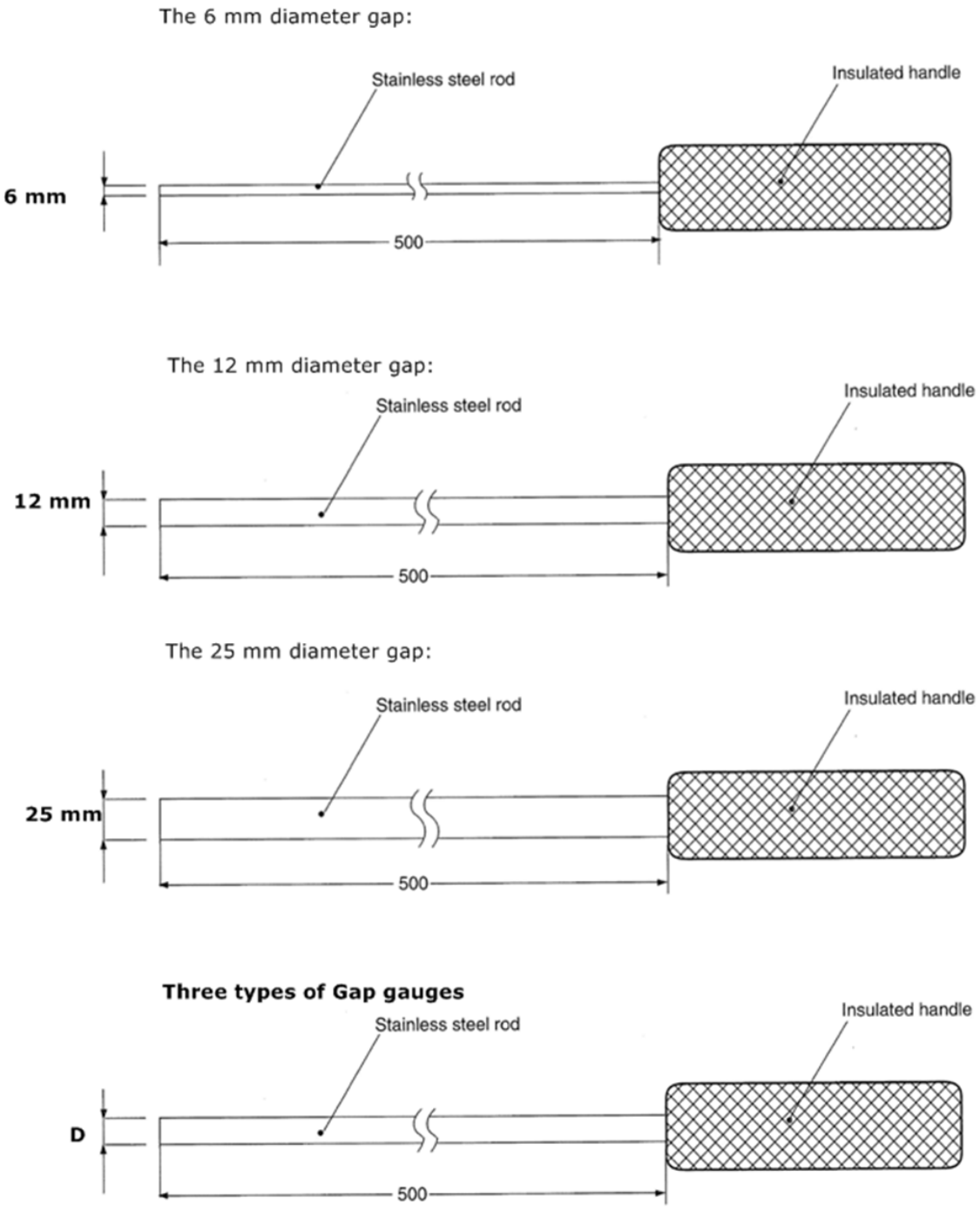


Figure 10 – Cotton-wool pad holder

7.10 Gap gauges

Three types of gap gauge, as shown in figure 11, shall be available for the measurement of integrity. They shall be made of stainless steel of the diameter specified to an accuracy of ± 0.5 mm. They shall be provided with appropriate handles.



No.	Gap gauge	Steel rod diameter (D) mm
1	φ 6 mm	6 ± 0.5
2	φ 12 mm	12 ± 0.5
3	φ 25 mm	25 ± 0.5

Figure 11 – Gap gauges

8 METHOD OF TEST

8.1 General

The test shall be carried out generally in accordance with the standard ISO 834-1, except where amended by this section. The procedures given in the following sections are supplementary to, an elaboration of, or a deviation from the ISO requirements.

8.2 Commencement of test

8.2.1 Not more than 5 min before the commencement of the test, the initial temperatures recorded by all thermocouples shall be checked to ensure consistency and the datum values shall be noted. Similar datum values shall be obtained for deformation, and the initial condition of the test specimen shall be noted.

8.2.2 At the time of the test, the initial average internal temperature and unexposed surface temperature of the specimen shall be from 10°C to 35°C and shall be within 5°C of the initial ambient temperature.

8.2.3 Prior to the commencement of the test the furnace temperature shall be less than 50°C. The commencement of the test shall be considered to be the moment when the programme to follow the standard heating curve has been initiated.

8.2.4 Ambient conditions

The laboratory shall be virtually draught free during the test. The ambient temperature shall be from 10°C to 35°C at the commencement of the test and during the test the temperature shall not decrease more than 5°C or increase more than 20°C for all insulated separating elements while they are still satisfying the insulation criterion.

8.3 Furnace control

8.3.1 Furnace temperature

8.3.1.1 The average temperature of the furnace as derived from the furnace thermocouples specified in paragraph 7.3 shall be monitored and controlled such that it follows the relationship (i.e. the standard heating curve):

$$T = 345 \log10(8t+l) + 20$$

where:
T is the average furnace temperature (°C),
t is the time (min).

8.3.1.2 The following points are defined by the above relationship:

- **.1** at the end of the first 5 min 576°C;
- **.2** at the end of the first 10 min 679°C;
- **.3** at the end of the first 15 min 738°C;
- **.4** at the end of the first 30 min 841°C; and
- **.5** at the end of the first 60 min 945°C.

8.3.1.3 The percentage deviation 'd' in the area of the curve of the average temperature recorded by the specified furnace thermocouples versus time from the area of the standard heating curve shall be within:
± 15%from t = 0 to 10(1)

± (15-0.5(t-10))%from t = 10 to 30(2)
± (5-0.083(t-30))%from t = 30 to 60(3)
± 2.5%from t = 60 and over(4)

where:
d = (A – As) x 1/As x 100, and
A is the area under the actual average furnace time-temperature curve; and
As is the area under the standard time-temperature curve.

All areas shall be computed by the same method, i.e. by the summation of areas at intervals not exceeding 1 min.

8.3.1.4 At any time after the first 10 min of test, the temperature recorded by any thermocouple shall not differ from the corresponding temperature of the standard time-temperature curve by more than ± 100°C.

8.3.2 Furnace pressure

8.3.2.1 A linear pressure gradient exists over the height of a furnace, and although the gradient will vary slightly as a function of the furnace temperature, a mean value of 8 Pa per metre height may be assumed in assessing the furnace pressure conditions. The value of the furnace pressure shall be the nominal mean value, disregarding rapid fluctuations of pressure associated with turbulence, etc., and shall be established relative to the pressure outside the furnace at the same height. It shall be monitored and controlled continuously and by 5 min from the commencement of the test shall be achieved within ± 5 Pa and by 10 min from the commencement of the test shall be achieved and maintained within ± 3 Pa.

8.3.2.2 For vertically orientated specimens the furnace shall be operated such that a pressure of zero is established at a height of 500 mm above the notional floor level to the test specimen. However, for specimens with a height greater than 3 m, the pressure at the top of the test specimen shall not be greater than 20 Pa, and the height of the neutral pressure axis shall be adjusted accordingly.

8.3.2.3 For horizontally orientated specimens the furnace shall be operated such that a pressure of 20 Pa is established at a position 100 mm below the underside of the specimen.

8.4 Measurements and observations on the test specimen

8.4.1 Temperature

8.4.1.1 All temperature measurements shall be recorded at intervals not exceeding 1 min.

8.4.1.2 When calculating temperature rise on the unexposed surface of the test specimen, this shall be done on an individual thermocouple-by-thermocouple basis. The average temperature rise on the unexposed surface shall be calculated as the average of the rises recorded by the individual thermocouples used to determine the average temperature.

8.4.1.3 For "A" class divisions, excluding doors, the average temperature rise on the unexposed face of the specimen shall be calculated from the thermocouples specified in paragraph 7.6.1.1 only.

8.4.1.4 For "B" and "F" class divisions, excluding doors, the average temperature rise on the unexposed face of the specimen shall be calculated from the thermocouples specified in paragraph 7.6.2.1 only.

8.4.1.5 For "A", "B" and "F" class doors, the average temperature rise on the unexposed face of the specimen shall be calculated from the thermocouples specified in paragraph 7.6.3.1 only. For a double-leaf door, all ten thermocouples used on both door leaves shall be used for this calculation.

8.4.2 Flaming on unexposed face

The occurrence and duration of any flaming on the unexposed surface, together with the location of the flaming, shall be recorded. In cases where it is difficult to identify whether or not there are flames then the cotton-wool pad shall be applied to the area of such disputed flaming to establish whether ignition of the pad can be initiated.

8.4.3 Cotton-wool pad

8.4.3.1 Tests with the cotton-wool pad are used to indicate whether cracks and openings in the test specimen are such that they could lead to the passage of hot gases sufficient to cause ignition of combustible materials.

8.4.3.2 A cotton-wool pad is employed by placing the frame within which it is mounted against the surface of the test specimen, adjacent to the opening or flaming under examination, for a period of 30 s, or until ignition (defined as glowing or flaming) of the cotton-wool pad occurs (if this happens before the elapse of the 30 s period). Small adjustments in position may be made so as to achieve the maximum effect from the hot gases. A cotton-wool pad shall be used only once.

8.4.3.3 The cotton-wool pad need not be used on the unexposed face after the period relevant to the insulation classification of the product.

8.4.3.4 Where there are irregularities in the surface of the test specimen in the area of the opening, care shall be taken to ensure that the legs of the support frame are placed so that clearance between the pad and any part of the test specimen surface is maintained during the measurements.

8.4.3.5 The cotton-wool pad shall be applied freely and not necessarily parallel to the surface of the specimen, and not always such that the crack or opening is central to the pad. The pad shall be positioned in the flow of hot gases but shall never be positioned such that any part of the pad is closer than approximately 25 mm from any point of the test specimen. For example, to adequately evaluate the hot gas leakage around a door it may be necessary to use the pad both parallel and normal to the face of the door or possibly at an oblique angle within the confines of the door frame.

8.4.3.6 The operator may make "screening tests" to evaluate the integrity of the test specimen. Such screening may involve selective short duration applications of the cotton-wool pad to areas of potential failure and/or the movement of a single pad over and around such areas. Charring of the pad may provide an indication of imminent failure, but an unused pad shall be employed in the prescribed manner for an integrity failure to be confirmed.

8.4.4 Gap gauges

8.4.4.1 Tests with the gap gauges are used to indicate whether cracks and openings in the test specimen are of such dimensions that they could lead to the passage of hot gases sufficient to cause ignition of combustible materials.

8.4.4.2 The gap gauges shall be used at intervals which will be determined by the apparent rate of the specimen deterioration. Two gap gauges shall be employed, in turn, and without undue force to determine:

.1 whether the 6 mm gap gauge can be passed through the specimen such that the gauge projects into the furnace, and can be moved a distance of 150 mm along the gap; or

.2 whether the 25 mm gap gauge can be passed through the specimen such that the gauge projects into the furnace.

Any small interruption to the passage of the gauge that would have little or no effect upon the transmission of hot gases through the opening shall not be taken into account, e.g., small fastening across a construction joint that has opened up due to distortion.

8.4.4.3 If gaps in "A" or "B" class divisions are fully or partly sealed by intumescent materials, the gap gauge test shall be performed as if no intumescent material is present.

8.4.4.4 For doors mounted in a three-sided frame, the change of gap at the bottom of the door as measured by a horizontally-held gap gauge shall not increase by more than 12 mm along the bottom edge of the door. 12 mm gap gauge can be used for the purpose of examining the increase of such gap. The edges of the door above the horizontal plane along the bottom of the door should be checked in the same manner as the four-sided framed door.

Note: If the door is mounted with a 13 mm gap, the 25 mm gap gauge may be used to determine an unacceptable change in gap.

8.4.5 Deformation

The deflection of an "A", "B" or "F" class test specimen, and additionally in the case of a door the maximum displacement of each corner of the door leaf relative to the door frame, shall be recorded during the test. These deflections and displacements shall be measured with an accuracy of ± 2 mm.

8.4.6 General behaviour

Observations shall be made of the general behaviour of the specimen during the course of the test and notes concerning the phenomena such as cracking, melting or softening of the materials, spalling or charring, etc., of materials of construction of the test specimen shall be made. If quantities of smoke are emitted from the unexposed face this shall be noted in the report. However, the test is not designed to indicate the possible extent of hazard due to these factors.

8.5 Duration of testing

8.5.1 “A" class divisions

For all "A" class divisions, including those with doors, the test shall continue for a minimum of 60 min. However, when the specimen is of an "A" class division, with a structural steel core which is imperforate (e.g., without a door), and where insulation is provided to the exposed face only (i.e. the structural steel core is the unexposed face of the construction), it is permitted to terminate the test prior to 60 min once the unexposed-face temperature-rise limits have been exceeded.

8.5.2 "B" and "F" class divisions

For all "B" and "F" class divisions, including those with doors, the test shall continue for a minimum of 30 min.

8.5.3 Termination of the test

The test may be terminated for one or more of the following reasons:

.1 safety of personnel or impending damage to equipment;
.2 attainment of selected criteria; or
.3 request of the sponsor.

The test may be continued after failure under subparagraph .2 above to obtain additional data.

9 TEST REPORT

The test report shall include the following information as a minimum. A clear distinction shall be made between the data provided by the sponsor and the data determined by the test:

.1 reference that the test was carried out in accordance with part 3 of the 2010 FTP Code (see also subparagraph .2 below);
.2 any deviations from the test method;
.3 name and address of the testing laboratory;
.4 date and identification number of the report;
.5 name and address of the sponsor;
.6 name and/or identification of the product tested;
.7 the name of the manufacturer of the test specimen and of the products and components used in the construction;
.8 type of the product, e.g., bulkhead, ceiling, door, window, duct penetration, etc.;
.9 fire-resistant class of the test, e.g., "A" class, "B" class, "F" class;
.10 the constructional details of the test specimen, including description and drawing and principal details of components. All the details requested in paragraph 2 shall be given. The description and the drawings which are included in the test report shall, as far as practicable, be based on information derived from a survey of the test specimen. When full and detailed drawings are not included in the report, then the applicant's drawing(s) of the test specimen shall be authenticated by the laboratory and at least one copy of the authenticated drawing(s) shall be retained by the laboratory; in this case reference to the applicant's drawing(s) shall be given in the report together with a statement indicating the method of endorsing the drawings;
.11 all properties of materials used that have a bearing on the fire performance of the test specimen together with measurements of thickness, density and, where applicable, the moisture and/or organic content of the insulation material(s) as determined by the test laboratory;
.12 date of the test specimen arrival;
.13 details of specimen conditioning;
.14 . date of test;
.15 test results:
- **.1** information concerning the location of all thermocouples fixed to the specimen, together with tabulated data obtained from each thermocouple during the test. Additionally, a graphical depiction of the data obtained may be included. A drawing shall be included which clearly illustrates the positions of the various thermocouples and identifies them relative to the temperature-time data;
- **.2** the average and the maximum temperature rises and the average core temperature rise, when applicable, recorded at the end of the period of time appropriate to the insulation performance criteria for the relevant classification (see paragraph 3 of part 3) or, if the test is terminated due to the insulation criteria having been exceeded, the times at which limiting temperatures were exceeded; and

.3 the maximum deflection of the specimen. In case of doors, the maximum deflection at the centre of the door specimen and the maximum displacement of each corner of the door leaf relative to the door frame;

.16 the classification attained by the test specimen shall be expressed in the form of "class "A-60" deck", i.e. including the qualification on orientation of the division.

The result shall be presented in the test report in the following manner, which includes provision regarding non-combustibility, under the heading "Classification":

"A deck constructed as described in this report may be regarded as an "A-60" class deck according to part 3 of annex 1 to the FTP Code if all the materials comply with paragraph 3.5.1 of part 3 of annex 1 to the 2010 FTP Code.";

.17 the name of the representative of the Administration present at the test. If the Administration requires prior notification of test and a representative does not witness the test, a note to this effect shall be made in the report in the following form:

"The … (name of the Administration) … was notified of the intention to conduct the test detailed in this report and did not consider it necessary to send a representative to witness it."; and

.18 the statement:

"The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use".

ANNEX 1 – PART 3 – APPENDIX 2
TESTING OF WINDOWS, FIRE DAMPERS, PIPE AND DUCT PENETRATIONS AND CABLE TRANSITS

INTRODUCTION

This appendix covers the testing of windows, fire dampers, pipe penetrations and cable transits, all of which may be incorporated within "A" class divisions.

Irrespective of the fact that this appendix is written only for "A" class divisions, the prescriptions given can be used by analogy when testing windows, fire dampers, pipe and duct penetrations and cable transits incorporated in "B" class divisions, where appropriate.

The testing and reporting of these components shall be generally in accordance with the requirements given in appendix 1 to this part. Where additional interpretation, adaptions and/or supplementary requirements may be necessary, these are detailed in this appendix.

Since it is not possible to introduce the distortions which are experienced by the structural core during tests corresponding to procedures given in this appendix, into specimens of smaller scale, all the tests of the components covered by this appendix shall be undertaken with those components installed in full-size dimensioned structural cores as specified in appendix 1.

A.I – WINDOWS

1 GENERAL

1.1 The term window is taken to include windows, sidescuttles and any other glazed opening provided for light transmission or vision purposes in "A" class bulkheads. Windows in "A" class doors are considered to be part of the door and they shall be tested within the appropriate door.

1.2 The approach adopted for testing windows shall generally follow the requirements for testing "A" class doors where relevant and appropriate.

2 NATURE OF TEST SPECIMENS

2.1 Dimensions

2.1.1 The test shall be conducted on the window of the maximum size (in terms of both the width and the height) for which approval is sought.

2.1.2 The test shall be conducted on a window of the maximum size (in terms of both the height and the width) and the type of the glass pane and/or the minimum thickness of the glass pane or panes and gaps, if appropriate, for which approval is sought. Test results obtained on this configuration shall, by analogy, allow approval of windows of the same type, with lesser dimensions in terms of height and width and with the same or greater thickness.

2.2 Design

2.2.1 The bulkhead which includes the window shall be insulated to class "A-60" on the stiffened face, which shall be the face exposed to the heating conditions of the test. This is considered to be most typical of the use of windows on board ships. There may be special applications of windows where the Administration considers it appropriate to test the window with the insulation of the bulkhead to the unexposed face of the structural core, such as the window on front bulkhead of the tanker,* or within bulkheads other than class "A-60".

2.2.2 The window shall be positioned within the bulkhead, shown in figure 1 of appendix 1, at that height which is intended for practical application. When this is not known, the window shall be positioned with the top of its frame as close as possible, but not closer than 300 mm, to the top of the bulkhead.

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* *Interpretation:*
Windows to be fitted at the forward bulkhead of accommodation block on tankers shall correspond to prototype subject to the "A" class standard fire test with the fire against its external side (i.e. the side which, after the installation on board, will be exposed to the weather). The insulation of the bulkhead used along with the window's specimen shall be fitted on the unexposed face of the structural core. (MSC.1/Circ.1203) and (IACS UI FTP4/Rev.2)

3 INSTRUMENTATION

When a window is required by the Administration to be of a classification other than class "A-0", thermocouples shall be fixed to the window pane as specified for the leaf of a door. In addition, thermocouples shall be provided to the window frame, one at mid-length of each perimeter edge. When windows are fitted with transoms and/or mullions, five thermocouples shall be fixed to each window pane as specified for the leaf of a door, and, in addition to the thermocouples fixed to the window frame, a single thermocouple shall be fixed at mid-length of each transom or mullion member.

4 METHOD OF TEST

4.1 Temperature

For the calculation of the average temperature rise on the unexposed face, only those thermocouples fixed to the face of the window pane(s) shall be used.

4.2 Cotton-wool pad and gap gauges

For windows which are to be of a classification "A-0", the cotton-wool pad test need not be used to evaluate the integrity of a window since radiation through the window pane could be sufficient to cause ignition of the cotton-wool pad. In such cases cracks or openings in windows shall not be such as to allow the gap gauges to enter in the manner described in paragraph 8.4.4 of appendix 1.

5 HOSE-STREAM TEST

5.1 General

This procedure is an optional requirement and may be requested by some Administrations for windows used in specific areas of a ship. The window is subjected to the impact, erosion and cooling effects of a hose stream.

5.2 Method of test

5.2.1 The hose-stream test shall be applied to the exposed face of the specimen immediately, but at least within not more than 1.5 min following the termination of the heating period.

5.2.2 The water stream is delivered through a standard fire hose and discharged through a 19 mm nozzle of tapered smooth-bore pattern without shoulder at the orifice. The nozzle orifice shall be 6 m from the centre and normal to the exposed face of the specimen.

5.2.3 The water pressure at the nozzle shall be 310 kPa when measured with the water flow in progress.

5.2.4 The duration of application of the hose stream to the surface of the specimen shall be 0.65 min for each square metre of the exposed area of the specimen. The stream shall be directed firstly at the centre and then at all parts of the exposed face, changes in direction being made slowly.

5.3 Performance criteria

5.3.1 For the calculation of the average temperature rise on the unexposed face, only those thermocouples fixed to the face of the window pane(s) shall be used.

5.3.2 For the judgment of the maximum temperature rise on the unexposed face, all the thermocouples fixed to the face of the window pane(s), window frame, transoms and mullions shall be used.

5.3.3 The specimen is considered to have satisfied the criteria of the hose-stream test if no openings develop during the application of the stream which allow water to pass to the unexposed face.

5.3.4 The window shall be considered to have failed the hose-stream test if an opening develops that allows an observable projection of water from the stream beyond the unexposed surface during the hose-stream test. Gap gauges need not be applied during or after the hose stream test.

A.II – FIRE DAMPERS

1 GENERAL

1.1 "A" class divisions may have to be pierced for the passage of ventilation ducting, and arrangements shall be made to ensure that the effectiveness of the division in relation to the criterion for integrity, as specified in paragraph 3 of Part 3 , is not impaired. Provisions shall also be made to ensure that, shall a fire be initiated within, or gain access to, ventilation ductwork, such a fire does not pass through the division within the ductwork.

1.2 To provide for both these requirements, fire dampers are provided within or fixed to spigots or coamings which are welded to the structural core and are insulated to the same standard as the division.

2 NATURE OF THE TEST SPECIMEN

2.1 Dimensions

The maximum sizes (in terms of both the width and the height, or the diameter) of each type of fire damper for which approval is sought shall be tested in both vertical and horizontal orientation.

2.2 Design

2.2.1 A bulkhead which includes the damper shall be constructed in accordance with paragraph 2.1 of appendix 1 and shall be insulated to class "A-60" on the stiffened face, which shall be the face which is not exposed to the heating conditions of the test. A deck which includes the damper shall be constructed in accordance with paragraph 2.2 of appendix 1 and shall be insulated to class "A-60" on the stiffened face, which shall be the face which is exposed to the heating conditions of the test.

2.2.2 Fire dampers shall be incorporated into or fixed to coamings or a spigot, which shall be welded or bolted into the structural core.

The length on the unexposed side = (450 mm or a needed insulation length for a damper under test) (Lunexp) + 50 mm.

The thickness of the coaming or spigot shall be as follows:

Width * or diameter of the duct	**Minimum thickness of coaming**
Up to and including 300 mm	3 mm
760 mm and over	5 mm

* Width means the greater of the two cross-sectional dimensions.

For widths or diameters of ducts in excess of 300 mm but less than 760 mm, the thickness of the coaming or spigot shall be obtained by interpolation.

The coaming or spigot shall be insulated as shown in figure A1.

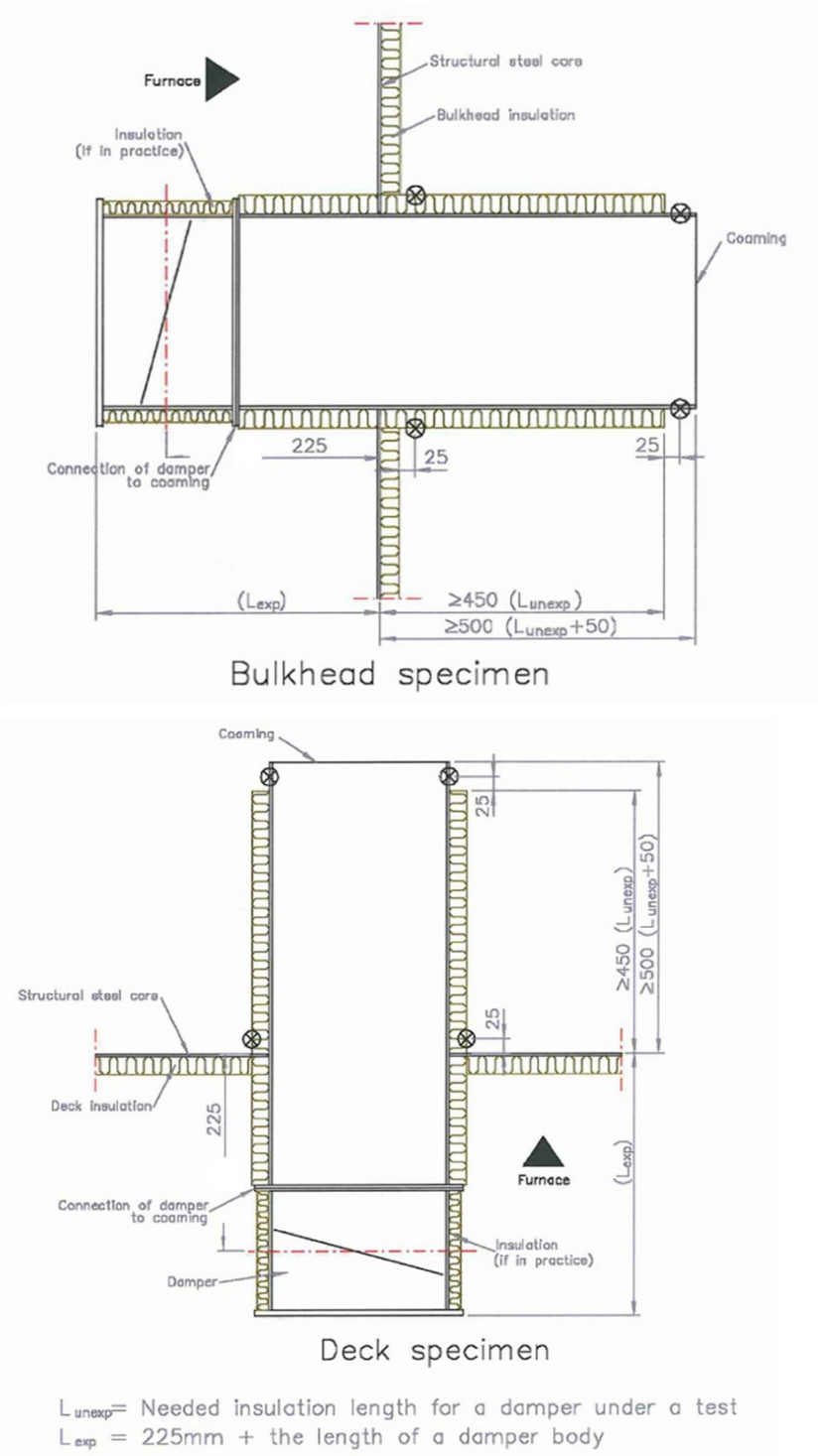

Figure A1 –Fire dampers: insulation on test specimens and position of unexposed-face thermocouples

2.2.3 The coamings or spigots (including insulation) shall be positioned only in the top half of a bulkhead. Where more than one damper is included in a bulkhead, the top edges of all dampers should be, as far as possible, at the same height. These shall be no closer than 200 mm from the edges of a bulkhead or deck. Where more than one damper is to be tested simultaneously in a division, the distance between adjacent coamings or spigots (including insulation) shall not be less than 200 mm.

2.2.4 The fire dampers shall be positioned on the exposed face of the bulkhead or deck. The distance between the fire damper centre and the structural core shall be at least 225 mm.

The operative control of a damper is positioned on the exposed side of the division. When a damper is mounted in the bulkhead the fuse element should be situated at the lowest level of the damper as in practice.

2.2.5 Fire dampers which are operated automatically shall be in the open position at the start of the test and shall be closed by an automatic device. The damper shall be in the closed position within 2 min after the commencement of the test. If the fire damper fails to close after 2 min from the start of the test, the fire damper shall be deemed to have failed and the test shall be discontinued.

2.2.6 Fire dampers which are operated with a manual system shall be closed at the test time of 1 min.

3 INSTRUMENTATION

3.1 Positioning of thermocouples on the specimen

3.1.1 For each fire damper, two thermocouples where the width* or diameter of a damper is not more than 200 mm and four thermocouples when that is over 200 mm shall be fixed to the unexposed face at each of the following locations:

.1 on the surface of the insulation provided to the coaming or spigot at a distance of 25 mm from the unexposed surface of the divisions; and

.2 on the surface of the coaming or spigot at a distance of 25 mm from where the coaming or spigot emerges from its insulation.

* Width means the greater of the two cross-sectional dimensions.

3.1.2 In the damper where the size exceeds 200 mm, four thermocouples, for each of the positions indicated in paragraphs 3.1.1.1 and 3.1.1.2, shall be fixed. One of the thermocouples shall be fixed at the centre of each side of the coaming or spigot.

3.1.3 In the damper where the size is not more than 200 mm, two thermocouples, for each of the positions indicated in paragraphs 3.1.1.1 and 3.1.1.2, shall be fixed. One of the thermocouples shall be fixed at the centre of opposing sides of the coaming or spigot and for dampers in bulkheads situated on the top and bottom surface of the coaming or spigot.

4 PERFORMANCE CRITERIA

4.1 It will not always be possible to utilize the cotton-wool-pad test to evaluate the integrity of a fire damper since radiation through the damper could be sufficient to cause ignition of the cotton-wool pad. In such cases, cracks or openings in fire dampers shall not be such as to allow the gap gauges to enter in the manner described in paragraph 8.4.4 of appendix 1.

4.2 The performance of fire dampers may be related to their ability to satisfy both the insulation and the integrity criteria or may be related only to the requirements for integrity, depending on the requirements of the Administration.

4.3 If evaluation of insulation is required, the temperature rise at any point on the surface shall not exceed 180°C above the initial temperature. The average temperature rise shall not be used for this purpose.

A.III – PIPE AND DUCT PENETRATIONS

1 GENERAL

1.1 "A" class divisions may have to be provided with apertures to allow them to be penetrated by service pipes and ducts, and it is necessary to reinstate the insulation and/or integrity performance of the division at the position where it has been penetrated.

1.2 Administrations may have different requirements relating to the need to classify pipe and/or duct penetrations, e.g., related to the pipes' diameter and their direct attachment or not to the structural core.

1.3 This section refers from here on to pipe penetrations but may be read as equally applicable to duct penetrations.

2 NATURE OF THE TEST SPECIMEN

2.1 Dimensions

The maximum and minimum sizes (in terms of both the width and the height, or diameter) of each type of pipe penetration for which approval is sought shall be tested in both vertical and horizontal orientation.

2.2 Design

2.2.1 A bulkhead which includes the pipe penetration shall be constructed in accordance with paragraph 2.1.1 of appendix 1 and shall be insulated to class "A-60" on the stiffened face, which shall be the face which is not exposed to the heating conditions of the test. A deck which includes the pipe penetration shall be constructed in accordance with paragraph 2.2.1 of appendix 1 and shall be insulated to class "A-60" on the stiffened face, which shall be the face which is exposed to the heating conditions of the test.

2.2.1.1 "A-0" class pipe penetrations are recommended to be performed in an uninsulated ("A-0") bulkhead/deck. If the pipe penetrations are tested as an "A-60" class penetration, any insulation fitted (on the penetration itself and 200 mm around) will be required to be fitted also for class "A-0".

2.2.1.2 "A-0" penetrations shall not be approved without an "A-0" test although tested and approved as "A-60".

2.2.2 The pipe penetrations shall be positioned only in the top half of a bulkhead but shall not be closer than 200 mm from the edges of a bulkhead or a deck. Where more than one pipe penetration is to be tested simultaneously in a division, the separation between adjacent penetrations shall not be less than 200 mm. Both measurements shall relate to the distance to the nearest part of the penetration system, including any insulation which is part of the system.

2.2.3 Each pipe passing through a penetration shall project 500 ± 50 mm beyond the exposed end of the penetration and 500 ± 50 mm beyond the unexposed end of the penetration. The exposed end of the pipe shall be blanked off, using an appropriate methodology to ensure that any fire penetration into the pipe does not occur via the end of the pipe in advance of it occurring through the exposed perimeter of the pipe.

2.2.4 Each pipe shall be firmly supported and fixed independent of the bulkhead or deck on the unexposed side of the test specimen, e.g., by a framework mounted from the restraint frame. The support and fixing of the pipe shall restrain it from movement during the test.

2.2.5 When the deck penetration is fitted on an exposed side or is fitted symmetrically, general application will be given. When the deck penetration is fitted on an unexposed side, the approval will limit the penetration to the tested orientation.

2.2.5.1 When the bulkhead penetration is fitted symmetrically, approval would be given for general application. For bulkhead penetrations with an exposed or unexposed fitted frame, one test for each fitting is required in order for obtaining approval for general application.

2.2.6 Sealing of pipe and duct penetrations: there shall be no visible openings before the start of the fire test.

2.2.6.1 In cases where a test specimen (deck) which includes the prototype penetration(s) is not mounted within a rigid restraint frame but is connected to the furnace roof by side wall coamings, the rigidity of the coamings is to be equivalent to that of a restraint frame and evaluated in accordance with paragraph 5.1 of appendix 1.

2.2.6.2 In cases where insulation is fitted to the test pipe(s), the distance(s) of 500 ± 50 mm required in paragraph 2.2.3 to which the pipe should project is to be taken from the end of the insulation as this is considered an integral part of the penetration(s) being tested and it is necessary that a length of unprotected pipe is exposed to the furnace.

2.2.6.3 In all cases, the support and fixing of the test pipe(s) is to be by a framework mounted from the restraint frame such that any movement of the bulkhead or deck relative to the pipe(s) will be experienced by the penetration(s) being tested.

3 INSTRUMENTATION

3.1 Positioning of thermocouples on the specimen

3.1.1 For each pipe penetration, two thermocouples shall be fixed on the unexposed face at each of the following locations:

- **.1** on the surface of the pipe at a distance of 25 mm from the centre of the thermocouples to the position where the pipe emerges from the penetration seal;
- **.2** on the pipe penetration at a distance of 25 mm from the centre of the thermocouples to the face of the insulation on the unexposed side of the test specimen; and
- **.3** on the surface of any insulation or filling material used between the pipe and any coaming or spigot fixed to the division (provided that the gap between the pipe or any such coaming or spigot is greater than 30 mm), or on the surface of any collar or shroud used between the pipe and the division (e.g., vapour barrier).

3.1.2 For pipe penetrations in bulkheads, for each of the positions indicated above, one of the thermocouples shall be fixed directly above the centre of the pipe and the other thermocouple shall be fixed directly below the centre of the pipe.

3.1.3 Additional thermocouples may be required to be fitted, dependent upon the complexity of the pipe penetration.

4 PERFORMANCE CRITERIA

4.1 General

4.1.1 The performance of pipe penetrations may be related to their ability to satisfy both the insulation and the integrity criteria or may be related only to the requirements for integrity, depending on the requirements of the Administration.

4.1.2 Duct penetrations shall meet both integrity and insulation criteria.

4.2 Insulation

Since the pipe penetration is a local weakness in the division it shall be capable of preventing a temperature rise exceeding l80°C above the initial temperature. The average temperature rise is not relevant.

A.IV – CABLE TRANSITS

1 GENERAL

"A" class divisions may have to be provided with apertures to allow them to be penetrated by cables, and it is necessary to reinstate the insulation and integrity performance of the division at the position where it has been penetrated. A cable transit consists of a metal frame, box or coaming, a sealant system or material and the cables, and it may be uninsulated, partially insulated or fully insulated.

2 NATURE OF THE TEST SPECIMEN

2.1 Dimensions

The maximum and minimum sizes (in terms of both the height and the width) of each type of cable transit for which approval is sought shall be tested in both vertical and horizontal orientation.

2.2 Design

2.2.1 A bulkhead which includes the cable transit shall be constructed in accordance with paragraph 2.1.1 of appendix 1 and shall be insulated to class "A-60" on the stiffened face, which shall be the face which is not exposed to the heating conditions of the test. A deck which includes the cable transit shall be constructed in accordance with paragraph 2.2.1 of appendix 1 and shall be insulated to class "A-60" on the stiffened face, which shall be the face which is exposed to the heating conditions of the test.

2.2.1.1 "A-0" class cable transits are recommended to be performed in an uninsulated ("A-0") bulkhead/deck. If the cable transits are tested as "A-60" penetration, any insulation fitted on an exposed side (on the cable transits itself and 200 mm around) will be required to be fitted also for "A-0".

2.2.1.2 "A-0" cable transits shall not be approved without an "A-0" test although tested and approved as "A-60".

2.2.2 The cable transits shall be positioned only in the top half of a bulkhead but shall not be closer than 200 mm from the edges of a bulkhead or a deck. Where more than one cable transit is to be tested simultaneously in a division, the separation between adjacent transits shall not be less than 200 mm. Both measurements shall relate to the distance to the nearest part of the transit system, including any insulation which is part of the system.

2.2.3 Notwithstanding the above, the distance between transits shall be sufficient to ensure that the transits do not influence each other during the test, except that this requirement does not apply to multi-transits which are intended to be positioned adjacent to one another.

2.2.4 The cables shall project 500 ± 50 mm beyond the transit on the exposed side of the division and 500 ± 50 mm on the unexposed side.

2.2.4.1 Each cable shall be firmly supported and fixed independent of the bulkhead or deck on the unexposed side of the test specimen, e.g., by a framework mounted from the restraint frame. The support and fixing of the cables shall restrain them from movement during the test.

2.2.5 Cable transits shall be fitted to the bulkhead or deck in accordance with the manufacturer's specifications. The cables and sealing compounds or blocks shall be incorporated into the transits with the bulkhead and deck panels placed respectively in vertical and horizontal positions. Any insulation shall be applied to the cables and transits with the panels in the same respective positions.

2.2.6 The transit(s) shall be tested incorporating a range of different types of cables (e.g., in terms of number and type of conductor, type of sheathing, type of insulation material, size) and shall provide an assembly which represents a practical situation which may be found on ships. An individual Administration may have its own specification for a "standard" configuration of penetrating cables which it may use as a basis of its approvals.

2.2.6.1 The test results obtained from a given configuration are generally valid for the tested types of cables of size equal to or smaller than tested.

2.2.7 Tests shall be conducted for the maximum and minimum fill based on the inside cross-sectional area at each transit. The distance between the adjacent cables shall be the minimum specified by the manufacturer, and the cables should be placed close to the centre of the transit.

2.2.8 When the deck cable transit is fitted on an exposed side or is fitted symmetrically, general application will be given. When the deck cable transit is fitted on the unexposed side, the approval will limit the penetration to the tested orientation.

2.2.8.1 When the bulkhead cable transit is fitted symmetrically, approval would be given for general application. For bulkhead cable transit with exposed or unexposed fitted frame, one test for each fitting is required in order for obtaining approval for general application.

2.2.9 Sealing of cable transits shall have no visible openings before the start of the fire test.

3 INSTRUMENTATION

3.1 Positioning of thermocouples on the specimen

3.1.1 For each uninsulated cable transit, thermocouples shall be fixed on the unexposed face at each of the following locations:

.1 at two positions on the surface of the frame, box or coaming at a distance of 25 mm from the unexposed surface of the division. When the penetration does not extend a minimum of 25 mm beyond the bulkhead or deck plate on the unexposed side of the assembly, these thermocouples shall be placed at the end of the frame, box or coaming;

.2 at two positions at the end of the transit, on the face of the sealant system or material at a distance of 25 mm from a cable. If there is insufficient area to affix the thermocouples as described, one or both may be placed within a distance of 25 mm from a cable; and

.3 on the surface of each type of cable included in the cable transit, at a distance of 25 mm from the face of the sealant system or material. In case of a group or bunch of cables, the group shall be treated as a single cable. In case of horizontal cables, the thermocouples shall be mounted on the uppermost surface of the cables. These thermocouples may be excluded if the diameters of the cables are too small to effectively affix the thermocouples to the cables. This shall be at the discretion of the Administration.

3.1.2 For those thermocouples placed on the outer perimeter of the frame, box or coaming, one thermocouple shall be fixed on each of two opposite faces, which in the case of bulkheads shall be the top and bottom faces.

3.1.3 For each partially insulated or fully insulated cable transit, thermocouples shall be fixed on the unexposed face at equivalent positions to those specified for an uninsulated transit as illustrated in figure A2.

3.1.4 Additional thermocouples may be required to be fixed, dependent upon the complexity of the cable transit.

3.1.5 When fixing thermocouples to the unexposed surface of the cables, the copper disc and the insulating pad shall be formed over the surface to provide good contact with the surface of the cable. The copper disc and the pad shall be retained in position by some mechanical means, e.g., wiring or spring clips, such that they do not become detached during the test. The mechanical retention shall not provide any significant heat-sink effect to the unexposed face of the thermocouple.

4 PERFORMANCE CRITERIA

4.1 General

Cable transits shall meet both integrity and insulation criteria.

4.2 Insulation

Since the cable transit is a local weakness in the division the temperature rise at any point on the surface shall not exceed l80°C above the initial temperature. The average temperature rise shall not be used for this purpose.

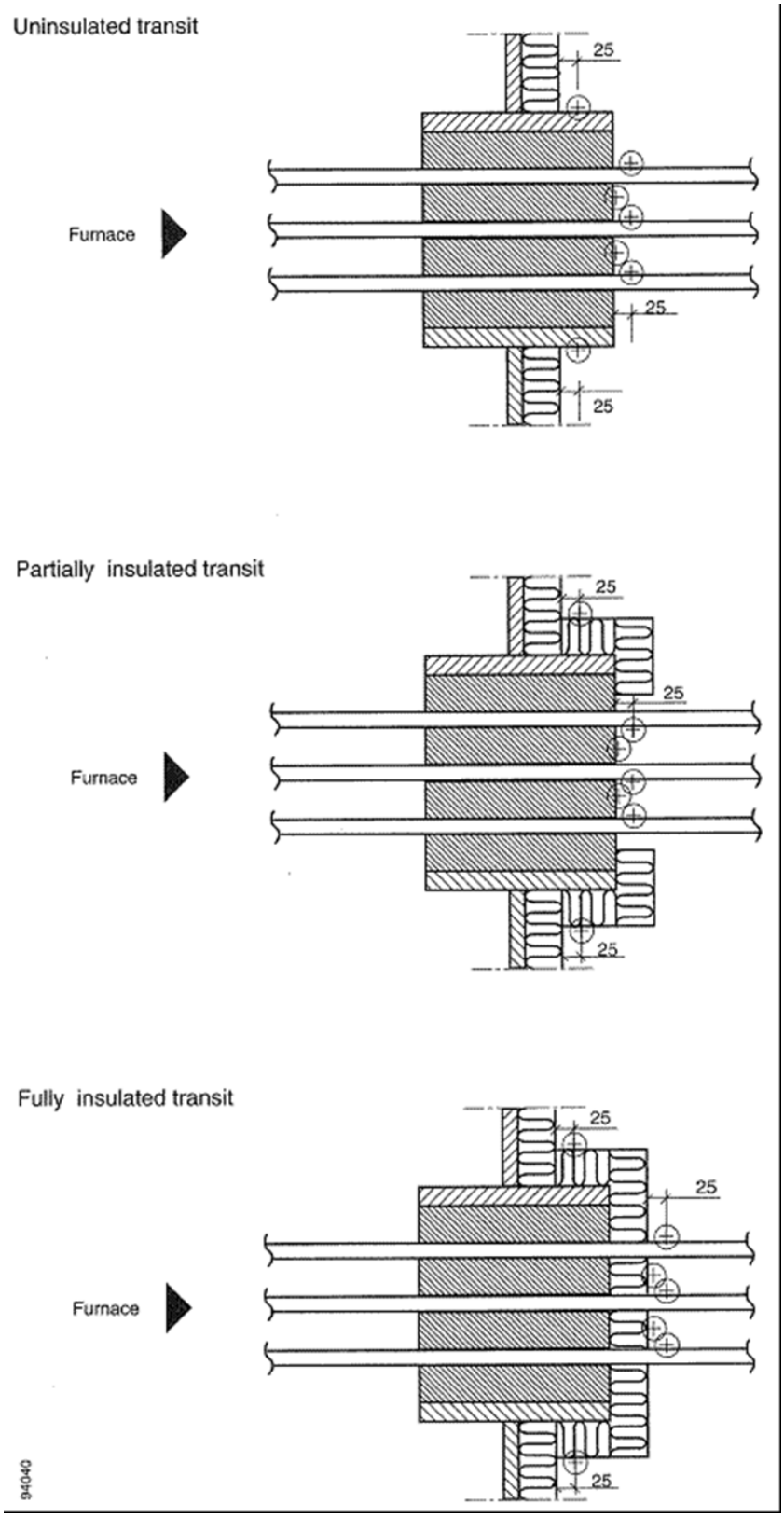

Figure A2 – Cable transits: position of unexposed-face thermocouples (shown for bulkhead)

ANNEX 1 – PART 3 – APPENDIX 3
THERMAL RADIATION TEST SUPPLEMENT TO FIRE RESISTANCE TEST PROCEDURES FOR WINDOWS IN "A", "B" AND "F" CLASS DIVISIONS

1 SCOPE

1.1 This appendix specifies a procedure for measuring heat flux through windows as a basis for characterizing their ability to limit the heat radiation in order to prevent the spread of fire and to enable escape routes to pass near the windows.

1.2 This procedure is an optional requirement and may be requested by some Administrations for windows in specific areas of a ship.

2 TEST PROCEDURES

2.1 The window shall be tested in accordance with appendix 2 of this part using the additional instrumentation as described below.

2.2 The term "window" includes windows, side scuttles and any other glazed opening provided for light transmission or vision purposes in a fire resistant division. The term "fire resistant division" includes bulkheads and doors.

3 ADDITIONAL INSTRUMENTATION

3.1 Additional instrumentation consists of a restricted-view total-heat flux meter calibrated with the restricted view to indicate incident heat flux. The flux meter shall be water-cooled and capable of measuring heat flux 0 kW/m2 to 60 kW/m2. The flux meter should be calibrated at least once a year against a standard device.

3.2 The flux meter should be placed perpendicular to the centre of the window being tested, and in a position such that the centre of the flux meter's view coincides with the centre of the window * (see figure). The flux meter should be located at a distance greater than 0.5 m from the window, such that the view of the flux meter just includes part of the frame. However, the flux meter should not be located more than 2.5 m from the window. The dimension of the boundary and window frame seen by the flux meter, which remains outside the window, should not exceed 10% of the total width seen by the flux meter on the surface of the sample. It should be calculated on the basis of restricted view angle of the flux meter and its distance to the sample surface.

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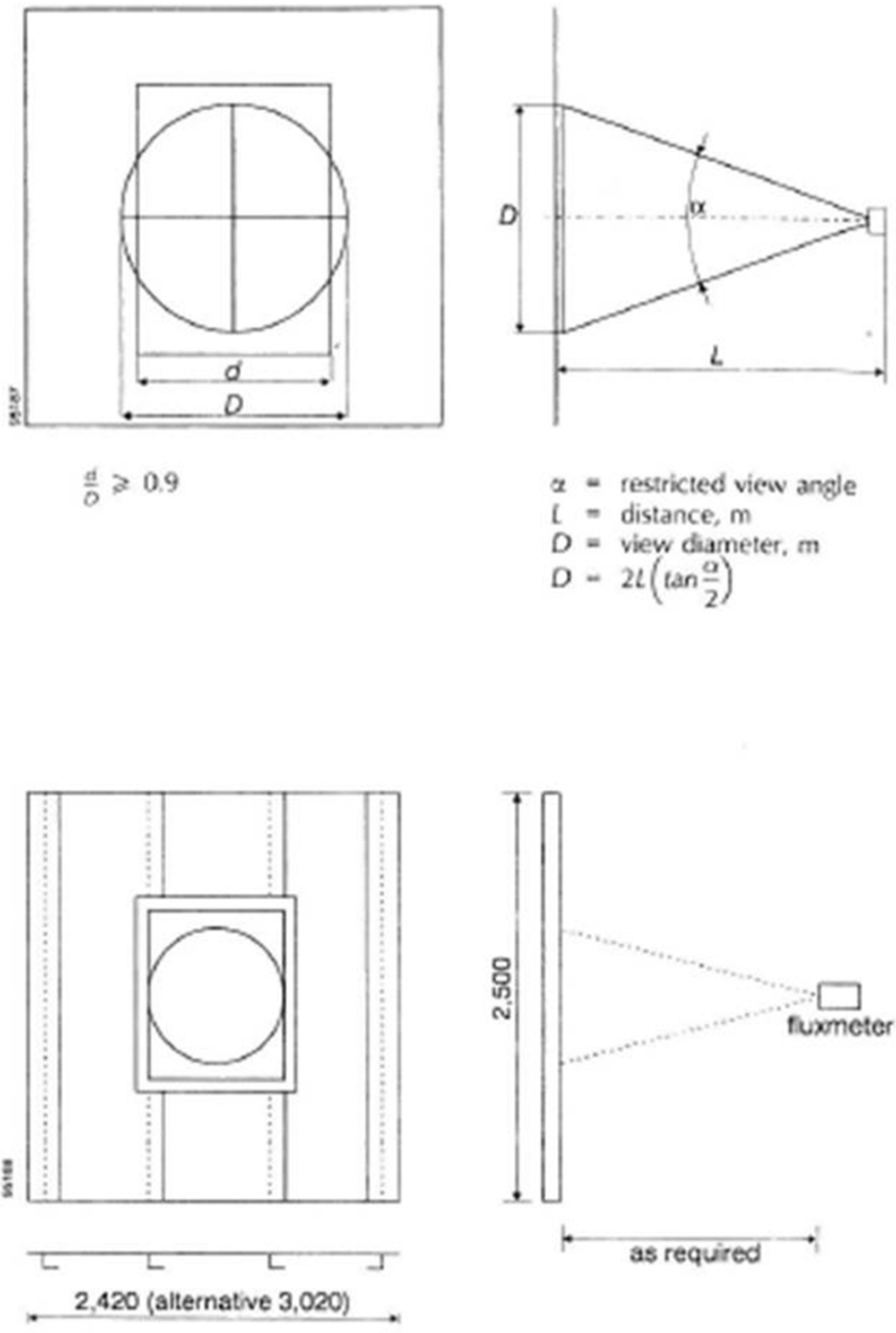
* A satisfactory method of placing, mounting, and aiming the fluxmeter is as follows: A metal stand constructed of a pipe mounted on a sturdy base serves as an instrument tree to locate the fluxmeter at the required distance from the test specimen. A suitable holder for the fluxmeter is constructed by mounting a gun-sight mount on a lockable ball and socket joint. This joint provides flexibility for aiming the meter. The fluxmeter holder is mounted on the instrument tree at the appropriate height. A laser pointer is placed in the gun-sight mount and the mount is oriented such that the dot is in the centre of the window. The laser pointer is slipped out of the holder and replaced by the fluxmeter.

3.3 For windows whose greater dimension is less than 1.57 times the smaller dimension, only one flux meter is needed.

3.4 For oblong windows whose greater dimension is more than 1.57 times the smaller dimension, additional flux meters should be provided. The distance of the flux meters from the window should be adjusted such that the flux meters' view covers at least 50% of the window.

However, the flux meters should not be located less than 0.5 m nor more than 2.5 m from the window.



Figure

4 PERFORMANCE CRITERIA

4.1 The peak heat flux (Ew) should be measured for the first 15 min of the test, for the first 30 min of the test, and for the entire duration of the test (i.e. 60 min for class "A" and 30 min for class "B" boundaries).

4.2 The peak heat fluxes (Ew) measured in accordance with paragraph 4.1 should be compared against the reference value (Ec) from table 1 below.

4.3 If (Ew) is less than (Ec), the window is acceptable for installation in a boundary of the corresponding fire resistant classification.

Table 1 – Criteria for heat flux

Fire resistant division classification	Time period from beginning of test to	Heat flux E_c (kW/m^2)
"A-0"	60 min	56.5
"A-15"	15 min 60 min	2.34 8
"A-30"	30 min 60 min	2.34 6.4
"A-60"	60 min	2.34
"B-0"	30 min	36.9
"B-15"	15 min 30 min	2.34 4.3

ANNEX 1 – PART 3 – APPENDIX 4
CONTINUOUS "B" CLASS DIVISIONS

1 SCOPE

1.1 This appendix specifies the procedure for testing linings and ceilings for verifying that they are "continuous 'B' class linings" and "continuous 'B' class ceilings" and for evaluating full constructions to be "continuous 'B' class constructions".

1.2 This procedure is an optional requirement and may be requested by some Administrations for continuous "B" class divisions.

2 TEST PROCEDURES AND EVALUATION

2.1 The linings, ceilings and constructions should be evaluated in accordance with this part using the arrangements described below.

2.2 The ceilings should be tested in accordance with paragraph 2.8 of the appendix 1 except that the ceiling should be mounted on the horizontal furnace so that at least 150 mm high "B" class bulkheads are mounted on the furnace and the ceiling is fixed to these partial bulkheads by using the joining method as is intended to be used in practice. Such ceilings and the joining methods should be evaluated as required for ceilings in accordance with appendix 1 of this part and accordingly they should be classified as "continuous 'B' ("B-0" or "B-15", as applicable) class ceilings".

2.3 A lining which has been evaluated in accordance with this part to be a "B" ("B-0" or "B-15", as applicable on basis of the lining test) class lining may be considered as forming a "continuous 'B' ("B-0" or "B-15", as applicable) class lining" in conjunction with a "continuous 'B' ("B-0" or "B-15", as applicable) class ceiling" and with the joining method used in the test (see paragraph 2.2 above) without further testing the lining.

2.4 An enclosed construction installed on an "A" class deck and formed by "continuous 'B' ("B-0" or "B-15", as applicable) class linings" and "continuous 'B' ("B-0" or "B-15", as applicable) class ceiling" should be considered as forming a "continuous 'B' class construction".

ANNEX 1 - PART 4
TEST FOR FIRE DOOR CONTROL SYSTEMS

1 APPLICATION

Where a control system of fire doors is required to be able to operate in case of fire, the system shall comply with this part.

2 FIRE TEST PROCEDURE

The fire door control systems shall be tested and evaluated in accordance with the test procedure presented in the appendix to this part.

3 ADDITIONAL REQUIREMENTS

Part 1 of this annex is also applicable to insulation materials used in connection with a fire door control system. Part 5 of this annex is applicable to adhesives used in connection with a fire door control system.

ANNEX 1 – PART 4 – APPENDIX
FIRE TEST PROCEDURES FOR FIRE DOOR CONTROL SYSTEMS

See *FTP Code*.

ANNEX 1 – PART 5
TEST FOR SURFACE FLAMMABILITY (TEST FOR SURFACE MATERIALS AND PRIMARY DECK COVERINGS)

1 APPLICATION

1.1 Where a product is required to have a surface with low flame-spread characteristics, the product shall comply with this part.

1.2 Where the primary deck coverings are required to be not readily ignitable, they shall comply with this part.

1.3 Where a product of surface material is approved based on a test of a specimen applied on a non-combustible and non-metallic substrate, that product shall be approved for application to any non-combustible and non-metallic substrate with similar or higher density (similar density

may be defined as a density equal to or greater than 0.75 times the density used during testing) or with a greater thickness if the density is more than 400 kg/m3. Where a product is approved on the basis of a test result obtained after application on a metallic substrate (e.g., thin film of paints or plastic films on steel plates), such a product shall be approved for application to any metallic base of similar or higher thickness (similar thickness is obtained as a thickness equal to or greater than 0.75 times the thickness of metallic substrate used during testing).

2 FIRE TEST PROCEDURE

2.1 The surface materials and primary deck coverings shall be tested and evaluated in accordance with the test procedure specified in appendix 1 to this part. The test may be terminated after 40 min.

2.2 During fire tests for bulkhead, ceiling and deck finish materials and primary deck coverings, there are those specimens which exhibit various phenomena which cause difficulties in classification of the materials. Appendix 3 to this part provides guidance on the uniform interpretation of such results.

2.3 For preparation of the test specimen, refer to appendix 4 to this part, which provides guidelines for the specimen of the ***Publication*** (FTP Code), parts 2 and 5, and the type approval of those products (Range of approval and restriction in use).

3 PERFORMANCE CRITERIA

3.1 Surface flammability criteria

Materials having average values for all of the surface flammability criteria that comply with the values as listed in table 1, are considered to meet the requirement for low flame-spread in compliance with the relevant regulations in chapter II-2 of the Convention.

3.2 Burning droplets during the test

Materials for bulkhead, wall and ceiling linings and primary deck coverings shall not produce burning droplets during the test. The burning droplets shall be considered as a reject material regardless of the surface flammability criteria. For floor coverings, no more than 10 burning drops are acceptable.

Table 1 - Surface flammability criteria

	Bulkhead, wall and ceiling linings	Floor coverings	Primary deck coverings
CFE (kW/m²)	≥ 20.0	≥ 7.0	≥ 7.0
Qsb (MJ/m²)	≥ 1.5	≥ 0.25	≥ 0.25
Qt (MJ)	≤ 0.7	≤ 2.0	≤ 2.0
Qp (kW)	≤ 4.0	≤ 10.0	≤ 10.0
Burning droplets	Not produced	No more than 10 burning drops	Not produced

where:

CFE = Critical flux at extinguishment
Qsb = Heat for sustained burning
Qt = Total heat release
Qp = Peak heat release rate

Note: Qsb means an average of heat for sustained burning, as defined in paragraph 9.3 of appendix 1.

4 ADDITIONAL REQUIREMENTS

4.1 Surface materials for bulkheads and ceilings and similar exposed surfaces

In case that the requirement of maximum gross calorific value (e.g., 45 MJ/m2) applies for a product, the test method specified in the standard ISO 1716 shall be used for determining the gross calorific value.

4.2 Floor coverings and primary deck coverings

4.2.1 A "primary deck covering" is the first layer of a floor construction which is applied directly on top of the deck plating and is inclusive of any primary coat, anti-corrosive compound or adhesive which is necessary to provide protection or adhesion to the deck plating. Other layers in the floor construction above the deck plating are "floor coverings".

4.2.2 When the product that is the first layer of a floor construction which is applied directly on top of the deck plating and is also the exposed surface (i.e. no other layer applied on it), it shall be considered as the "floor covering", and shall comply with the requirements of "floor covering".

4.2.3 Where a floor covering is required to be low flame-spread, all layers shall comply with this part. If the floor covering has a multilayer construction, the Administration may require the tests to be conducted for each layer or for combinations of some layers of the floor coverings. Each layer separately, or a combination of layers (i.e. the test and approval are applicable only to this combination), of the floor covering shall comply with this part.

4.2.4 Primer or similar thin film of paint on deck plating need not comply with the above requirements.

4.3 Combustible ventilation ducts

Where combustible ventilation ducts are required to be of material which has low flame-spread characteristics, the surface flammability test procedure and criteria for lining and ceiling finishes of this part shall be applied for such ducts. In case homogeneous materials are used for the ducts, the test shall apply to outside surface of the duct, whilst both sides of the ducts of composite materials shall be tested.

4.4 Insulation materials for cold service systems

Where the exposed surfaces of vapour barriers and adhesives used in conjunction with insulation, as well as insulation of pipe fittings for cold service systems are required to have low flame-spread characteristics, the surface flammability test procedure and criteria for linings and ceilings of this part shall be applied for such exposed surfaces.

4.5 Adhesives used for "A", "B" and "F" class divisions

Adhesives used for "A", "B" and "F" class divisions are required to be of material which has low flame-spread characteristics. The surface flammability test procedure and acceptance criteria for linings and ceilings, according to appendix 1 to this part, shall apply to the adhesive as the exposed surface. The calcium silicate board described as a dummy specimen specified in paragraph 3.5 of appendix 1 to this part shall be used as a standard substrate for adhesives.

5 TEST REPORT

The test report shall include the information contained in paragraph 10 of appendix 1.

6 REFERENCE DOCUMENTS

ISO 5658-2, Reaction to fire tests – Spread of Flame – Part 2: Lateral spread on building and transport products in vertical configuration.

ISO 13943, Fire safety - Vocabulary.

ISO 14934-3, Fire tests – Calibration and use of heat flux meters – Part 3: Secondary calibration method.

ANNEX 1 – PART 5 – APPENDIX 1
FIRE TEST PROCEDURES FOR SURFACE FLAMMABILITY OF BULKHEAD, CEILING, DECK FINISH MATERIALS AND PRIMARY DECK COVERINGS

See *FTP Code*.

ANNEX 1 – PART 5 – APPENDIX 2
TECHNICAL INFORMATION AND CALIBRATION OF THE PHYSICAL TEST EQUIPMENT

See *FTP Code*.

ANNEX 1 – PART 5 – APPENDIX 3
INTERPRETATION OF RESULTS

See *FTP Code*.

ANNEX 1 – PART 5 – APPENDIX 4
GUIDELINES FOR THE SPECIMEN OF THE FTP CODE, PARTS 2 AND 5, AND THE TYPE APPROVAL OF THOSE PRODUCTS (RANGE OF APPROVAL AND RESTRICTION IN USE)

See *FTP Code*.

ANNEX 1 – PART 6 – (BLANK) *

* This part was intentionally left blank.

ANNEX 1 - PART 7
TEST FOR VERTICALLY SUPPORTED TEXTILES AND FILMS

1 APPLICATION

Where draperies, curtains and other supported textile materials are required to have qualities of resistance to the propagation of flame, not inferior to those of wool of mass 0.8 kg/m2, they shall comply with this part.

2 FIRE TEST PROCEDURES

The vertically supported textiles and films shall be tested and evaluated in accordance with the fire test procedure specified in appendix 1 of this part.

3 PERFORMANCE CRITERIA FOR CURTAINS AND DRAPES

3.1 Products which show any of the following characteristics obtained by the fire test in appendix 1, shall be considered unsuitable for use as curtains, draperies, or free-hanging fabric product for use in rooms containing furniture and furnishings of restricted fire risk as defined in the relevant regulations of chapter II-2 of the Convention:

.1 an after-flame time greater than 5 s for any of the 10 or more specimens tested with a surface application of the pilot flame (see also paragraph 3.2 below)*;

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* *Interpretation:*
The performance criteria for curtains, draperies of free-hanging product, as described in paragraphs 3.1.1 and 3.1.2, are also applicable with an edge application of the pilot flame. (MSC.1/Circ.1456/Rev.1)

.2 burn through, as determined by appendix 2, to any edge of any of the 10 or more specimens tested with a surface application of the pilot flame (see also paragraph 3.2 below)*;

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* *Interpretation:*
The performance criteria for curtains, draperies of free-hanging product, as described in paragraphs 3.1.1 and 3.1.2, are also applicable with an edge application of the pilot flame. (MSC.1/Circ.1456/Rev.1)

.3 ignition of cotton wool below the specimen in any of the 10 or more specimens tested (see also paragraph 3.2 below);

.4 an average char length, as determined by appendix 2, in excess of 150 mm observed in any of the batches of five specimens tested by either surface or edge ignition; and

.5 the occurrence of a surface flash propagating more than 100 mm from the point of ignition with or without charring of the base fabric (see also paragraph 3.2 below).

3.2 If, following analysis of the experimental data from tests of a fabric, it is found that either or both of the batches of five specimens cut in both warp and weft directions fail to meet one or more of the criteria specified in subparagraphs .1 to .3 and .5 above because of poor performance of only one of the five specimens tested, one complete retest of a similar batch is permitted. Failure of the second batch to meet any of the criteria shall provide the basis for rejection of the fabric for use.

4 ADDITIONAL REQUIREMENTS

The tests shall be made by using specimens of the final product (e.g., with colour treatment). In cases where only the colours change, a new test is not necessary. However, in cases where the basis product or the treatment procedure change, a new test is required.

5 TEST REPORT

The test report shall include the information contained in paragraph 7 of appendix 1 to this part.

ANNEX 1 – PART 7 – APPENDIX 1
FIRE TEST PROCEDURES FOR DETERMINING THE RESISTANCE TO FLAME OF VERTICALLY SUPPORTED TEXTILES AND FILMS

See *FTP Code*.

ANNEX 1 – PART 7 – APPENDIX 2
MEASUREMENT OF LENGTH OF CHAR OR MATERIAL DESTRUCTION

See *FTP Code*.

ANNEX 1 – PART 7 – APPENDIX 3
CLEANING AND WEATHERING PROCEDURES

See *FTP Code*.

ANNEX 1 – PART 8
TEST FOR UPHOLSTERED FURNITURE

1 APPLICATION

Where upholstered furniture is required to have qualities of resistance to the ignition and propagation of flame, the upholstered furniture shall comply with this part.

2 FIRE TEST PROCEDURES

The upholstered furniture shall be tested and evaluated in accordance with the fire test procedure specified in appendix 1 to this part.

3 PERFORMANCE CRITERIA

3.1 Smouldering cigarette test

3.1.1 Two smouldering cigarette tests are required, as specified in paragraph 7.2 of appendix 1.

3.1.2 If progressive smouldering or flaming is not observed within a one-hour period, or if the cigarette fails to smoulder its complete length, record a pass result for the smouldering cigarette test unless the test piece fails the final examination, as specified in paragraph 7.4 of appendix 1.

3.2 Flame ignition source test

3.2.1 Two propane flame ignition tests are required, as specified in paragraph 7.3 of appendix 1.

3.2.2 If flaming or progressive smouldering is not observed in this test, record a pass result for the propane flame ignition source test unless the test piece fails the final examination, as specified in paragraph 7.4 of appendix 1.

4 ADDITIONAL REQUIREMENTS

The tests shall be made by using specimens of the final product (e.g., with colour treatment).

In cases where only the colours change, a new test is not necessary, however, in cases where the basis product or the treatment procedure changes, a new test is required.

5 TEST REPORT

The test report shall include the information contained in paragraph 8 of appendix 1.

ANNEX 1 – PART 8 – APPENDIX 1
FIRE TEST PROCEDURES FOR THE IGNITABILITY BY SMOKERS' MATERIALS OF UPHOLSTERED COMPOSITES FOR SEATING

See *FTP Code*.

ANNEX 1 – PART 8 – APPENDIX 2
GUIDANCE NOTES

See *FTP Code*.

ANNEX 1 – PART 8 – APPENDIX 3
GUIDE FOR INDEPENDENT TEST FOR COVER AND FILLING MATERIALS SEPARATE OPTIONAL TESTS FOR EACH MATERIAL (COVER MATERIAL AND FILLING MATERIAL)

See *FTP Code*.

ANNEX 1 – PART 9
TEST FOR BEDDING COMPONENTS

1 APPLICATION

Where bedding components are required to have qualities of resistance to the ignition and propagation of flame, the bedding components shall comply with this part.

2 FIRE TEST PROCEDURES

The bedding components shall be tested and evaluated in accordance with the fire test procedure specified in the appendix to this part.

3 PERFORMANCE CRITERIA

The bedding component is classified as not readily ignitable if it shows no progressive smouldering ignition as specified in paragraph 10.1 of the appendix or flaming ignition as specified in paragraph 10.2 of the appendix.

4 ADDITIONAL REQUIREMENTS

The tests shall be made by using specimens of the final product (e.g., with colour treatment). In cases where only the colours change, a new test is not necessary. However, in cases where the basic product or the treatment procedure changes, a new test is required.

5 TEST REPORT

The test report shall include the information described in paragraph 11 of the appendix.

ANNEX 1 – PART 9 – APPENDIX
FIRE TEST PROCEDURES FOR IGNITABILITY OF BEDDING COMPONENTS

See *FTP Code*.

ANNEX 1 – PART 10
TEST FOR FIRE-RESTRICTING MATERIALS FOR HIGH-SPEED CRAFT

1 APPLICATION

Where materials used in high-speed craft are required to be fire-restricting, they shall comply with this part.

2 FIRE TEST PROCEDURE AND CRITERIA FOR FIRE-RESTRICTING MATERIALS

2.1 General

Surface materials on bulkheads, wall and ceiling linings including their supporting structure, furniture, and other structural or interior components required to be fire-restricting materials by the provisions of the *HSC Code* shall be tested and evaluated in accordance with the fire test procedures specified in appendix 1 to this part.

2.2 Definition of fire-restricting materials

Fire-restricting materials is as defined in the *HSC Code*.

2.3 Surface materials on bulkheads, wall and ceiling linings, including their supporting structure

2.3.1 Test procedures

Surface materials on bulkheads, wall and ceiling linings, including their supporting structure shall be tested to standard ISO 9705 as described in appendix 1 to this part. Bulkheads, wall and ceiling linings shall be tested in their end-use configuration, including any surface finish materials.

2.3.2 Criteria

Surface materials on bulkheads, wall and ceiling linings including their supporting structure are qualified as "fire-restricting material" if, during the testing time of 20 min according to appendix 1 to this part, the following six criteria are met:

.1 the time average of heat release rate (HRR) excluding the HRR from the ignition source does not exceed 100 kW;

.2 the maximum HRR excluding the HRR from the ignition source does not exceed 500 kW averaged over any 30 s period of time during the test;

.3 the time average of the smoke production rate does not exceed 1.4 m2/s;

.4 the maximum value of the smoke production rate does not exceed 8.3 m2/s averaged over any period of 60 s during the test;

.5 flame spread shall not reach any further down the walls of the test room than 0.5 m from the floor excluding the area which is within 1.2 m from the corner where the ignition source is located; and

.6 no flaming drops or debris of the test specimen may reach the floor of the test room outside the area which is within 1.2 m from the corner where the ignition source is located.

2.3.3 Other usage of the materials qualified as "fire-restricting materials"

Materials which are qualified as "fire-restricting materials" by paragraph 2.3.2 using the test method described in paragraph 2.3.1 may be used for furniture or other components if the material closely represents the configuration tested as a room lining in its actual end use (i.e. similar thickness and surface finish).

2.4 Materials used for furniture and other components

2.4.1 Test procedures

Materials used for furniture and other components shall be tested as described in appendix 2 to this part (this does not include vertically supported textiles and films, upholstery, or bedding which shall be tested in accordance with parts 7 to 9, respectively, of this annex).

2.4.2 Criteria

Materials used for furniture and other components are qualified as "fire-restricting material" if the following four criteria are fulfilled:

.1 the time to ignition (TIG) is greater than 20 s;
.2 the maximum 30-second sliding average heat release rate (HRR30,max) does not exceed 60 kW/m2;
.3 the total heat release (THR) does not exceed 20 MJ/m2;
.4 the time average smoke production rate (SPRavg) does not exceed 0.005 m2/s.

3 TEST REPORT

The test report shall include the information in paragraph 9 of appendix 1 or paragraph 12 of appendix 2 and designation of the material according to the test criteria specified in paragraph 2 above.

4 REFERENCE DOCUMENTS

ISO 9705, Fire tests – Full-scale room test for surface products.

ISO 5660-1, Reaction-to-fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method).

ISO 5660-2, Reaction-to-fire tests – Heat release, smoke production and mass loss rate – Part 2: Smoke production rate (dynamic measurement).

ISO 14697, Reaction to fire tests – Guidance on the choice of substrates for building and transport products.

ANNEX 1 – PART 10 – APPENDIX 1
FIRE TEST PROCEDURES – FULL-SCALE ROOM TEST FOR SURFACE MATERIALS ON BULKHEADS, WALL AND CEILING LININGS, INCLUDING THEIR SUPPORTING STRUCTURE, OF HIGH-SPEED CRAFT

See *FTP Code*.

ANNEX 1 – PART 10 – APPENDIX 2
FIRE TEST PROCEDURES FOR HEAT RELEASE, SMOKE PRODUCTION AND MASS LOSS RATE FOR MATERIALS USED FOR FURNITURE AND OTHER COMPONENTS OF HIGH-SPEED CRAFT

See *FTP Code*.

ANNEX 1 – PART 11
TEST FOR FIRE-RESISTING DIVISIONS OF HIGH-SPEED CRAFT

1 APPLICATION

Where constructions for use in high-speed craft are required to have fire-resisting properties, they shall comply with this part. Such constructions include fire-resisting bulkheads, decks, ceilings, linings and doors.

2 FIRE TEST PROCEDURE

Fire-resisting divisions of high-speed craft shall be tested and evaluated in accordance with the fire test procedures specified in the appendix to this part.

3 ADDITIONAL REQUIREMENTS

3.1 Materials used in fire-resisting divisions shall be non-combustible or fire-restricting as verified in accordance with part 1 or 10 of this annex, respectively.

3.2 Part 3 of this annex is also applicable to certain constructions such as windows, fire dampers, pipe penetrations and cable transits.

3.3 Part 4 of this annex is also applicable where a control system of fire doors is required to be able to operate in case of fire.

3.4 Where combustible veneers are allowed to be provided in fire-resisting divisions in conjunction with non-combustible substrates, the low flame-spread characteristics of such veneers, if required, shall be verified in accordance with part 5 of this annex.

ANNEX 1 – PART 11 – APPENDIX
FIRE TEST PROCEDURES FOR FIRE-RESISTING DIVISIONS OF HIGH-SPEED CRAFT

See *FTP Code*.

ANNEX 2
PRODUCTS WHICH MAY BE INSTALLED WITHOUT TESTING AND/OR APPROVAL

GENERAL

In general, the products and product groups listed in this annex are considered to have the fire safety characteristics specified below and they may be installed without testing according to and without approval on the basis of the specific fire test procedures in this *Publication* for the specific safety characteristics of the product.

The paragraphs below are numbered with the same part number in which the corresponding testing requirements are specified in annex 1.

1 NON-COMBUSTIBLE MATERIALS

In general, products made only of glass, concrete, ceramic products, natural stone, masonry units, common metals and metal alloys are considered as being non-combustible and they may be installed without testing and approval.

2 MATERIALS NOT GENERATING EXCESSIVE QUANTITIES OF SMOKE NOR TOXIC PRODUCTS IN FIRE

2.1 In general, non-combustible materials are considered to comply with the requirements of part 2 of annex 1 without further testing.

2.2 In general, surface materials and primary deck coverings with both the total heat release (Qt) of not more than 0.2 MJ and the peak heat release rate (Qp) of not more than 1 kW (both values determined in accordance with part 5 of annex 1) are considered to comply with the requirements of part 2 of annex 1 without further testing.

2.3 Materials meeting the provisions in paragraph 2.2 above are exempted from testing in accordance to standard ISO 1716. They will be expected to satisfy a requirement of maximum gross calorific value (e.g., 45 MJ/m2) without further testing.

2.4 For high-speed craft, fire-restricting materials are considered to comply with the requirements of part 2 of annex 1 without further testing.

3 "A", "B" AND "F" CLASS DIVISIONS

3.1 The following products may be installed without testing or approval:

Classification	Product description
Class "A-0" bulkhead	A steel bulkhead with dimensions not less than the minimum dimensions given below: - thickness of plating: 4 mm - stiffeners 60 mm x 60 mm x 5 mm spaced at 600 mm or structural equivalent
Class "A-0" deck	A steel deck with dimensions not less than the minimum dimensions given below: - thickness of plating: 4 mm - stiffeners 95 mm x 65 mm x 7 mm spaced at 600 mm or structural equivalent.

3.2 Notwithstanding the provisions in paragraph 3.1 above, the materials which are used in "A", "B" and "F" class divisions and which are required to have certain other specified characteristics (e.g., non-combustibility, low flame-spread characteristics, etc.) shall comply with the appropriate parts of annex 1 to this *Publication*.

4 FIRE DOOR CONTROL SYSTEMS

(no entries)

5 LOW FLAME-SPREAD SURFACES AND PRIMARY DECK COVERINGS

5.1 Non-combustible materials are considered to comply with the requirements of part 5 of annex 1. However, due consideration shall be given to the method of application and fixing (e.g., glue).

5.2 Primary deck coverings classified as not readily ignitable in accordance with part 5 of annex 1 are considered to comply with the requirements for floor coverings.

5.3 For high-speed craft, surfaces and materials that are qualified as fire-restricting materials are considered to comply with the requirements of part 5 of annex 1 without further testing.

6 VERTICALLY SUPPORTED TEXTILES AND FILMS

(no entries)

7 UPHOLSTERED FURNITURE

(no entries)

8 BEDDING COMPONENTS

(no entries)

9 FIRE-RESTRICTING MATERIALS FOR HIGH-SPEED CRAFT

(no entries)

10 FIRE-RESISTING DIVISIONS OF HIGH-SPEED CRAFT

no entries)

ANNEX 3
FIRE PROTECTION MATERIALS AND REQUIRED APPROVAL TEST METHODS

Table 1 – Fire protection materials and required approval test methods for passenger ships and high-speed craft

Item	Test method (FTP Code) → Specimen (Products) ↓	Part 1 Non-combustibility	Part 2 Smoke and toxicity	Part 3 A, B and F class divisions	Part 4 Door systems	Part 5 Surface flammabilit	Part 7 Curtains or Vertically supported textiles	Part 8 Upholstered furniture	Part 9 Bedding components	Part 10 – ISO 9705 (MSC.40(64) and MSC.90(71)	Part 10 – ISO 5660 (MSC.40(64) and MSC.90(71)	Part 11 – A.754(18) (for 2000 HSC Code)	ISO 1716 Calorific potential	Remarks/Notes	Applicable regulation SOLAS chapter II-2 and HSC Code
1	Non-combustibility materials	x													5.3.1.2.1
2	"A" class bulkhead	x		x											3.2.3, 9.2.2.3, 9.2.2.4
3	"B" class bulkhead	x		x											3.4.1, 9.2.2.3, 9.2.2.4
4	"C" class bulkhead	x												1)	3.10, 9.2.2.3, 9.2.2.4
5	"A" class deck	x		x											3.2.3, 9.2.2.3, 9.2.2.4
6	"B" class deck	x		x											3.4.1, 9.2.2.3, 9.2.2.4
7	"B" class lining	x		x											3.4.1, 9.2.2.3, 9.2.2.4
8	"B" class ceilings	x		x											3.4.1, 9.2.2.3, 9.2.2.4
9	"B" class continuous ceilings	x		x											3.4.1, 9.2.2.3.3, 9.2.2.4.3
10	"A" class fire door	x		x											3.2.3, 9.4.1.1.2
11	"B" class fire door	x		x											3.4.1, 9.4.1.2.1
12	"A" class windows	x		x											3.2.3, 9.4.1.3.1

Item	Test method (FTP Code) → Specimen (Products) ↓	Part 1 Non-combustibility	Part 2 Smoke and toxicity	Part 3 A, B and F class divisions	Part 4 Door systems	Part 5 Surface flammabilit	Part 7 Curtains or Vertically supported textiles	Part 8 Upholstered furniture	Part 9 Bedding components	Part 10 – ISO 9705 (MSC.40(64) and MSC.90(71)	Part 10 – ISO 5660 (MSC.40(64) and MSC.90(71)	Part 11 – A.754(18) (for 2000 HSC Code)	ISO 1716 Calorific potential	Remarks/Notes	Applicable regulation SOLAS chapter II-2 and HSC Code
13	"B" class windows	x		x											3.2.3, 9.4.1.3.1
14	Thermal and acoustic insulation materials	x													5.3.1.1
15	Partial bulkheads	x												2)	5.3.1.3.1
16	Fire damper			x											9.7.1.2.1
17	Cable transit			x											9.3.1
18	Pipe penetration			x											9.3.1
19	Fire Door Control System				x										9.4.1.1.5.15
20	Ventilation ducts	x													9.7.1.1
21	Adhesive (bulkhead, deck, door and other division)					x									5.3.1.1
22	Exposed painted surfaces		x			x							x	3)	5.3.2.4.1.1
23	Exposed foil, fabric or surface veneers		x			x							x	3)	5.3.2.4.1.1
24	Painted surfaces in concealed spaces					x									5.3.2.4.1.2
25	Foil, fabric or veneer on surfaces or grounds in concealed spaces					x							x		5.3.2.4.1.2
26	Ceilings and linings	x												2)	5.3.1.2.1
27	Surfaces of bulkhead and ceiling linings		x			x								4)	5.3.2.4.1.1
28	Grounds	x												2)	5.3.1.2.1
29	Draught stops	x												2)	5.3.1.2.1, 8.4

Item	Test method (FTP Code) → Specimen (Products) ↓	Part 1 Non-combustibility	Part 2 Smoke and toxicity	Part 3 A, B and F class divisions	Part 4 Door systems	Part 5 Surface flammabilit	Part 7 Curtains or Vertically supported textiles	Part 8 Upholstered furniture	Part 9 Bedding components	Part 10 – ISO 9705 (MSC.40(64) and MSC.90(71)	Part 10 – ISO 5660 (MSC.40(64) and MSC.90(71)	Part 11 – A.754(18) (for 2000 HSC Code)	ISO 1716 Calorific potential	Remarks/Notes	Applicable regulation SOLAS chapter II-2 and HSC Code
30	Paints, varnishes and other finishes on exposed interior surfaces		x			x									6.2
31	Floor coverings		x			X[3)]									5.3.2.4.1
32	Combustible ventilation ducts					x									9.7.1.1.1 Gases are transported by ducts
33	Insulation materials for cold service systems					x									5.3.1.1 Criteria have to be defined
34	Vapour barriers					x									5.3.1.1
35	Primary deck coverings		x			x									4.4.4, 6.3
36	Curtain - Vertically supported textiles						x								3.40.3, 9.2.2.3.2.2(6) Toxicity and Opacity criteria can be taken into account
37	Upholstered furniture							x							3.40.6, 5.3.3, 9.2.2.3.2.2 (6)
38	Bedding components								x						3.40.7, 9.2.2.3.2.2 (6)
39	Fire restricting divisions									x					HSC Code 7.4.3.1
40	Fire restricting ceilings									x					HSC Code 7.4.3.1

Item	Test method (FTP Code) → Specimen (Products) ↓	Part 1 Non-combustibility	Part 2 Smoke and toxicity	Part 3 A, B and F class divisions	Part 4 Door systems	Part 5 Surface flammabilit	Part 7 Curtains or Vertically supported textiles	Part 8 Upholstered furniture	Part 9 Bedding components	Part 10 – ISO 9705 (MSC.40(64) and MSC.90(71)	Part 10 – ISO 5660 (MSC.40(64) and MSC.90(71)	Part 11 – A.754(18) (for 2000 HSC Code)	ISO 1716 Calorific potential	Remarks/Notes	Applicable regulation SOLAS chapter II-2 and HSC Code
41	Fire restricting linings									x					HSC Code 7.4.3.1
42	Fire restricting case furniture										x				HSC Code 7.4.3.3.1
43	Fire restricting free-standing furniture										x				HSC Code 7.4.3.3.2
44	Fire restricting thermal and acoustic insulation material										x				HSC Code 7.4.3.3.2
45	Non-load bearing fire-resisting divisions											x			HSC Code 7.4.3.3.5
46	Load bearing fire-resisting divisions, with metal core											x			HSC Code 7.2.1
47	Load bearing fire-resistant divisions, without metal core											x			HSC Code 7.2.1

Notes:
1) Low flame-spread adhesives may be used.
2) Except in cargo spaces, mail rooms, baggage rooms and refrigerated compartments of service spaces.
3) Corridors and stairway enclosures only.
4) In accommodation and service spaces (except saunas) and control stations.
* In case of the maximum gross calorific value less than 45 MJ/m^2 was required.

Table 2 – Fire protection materials and required approval test methods for cargo ships (method IC)

Item	Test method (FTP Code) → Specimen (Products) ↓	Part 1 Non combustibility	Part 2 Smoke and toxicity	Part 3 A, B and F class divisions	Part 4 Door systems	Part 5 Surface flammability	ISO 1716 Calorific potential	Remarks/ Note	Applicable regulation SOLAS chapter II-2 and HSC Code
1	Non-combustible materials	x							5.3.1.2.2
2	"A" class bulkheads	x		x					3.2.3, 9.2.3
3	"B" class bulkheads	x		x					3.4.1, 9.2.3
4	"C" class bulkheads	x						1)	3.10, 9.2.3
5	"A" class decks	x		x					3.2.3, 9.2.3
6	"B" class decks	x		x					3.4.1, 9.2.3
7	"B" class linings	x		x					3.4.1, 9.2.3
8	"B" class ceilings	x		x					3.4.1, 9.2.3
9	"B" class continuous ceilings	x		x					3.4.1, 9.2.3.3
10	"A" class fire doors	x		x					3.2.3, 9.4.2.1
11	"B" class fire doors	x		x					3.4.1, 9.4.2.1
12	"A" class windows	x		x					3.2.3, 4.5.2.3
13	Thermal and acoustic insulation materials	x							5.3.1.1
14	Fire dampers								9.7.1.2.1
15	Cable transits			x					9.3.1
16	Cable transits			x					9.3.1
17	Ventilation ducts	x		x					9.7.1.1
18	Adhesives (bulkhead, deck, door and other division)					x			5.3.1.1
19	Exposed painted surfaces		x			x		3)	5.3.2.4.2
20	Exposed foil, fabric or surface veneers		x			x	x	3)	5.3.2.4.2
21	Painted surfaces in concealed spaces					x			5.3.2.4.2
22	Foil, fabric or veneer on surfaces or grounds in concealed spaces					x	x		5.3.2.4.2
23	Ceilings and linings	x						2)	5.3.1.2.1
24	Surfaces of ceiling linings		x			x		4)	5.3.2.4.1.1
25	Grounds	x						2)	5.3.1.2.1,
26	Draught stops	x						2)	5.3.1.2.1, 8.4
27	Paints, varnishes and other finishes on exposed interior surfaces		x						6.2
28	Floor coverings		x			x		3)	5.3.2.4.1
29	Combustible ventilation ducts					x			9.7.1.1.1
30	Insulation materials for cold service systems					x			5.3.1.1

31	Vapour barriers					x			5.3.1.1
32	Primary deck coverings		x			x			4.4.4, 6.3

Notes:
1) Low flame-spread adhesives may be used.
2) Except in cargo spaces, mail rooms, baggage rooms and refrigerated compartments of service spaces.
3) Corridors and stairway enclosures only.
4) In accommodation and service spaces (except saunas) and control stations.

ANNEX 4
INTERPRETATION OF SOLAS, CHAPTER II-2, REGULATIONS 5.3 AND 6.2 (MSC/Circ.1120)

I. Fire protection materials for passenger ships

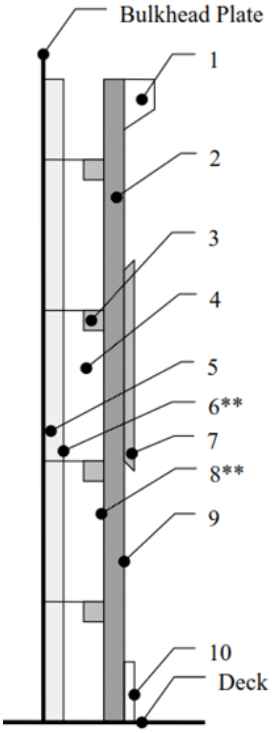

Figure 1 - Walls of accommodation spaces on passenger ships

Table 1 – Materials used on passenger ships for bulkheads of accommodation spaces as defined in regulation II-2/3.1 and its requirements (regulations 5.3 and 6.2)

Item	Bulkhead components	SOLAS , Chapter II-2 Requirements for components				
		Non-combustible material (5.3.1.1) (5.3.1.2.1)	Caloric value (5.3.2.2)	Equivalent volume (5.3.2.3)	Low flame-spread (5.3.2.4)*	Smoke production, toxic products (6.2)
		(A)	(B)	(C)	(D)	(E)
1	Moulding			X		
2	Wall panel (lining)	X				
3	Grounds and supports	X				
4	Draft stops	X				
5	Insulation	X				
6	Insulation surface**				X (5.3.2.4.1.2)	
7	Decoration			X		
8	Painted surface** or fabric or veneer****		- X		X (5.3.2.4.1.2) X (5.3.2.4.1.2	
9	Painted surface or fabric or veneer		- X	X X	X (5.3.2.4.1.1) X (5.3.2.4.1.1)	X X
10	Skirting board			X		

Notes:
* Exposed surfaces of corridors and stairway enclosures referred to in regulation II-2/5.3.2.4.1.1 include floor coverings.
** Where the wall panel is an integral part of the fire insulation in accordance with regulation II-2/9.2.2.3.3, these components are to be of non-combustible material.

II. Fire protection materials on cargo ships

For the application of SOLAS regulations II-2/4.4.4, 5.3, 6.2.1 and 6.3.1 - see figures 2 and 3 and related Tables 2 and 3.

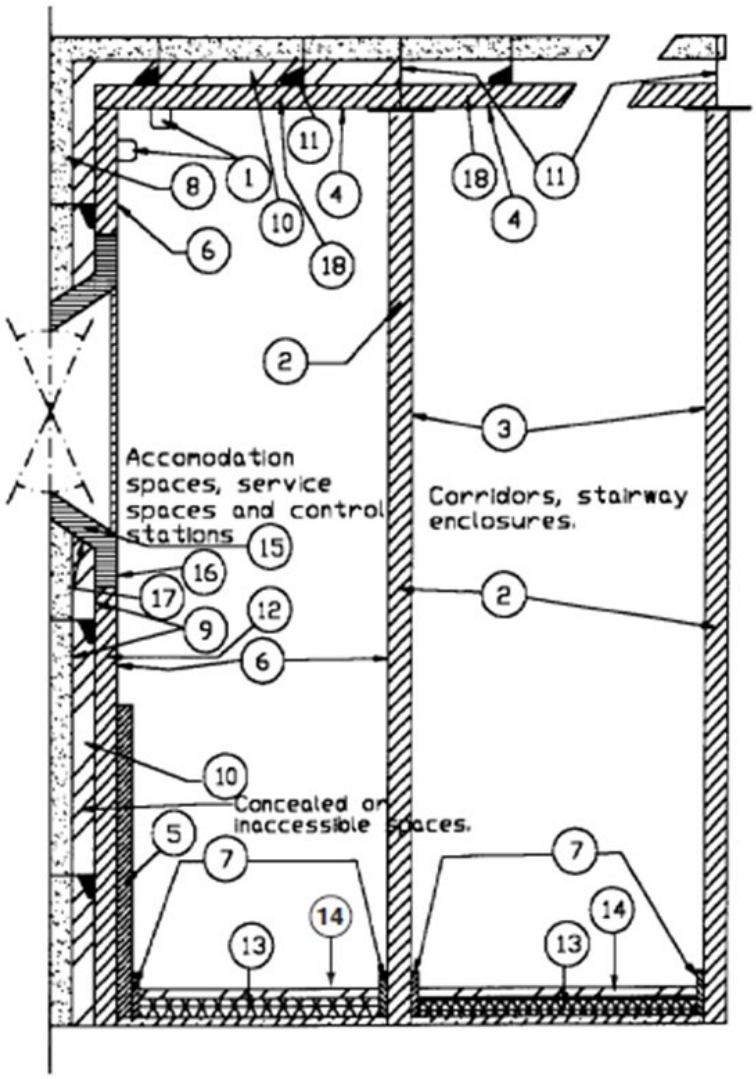

Figure 2 – Structural elements in accommodation spaces on cargo ships (IC method)

Table 2 – Materials used in accommodation spaces, as defined in regulation II-2/3.1, of cargo ships (method IC)

Item	Components	SOLAS , Chapter II-2 Requirements for components						
		Non-combustible material (regulation (5.3.1.2.2)	Non-combustible material (5.3.1.1)	Low flame-spread (5.3.2.4)	Equivalent volume (5.3.2)	Calorific value (5.3.2)	Smoke production, (6)	Not readily ignited (4.4.4 and 6)
		(A)	(B)	(C)	(D)	(E)	(F)	(G)
1	Moulding				X			
2	Panel	X						
3	Painted surfaces or veneer or fabric or foils			X	X	X	X[2)]	
4	Painted surfaces or veneer or fabric or foils		X	X	X		X[2)]	
5	Decorative panel				X		X	
6	Painted surfaces or veneer or fabric or foils				X	X	X[2)]	
7	Skirting board				X			
8	Insulation		X[1)]					
9	Surfaces and paints in concealed or inaccessible spaces			X				
10	Draught stops	X						
11	Ground and supports	X		X				
12	Lining	X						
13	Primary deck covering first layer						X[3)]	X
14	Floor finishing			X[3)]			X	
15	Window box	X						
16	Window box surface			X	X	X	X	
17	Window box surface in concealed or inaccessible spaces			X				
18	Ceiling panel	X						

Notes:

1) Vapour barriers used on pipes for cold services (see UI SC102 included in IMO-Vega Guide to reg. II-2/5, with reference to MSC/Circ.1120) may be of combustible materials providing that their surface has low flame-spread characteristics (regulation 5.3.1.1)
2) Applicable to paints, varnishes and other finishes (regulation 6.2)
3) Only in corridors and stairway enclosures
4) Only in accommodation and service spaces and control stations (Reg. II-2/6.3.1).
   - Regulation II-2/6.2 only applies to accommodation spaces, service spaces and control stations as well as stairway enclosures (UI SC 127)
   - As far as window boxes construction is concerned, reference is also to be made to MSC/Circ.917 and MSC/Circ. 917 Add. 1.

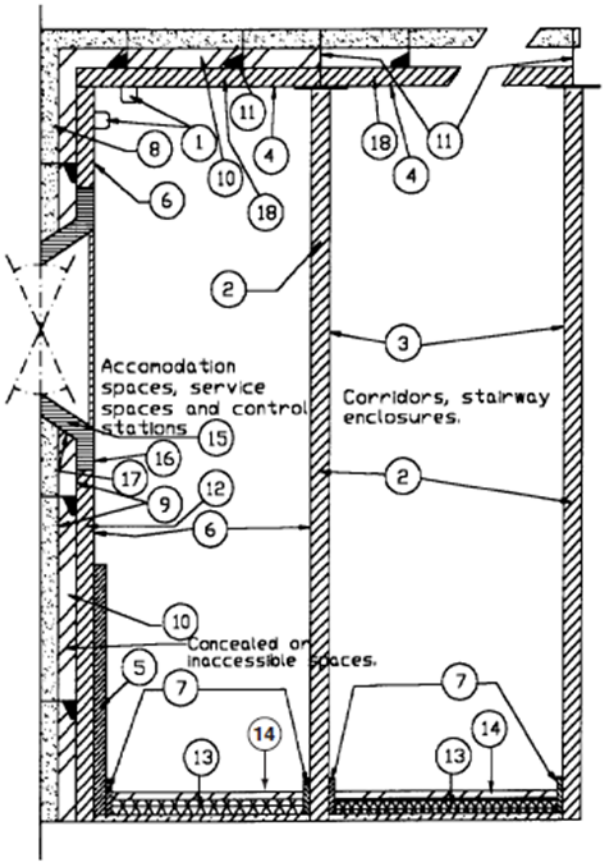

Figure 3 – Structural elements in accommodation spaces on cargo ships (method IIC and IIIC)

Table 3 – Materials used in accommodation spaces, as defined in regulation II-2/3.1, of cargo ships (method IIC – IIIC)

Item	Components	SOLAS , Chapter II-2 Requirements for components						
		Non-combustible material (regulation (5.3.1.2.2)	Non-combustible material (5.3.1.1)	Low flame-spread (5.3.2.4)	Equivalent volume (5.3.2)	Calorific value (5.3.2)	Smoke generation, (6)	Not readily ignited (4.4.4 and 6)
		(A)	(B)	(C)	(D)	(E)	(F)	(G)
1	Moulding				X[3)]			
2	Panel	X[4)]						
3	Painted surfaces or veneer or fabric or foils			X	X	X	X[5)]	
4	Painted surfaces or veneer or fabric or foils		X	X[3)]	X[2)]		X[5)]	
5	Decorative panel				X[3)]			

Item	Components	SOLAS , Chapter II-2 Requirements for components						
		Non-combustible material (regulation (5.3.1.2.2)	Non-combustible material (5.3.1.1)	Low flame-spread (5.3.2.4)	Equivalent volume (5.3.2)	Calorific value (5.3.2)	Smoke generation, (6)	Not readily ignited (4.4.4 and 6)
		(A)	(B)	(C)	(D)	(E)	(F)	(G)
6	Painted surfaces or veneer or fabric or foils				X[3)]	X[2)]	X[5)]	
7	Skirting board				X[3)]			
8	Insulation		X[1)]					
9	Surfaces and paints in concealed or inaccessible spaces			X				
10	Draught stops	X[4)]						
11	Grounds and supports	X[4)]		X				
12	Lining	X[4)]						
13	Primary deck covering first layer						X	X
14	Floor finishing			X[6)]			X	
15	Window box	X[4)]						
16	Window box surface			X[3)]	X[3)]	X[2)]	X	
17	Window box surface in concealed or inaccessible spaces			X				
18	Ceiling panel	X[3)]						

Notes:

1) Vapour barriers used on pipes for cold services (see UI SC102) may be of combustible materials providing that their surface has low flame-spread characteristics (regulation 5.3.1.1)
2) Where the material is fitted on non-combustible bulkheads, ceilings and linings, in accommodation and service spaces (regulation 5.3.2.2)
3) To be applied to those in accommodation and service spaces bounded by non-combustible bulkheads, ceiling and linings (regulation 5.3.2.3)
4) Only in corridors and stairway enclosures serving accommodation, service spaces and control stations (regulation 5.3.1.2.2)
5) Applicable to paints, varnishes and other finishes (regulation 6.2)
6) Only in corridors and stairway enclosures.
7) Only in accommodation and service spaces and control stations (Reg. II-2/6.3.1).

- Regulation II-2/6.2 only applies to accommodation spaces, service spaces and control stations as well as stairway enclosures (UI SC 127)
- As far as window boxes construction is concerned, reference is also to be made to MSC/Circ.917 and MSC/Circ. 917 Add. 1

Interpretation: (MSC/Circ.1120) and IACS UI SC126/Rev.2/Corr.1

List of documents implemented in the Publication

IMO Circulars:

1. MSC.1/Circ.1120
2. MSC.1/Circ.1203
3. MSC.1/Circ.1319
4. MSC.1/Circ.1435
5. MSC.1/Circ.1456/Rev.1
6. MSC.1/Circ.1488

IACS resolutions :

1. FTP3/Rev.3
2. FTP4/Rev.2
3. FTP5/Corr.1
4. FTP6/Rev.1
5. SC126/Rev.2
6. SC126/Rev.2/Corr.1