TER-GOVERNMENTAL MARITIME
NSULTATIVE ORGANIZATION

Distr.
GENERAL
A/ES.IV/Res.163
28 November 1968
Original: ENGLISH

IMCO

ASSEMBLY - 4th extraordinary session
Agenda item 9

RECOMMENDATION FOR FIRE TEST PROCEDURES FOR "A" AND "B" CLASS DIVISIONS

RESOLUTION A.163(ES.IV)

adopted on 28 November 1968

THE ASSEMBLY,

NOTING Article 16(i) of the IMCO Convention concerning the function of the Assembly,

NOTING ALSO Regulation 35(c) and (d) and proposed Regulation 94(c) of Chapter II of the International Convention for the Safety of Life at Sea, 1960, concerning the definition of "A" and "B" Class divisions,

NOTING FURTHER Recommendation 11 of the International Conference on Safety of Life at Sea, 1960,

DESIRING to ensure uniformity in the test procedures for such divisions,

HAVING CONSIDERED the Recommendation adopted by the Maritime Safety Committee at its seventeenth session,

ADOPTS the Recommendation for Fire Test Procedures for "A" and "B" Class divisions, the text of which is set out in the Annex to this Resolution,

INVITES all governments concerned to take steps to give effect to the Recommendation as soon as possible.

ANNEX

RECOMMENDATION FOR FIRE TEST PROCEDURES FOR "A" AND "B" CLASS DIVISIONS

1. Foreword

The purpose of this Recommendation is to provide the Administration with a procedure for testing assembled prototype divisions for compliance with the provisions for fire resistance laid down in Regulation 35(c) and (d) and proposed Regulation 94(c) of Chapter II of the International Convention for the Safety of Life at Sea, 1960.

The specimen of an "A" Class division or a "B" Class deck is to employ as the structural core a typical light scantling shipboard bulkhead or deck of the nominal dimensions and construction prescribed. It is intended that insulating materials which pass the test on this basis may be used on constructions of heavier scantlings.

The objective of the Convention is to establish uniform minimum standards to assure the construction of safe vessels. Therefore, the applicability of tests made in accordance with this Recommendation should be determined by the Administration, taking into account the overall design of the vessel from a fire safety standpoint. Although both steel and aluminium alloy are included in this test procedure, uninsulated steel is considered to meet the requirements for "A" Class divisions with regard to preventing the passage of smoke and flame while this is not the case with uninsulated aluminium alloy. Procedures are also included for the fire testing of doors.

Study of results of tests on prototype specimens may reveal to the Administration the properties necessary in each component of the Assembly. Subsequently, it may be necessary to test only for the requisite properties of the individual components, and not an entire assembly. For example, with "non-rigid" insulating materials, the requisite properties are generally stability and thermal insulating value under fire test exposure. These properties may be measured in smaller scale tests.

In all cases the manufacturer or agent should consult the Administration and a testing laboratory recognized by the Administration regarding details of construction and erection of the test specimen which should, as far as possible, simulate actual construction detail aboard ship.

2. Nature, Size and Erection of Test Specimens

2.1. "A" Class bulkheads

2.1.1. General

The dimensions given in 2.1.2. are intended for specimens having a structural core of flat stiffened plates of steel or aluminium alloy. The Administration may require tests to be performed on specimens of other materials or of other sections if they are more representative of the actual construction.

2.1.2. Dimensions of structural core

The dimensions of the structural core should be in accordance with the drawing in Fig. 1 and the following:

Nominal thickness of plates: 4-6 mm. (steel)
6-8 mm. (aluminium alloy)

Vertical stiffeners:

Spacing: 700 ± 100 mm.
Scantlings: 70 ± 10 x 70 ± 10 x 5-7 mm. (steel)
100 ± 10 x 75 ± 10 x 8-10 mm. (aluminium alloy)

2.1.3. Insulating materials

The following information should be submitted:

(1) Identification mark and trade name.

(2) (2) Principal detals of composition.

2.1.4. Drawings

A drawing of the test specimen indicating the following should be submitted:

(1) Dimensions of the specimen.

(2) Identity and disposition of insulating materials.

(3) Methods of securing insulation.

(4) Details of joints and connexions.

2.2 "A" Class decks

2.2.1. General

The dimensions given in 2.2.2. are intended for specimens having a structural core of flat stiffened plates of steel or aluminium alloy. The Administration may require tests to be performed on specimens of other materials or of other sections if they are more representative of the actual construction.

2.2.2. Dimensions of structural core

The dimensions of the structural core should be in accordance with the drawing in Fig. 1 and the following:

Nominal thickness of plates: 4-6 mm. (steel)
6-8 mm. (aluminium alloy)

Deck beams:

Spacings: 700 ± 100 mm.
Scantlings: 100 ± 10 x 75 ± 10 x 6-8 mm. (steel)
150 ± 10 x 90 ± 10 x 8-10 mm. (aluminium alloy)

2.2.3. Insulating materials

The following information should be submitted:

(1) Identification mark and trade name.

(2) Principal details of composition.

2.2.4. Drawings

A drawing of the test specimen indicating the following should be submitted:

(1) Dimensions of the specimen.

(2) Identity and disposition of insulating materials.

(3) Methods of securing insulation.

(4) Details of joints and connexions.

2.3. "A" Class doors and frames

2.3.1. General

The specimen should be representative of the door and frame to be used in practice, including the materials and the method of construction.

2.3.2. Erection of test specimen

(1) Doors and door frames should always be tested as an assembly.

(2) Door frames should be mounted in a concrete or brick surround or in an "A" Class bulkhead if required by the Administration.

(3) Where doors can be exposed to fire from either side, they should be tested from the side expected to give inferior performance. In the case of a hinged door this condition is generally achieved when it opens away from the fire.

(4) Hinges should be constructed of material having a melting point of not less than 950°C.

2.3.3. Drawings

A drawing of the test specimen indicating the following should be submitted:

(1) Dimensions of the specimen.

(2) Details of construction of door and door frame and its connexion to the bulkhead.

(3) Composition of insulating materials, if any.

(4) Methods and materials used for securing insulation, if any.

(5) Details of other fittings, such as hinges and locks.

2.4. "B" Class bulkheads

2.4.1. Dimensions

The dimensions of the test specimen should be in accordance with the drawing in Fig. 2. The test specimen should be constructed of panels at least one of which is of the maximum width which may be used in practice. At least one joint should be incorporated.

2.4.2. Materials

The following information should be submitted:

(1) Identification mark and trade name.

(2) Principal details of composition and construction.

(3) Whether the materials are combustible or incombustible.

2.4.3. Drawings

A drawing indicating the following should be submitted:

(1) Dimension of the specimen.

(2) Methods of support and details of joints and all materials used.

(3) Panel identification mark and trade name.

2.5. "B" Class decks

The prototype specimens of "B" Class decks should be constructed in accordance with the provisions of 2.2.

2.6. "B" Class doors and door frames

2.6.1. General

The specimen should be representative of the door and frame to be used in practice, including the materials and the method of construction.

2.6.2. Erection of test specimen

(1) Doors and door frames should always be tested as an assembly.

(2) Door frames should be erected in a "B" Class bulkhead approved by the Administration.

(3) A test made on a door fitted in an incombustible bulkhead is valid also for a similar door in a combustible bulkhead, but not conversely.

(4) Where doors can be exposed to fire from either side, they should be tested from the side expected to give inferior performance. In the case of a hinged door this condition is generally achieved when it opens away from the fire.

(5) Hinges should be constructed of materials having a melting point of not less than 950°C.

2.6.3. Materials

The following information should be submitted:

(1) Identification mark and trade name.

(2) Principal details of composition and construction.

(3) Whether the materials are combustible or incombustible.

2.6.4. Drawings

A drawing of the test specimen indicating the following should be submitted:

(1) Dimensions of the specimen.

(2) Details of construction of door and door frame and its connexion to the bulkhead.

(3) Details of other fittings, such as hinges, locks and escape panels.

3. Testing Procedure

3.1. Preparation of test specimen

3.1.1. Conditioning of test specimen

Test specimens should be conditioned to approximately constant weight with an atmosphere of a relative humidity of 40-70 per cent and a temperature of 15° - 25°C. After conditioning but before testing the temperature of the specimen should not exceed 40°C.

3.1.2. Erection of test specimen

In general, bulkheads should be tested without paint or superimposed finish. If the panels are only produced with a finish, they may be tested as produced.

3.1.3. Means of fastening specimens in the furnace

(1) The specimens should be mounted in the furnace in such a way as to give an exposed surface of at least 4.65 square metres and a height or length of at least 2.44 metres.

(2) Bulkheads and doors should be tested in a vertical position and decks in a horizontal position.

(3) A specimen of a construction which is required to withstand fire from either side should be tested from each side unless a relaxation is granted by the Administration.

(4) The specimen should be secured as follows:

(a) In the case of an "A" Class division, or a "B" Class deck, the specimen should be restricted against expansion on all four sides, and details should be shown in the test report.

(b) In the case of a "B" Class bulkhead, the specimen should be supported at the top and secured on the vertical sides and at the bottom in a manner representative of conditions in service. If provision for movement at the edges of a bulkhead is made for a particular construction in service, the specimen should simulate these conditions.

(c) The method of securing should be such that there is no possibility of misinterpretation of test results of passage of flame and smoke for "A" Class divisions and passage of flames for "B" Class divisions at the edges of the specimen when the method of fixing is not subject of the test.

3.2. Furnace control

(1) The furnace temperature should be determined by at least four thermocouples having rapid response and distributed so as to represent fairly the furnace temperature and to ensure as uniform heating as possible. The thermocouples should be arranged so that the hot junction is approximately 10 cm. from the nearest point of the specimen.

(2) The furnace temperatures should be continuously controlled so as to follow the standard time-temperature curve within the accuracy specified in (4) below.

(3) The standard time-temperature curve is defined by a smooth curve drawn through the following points:

At the end of the first 5 minutes	538°C
" " " " " " 10 "	704°C
" " " " " " 30 "	843°C
" " " " " " 60 "	927°C

(4) The accuracy of furnace control should be as follows:

(a) During the first 10 minutes of the test the area under the curve of mean furnace temperature should not vary by more than ± 15 per cent of the area under the standard curve.

(b) During the first one half-hour of the test the area under the curve of mean furnace temperature should not vary more than ± 10 per cent of the area under the standard curve.

(c) For any period after the first one half-hour of the test the area under the curve of mean furnace temperature should not vary more than ± 5 per cent of the area under the standard curve.

(d) At any time after the first 10 minutes of the test the mean furnace temperature should not differ from the standard curve by more than $\pm$ 100°C.

(5) For tests of bulkheads or doors the pressure in the furnace should be equal to that in the laboratory at about one-third of the height of the specimen. For tests of decks the pressure just under the test specimen should be slightly higher than that in the laboratory.

3.3. Construction of thermocouples for measuring the temperature on the unexposed surface

A thermocouple of 0.5 mm. diameter wires should be soldered centrally to one surface of a disc of copper 12 mm. diameter and 0.2 mm. thick. The discs should be covered with an oven-dry asbestos pad of 50 mm. x 50 mm. and 4 mm. thick. The disc and the pad may be fixed to the surface of the specimen by pins, tape or a suitable adhesive, depending on the nature of the specimen material. The asbestos pad should have a density of approximately 100 kg/m^3 and thermal conductivity of 0.2 kcal/m./hr. x °C at 100°C.

3.4. Construction of thermocouples for measuring the temperature of structural core

Thermocouples made of not more than 0.75 mm. diameter wires should be used to measure the temperature of the structural core of the test specimen.

3.5. Smoke and/or flame penetration test

The purpose of this test is to indicate whether cracks and openings formed during the test are such that they would lead to passage of smoke and/or flame.

(1) Where cracks or openings are formed during the test, an ignition test as prescribed in 4.1.2. and 4.2.2. should take place immediately after the appearance of cracks or damage followed by similar tests at frequent intervals.

(2) The cotton wool used for the test prescribed in 4.1.2. and 4.2.2. should consist of new, undyed and soft fibres without any admixture of artificial fibres, and it should be free from thread, leaf and shell fibre dust. A suitable material for this purpose is sold in the form of rolls for surgical use. A pad should be cut measuring 10 cm. x 10 cm. x approximately 2 cm. thick and weighing between 3 and 4 g. It should be oven dried prior to the test. The pad should be attached by means of wire clips to a 10 cm. x 10 cm. frame of 1 mm. diameter. A wire handle approximately 75 cm. long attached to the frame would facilitate its use on the specimen.

(3) When testing for cracks or openings during the test the pad should be held in a vertical position facing the crack or opening with the aperture located in the central part of the cotton wool. The pad may be re-used if it has not absorbed any moisture or become charred during the previous application.

3.6. Temperature observations during testing

(1) All observations should be taken at intervals not exceeding five minutes. The surface temperatures on the unexposed side of the test specimen should be measured by thermocouples located as follows and indicated on drawings in Figs. 1 and 2;

(a) Four thermocouples each located approximately in the centre of a quarter section of the test specimen;

(b) One thermocouple close to the centre of the test specimen, but away from the joint, if any;

(c) One thermocouple placed in way of or as close as possible to each of the central stiffeners in a specimen for an "A" Class division;

(d) At least one thermocouple at a joint, if any, in a specimen of an "A" Class division;

(e) At least one thermocouple at the vertical joint in a specimen of a "B" Class bulkhead;

(f) Further thermocoupleas at the discretion of the testing laboratory for the purpose of determining the temperature at points deemed likely to give a greater temperature rise than any of the thermocouples mentioned in (a) and (b) above.

(2) The surface temperatures on the unexposed side of doors should be measured in a manner similar to those for a bulkhead except that thermocouples should be located away from through metal connexions.

(3) The average temperature rise on the unexposed surface should be obtained as follows:

(a) For a specimen of an "A" Class division, by the average reading of the thermocouples mentioned in (1)(a), (b) and (c) above;

(b) For a specimen of a "B" Class division, by the average reading of the thermocouples mentioned in (1)(a) and (b) above.

(4) When testing the specimen with a structural core other than steel, thermocouples should be fixed to the core in positions corresponding to the surface thermocouples mentioned in 3.6.(1)(a) and (b) above, to determine the temperature of the core.

3.7. Other observations

Throughout the test, observations should be made of all changes and occurrences, which are not criteria of performance but which may create hazard in case of a fire; for example the emission of appreciable volumes of smoke or noxious vapours from the unexposed side of the test specimen. The specimen should be examined after the test for changes that have taken place. The information should be noted in the test report.

3.8. Duration of testing

The testing should continue for at least one hour for "A" Class divisions and one half-hour for "B" Class divisions. The testing may be continued beyond this period if deemed appropriate by the Administration.

4. Test Requirements

4.1. "A" Class divisions and "A" Class doors

4.1.1. Thermal insulation

(1) The insulating value of the specimen should be such that the average temperature of thermocouples on the unexposed surface described in 3.6.(3)(a) will not rise more than 139°C above the initial temperature, nor will the temperature at any one point on the surface, including any joint, rise more than 180°C above the initial temperature, during the time specified by the Administration. If "A" Class

divisions are rated as A-60, A-30, A-15 or A-0, the above temperature limits should not be exceeded during the times listed below:

Class A-60	60 minutes
Class A-30	30 minutes
Class A-15	15 minutes
Class A-0	0 minutes

(2) The temperature rise on the unexposed surface of a door should not exceed the limits given in **(1)** above.

4.1.2. Smoke and flame penetration

Cracks and openings which may be formed in "A" Class divisions with the structural core other than steel and "A" Class doors should not be such as to lead to flaming of a cotton wool test pad as described in 3.5.(2) held facing the aperture at about 25 mm. for a period of 30 seconds. If no flaming occurs, the pad should be removed and re-applied after a suitable interval.

4.1.3. Structural core

In the case of load-bearing divisions of aluminium alloy, the average temperature of structural core obtained by thermocouples described in 3.6.(4) should not rise more than 200°C above its initial temperature at any time during the test for one hour.

4.2. "B" Class divisions and "B" Class doors

4.2.1. Thermal insulation

The insulation value of the specimen should be such that the average temperature of thermocouples on the unexposed

surface described in 3.6.(3)(b) will not rise more than 139°C above the initial temperature, nor will the temperature at any one point on the surface, including any joint, rise more than 225°C above the initial temperature during the period specified by the Administration. For combustible "B" Class bulkheads and those assembled "B" Class bulkheads with an incombustible core as defined in Regulation 39(b)(v) of Chapter II of the 1960 Safety Convention, the above temperature limits should generally not be exceeded for a period of 30 minutes. If incombustible "B" Class division are rated as B-15 or B-0 the above temperature limits should not be exceeded during the times listed below:

Class B-15	15 minutes
Class B-0	0 minutes

4.2.2. Flame penetration

(1) Cracks and openings should not be such as to lead to flaming of a cotton wool test pad as described in 3.5.(2) held facing the aperture at about 25 mm. for a period of 30 seconds. If no flaming occurs, the pad should be removed and re-applied after a suitable interval.

(2) The provisions of (1) above should apply also to doors and door clearances where required by the Administration.

4.2.3. Structural core

In the case of load-bearing divisions of aluminium alloy, the average temperature of the structural core obtained by thermocouples described in 3.6.(4) should not rise more than 200°C above its initial temperature at any time during the test for one half-hour.

5. Test Report

A test report should include the following:

(1) Name of manufacturer

(2) Date of test

(3) Purpose of test

(4) Description and drawing of the test specimen

(5) Principal details of components with manufacturer's identification mark and trade names

(6) Test conditions

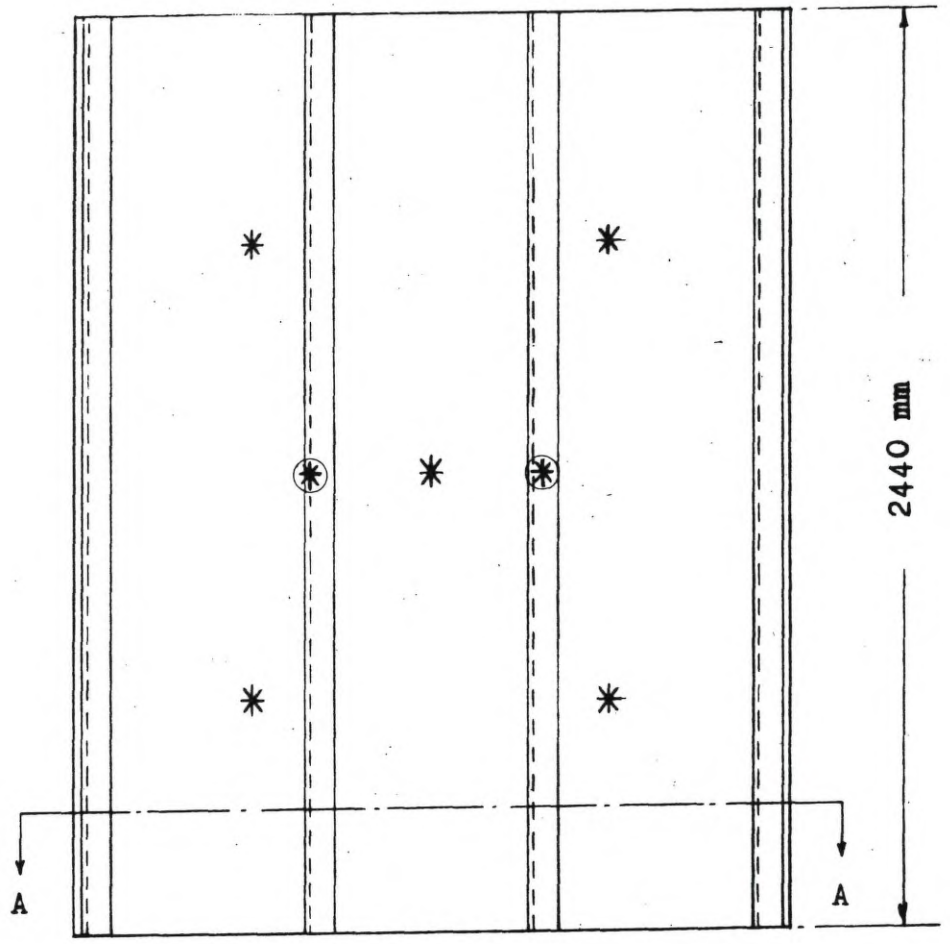
(7) Testing procedure

(8) Observations during the test, including temperature curves and photographs, if any

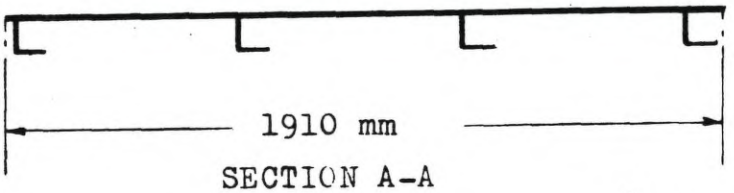
(9) Summary of test results.

Fig. 1

Fire Test Specimen for "A" Class Divisions and "B" Class Decks



ELEVATION



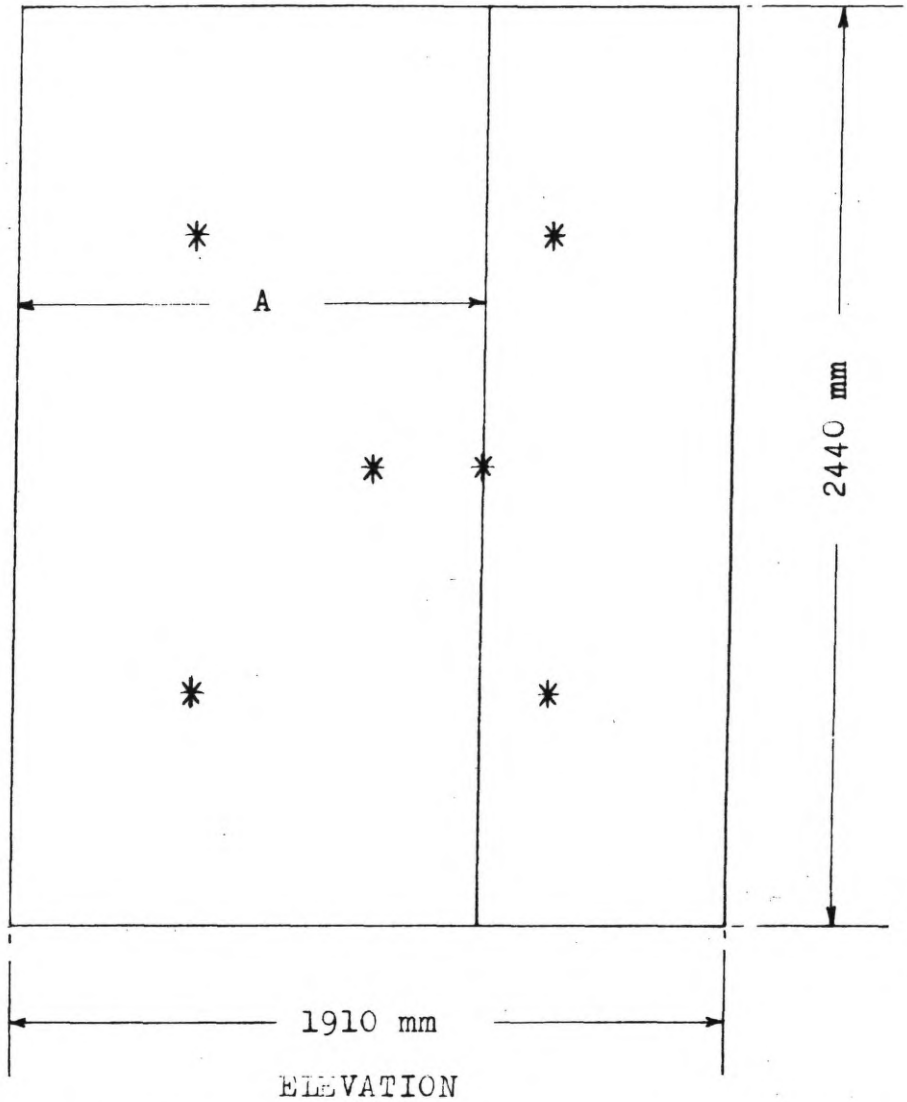
SECTION A-A

Notes:

1. The dimensions of specimen shown are minimum and may be increased to fit supporting frame in a laboratory.
2. ✱ and ⊛ indicate positions of surface thermocouples.
3. Thermocouples marked ⊛ are not required to be fitted to the specimen of a "B" Class deck.

Fig. 2

Fire Test Specimen for "B" Class Bulkheads



ELEVATION

Notes:
1. The dimensions of specimen shown are minimum and may be increased to fit supporting frame in a laboratory.
2. Dimension A is the maximum width used in practice
3. * indicates positions of surface thermocouples.