INTERNATIONAL STANDARD

ISO 834-12

First edition
2012-11-01

Fire resistance tests — Elements of building construction —

Part 12: Specific requirements for separating elements evaluated on less than full scale furnaces

Essais de résistance au feu — Éléments de construction —

Partie 12: Exigences spécifiques pour éléments de séparation évalués dans des fours de dimensions réduites

Reference number
ISO 834-12:2012(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 834-12 was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 2, *Fire containment*.

ISO 834 consists of the following parts, under the general title *Fire resistance tests — Elements of building construction*:

— *Part 1: General requirements*

— *Part 2: Guidance on measuring uniformity of furnace exposure on test samples* [Technical Report]

— *Part 3: Commentary on test method and guide to the application of the outputs from the fire-resistance test* [Technical Report]

— *Part 4: Specific requirements for loadbearing vertical separating elements*

— *Part 5: Specific requirements for loadbearing horizontal separating elements*

— *Part 6: Specific requirements for beams*

— *Part 7: Specific requirements for columns*

— *Part 8: Specific requirements for non-loadbearing vertical separating elements*

— *Part 9: Specific requirements for non-loadbearing ceiling elements*

— *Part 12: Specific requirements for separating elements evaluated on less than full scale furnaces*

The following parts are under preparation:

— *Part 10: Specific requirements to determine the contribution of applied fire protection materials to structural elements*

— *Part 11: Specific requirements for the assessment of fire protection to structural steel elements*

Introduction

This part of ISO 834 contains specific requirements for fire resistance testing which are unique to the elements of construction described as separating non-loadbearing elements both horizontal and vertical. The requirements for these non-loadbearing elements are intended to be applied in appropriate conjunction with the detailed and general requirements contained in ISO 834-1.

Fire resistance tests — Elements of building construction —

Part 12: Specific requirements for separating elements evaluated on less than full scale furnaces

1 Scope

This part of ISO 834 specifies the procedures to be followed for determining the fire resistance of non-load-bearing separating elements when exposed to heating on one face when the specimen size is such that a less than full scale fire resistance furnace is justified. This condition is particularly found in the testing of separating elements in transport applications since the end-use dimensions of the barrier products are often smaller than those specified in other parts of ISO 834. Specimen sizes requiring less than full size resistance furnaces are also found when testing elements to be fitted into a separating element, such as pipe penetration systems, ducts, dampers and cable transits.

The test is not appropriate for the evaluation of curtain walls (non-load-bearing external walls suspended from the ends of floor slabs) or walls containing doors or glazing. Tests of walls containing doors are covered by ISO 3008; tests of walls containing glazing are covered by ISO 3009.

The application of this test to other untested forms of construction is acceptable when the construction complies with the direct field of application as given in this part of ISO 834 or when it is subjected to a field of extended application analysis in accordance with ISO/TR 12470.

NOTE Since ISO/TR 12470 gives only general guidelines, specific extended application analyses are to be performed only by experts in fire resistant constructions.

Caution — Attention 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. Mechanical and operational hazards may also arise during the construction of the test elements or structures, their testing and 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.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 13943, *Fire tests — Vocabulary*

ISO 834-1, *Fire resistance tests — Elements of building construction — Part 1 — General requirements for fire resistance testing*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 834-1 and ISO 13943, and the following apply.

3.1
separating elements
building elements, such as walls, bulkheads or ceilings, which are required to act as fire separations or fire barriers; divide buildings (including ships, airplanes, trains, etc.) into fire compartments or fire zones; or separate a building from adjoining buildings, in order to resist the spread of fire to or from adjoining compartments or buildings

3.2
non-loadbearing separating element
separating element designed not to be subject to any load other than its self-weight

3.3
internal non-loadbearing wall
wall, which provides fire separation which may be exposed separately to a fire from either side

3.4
external non-loadbearing wall
wall forming the external envelope of a building which may be exposed separately to an internal or an external fire

3.5
insulated non-loadbearing separating element
separating element which satisfies both the integrity and insulation criteria for the anticipated fire resistance period

3.6
standard supporting construction
form of construction used to close off the furnace and to support the non-loadbearing separating element being evaluated and which has known resistance to thermal distortion

3.7
plinth
form of standard supporting construction that reduces the height of the opening by raising the support base to accommodate the test specimen

3.8
uninsulated non-loadbearing separating element
separating element which satisfies the integrity criteria for the anticipated uninsulated fire resistance period, but which is not required to meet the thermal insulating criterion contained in ISO 834-1

4 Symbols and abbreviated terms

Symbols and designations appropriate to this test are given in ISO 834-1.

5 Test equipment

Equipment employed in the conduct of this test consists of a furnace, restraint and support frames, and instrumentation as specified in ISO 834-1 and this part of ISO 834. The intent of this part of ISO 834 is to describe applicable furnaces to be used in evaluating test elements that are normally not used in dimensions that require the use of a full scale test furnace (as described in ISO 834-1, but that are capable of exposing the test specimen to similar heat regimes. Since applied loads do not scale well when the specimen sizes are reduced, this part of ISO 834 is for evaluating non-loadbearing specimens only.

NOTE Utilizing furnaces of less than full scale results in reduced testing fees and effort, while yielding similar test results. Potential applications include product development and extended applications. Take care when evaluating test results to be assured that the reduced furnace size did not influence the movement of test sample components resulting from thermal exposure such as adhesion of protective coatings and sheathing materials.

5.1 Test furnace

Test furnaces used in evaluating test elements of less than full scale dimensions shall be capable of maintaining any required pressure, temperature or restraining conditions as given in ISO 834-1.

Vertical furnaces and horizontal furnaces shall be capable of uniformly exposing the entire surface of a test specimen. Consequently, the furnace shall be at least as large as the width and height of the test element, with a minimum depth of 0,5m. Practice has shown that deeper furnaces are more uniform in their exposure.

6 Test conditions

The heating and pressure conditions and the furnace atmosphere shall conform to those given in ISO 834-1.

7 Test specimen preparation

7.1 Design

7.1.1 General

The test specimen shall be either:

a) fully representative of the construction intended for use in practice, including any surface finishes and fittings which are essential and may influence its behaviour in the test, or

b) designed to obtain the widest applicability of the test result to other similar constructions.

The design features which influence fire performance that should be included to give the widest application can be derived from the field of direct application.

The test specimen shall not contain mixtures of different types of construction, e.g. brick or blocks in a wall, unless this is fully representative of the construction in practice.

When separating elements incorporate services, such as electrical junction boxes or surface finishes, which are an integral part of the design of the element, these shall be included in the test specimen.

7.2 Specimen size

In some cases, in particular in transport media, actual dimensions of samples are smaller than the dimensions of the full scale furnace requirements of ISO 834-1. ISO 834-1 describes conditions under which these samples can be tested. Specimens should be evaluated at the largest dimensions for which they will be used in the field when these dimensions are smaller than specified in ISO 834-1. The specimen shall have a width of at least 1m, and a length or height of at least 1m.

7.3 Number of test specimens

For symmetrical constructions only one test specimen is required unless otherwise required by this part of ISO 834.

For asymmetrical constructions required to resist fire from either side, test specimens representative of the construction shall be subjected to fire exposure from each side unless it can be established that the fire exposure of a particular face would be more onerous.

Asymmetrical constructions required to resist fire from one specified side only shall be subjected to fire exposure from that side only.

7.4 Specimen conditioning

At the time of the test the strength and moisture content of the test specimens shall approximate the conditions expected in normal service. This includes any infills and jointing materials. Guidance on conditioning is given in ISO 834-1. After equilibrium has been achieved the moisture content or state of cure shall be determined and recorded. Any supporting construction, including the lining to the test frame, is exempt from this requirement.

7.5 Specimen installation and restraint

7.5.1 General

The test specimen shall be installed in the test frame and, if used, the supporting construction representative for the practical use.

The test specimen shall be mounted as near as possible to the exposed vertical or horizontal plane of the test frame or supporting construction as appropriate, unless in practice a different position is used.

The whole area of the test construction shall be exposed to the heating conditions.

7.5.2 Standard supporting construction

If the size of the test specimen is smaller than the opening in the test frame then it shall be installed in the test frame using one of the following approaches:

a) Where the height of a vertical test specimen is smaller than the height of the test frame opening, then a plinth shall be provided to reduce the opening to the required height. The plinth shall possess sufficient stability for the test specimen.

b) Where the width of a vertical test specimen is smaller, a rigid supporting construction shall be provided on the vertical sides of the opening.

c) Where the width or length of a horizontal test specimen is smaller than the test frame opening, a rigid supporting construction shall be provided to fill the opening.

7.5.3 Non-standard supporting construction

If the test specimen is mounted in a supporting construction not given in ISO 834-1, then the result may only be valid for elements mounted in the construction as tested.

7.5.4 Restraint

When in practice the test specimen is not larger than the front opening of the furnace, then the edges of a vertical test specimen shall be restrained as in practice. Horizontal elements shall be restrained around the entire perimeter.

8 Application of instrumentation

8.1 Furnace thermocouples (plate thermometer)

8.1.1 General

Plate thermometers shall be provided to measure the temperature of the furnace and shall be uniformly distributed to give a reliable indication of the temperature across the exposed face of the test specimen. These plate thermometers shall be constructed and located in accordance with ISO 834-1.

8.1.2 Number and position of plate thermometer

The number of plate thermometers shall not be less than one for every 1,5 m^2 of the exposed surface area of the test specimen. There shall be a minimum of four plate thermometers for any test and each shall be oriented so that side "A" faces the back wall or floor of the furnace. The plate thermometers shall be distributed uniformly ensuring no plate thermometer is closer than 250 mm to the edge of the furnace opening.

NOTE Many wall tests of size of 1m wide and 1m high have been conducted, and minimum distance of 250 mm between the plate thermocouples and the edge of the opening has been found suitable.

8.2 Unexposed specimen thermocouples

8.2.1 General

Unexposed surface thermocouples shall be constructed and located in accordance with ISO 834-1.

8.2.2 Position of thermocouples

When the test specimen incorporates elements considered as non-insulating, the location of the surface thermocouples shall be adjusted so as to avoid them. Thermocouples shall not be placed within 100 mm of a non-insulating element.

Thermocouples shall not be placed closer than 100 mm to any edge of the specimen.

8.3 Deflection measurement

8.3.1 General

Appropriate instrumentation shall be provided to determine a history of all significant deflection (i.e. greater than 5 mm) of the test specimen during the test.

8.3.2 Position of the measurement

Measurements shall be made at the centre of the specimen and at mid-height, 50 mm in from the free edge. The interval of measurement shall be adequate to present a history of movement during the test.

8.3.3 Method of the measurement

Guidance on the application of deflection measurement is given in ISO 834-1.

NOTE Measurement of deflection is a mandatory requirement although there are no performance criteria associated with it. The deflection of the test specimen may be important in determining the extended field of application of the test result.

8.4 Pressure

Pressure within the furnace shall be measured as described in ISO 834-1.

9 Test procedure

9.1 Furnace control

Measure and control the furnace temperature and pressure conditions in accordance with ISO 834-1.

9.2 Measurements and observations

Monitor the specimen for compliance with the criteria of integrity and insulation, and make required measurements and observations in accordance with ISO 834-1. Observations that may affect the fire properties should be noted, e.g. fall down of parts on the fire exposed side.

10 Performance criteria

The criteria employed in judging the performance of separating elements are integrity and insulation, and are described in ISO 834-1.

11 Validity of the test

The test shall be considered to be valid when it has been conducted within all of the prescribed limits of the requirements pertaining to: the test equipment, test conditions, test specimen preparation, instrument application and test procedure according to this part of ISO 834.

The test shall also be considered for acceptance when the fire exposure conditions relating to furnace temperature, pressure and ambient temperature are in excess of the upper limits of the tolerances prescribed in this part of ISO 834 and ISO 834-1.

12 Expression of results

The results of the fire resistance test shall be expressed in accordance with ISO 834-1.

13 Test report

The report shall be in accordance with ISO 834-1.

Annex A
(informative)

Direct application of results

The results of the fire test are directly applicable to similar constructions where one or more of the changes listed below are made and the construction continues to comply with the appropriate design code for its stiffness and stability.

a) Decrease in height

b) Increase in the thickness of the separating element

c) Increase in the thickness of component materials (e.g. linings, boards, studs, thermal insulation)

d) Decrease in linear dimensions of boards or panels but not thickness

e) Decrease in stud or joist spacing

f) Decrease in distance of fixing centres

g) Increase in the number of horizontal joints when tested with one joint not more than 500mm from the top edge

h) Horizontal and/or vertical joints, of the type tested

i) Increase in the length of fixing used

A.1 Supporting constructions

A.1.1 Standard supporting constructions

The result of a test of a non-loadbearing separating element tested in one of the standard supporting constructions given in ISO 834-1, or the test frame, is applicable to any other supporting construction within the same type (rigid, low-density rigid or flexible) that has a greater fire resistance (thicker, denser, more layers of boards, as appropriate).

A.1.2 Non-standard supporting constructions

The result of a test on a non-loadbearing separating element tested in a non-standard supporting construction is only applicable to that construction.

Annex B
(informative)

Guidance for justification for smaller specimen size in less than full scale fire resistance furnace

The scope of this part of ISO 834 includes the statement, "when the specimen size is such that a less than full scale fire resistance furnace is justified". This annex gives guidance cases where specimen size of less than full scale fire resistance furnace is justified. All structural fire protection components requiring approval for any SOLAS ship shall be tested full scale in accordance with IMO Fire Test procedures code.

B.1 Smaller size of the end-use product

In case the size of end-use of the product is smaller than the full scale fire resistance test (e.g., 3m by 3m for vertical specimens as specified in ISO 834-1, the specimen of less than 3m can be accepted. Examples are a bulkhead of small fishing vessels height of which is less than 3 m, and the separating element in passenger railway cars where maximum height is less than 3 m.

B.2 Test specimen for penetrations on fire resistance building elements

Penetrations, such as pipe penetration systems, ducts, dampers and cable transits can be fitted in a wall or floor specimen whose size is less than 3 m.

B.3 Approval and/or certification to be given to the size less than 3m

When the approval and/or certification is sought to the size less than 3m, a specimen of the maximum size to which the approval/certification is sought shall be tested.

B.4 Thermal expansion and thermal bow

B.4.1 General

Two parameters to consider when determining whether test specimens that are smaller than the standard dimensions can be used for the fire test are: thermal expansion and thermal bow.

B.4.1.1 Thermal expansion

Test specimens smaller than the full scale standard specimen prescribed in ISO 834-1 can be used when the test specimen is provided with an insulation which will keep the test specimen temperature below a level at which the thermal expansion is less than 1%.

B.4.1.2 Thermal bow

When the span of an ISO 834-1 test specimen size is reduced, the deflection before fire exposure is also reduced. This reduction in deflection, through reduction in test specimen size, may not be representative of an insulation's ability to deflect with the test specimen as in practice. If the test specimen is provided with an insulation which will keep the test specimen temperature gradient below a level at which the thermal bow is less than 1% of the largest dimension, test specimens smaller than the full scale standard specimen prescribed in ISO 834-1 can be used provided that insulation's deflection as in practice is addressed.

Bibliography

[1] ISO 834-3, *Fire-resistance tests — Elements of building construction — Part 3: Commentary on test method and guide to the application of the outputs from the fire-resistance test*

[2] ISO 3008, *Fire resistance tests — Door and shutter assemblies*

[3] ISO 3009, *Fire resistance tests — Glazed elements*

[4] ISO/TR 12470, *Fire resistance tests — Guidance on the application and extension of results*

ICS 13.220.50

Price based on 9 pages