

इंटरनेट

मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 3614-2 (1992): Metallic and non-metallic fire check doors - Resistance test and performance criteria [CED 36: Fire Safety]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE



भारतीय मानक

धात्विक और अधात्विक अग्नि अवरोधक दरवाजे — अग्नि
प्रतिरोधी परीक्षण पद्धति और कार्यकारिता माप दण्ड

Indian Standard

**METALLIC AND NON-METALLIC FIRE
CHECK DOORS — RESISTANCE TEST
AND PERFORMANCE CRITERIA**

UDC 699·814 : 620·16

© BIS 1992

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Fire Fighting Sectional Committee had been approved by the Civil Engineering Division Council.

The method of fire resistance test of various structures and buildings are covered in IS 3809 : 1979 Indian Standard for Fire Resistance Test for Structures (*First Revision*). The method of Fire Resistance Test of Fire Check Doors included for use in openings in fire resistance wall require different procedure in view of its importance and hence the same has been covered in this standard. This standard covers method of test and criteria for specifying fire rating instead of specification in view of giving flexibility in design.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test for analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

METALLIC AND NON-METALLIC FIRE CHECK DOORS — RESISTANCE TEST AND PERFORMANCE CRITERIA

1 SCOPE

1.1 This standard specifies methods of fire resistance test and the performance criteria for the fire check door or shutter provided to resist the passage of fire and/or gaseous products of combustion, when closed in order to decide the capability of the door/shutters for the intended use.

1.2 The test provides for the determination of fire rating of fire door on the basis of length of time the fire door to resist passage of fire and smoke at ambient temperature before the first development of through openings or flaming and transmission of heat on unexposed surface.

1.3 For the purpose of identifying where the fire doors should be used and the fire resistance requirements, reference should be made to IS 1642 : 1989 and IS 1643 : 1988.

2 REFERENCES

2.1 The following Indian Standards have been referred to in this standard:

<i>IS No.</i>	<i>Title</i>
1642 : 1989	Code of practice for fire safety of buildings (general): General principles of fire grading and classification (<i>first revision</i>)
1643 : 1988	Code of practice for fire safety of buildings (general): Exposure hazard (<i>first revision</i>)
8757 : 1978	Glossary of terms associated with fire safety

3 DEFINITIONS

3.1 For the purpose of this standard the definitions covered in IS 8757 : 1978 and IS 1642 : 1989 shall apply.

3.2 In addition to the above mentioned definition the following additional definitions shall also be applicable to this standard.

3.2.1 *Escape Route*

A route forming part of the means of escape from a point in a building to a final exit.

3.2.2 *Final Exit*

The termination of an escape route from a building giving direct access to a street, passageway, walkway or open space, so sited to ensure

the rapid dispersal of persons from the vicinity of a building and that they are no longer in danger from fire and/or smoke.

3.2.3 *Fire*

A process of combustion characterized by the emission of heat accompanied by smoke and/or flame.

3.2.4 *Fire Compartmentation*

The division of a building into compartments by elements of a building construction intended to resist the passage of fire, capable of meeting specified performance criteria to those ends.

3.2.5 *Fire Door*

A door or shutter provided for the passage of persons, air or things which, together with its frame and fixture as installed in a building, is intended, when closed, to resist the passage of fire and/or gaseous products of combustion and is capable of meeting specified performance criteria to those ends. The fire doors may be insulated or uninsulated.

3.2.6 *Means of Escape*

Structural means whereby a safe route is provided for persons to travel from any point in a building to a place of safety without outside assistance.

3.2.7 *Protected Escape Route*

An escape route enclosed with fire resisting construction.

3.2.8 *Impermeability*

The ability of a specimen of a separating element to restrict the egress of hot gases from the unexposed face of the specimen causing ignition of the cotton pad.

4 APPARATUS

4.1 *Furnace*

It shall be capable of subjecting a full size specimen individually or in combination with others in a fire rated vertical structural element with fire resistance not less than specimen to be evaluated. The furnace shall also be capable of reproducing standard conditions of heating and pressure.

4.2 Thermocouples

4.2.1 Appropriate thermocouples shall be provided for measuring the internal furnace temperatures and unexposed surface temperatures of the fire door assembly in conformity with the requirements of 5.3 and 5.4.

4.3 Pressure Measuring Equipment

4.3.1 Pressure measuring equipment coupled with the furnace shall be provided in conformity with the requirements of 6.1 and 6.2.

5 STANDARD HEATING CONDITIONS

5.1 Temperature Rise

The temperature rise within the furnace shall be controlled so as to vary with time within the limits specified in 5.3 according to the following relationship:

$$T - T_0 = 345 \text{ Log}_{10} (8t + 1)$$

where

T = furnace temperature at time t , expressed in degree Celsius;

T_0 = initial furnace temperature, expressed in degree Celsius; and

t = time, expressed in minutes

The curve representing this function, known as the 'Standard time temperature rise curve' is shown in Fig. 1. The furnace characteristics in terms of temperature rise as a function of time shall be as given in Table 1.

Table 1 Temperature Rise as a Function of Time

Time, t <i>Min</i>	Elevation of Furnace Temperature, $T - T_0$ °C
5	556
10	659
15	718
30	821
60	925
90	986
120	1 029
180	1 090
240	1 133
360	1 193

5.2 Measurement of Furnace Temperature

5.2.1 The furnace temperature is deemed to be the average of the temperatures recorded by thermocouples arranged within the furnace to give an approximation to its average temperature.

5.2.2 These thermocouples shall not be less than 5.

5.2.3 Bare wire thermocouples of wire diameter not less than 0.75 mm and not more than 1.5 mm shall be fixed on the faces of the door or shutter, excluding the frame, one at the centre and the other at the centre of each quarter section. None of these fire thermocouples shall be fixed on positions with through metal connections or closer than 100 mm to the edge of the door leaf or shutter. If insulation data are required on glazed door or multi-leaf door, the thermocouple

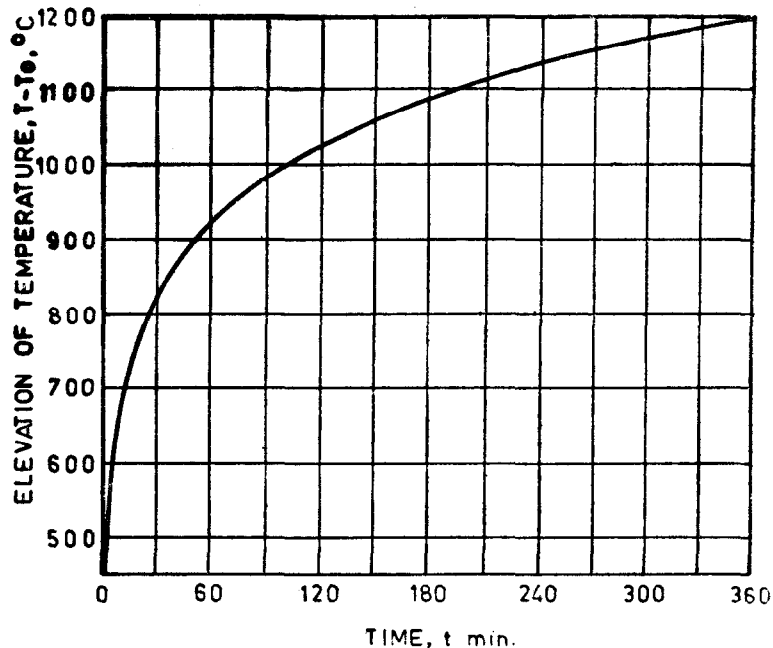


FIG. 1 STANDARD TIME-TEMPERATURE RISE CURVE

shall be distributed as uniformly as possible. The maximum temperature rise on the unexposed surfaces shall be determined from the fire thermocouple specified above plus additional thermocouple (fixed or mobile) which may be used over through metal connections or at other points considered to be of special interest.

5.2.4 Sheathed thermocouples may be used provided that they have a sensitivity not less than and time-constant not greater than those of bare thermocouples. The wires of the thermocouples shall be placed approximately 25 mm from the hot junction.

5.3 Tolerances

5.3.1 The mean deviation of the furnace temperature rise is given as a percentage by the following expression :

$$\frac{A - B}{B} \times 100$$

where

A = integral value of the average furnace temperature as a function of time, and

B = integral value of $T - T_0$ from the equation defined in 5.1.

The tolerances on the mean deviations shall satisfy the following conditions:

- a) ± 15 percent during the first 10 minutes of test,
- b) ± 10 percent during the first 30 minutes of test, and
- c) ± 5 percent after the first 30 minutes of test.

5.3.2 At any time after the first 10 minutes of test, the temperature recorded by any thermocouples, shall not differ from the corresponding temperature of the standard time-temperature curve by more than $+100^\circ\text{C}$. For specimens incorporating a significant amount of combustible material, the deviation of any one thermocouple shall not exceed 200°C .

5.4 Measurement of Temperature of Test Specimens

Surface temperature of test specimens shall be measured by means of thermocouples with a wire diameter of not more than 0.7 mm.

5.4.1 Each thermocouple junction shall be attached to the centre of the face of a copper disk 12 mm in diameter and 0.2 mm thick, which is secured to the surface of the specimen at the required position.

5.4.2 The disks shall be covered with oven-dry square asbestos pads of 30×30 mm and 2 mm thick. The asbestos material shall have a density of 100 kg/m^3 .

5.4.3 The disk end and pad may be fixed to the surface of the specimen by pins, tape or a

suitable adhesive, depending on the nature of the material forming the side of the specimen.

5.5 The temperature reading shall be measured at intervals of 15 minutes or less until a reading exceeding 100°C has been obtained at any one point. Thereafter, the readings be taken at intervals not less than 5 minutes depending on the rate of temperature rise (slow/rapid).

6 PRESSURE CONDITIONS

6.1 An overall pressure difference of (25 ± 5) Pa [(2.5 ± 0.5) mm of H_2O] shall exist in the furnace during the evaluation period from 15 minutes onwards.

6.2 The overall pressure shall be measured and monitored at 100 mm from the underneath surface for the horizontal specimen and at a point located approximately at three quarters of the height of the test specimen.

7 TESTING CONDITIONS

The testing equipment and test sample assembly shall be protected from abnormal condition of wind or weather. The ambient temperature at the beginning of test shall lie within 20°C to 40°C range. Doors made entirely of metal do not require any conditioning.

8 TEST SPECIMEN AND ITS INSTALLATION

8.1 Two representative samples as test specimen shall be conditioned for a week prior to testing. The drying of the test specimen may be carried out by natural or artificial means that the temperature should not exceed 60°C .

8.2 Special care is to be taken to ensure that Fire Doors particularly, when made of or containing timber, gaps which are representative of site conditions are provided in the test specimen. For anybody to judge, a clearance gap of 2 mm between door leaf edge and door frames and 4 mm between the meeting edges of leaves in double leaf door may be considered a good fit.

9 PROCEDURE AND RATING

9.1 For Insulated Doors

Test method described in clauses 9.3 to 9.7 shall apply.

9.2 For Uninsulated Doors

Test method described in clauses 9.4, 9.6 and 9.7 shall apply.

9.3 Loss of Integrity

9.3.1 A failure of the test specimen to maintain integrity shall be deemed to have occurred when collapse or sustained flaming on the unexposed face occurs or the criteria given in 9.3.2 for impermeability are exceeded.

9.3.2 Impermeability

Failure shall be deemed to have occurred when one or other of the following conditions prevail :

- a) For situations where the cotton fibre pad (see note) is suitable, failure shall be deemed to have occurred when flames and/or hot gases cause flaming of cotton fibre pad.
- b) For situations where the use of the cotton pad is not suitable, failure shall be deemed to have occurred when either:
 - i) The 6 mm diameter gap gauge shall penetrate a through gap such that the end of the gauge projects into the furnace and the gauge be moved in the gap for a distance of at least 150 mm.

OR

- ii) The 25 mm diameter gap gauge shall penetrate a through gap such that the end of the gauge projects into the furnace.

NOTE — The passage of flame is characterized by ignition of cotton fibres pad (100 mm × 100 mm, 20 mm thick of mass 3 to 4 g conditioned at 100°C for half hour) at a distance of 25 mm approx. With doors or shutters having no or only slight insulation, it may not be possible to apply this test shortly after the commencement of heating; in such cases note shall be made of the time after which it is not practicable to apply this test.

9.4 Insulation

9.4.1 The average temperature of the unexposed face of the specimen shall not increase above the initial temperature by more than 140°C.

9.4.2 The maximum temperature at any point of this face shall not exceed the initial temperature by more than 180°C, and shall not exceed 220°C irrespective of the initial temperature.

9.5 Stability

If it is required to determine stability or collapse of specimen, the test is to be continued even after the loss of integrity has occurred or when insulation failure has taken place. In such case, the time should be noted at which the door collapses or through openings are formed or when failure of the locking or latching mechanism takes place.

9.6 Additional Observations

Throughout the test, observation shall be made of all changes and occurrences which are not criteria of performance but which could create hazards in a building including for emission of smoke or noxious vapours from the unexposed face of a separating element.

9.7 Criteria of Failure

9.7.1 The fire resistance of a fully insulated doorset or shutter assembly shall be determined with respect to integrity and insulation. The criteria for integrity failure shall be as follows:

- a) During the test, the cotton pad provisions apply;
- b) During the test, the 6 mm gap gauge provisions apply to any other gap other than at sill level;
- c) During the test, the 25 mm gap gauge provisions apply to any gap;
- d) During the test, the requirements concerning sustained flaming apply.

9.7.2 The fire resistance of an uninsulated doorset or shutter assembly shall be determined with respect to integrity. The criteria for failure shall be as follows:

- a) During the test, the 6 mm gap gauge provisions apply to any gap other than at sill level;
- b) During the test, the 25 mm gap gauge provisions apply to any gap;
- c) During the test, the requirements concerning sustained flaming apply.

10 REPORT

10.1 The report shall include following information:

- a) Name of manufacturer;
- b) A description of the assembly including fixing arrangements of fire door including drawing, exact sizes and components like thickness and the locations of fire door test assembly. The clearance and gaps between doors and frame shall be fully recorded;
- c) Rating of the fire door mentioning stability and integrity rating;
- d) Furnace time/pressure chart and temperature curves actually attained during heating conditions;
- e) Time/temperature results; and
- f) Any other information about the performance of door/shutter specimen.

11 FIRE PERFORMANCE

11.1 The performance of a fire door shall be stated in terms of the elapsed time between the commencement of heating and the time of failure as per clauses 9.3 and 9.4. The fire rating of fire door is normally expressed as 30 minutes, 60 minutes, 120 minutes, 180 minutes and 240 minutes fire rating. The fire rating shall be expressed by prefix FD, for example, FD 30, FD 60 etc.

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Revision of Indian Standards

Indian Standards are reviewed periodically and revised, when necessary and amendments, if any, are issued from time to time. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition. Comments on this Indian Standard may be sent to BIS giving the following reference :

Doc : No. CED 36 (4784)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices :

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg
NEW DELHI 110002

Telephone

{ 331 01 31
{ 331 13 75

Eastern : 1/14 C.I.T. Scheme VII M, V.I.P. Road, Maniktola
CALCUTTA 700054

37 86 62

Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036

53 38 43

Southern : C.I.T. Campus, IV Cross Road, MADRAS 600113

235 0216

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)
BOMBAY 400093

6 32 92 95

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR,
COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI.
HYDERABAD. JAIPUR. KANPUR. LUCKNOW. PATNA.
THIRUVANANTHAPURAM.