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Fire resistance tests — Door and shutter assemblies —

Part 4: Linear joint fire seal materials used to seal the gap between a fire door frame and the supporting construction

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 2, *Fire containment.*

A list of all parts in the ISO 3008 series can be found on the ISO website.

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

Introduction

This fire test method provides a methodology for testing linear joint fire seal materials intended to be used to seal the 'linear joint gap' between a fire door frame and the supporting construction.

This test methodology is only appropriate for the evaluation of alternate linear joint fire seal materials used to seal the gap between a fire door frame and the supporting construction, if:

a) the fire door frame, doors and supporting construction have already been successfully tested according to ISO 3008-1 and the gap between the door frame and the supporting construction does not exceed 6 mm, provided the door and frame assembly does not permit the penetration of a gap gauge, as specified in ISO 834-1:1999, 8.4.2; or

b) the fire door frame, doors and supporting construction have already been successfully tested according to ISO 3008-1 and during the full-scale fire resistance test, deflection of the supporting construction and the fire door frame was found to be less than 100 mm.

Fire resistance tests — Door and shutter assemblies —

Part 4: Linear joint fire seal materials used to seal the gap between a fire door frame and the supporting construction

CAUTION — The attention of all persons concerned with managing and carrying out this fire-resistance test is drawn to the fact that fire testing can be hazardous and that there is a possibility of toxic and/or harmful smoke and gases evolving during the test. Mechanical and operational hazards can also arise during the construction of the test elements or structures, their testing 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

This document specifies a standard test methodology and resulting field of direct application which are applicable to linear joint fire seal materials used to seal around fire door sets which have been tested in accordance with ISO 3008-1.

The test methodology described in this document uses a smaller-scale fire resistance furnace than that prescribed in ISO 3008-1.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 834-8, *Fire-resistance tests — Elements of building construction — Part 8: Specific requirements for non-loadbearing vertical separating elements*

ISO 3008-1, *Fire resistance tests — Door and shutter assemblies — Part 1: General requirements*

ISO 10295-1, *Fire tests for building elements and components — Fire testing of service installations — Part 1: Penetration seals*

ISO 10295-2, *Fire tests for building elements and components — Fire testing of service installations — Part 2: Linear joint (gap) seals*

ISO/TR 10295-3, *Fire tests for building elements and components — Fire testing of service installations — Part 3: Single component penetration seals — Guidance on the construction and use of test configurations and simulated services to characterise sealing materials*

ISO 13943, *Fire safety — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 834-1, ISO 834-8, ISO 3008-1, ISO 10295-1, ISO 10295-2, ISO 10295-3, ISO 13943 and the following apply.

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

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

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

3.1
fire seal
seal designed to prevent the passage of fire or hot gases

[SOURCE: ISO/TR 10295-3:2012, 3.8, modified]

4 Test equipment

4.1 Reduced-scale furnace

The test equipment shall be as specified in ISO 834-1 and ISO 10295-1. A reduced-scale furnace may be used, provided the furnace is of sufficient size to accommodate a linear joint fire seal at least 900 mm in length. Guidance on the construction of reduced scale furnaces is provided in ISO 834-12.

In instances where the distance between anchors for the fire door frame exceeds 900 mm, the furnace used shall be of sufficient size to test a length of linear joint fire seal equivalent to the maximum distance between door frame anchors.

4.2 Furnace internal dimensions

The test furnace used for this test protocol shall have internal dimensions such that a distance of at least 200 mm exists between the side or long edge of a linear joint and the furnace boundary, subject to a minimum internal size of 1 m × 1 m × 1 m for horizontal (floor) furnaces.

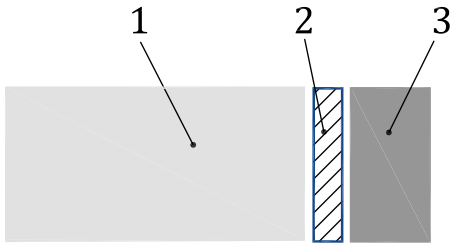
4.3 Vertical furnace dimensions

For vertical (wall) furnaces, the minimum internal size of the furnace shall be 1 m × 1 m and it shall be of sufficient depth to ensure that the temperature conditions specified in ISO 834-1 can be achieved, that the pressure conditions described in 6.2 can be achieved and that the test specimen is not subject to direct flame impingement at any time during the conduct of a test.

5 Test specimen

5.1 General

The specimen shall consist of a section of the supporting construction, the fire door frame and the linear gap seal. A typical sample installation on a reduced scale furnace is shown in Figure 1.



Key

1 supporting construction
2 linear joint fire stopping material
3 door frame

Figure 1 — Typical test sample configuration

5.2 Specimen size

Each test specimen shall be a minimum of 900 mm in length. In instances where the distance between anchors for the fire door frame exceeds 900 mm, the test specimen shall be of a length such that the combined length of linear joint fire seal, door frame and supporting construction is at least equivalent to the maximum distance between door frame anchors.

Both a vertical and horizontal specimen of the same linear joint seal design and adjacent fire door frame and supporting construction shall be tested in all cases. The vertical portion represents the fire door frame jamb and the horizontal portion represents the fire door frame header portion.

The maximum intended joint fire seal width shall be tested.

The minimum intended door frame section width shall be tested.

The width of supporting construction shall at least be 300 mm.

5.3 Specimen design

Any intended architrave materials shall be fitted over the linear joint seal and become an additional component of the seal. In this case the field of application is limited.

5.4 Timber door frame sections

The minimum intended timber density shall be tested.

Density and moisture measurements shall be taken prior to testing.

5.5 Splices

Where a splice within the seal material(s) and/or backing material(s) is present, in practice, this shall be included within the specimen. This splice shall be located 1/4 of the way down from the top of a vertical specimen and 1/4 of the way from the left-hand edge on a horizontal specimen.

5.6 Supporting construction

The supporting construction may be selected from the standard flexible and rigid supporting constructions specified in ISO 834-8 for the required time period.

Alternatively, a specific associated construction may be tested, but in this case, the field of application is limited to the specific construction only.

5.7 Packers and fixings

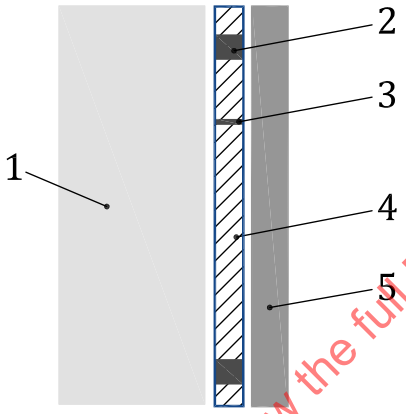
5.7.1 Packers

At present, this test methodology is only intended to evaluate the linear joint seal materials and not the packer and fixing materials. For this reason, the packer shall be of non-combustible material of maximum width of 50 mm × the required thickness, in order to set the linear joint seal gap width.

5.7.2 Fixings

Suitable steel fixings (e.g. screws) shall be used to fix the door frame section to the supporting construction wall to ensure the gap remains constant during the test.

See Figure 2 and Figure 3 for example test setups.

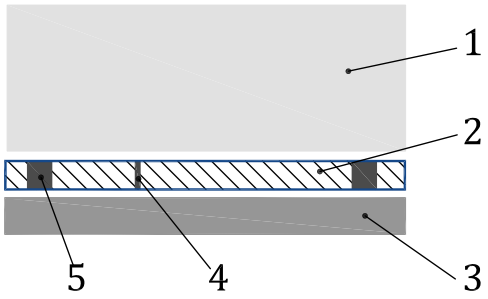


Key

1 supporting construction
2 packer
3 splice 1/4 down from top of seal (if applicable)
4 liner gap seal material tested at maximum required width
5 door frame at minimum density and section size required

NOTE Fire exposure is from right side of section as shown in the figure.

Figure 2 — Example vertical test set up with timber door frame section



Key

1 supporting construction
2 linear gap seal material tested at maximum required width
3 door frame at minimum density and section size required
4 splice 1/4 distance from left edge (if applicable)
5 packer

NOTE Fire exposure is from underside of section as shown in the figure.

Figure 3 — Example horizontal test set up with a timber door frame section

6 Test conditions

6.1 Heating conditions

The heating conditions shall conform to ISO 834-1.

6.2 Pressure

6.2.1 For vertical test constructions, the furnace shall be operated such that a minimum pressure of 20 Pa exists at the bottom of any test specimen.

6.2.2 In vertical elements, all splices shall be located within the positive pressure zone so that the pressure at the bottom of the splice is a minimum of 20 Pa for the lowest splice in the test construction.

6.2.3 For horizontal test constructions, the furnace shall be operated such that a minimum pressure of 20 Pa is established at a position (100 ± 10) mm below the lowest point of the test construction.

7 Specimen preparation

7.1 Supporting construction

The supporting construction shall be of known fire resistance and representative of that used in practice.

7.2 Joint seal

7.2.1 All materials used in the construction, fabrication and installation of the test specimen shall be representative of the intended application, design, materials and workmanship of those used in practice.

7.2.2 Where voids exist within a joint seal, the ends shall be sealed to prevent air flow through the test specimen.

7.3 Splice location

7.3.1 Splices shall be located within the positive-pressure zone so that the pressure conditions are as specified in 6.2.

7.3.2 The splices shall be located no closer than 200 mm to any interior furnace face nor closer than 200 mm to any other splice in that test specimen.

7.4 Conditioning

7.4.1 Conditioning shall be in accordance with ISO 834-1.

7.4.2 At the time of the fire test, the supporting construction shall be in an air-dry condition and in equilibrium with the laboratory atmosphere.

7.4.3 The curing regime of the joint seal required by the manufacturer's installation instructions shall be followed and clearly reported.

7.5 Information and test specimen verification

7.5.1 For each test specimen, the following information shall be provided by the test sponsor prior to the test:

a) All fabrication details, including drawings.

b) An adequate description of materials and their manufacture/supplier.

c) An installation procedure.

7.5.2 The laboratory shall verify, as far as possible, the conformity of the test specimen with the information provided. Any area of discrepancy shall be resolved and any details that are not verified shall be documented prior to commencement of the test.

7.5.3 On certain occasions, it is not be possible to verify the conformity of all aspects of the test specimen construction prior to the test and adequate evidence can be unavailable after the test. When it is necessary to rely on information provided by the sponsor then it 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.

8 Instrumentation

8.1 Temperature

8.1.1 Furnace thermocouples (Plate thermometers)

Unless otherwise noted herein, the plate thermometers shall be distributed in accordance with ISO 834-1. At least one plate thermometer shall be provided for every 1,5 m^2 of the heated test construction area, subject to a minimum of four plate thermometers for each test construction. These plate thermometers shall be symmetrically distributed with respect to the heated area of the test construction.

8.1.2 Unexposed-surface thermocouples

8.1.2.1 Specimen thermocouples shall conform to specification and installation requirements of ISO 834-1, except as described in 8.1.2.2 to 8.1.2.4.

8.1.2.2 All unexposed-surface thermocouples provided for thermal measurements shall be in conformity with ISO 834-1. When necessary, the disc and thermocouple pad may be deformed to follow a non-planar surface profile of a test specimen. In the event of small sections, it is permissible to reduce the size of the pad subject to a minimum dimension of 12 mm in either width or length. If the modified unexposed-surface thermocouple and pad cannot be placed on the contour of the surface, use the roving thermocouple in 8.1.3.

8.1.2.3 No unexposed-surface thermocouples shall be placed inside the 200 mm boundary around the furnace walls.

8.1.2.4 Unexposed-surface thermocouples shall be located on the test construction as given in 8.1.2.4.1 to 8.1.2.4.4.

8.1.2.4.1 One unexposed-surface thermocouple shall be positioned on every splice. Centre the unexposed-surface thermocouple on the splice.

8.1.2.4.2 Provide at least two unexposed-surface thermocouples and place a minimum of one thermocouple per linear metre on the test specimen.

8.1.2.4.3 Two unexposed-surface thermocouples shall be placed at the junction between the supporting construction and test specimen.

8.1.2.4.4 If, in the opinion of the laboratory, potential weak spots can be identified, additional unexposed-surface thermocouples shall be attached to these locations.

8.1.3 Roving thermocouples

8.1.3.1 Roving thermocouples shall conform to specification and installation requirements of ISO 834-1.

8.1.3.2 Where it is impractical to attach unexposed-surface thermocouples as outlined above because of the nature of the test specimen or to identify any local "hot spots", careful use shall be made of a roving thermocouple in accordance with the procedures given in ISO 834-1.

8.2 Pressure

8.2.1 The pressure sensors shall be in accordance with ISO 834-1.

8.2.2 The pressure sensors shall be positioned, and the pressure monitored and controlled, using the principles given in ISO 834-1.

8.3 Deformation

8.3.1 Deformations of the test construction shall be measured and recorded. For horizontal specimens, the measurements shall be taken at mid-width and at 1/4 and 3/4 distance from the left edge. For vertical specimens, the measurements shall be taken at mid-height and 1/4 and 3/4 distance from the bottom edge.

8.3.2 Instrumentation for the measurement of deflection of the supporting construction shall be located so as to provide data in terms of the amount and rate of deflection during and, where appropriate, after the fire test.

8.4 Integrity

8.4.1 The integrity of the test construction shall be measured in accordance with the procedures given in ISO 834-1.

8.4.2 When difficulties arise in attempting to use the normal cotton pad for the assessment of loss of integrity in accordance with ISO 834-1, the size of the cotton pad shall be reduced to 30 mm × 30 mm × 20 mm. The cotton pads shall be prepared and conditioned in accordance with ISO 834-1. The wire supporting frame shall also be adapted to suit the smaller cotton pad size.

9 Test procedure

9.1 General test procedure

9.1.1 The procedures given in ISO 834-1 shall govern the commencement of the fire test.

9.1.2 The procedures given in ISO 834-1 shall govern the measuring and recording of the following:

a) temperatures;

b) furnace pressure;

c) deformation;

d) integrity of the test construction.

The furnace pressure shall be monitored, controlled and recorded so that the conditions specified in 6.2 are met.

9.2 Termination of test

The test shall be terminated in accordance with any of the provisions of ISO 834-1.

10 General performance criteria

10.1 Insulation

10.1.1 For each test specimen, all unexposed-surface thermocouples as described in 8.1.2, shall be used in the average temperature calculations.

NOTE The initial temperature is defined as the average unexposed-surface temperature of the relevant test specimen at the commencement of the test.

10.1.2 Transmission of heat through the joint seal during the classification period shall not raise the average temperature on its unexposed-surface more than 140 K above the initial average temperature.

10.1.3 Transmission of heat through the test construction during the classification period shall not raise any one of the thermocouple temperatures of the unexposed-surface more than 180 K above its initial temperature.