BRITISH STANDARD

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Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware

Part 2: Fire resistance characterisation test for elements of building hardware

ICS 13.220.50; 91.060.50

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 1634-2:2008.

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A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware - Part 2: Fire resistance characterisation test for elements of building hardware

Feuerwiderstands- und Rauchleckageprüfungen für Tür- und Abschlusseinrichtungen, Fenster sowie Beschläge - Teil 2: Charakterisierungsprüfungen zum Feuerwiderstand von Beschlägen

This European Standard was approved by CEN on 13 September 2008.

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Foreword

This document (EN 1634-2:2008) has been prepared by Technical Committee CEN/TC 127 “Fire safety in buildings”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2009, and conflicting national standards shall be withdrawn at the latest by May 2009.

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

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EC Directive 89/106/EEC.

EN 1634 ‘*Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware*’ of the following:

— Part 1: *Fire resistance tests for doors, shutters and openable windows*;

— Part 2: *Fire resistance characterisation test for elements of building hardware*;

— Part 3: *Smoke control test for door and shutter assemblies*.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This European Standard permits an evaluation of the contribution that a selected item of building hardware is able to make (either positive or negative) to the fire resistance of a hinged or pivoted doorset or an openable window assembly without requiring a full size test.

An item of building hardware does not have a fire resistance capability in itself because fire resistance is a term which can only be applied to an element of structure and is quantified by means of the fire resistance test. An item of building hardware does, however, form part of a fire barrier (fire resisting doors and openable windows) and therefore is required to have demonstrated suitability for that purpose. See Annex F for the relationship of this Test Standard with door-related product standards, test methods and classification.

This European Standard describes a procedure for determining the influence of building hardware with respect to fire resistance in terms of integrity and insulation when incorporated in a fire resisting door or openable window assembly used for personnel access, maintenance, and in some countries, as a means of escape. Such test assemblies use reduced size specimens of the proposed construction in place of the full size assembly. More than one specimen may be tested together in a standard furnace test providing the separation of the elements required by EN 1363-1 is maintained. The test is designed to characterize the influence that the selected item of building hardware has on the fire resistance of a full size assembly in a manner that solely addresses the factors attributed to that item.

There are five individual methods for characterizing the fire behaviour of the following items of building hardware. The scope of each method is given in the following:

a) Method for testing single axis hinges and pivots for side hung door assemblies and openable windows:

   1) single axis hinges[1)];

   2) single action pivots[1)];

   3) spring hinges (for evaluating the influence on integrity) - uncontrolled door closing devices;

   4) double action pivots.

b) Method for testing edge mounted securing devices, including those for use on sliding doors:

   1) mortice latches and mortice locks and mortice deadlocks, including electric locks and multi-point locks with locking plates[2)];

   2) rim latches and locks[1)];

   3) cylinders (for latches and locks);

   4) door and window bolts;

   5) exit devices.

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1) Dependent upon decision ‘tree’ indicating that the method is applicable.

2) If changed separately from the lock.

c) Method for testing non-edge mounted items of building hardware:

   1) letter plates;

   2) air transfer grilles;

   3) push plates and pull handles;

   4) door furniture (such as lever handles and knobs);

   5) door viewers;

   6) fixings/fixing techniques.

d) Method for evaluating ignition for items attached to the unexposed face of uninsulated steel or glazed doors:

   1) overhead face fixed controlled door closing devices.

e) Method for testing controlled door closing devices for use on unlatched fire resisting door assemblies:

   1) overhead face fixed controlled door closing devices[1)];

   2) spring hinges (for evaluating the ability to retain door closed) - uncontrolled door closing device.

This method is not suitable for evaluating concealed and/or floor mounted door closing devices.

Results of tests described in this European Standard are expressed in terms of performance rating which, when used in conjunction with the associated field of direct application clause, will define a range of applications for which the selected item of building hardware is suitable. This can be used when establishing the field of application of the door or openable window assembly by ensuring that only building hardware which has a positive influence is used. Whilst the instrumentation recommended is the minimum required, the use of additional thermocouples is recommended since this will assist in making further extrapolation or interpolation of the results.

Attention is drawn to the need to ensure that the test described in this European Standard is performed under suitable conditions which afford adequate protection to personnel against the risk of fire and/or inhalation of smoke and/or toxic products of combustion.

1 Scope

This European Standard specifies a method for characterizing the influence on fire performance of items of building hardware for incorporation into hinged or pivoted vertically installed fire door assemblies (having either one or two leaves) or vertically installed openable window assemblies, of known fire resistance of up to and including 240 minutes integrity (and where relevant insulation) in accordance with EN 1634-1. It applies to the testing of building hardware for use on hinged and pivoted doors and openable windows which include framed glazed doors and windows, but not glass doors. It does not include a test for durability or other performance characteristics, which should be evaluated according to the product standard for the item of building hardware or as given in EN 14600.

The method is suitable for characterizing building hardware for use on non-metallic door or window assemblies consisting of cellulosic materials or mineral boards faced with cellulosic materials, hung in either cellulosic, mineral cored or metal frames: or conventional steel doors made from sheet steel, not more than 1,5 mm thick, hung in steel frames (steel doors include doors filled with mineral board or mineral fibre cores but not steel clad timber/cellulosic doors). The size of these assemblies can be up to that given in the field of direct application for the door leaf construction concerned.

This method is not directly appropriate for evaluating building hardware for use on glass or glazed doors with decorative perimeter framing. The appropriateness of this method of test can be established by reference to the flow chart given in Annex A.

This European Standard does not constitute a fire resistance test for a leaf, window, frame, intumescent seal, or anything other than the selected item of building hardware. The use of any resulting field of direct application is restricted to leaf and frame constructions which have been successfully tested to EN 1634-1. The method has been developed primarily to permit the evaluation of building hardware for hinged or pivoted door assemblies and openable windows, but the method is also suitable for evaluating some items of building hardware, which are non-edge mounted, for use with sliding doors and openable windows.

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.

EN 1154:1996, *Building hardware — Controlled door closing devices — Requirements and test methods*

EN 1363-1:1999, *Fire resistance tests — Part 1: General requirements*

EN 1634-1:2000, *Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware — Part 1: Fire resistance test for doors and shutter assemblies and openable windows*

EN 1935:2002, *Building hardware — Single-axis hinges — Requirements and test methods*

EN 12209[3)], *Building hardware — Locks and latches — Mechanically operated locks, latches and locking plates — Requirements and test methods*

EN 12519:2004, *Windows and pedestrian doors — Terminology*

3) Only selected locks, deadlocks and latches from EN 12209 are subjected to the requirements of this European Standard, EN 1634-2.

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

EN 14600:2005, *Doorsets and openable windows with fire resisting and/or smoke control characteristics — Requirements and classification*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 1634-1:2000, EN 12519:2004, EN 14600:2005 and the following apply:

3.1
associated construction
section of door leaf, window and/or frame if appropriate, into or onto which the item of building hardware is fitted, including any special protection, e.g. intumescent strips, that may be used to obtain the required result (Figure 1)

3.2
door frame/door lining
sub-structure installed in an aperture in a wall from which a door leaf is hung or pivoted

3.3
element of building construction
defined construction component e.g. wall, partition, floor, doorset, roof, beam or column

3.4
air transfer grille (louvre)
non-ducted grille installed in a door, to allow air to transfer naturally from one room or zone to another without connection to a mechanical ventilation system which may operate by various methods

NOTE This test identifies the integrity and insulation criteria of a door panel incorporating the air transfer grille.

3.5
glass door
door where the leaf consists entirely of glass and onto which the building hardware is directly attached

3.6
glazed door
door which incorporates at least one glass panel which is supported in the leaf construction to which the building hardware is directly attached

3.7
high temperature sealing material
material used to seal gaps in the associated and the supporting construction and between the two constructions (except where there is anticipated movement and/or expansion) which is able to maintain the integrity of the test construction for the required duration

3.8
hinged supporting construction
panel constructed for the greater part from re-usable non-combustible material such as refractory board or aerated concrete slab (supporting construction) and onto which is mounted the associated door or window section (associated construction), and is designed to simulate the movement and mass of the full size assembly (see Figure 1)

3.9
intumescent seal
seal which is used to impede the flow of heat or furnace gases which only becomes active when subjected to elevated temperature

3.10
non-combustible material
material which is either euroclass A1 or A2, when classified according to EN 13501-1

3.11
non-pressure forming intumescent seal
seal as in 3.9 which when activated will not influence the application of forces or restrict the displacement of the leaf

NOTE These are normally based upon mono- or poly-ammonium phosphate compounds.

3.12
notional floor level
level from which the height of the item of building hardware is measured when incorporated in a door assembly

3.13
pressure forming intumescent seal
seal as in 3.9 which when activated may influence the application of forces or restrict the displacement of a leaf

NOTE These are normally based upon compounds of sodium silicate or inter-collated graphite.

3.14
securing device
item of building hardware used for retaining a leaf or window in the closed position, both in normal use and also in the event of a fire, which is normally automatic in operation, such as a latch, but may not always be so, such as a deadlock or an edge bolt in one leaf of a double leaf doorset

3.15
supporting construction
inert construction, able to withstand exposure to the prescribed heating conditions without undue damage and capable of transmitting the prescribed loads, consisting of a non-combustible peripheral frame and where appropriate a re-usable part on the hinged supporting construction, to which the associated construction is fixed and supported as shown in Figure 1

3.16
test construction
assembly which includes a test specimen and the supporting construction

3.17
test specimen
item of building hardware, its fixings and the associated leaf/frame construction applicable to the door or window to which the field of direct application of the test result is related

4 Test conditions

4.1 Ambient conditions within laboratory

The ambient conditions within the laboratory shall be as specified in EN 1363-1.

4.2 Heating conditions

The specimen shall be exposed to the furnace conditions specified in EN 1363-1.

4.3 Pressure conditions

4.3.1 General

The specified pressure conditions shall be established within the furnace as quickly as possible and as no later than 5 minutes into the test. The mean pressure shall be maintained for the duration of the test and shall be within ± 2 Pa of the specified pressure. There is no requirement to establish a pressure gradient within the furnace.

The mean pressure shall relate to the item under test and shall be equivalent to the pressure which would be experienced by the item when included in a full size assembly tested to EN 1634-1. The pressure shall be governed by the vertical position of the item relative to the neutral pressure axis and further details shall be as specified in 4.3.2 to 4.3.5. The mean pressure at the centre of the item is given by:

P = 8,5a - 4,25 Pa rounded to the nearest Pascal

where

a = the height of the centre of the item above notional floor level in metres; see Figure 3.

When the height is not known, e.g. as in the case of letter plates, the pressure shall be that which represents the maximum pressure differential that it may experience. Some standards may define limits in the position of products, e.g. EN 13724 for Letter Plates.

4.3.2 Pressure conditions for testing single axis hinges on side hung doors or openable windows

Hinges which are fixed in the positive and negative pressure zones, for use in conjunction with a side hung cellulosic door leaf edge, or openable window casement, and associated frames, shall be tested at both positive furnace pressure and negative furnace pressure (see Annex B.1).

For the positive pressure test the mean pressure at the centre of the upper hinge shall be 1 4 Pa ± 2 Pa unless 'a_1' is > 2 m. For door leaves > 2 m high, the pressure shall be increased on a linear basis up to a maximum of 20 Pa when a_1 is 3 m. For the negative pressure test, the mean pressure at the centre of the lower hinge (a_2) shall be – 2 Pa ± 1 Pa (see Figure 2).

An easily operated bolt & keep (see Figure 2) is to be fitted to prevent the furnace pressures from moving the simulated door leaf.

In the case of hinges for use with metal doors, or metal openable windows mounted on an associated construction consisting of a metal leaf and metal frame, exposure to a test performed at positive pressure on a hinge mounted in a position to replicate the top hinge position is adequate to cover use in all pressures and positions.

4.3.3 Pressure conditions for testing securing devices

The furnace pressure shall be established and maintained in accordance with 4.3.1. The mean overpressure at the centre of the device shall be 4 Pa unless 'a' is > 1 m in which case the overpressure shall be 10 Pa, for a latch or deadlock or 18 Pa for an edge bolt. See Figure 3.

4.3.4 Pressure conditions for testing non-edge mounted items of building hardware

The furnace pressure shall be established and maintained in accordance with 4.3.1.

Where multiple items are to be tested simultaneously, the size of the associated leaf construction may be increased, in order to achieve the required furnace overpressure at each item, i.e. P_1 and P_2, etc. The pressure levels P_1 and P_2 shall be established by considering the range of possible locations for the building hardware over the height of a full sized door assembly. P_1 and P_2 shall be calculated from the following formulae:

$P_1 = ((8{,}5a_1) - 4{,}25)$ Pa

$P_2 = ((8{,}5\ a_2) - 4{,}25)$ Pa

where:

a_1 and a_2 are the heights of the centres of the particular items above the notional floor level.

Where the required pressure gradient cannot be achieved by the furnace while maintaining the minimum edge distance limitations imposed by the manufacturer or supplier and indicated by c_1 and c_2 in Figure 4, the distances may be reduced providing the pressure conditions do not fall below the minimum requirements given in 4.3.1 for the items being evaluated. Each item shall either be tested against the minimum required pressure differential or if this is not possible, then separate tests shall be undertaken, one with a furnace pressure of P_1 and one with a furnace pressure of P_2.

4.3.5 Pressure conditions for testing surface mounted overhead closing devices

The furnace pressure shall be established and maintained in accordance with 4.3.1. The mean overpressure at the centre of the closing device shall be 12 Pa ± 2 Pa unless the height of the centre of the item ‘a’ is > 2 m in which case the overpressure shall be 18 Pa ± 2 Pa (see Figure 5).

4.3.6 Pressure conditions for the ignitibility test

The pressure conditions for the ignitibility test (Figure 6) shall be 18 Pa ± 2 Pa at the top of the assembly.

5 Test construction

5.1 General

The test construction shall consist of either a fixed panel, or moving parts hung either on the test specimen or independently as given below.

5.2 Test construction for evaluating single axis hinges

The test construction shall be as shown in Figure 2. It consists of a fixed outer supporting construction incorporating an associated frame construction to which are fixed the hinges to be evaluated and from which is hung a section of leaf or window. The construction shall be designed to allow the panel to swing freely on the hinges. The gaps between the hinged supporting construction and the fixed supporting construction, as given in Clause 6.4.3, shall be as small as possible commensurate with the gaps at the side and bottom being large enough to permit sufficient in-plane movement of the panel to detect a loss of fixity in the hinge fixings. For convenience the frame member shall be the full height of the moving panel.

5.3 Test construction for evaluating securing devices

The test construction for securing single leaf doors is shown in Figure 3, and for double leaf doors in Figure 1b.

It consists of a fixed, outer supporting construction incorporating either a section of frame or a section of leaf in the case of securing devices designed for use with double leaf doors (see Figure 1b).

There is also a separate, externally pivoted, moving panel of supporting construction incorporating a section of door leaf (see E.1). The movement of the central panel is designed to simulate the movement at the opening edge of a leaf which is 725 mm wide.

When evaluating a latch or deadbolt for use with double leaf door assemblies, or edge mounted latch bolts, including door edge bolts, the fixed outer supporting construction shall incorporate an associated leaf construction. For all other uses an associated frame section shall be fitted into the outer supporting construction. (See Figure 1d for general arrangement.)

5.4 Test construction for evaluating non-edge mounted items of building hardware

For evaluating non-edge mounted items of building hardware, the test construction may consist of leaf or window construction mounted directly into the furnace aperture. Where this is not appropriate the associated construction may be fitted into a fixed supporting construction (see Figure 4).

5.5 Test construction for evaluating ignition risk for items attached to the unexposed face of uninsulating steel or glazed doors

The basic test construction shall be as shown in Figure 6. It consists of a fixed outer supporting construction incorporating a section of uninsulated door or window. The section of door leaf shall be mounted at an angle of $10^{o} + 2^{o}, - 1^{o}$ from the vertical to simulate the maximum potential bowing of a door leaf, and it shall be adequately secured to the supporting construction to resist the forces transmitted by the door panel, using angles along the two vertical edges in a manner suitable to the particular furnace.

The item to be evaluated (e.g. surface mounted overhead controlled door closing device) shall be installed near the top of the door panel on the unexposed face, and be installed in accordance with the mounting instruction of the product.

5.6 Test construction for evaluating surface mounted overhead controlled door closing devices for use on unlatched doorsets

The test construction consists of an outer fixed supporting construction to which is attached a section of associated door frame of the dimension and materials representative of the fire resistance period for which the surface mounted overhead controlled door closing device is seeking approval. Within this fixed frame a moving panel is fitted which consists of a panel primarily of re-usable supporting construction into which, across the majority of the top of this moving panel, is inserted a section of the appropriate associated construction to which the closing device is attached. This moving panel is fixed to external pivots (as shown in Figure 5) which replicate the loci and closing moment appropriate to a full sized door assembly.

The item to be evaluated (e.g. the surface mounted, overhead controlled door closing device) is fixed to the exposed face of the associated door construction whilst the arm is attached to the exposed face of the associated frame, as in practice. The hinged supporting construction shall simulate the movement and closing moments as produced in normal practice such that the door closing device is adjusted to a maximum of power size 3 in accordance with the relevant clauses of EN 1154 to enable a wider application to higher power sizes. The closing time shall also be adjusted in accordance with the relevant clauses of EN 1154. Additionally there shall be adequate fixity between the supporting and associated construction forming the moving element.

A mechanism shall be provided that will apply an opening force to the moving element at intervals of not more than 1 minute, such that the leaf will be opened to an angle of 2,5° - 0.5 + 0° and allowed to self-close under the influence of the devices' incorporated closing mechanism. Instrumentation shall be incorporated such that the force of the closing action is measured for each displacement action (see Clause 11.6.4).

It will generally be necessary to prevent the passage of flame and hot gases egressing around the perimeter of the moving element. It is important that any seals introduced to prevent this do not restrict the movement of the leaf during the test.

NOTE Either using a mono-ammonium phosphate seal or high temperature fabric gasket loosely fitted could be a way of sealing the gap.

6 Test specimen

6.1 Associated construction

The item(s) of building hardware to be tested shall be fitted in or on a section of associated construction which represents the door leaf into which it is to be fitted (see E.2). The choice of associated construction will influence the field of direct application and shall be selected accordingly (see Clause 14).

The associated door leaf/window construction shall be attached to the moving supporting construction in a manner which can accept the application of a force applied perpendicular to the face of the associated door/window construction (see 7.2.2).

6.2 Conditioning

The building hardware will not require conditioning, but any associated construction that consists of, or contains, hygroscopic materials, or materials which achieve their full properties only after conditioning shall be conditioned in accordance with the requirements of EN 1363-1.

6.3 Fixings

Unless specifically identified in subsequent clauses, the item of building hardware shall be fixed to the associated door leaf, window or frame construction in accordance with the manufacturer's instructions. Where the item is supplied complete with fixings it shall be tested with those fixings. The selection of fixings shall otherwise take account of the field of direct application (see Clause 14).

6.4 Test specimen for evaluating single axis hinges

6.4.1 Design of test specimen

The test specimen shall consist of two hinges of the design to be evaluated, fixed to an opening element and frame construction so that the panel swings freely (see Figure 2). Any seal that is used in practice to seal the edge and/or to protect the hinges shall be incorporated in the specimen. This seal shall be of the type used in practice, or if this is not known, a type shall be chosen to give the required field of direct application (see Clause 14).

The perimeter frame substrate is to be an inert part of the test construction whose function is simply to support the representative elements of the specimen, and contain the furnace conditions. It is therefore important that the substrate be constructed from materials which are non-combustible, whose strength is preserved under furnace conditions, and which will not influence the behaviour of the specimen. Suitable materials would be aerated concrete blocks, calcium silicate boards, mineral fibre boards, or similar which could be cast or moulded into the required shape for repeated use, provided that their strength does not deteriorate.

The size and design of the hinged supporting construction shall be chosen to meet the following loading requirements:

To subject the hinges to a realistic load, the swinging panel shall be weighted so that the vertical load on both the upper and the lower hinge shall be chosen for the grade of hinge in accordance with Table 1 of EN 1935:2002 and shall be dependant on the maximum size/mass of the door/window for which the product is intended.

The force to be applied in the plane of the associated leaf/window construction shall be created by the mass of the associated leaf/window plus the mass of the moving supporting construction to simulate the force equivalent to the maximum mass of the door/window to be used in practice.

Where the mass of the moving supporting construction is less than that required to meet the above condition, additional weights shall be distributed about the centre of gravity of the moving supporting construction:

$$F = F_1 + F_2$$

where

F = anticipated maximum door leaf/window mass

F_1 = mass of associated door leaf/window construction

F_2 = mass of moving supporting construction including any added weights

NOTE The moving supporting construction will not normally expand in the plane of the leaf to close up perimeter gaps and hence the forces in the plane of the associated door leaf/window construction will always be equal to or greater than those expected in practice.

6.4.2 Number of specimens

For hinges for use on timber/cellulosic doorsets, or framed glazed doors/windows all with timber/cellulosic frames (see 4.3.2 and B.1) two tests shall be performed. For hinges for use with steel doorsets and steel framed glazed doors/windows all with steel frames or window assemblies only one test is required.

6.4.3 Gap sizes

When testing hinges for use on non-metallic doors, the requirements for door gap sizes differ according to whether the positive or negative pressure test is being carried out.

Positive pressure test: The specimen shall have a minimum stop clearance gap of 2 mm or as required for any seals that are fitted, and a minimum leaf to frame gap of 3 mm. The gap between the bottom of the test specimen and the supporting construction shall be a minimum of 5 mm.

Negative pressure test: The specimen shall have a minimum stop clearance gap of 0,5 mm and a minimum leaf to frame gap of 2 mm. The gap between the bottom of the test specimen and the supporting construction shall be a minimum of 5 mm.

When testing hinges for use on metal doors the gap sizes are not critical and accepted industry dimensions should be used or within the required limits given in EN 1634-1.

All gaps shall be recorded.

6.4.4 Installation

The test construction shall be installed in the furnace so that the hinge knuckles are on the heated face.

6.5 Test specimen for evaluating securing devices

6.5.1 Design of test specimen

The general test arrangement is shown in Figure 7 where the external pivot system shall be designed in a manner which allows the associated door leaf/window construction to close against the associated frame construction at an angle equivalent to that expected in practice.

For latches or deadlocks designed for use on single leaf doorset or window assemblies the test specimen shall consist of a section of leaf or window (8) and frame (6) as shown in Figure 3.

For latches or deadlocks for use on double leaf door assemblies the test specimen shall consist of two sections of door leaf as shown in Figure 1b.

To test an edge fixing bolt the test specimen shall consist of two sections of door and a section of associated frame as shown in Figure 1b. The bolt shall be fixed into the edge of the moving leaf.

The section of leaf shall extend at least 50 mm above the highest point on the securing device or forend plate and at least 50 mm below the lowest point on the securing device or for end plate. The width of the leaf section shall allow a minimum of 100 mm between the edge of the leaf and any mortice required to accommodate the securing devices (see Figure 3).

The latch/lock shall be fitted with door furniture that is typical of the handle set and plates that are likely to be used in practice.

Any heat activated seal used in practice to maintain the edge seal and/or to protect the item shall be incorporated in the test specimen and shall be of the type used in the full sized assembly.

6.5.2 Number of test specimens

The majority of securing devices are set centrally in the leaf/window thickness and are generally symmetrical. Therefore a single specimen shall be tested, unless indicated in 6.5.4.

Where the securing device is either asymmetric, or is fitted asymmetrically, e.g. a face fixed door bolt, a single test shall be performed with the securing device towards the exposed face, and the door stop towards the unexposed face.

6.5.3 Gap sizes

The door stop to leaf surface gap shall be 1,5 mm ± 0,5 mm. The leaf to frame gap shall be 3 mm ± 0,5 mm.

6.5.4 Installation

The test construction shall be installed with the door stop on the side that represents the worst case for the item being evaluated. This is normally with the door stop on the unexposed face.

When testing a mortice lock at the start of the test the specimen shall be in the closed position, unlocked but with the latch engaged. When testing a deadlock it shall be fully engaged in the keep/strike plate.

When the lock utilizes an electrically operated bolt release, the release shall be tested from both sides.

When testing a flush door bolt, the bolt in the leaf edge shall be engaged in the frame section at the head of the associated construction.

6.6 Test specimen for the evaluation of non-edge mounted items of building hardware (including air transfer grilles)

6.6.1 Design of test specimen

Figure 4 shows the test construction for use using the positive or negative pressure test. This consists of a supporting construction containing an associated construction into which the item of building hardware to be evaluated is fitted. As stated in 5.4 the test construction can consist solely of associated construction, particularly if this enables more than one item to be tested. In this case, due regard shall be taken of the pressure requirements of each item (see 4.3.4).

6.6.2 Number of test specimens

If the building hardware item can be installed in practice in a range of locations and penetrates the leaf in a manner that may create a gap around it, then it shall be tested at the pressures representing the maximum and minimum to which it could be exposed. This shall be achieved either by testing two items in one specimen, each exposed to the required pressure, or by performing two separate tests, with one at the higher pressure and one at the lower pressure. In both cases two specimens will be required. If the item does not penetrate the leaf then one test shall be performed at positive pressure on a single specimen.

Where the building hardware item is asymmetrical it will normally be sufficient to test one specimen in its most onerous direction of exposure. Where it is not possible to establish the most onerous direction of exposure of an asymmetrical item, the item shall be tested from both directions and two specimens will be required. Both specimens may be mounted in the same associated construction and tested simultaneously if the size permits and the pressure conditions can be complied with. Where the item is asymmetrical and penetrates the construction and can be positioned in a range of locations on the leaf then 4 specimens may be required.

6.6.3 Gap sizes

There shall be no gaps between the associated construction and supporting construction and any gaps between the building hardware item and the associated construction shall be identified and form part of the product’s field of application.

6.6.4 Installation

The test construction shall be installed with the item of building hardware on the exposed face or in the case of through fixed items, in the direction of established weakest performance or from both sides where the weakest performance cannot be established.

6.7 Test specimen for evaluation of ignition risk for surface mounted controlled overhead door closing devices

6.7.1 Design of test specimen

Figure 6 shows the test construction for use in this method. This consists of a supporting construction containing an associated construction consisting of a section of un-insulated steel door (normally two skins of steel, not more than 1 mm thick separated by a steel frame, or of a 'pan and lid' construction) onto which the item of building hardware is to be fitted. This leaf section shall be approximately

725 mm wide x 900 mm tall and shall be mounted in supporting construction at an angle of 10^{o} with the top edge nearest to the furnace, to ensure that any spillage will drip onto the door panel. The item shall be fixed near to the top of this panel, as it would be in practice, on the unexposed face, as shown in the figure. The edge of the leaf shall be sealed into the supporting construction by a suitable linear gap seal with an equivalent level of fire resistance to the leaf, when fitted adjacent to a steel member.

6.7.2 Number of test specimens

Test one specimen when evaluating face fixed controlled overhead door closing devices.

6.7.3 Gap sizes

The associated construction is mounted in the supporting construction without gaps.

6.7.4 Installation

The item shall be mounted on the unexposed face, near the top of the panel and in the manner that it will be attached in practice using the fixings supplied.

6.8 Test specimen for evaluating surface mounted overhead controlled door closing devices for their ability to retain an unlatched timber door closed

6.8.1 Design

The test specimen shall consist of the controlled door-closing device to be tested fixed to an associated construction consisting of a leaf section and a length of frame head (see Figure 5). If the leaf or frame is made of combustible material, a non-pressure forming intumescent seal shall be fitted between the leaf edge and the frame.

If the controlled door-closing device is protected by an optional removable cover, testing the item without this cover is applicable for use with all cover designs. If a cover is fitted this will influence the field of direct application (see 14.4.3).

If the controlled door-closing device is fitted with slide arms or brackets that interfere with the leaf to frame gap these may be protected with non-pressure forming intumescent material which does not influence the forces being measured (see C.3).

6.8.2 Number of specimens

A single specimen is adequate for the purpose of establishing the influence of the controlled door closing device on the fire performance of a door assembly. If the closing device is to be evaluated for its influence on the integrity of the assembly, more than one specimen may need to be tested to cover other forms of associated construction.

6.8.3 Gap sizes

The leaf to frame gap across the head of the leaf has a negligible effect on the performance of the closer but shall be set to a value which is typical of that found in practice, e.g. the gap shall be 3 mm $\pm$ 1 mm. For a metal door that relies on expansion for restraint, the gap shall be of a size that has been demonstrated by test to be effective.

6.8.4 Installation

The test construction shall be installed so that the controlled door closing device is on the exposed face of the assembly and in the manner that it will be attached in practice using the fixings supplied.

7 Loading and restraint

7.1 General

In order to enhance the correlation between large scale and small scale testing, many items of building hardware shall have an applied load to simulate the full scale conditions.

NOTE A potential difficulty with any reduced size test is that the actual loads and restraints that an item of building hardware may be subjected to in a full size assembly are not present. This has been overcome in this European Standard by subjecting the reduced size specimen to loads designed to simulate the full size conditions as given in the following clauses, for evaluating hinges and securing devices.

7.2 Loading and restraint conditions for evaluating single axis hinges

7.2.1 Leaf mass

In order that the hinges carry a load representative of that which they would carry on a full size door leaf, the hinged part of the supporting and associated construction shall be of sufficient size to reproduce the mass conditions given in clause 6.4.1. This may be achieved by a smaller panel weighted to produce the required forces.

7.2.2 Applied point load to simulate distortion forces

In order to simulate distortion forces, a force F_p is to be applied perpendicular to the associated door leaf/window construction in a position 50 mm above the top of the hinge and 75 mm in from the edge of the associated door leaf/window construction (see Figure 2)

In the case of non-metallic door leaves and non-metallic framed windows F_p shall be 60 N and for metallic door leaves it shall be 2000 N.

NOTE 1 The values of 60 N and 2000 N have been derived from full size tests on timber and steel doorsets respectively, with force transducers introduced to replace the selected restraining elements of hardware.

NOTE 2 As there has not been any proving test for metal framed windows the above value of 2000 N is not validated at this time.

NOTE 3 The force that has to be resisted by the restraining element of hardware when used in a metal door assembly is the product of the differences in temperature between the hot and cold faces (in turn related to the insulating nature of the door), the section modulus of the leaf (I), the strength and thickness of the metal, the height of the leaf and the strength of the composite action between faces.

At the start of the test the specimen shall be in the closed position with the relevant point load applied and the opening edge of the hinged supporting construction restrained to resist the reaction force arising from the applied load.

7.3 Loading and restraint conditions for evaluating securing devices

7.3.1 Leaf mass

In a correctly set up door assembly the securing device shall not carry any of the mass of the leaf and therefore there is no need to simulate the leaf mass.

7.3.2 Applied point load to simulate distortion forces

In order to simulate distortion forces, a force F_p is to be applied perpendicular to the associated door leaf/window construction in a position 50 mm below the top of the securing device and 75 mm in from the edge of the associated door leaf/window construction (see Figure 3).

In the case of non metallic doors F_p shall be 60 N and for metallic doors shall be 2000 N.

NOTE The values of 60 N and 2000 N have been derived from full size tests on timber and steel doorsets respectively, with force transducers introduced to replace the selected restraining elements of hardware.

At the start of the test the specimen shall be in the closed position with the relevant point load applied and the opening edge of the hinged supporting construction restrained to resist the reaction force arising from the applied load.

8 Test equipment

8.1 Furnace

The furnace shall be of a design capable of exposing vertical specimens to the temperature and pressure conditions given in Clauses 4.2 and 4.3 respectively.

NOTE Guidance on the suitability of reduced size furnaces is given in Annex D.

8.2 Measurement of ambient conditions

A shielded thermocouple or thermometer in accordance with EN 1363-1 shall be provided to monitor the ambient conditions in the laboratory.

8.3 Measurement of furnace conditions

The equipment to measure furnace pressure and furnace temperature shall be in line with the requirements given in EN 1363-1.

8.4 Loading equipment

8.4.1 Types of loading

Where it is required that forces are applied to the test specimen, these shall be by either dead weight hydraulic or a pneumatic loading system. The choice shall be dictated by practical convenience, considering the type of door or associated construction and the type and magnitude of the loading required. The method of loading shall not affect the natural thermal or mechanical behaviour of the specimen.

8.4.2 Method of loading

The area of the loading contact point shall be large enough to limit localized stresses to a low level. The location of the loading point shall present minimal restriction to the application of the cotton pad and roving thermocouple.

The loading mechanism shall be capable of accommodating enough movement to enable the point of failure of the specimen to be determined.

8.5 Monitoring instrumentation

8.5.1 Measurement of unexposed surface temperature

To establish compliance with the maximum unexposed face temperature rise criteria specified in EN 1363-1, fix surface thermocouples to the test specimen as specified in Clause 10.1.2. Care shall be taken to avoid measurements within 20 mm of any joint between the associated construction and any supporting construction used.

8.5.2 Measurement of displacement

Measurements of displacement shall be made using the frame or the supporting construction as the datum and shall be as required in Clauses 10.1.6 and 10.1.7. Where this European Standard requires the deformation or movement of the specimen to be recorded, it shall be monitored with a device of sufficient range, and which is accurate to ± 0,5 mm and indicates the deformation to a precision of at least half of one millimetre.

The displacement measurement device shall be fixed and located so that no part of it shall interfere with the natural mechanical or thermal behaviour of the item of building hardware being tested and it shall not be subjected to temperature effects which would produce loss of accuracy. Provision shall be made for the measured deformation to be indicated and recorded remote from the test specimen. The measurements indicated by the device shall be displayed continuously or updated at intervals not exceeding 1 % of the expected test duration. The interval between measurements shall be chosen to present a history of deflection throughout the test period. Proposals for suitable intervals between measurements is given in EN 1363-1.

8.5.3 Measurement of force

Specific requirements for measurement of force shall be as given in Clause 10.1.5 of this European Standard. Where this European Standard requires measurement of the closing force generated by an item of building hardware, an electrical load cell shall be used which is capable of measuring to an accuracy of 5 % or better.

NOTE A spring balance is not suitable as this would require considerable movement to register a change in force.

The fixing and location of the load cell shall be such that no part of it shall interfere with the natural mechanical or thermal behaviour of the test specimen and it shall not be subjected to temperature effects which would produce loss of accuracy. Provision shall be made for the measured force to be indicated and recorded remote from the test specimen. The force indicated by the load cell shall be displayed continuously and updated and recorded at intervals of not more than 1 minute.

9 Pre-test examination/characterization of the specimen

9.1 General

The test specimen shall be measured, analysed and described in detail before the test commences. Where it is not possible to confirm the manufacturer's description it shall be clearly stated that the manufacturer's declaration has been used. Critical aspects exist for each item covered by the Scope of this European Standard and these are given in the following clauses.

9.2 Characterization of the test specimen for evaluating a single axis hinge

9.2.1 Dimension of the components

The dimensions of the hinge shall be accurately established, including the width, length and thickness of the hinge leaf(ves) and the diameter of the knuckle. The dimensions of the associated construction and the size and nature of any fire seals shall be accurately determined, as shall the dimensions of any part of the associated construction that has been removed to accommodate the hinge.

9.2.2 Location of the hinges

The exact location of the hinges with respect to the section of door leaf/window and frame shall be measured and recorded, particularly the location of the end of the hinge blade and hinge axis relative to the faces of the leaf.

9.2.3 Materials

The manufacturer shall declare the materials used in the construction of the hinges, paying particular attention to any bearings. An exact description of the associated construction is necessary for determining the field of direct application.

9.2.4 Fixing of hinge to the associated construction

The method of fixing the hinge to the leaf and frame section shall be fully described and recorded. Screw specification, location and number shall be recorded. Where additional intumescent protection is used as part of the fixing detail (e.g. intumescent plugs or mastic), it shall be fully documented.

9.3 Characterization of the test specimen for evaluating securing devices

9.3.1 Dimensions of the components

The dimensions of the securing device shall be accurately established, including the width and length of the forend and locking plate or keep, and the length of any latchbolt or deadbolt. The dimensions of the associated construction shall be accurately determined as shall the dimensions of any part removed to accommodate the latch or lock. The position of the bolt relative to the face(s) of the door shall be given.

9.3.2 Location of the securing device

The exact location of the securing device with respect to the outer faces of the leaf and the frame shall be measured and recorded.

9.3.3 Materials

The manufacturer shall declare the materials used in the construction of securing devices, paying particular attention to those used for the manufacture of the latch bolt or other bolts together with forend plates, guides and locking plates. The exact selection and characterization of the associated construction is important for determining the field of direct application.

9.3.4 Fixing of securing device

The method of fixing the securing device to the door leaf/window and frame shall be fully described and recorded. Screw specification, location and number shall be recorded. Where additional intumescent protection is installed as part of the fixing detail (e.g. intumescent plugs or mastic), it shall be fully documented.

9.4 Characterisation of the test specimen for evaluating non-edge mounted items

As there are so many different types of non-edge mounted items of building hardware the critical aspects of the test specimen will vary. The materials used in the associated construction will be important in determining the field of direct application and these shall be described and recorded in detail.

9.5 Characterisation of the test specimen for evaluating the ignition risk of surface mounted overhead controlled door closing devices

With this method it is necessary to describe fully the associated leaf construction. This affects the heat transfer through the associated leaf construction to the unexposed surface and the controlled door closing device which may lead to ignition of the fluid. Any gaskets between the controlled door closing device and the face of the leaf shall be fully characterised.

9.6 Characterisation of the test specimen for evaluating surface mounted overhead controlled door closing devices

9.6.1 Dimensions of the components

The dimensions of the controlled door closing device, arms and any fixing plates shall be established. The dimensions of the associated construction shall be determined as shall the dimensions of any part removed to accommodate the closer.

9.6.2 Materials

The material used for the main body of the controlled door closing device, any removable covers (if used), arms, brackets, fixings and the damping fluid shall be established and recorded. The materials used for the associated construction need not be determined in detail unless the controlled door-closing device is also being evaluated with respect to the integrity criteria.

9.6.3 Fixing of the surface mounted overhead controlled door closing device

The manner of fixing the controlled door-closing device to the leaf and frame sections, including any brackets shall be fully described in the test report. The specification, location and number of fixings shall be recorded. Where additional protection is installed as part of the fixing detail (e.g. intumescent strips or mastics) these shall be fully documented.

10 Test procedure

10.1 Common procedures

10.1.1 General

The procedure for conducting the test and measurements observations to be made during the course of the test shall be as specified in Clauses 10.1.2 to 10.4. Details specific to individual items of building hardware will be found in the earlier clauses relating to the individual items.

10.1.2 Fixing of unexposed face thermocouples

The unexposed face thermocouples, required in accordance with 8.5.1 for establishing whether the item of building hardware affects the insulation performance of the associated construction shall be applied in accordance with EN 1634-1.

NOTE Additional thermocouples may be fixed as follows, in order to assist with defining the field of application:

For non-edge mounted items:

Where the item has a face width greater than 12 mm, fix thermocouples to the centre of the item and 50 mm from the edge of the item on the adjacent associated leaf construction in order to obtain a full temperature profile of the influence of the item on the unexposed face temperatures of a full sized assembly.

10.1.3 Ambient air temperature

Measure the ambient air temperature using the ambient temperature thermocouple or thermometer for compliance with the conditions specified in EN 1363-1:1999, Clause 5.6.

10.1.4 Application of loading

Where this European Standard requires a test load to be applied to the specimen, this shall be in place not less than 5 minutes before the start of test to enable conditions to reach a steady state. The load shall be maintained constant within ± 5 % for the duration of the test.

10.1.5 Force measurement

This European Standard requires the measurement of force, either to confirm the value of the applied load or to measure the response force (see 11.6.4). This can be achieved by a load cell positioned and energized not less than 15 minutes before the measurement of the datum value. All electrical devices shall be switched on at this time in order that they reach their normal operational temperature by the time the datum value is taken. The load cell shall be calibrated at normal working temperature. Where the instructions of the manufacturer of the load cell conflicts with this the manufacturer's instructions shall be followed.

10.1.6 Displacement measurement

Where an electrical displacement transducer is used, this shall be positioned and activated no less than 15 minutes before the measurement of the datum value. All electrical devices used in conjunction with the displacement transducer shall be switched on at this time so that they reach their normal operational temperature by the time the datum value is measured. The displacement transducer shall be calibrated if necessary when all electrical devices are at their normal working temperature. Where the instructions of the manufacturer of the transducer conflicts with this the manufacturer's instructions shall be followed.

10.1.7 Establishment of datum values

All datum values of temperature, force and deflection shall be taken and recorded no earlier than 15 minutes prior to the commencement of the test.

10.2 Commencement of heating and control of heating conditions

Commence heating. Control the furnace temperature to conform to Clause 4.2 and the furnace pressure to conform to Clause 4.3.

10.3 Test protocols

10.3.1 Single axis hinges

From at least 5 minutes before the commencement of heating, loads shall be applied to the associated supporting construction at the designated loading points which simulate the weight of the full size door/window and the out of plane loads due to thermal distortion. In the case of the latter loads, they shall be either 60 N or 2000 N depending on whether the specimen leaf is of cellulosic or metal construction. The resistance to loading shall be monitored continuously by means of a displacement transducer throughout the heating period until failure, as defined in 11.2, is reached, at which time the test may be terminated. The exposed face of the test construction shall be monitored for compliance with the integrity and insulation criteria throughout the heating period.

10.3.2 Securing devices

From at least 5 minutes before the commencement of heating, a perpendicular force to simulate out of plane thermal distortion shall be applied at the loading point equal to 60 N or 2000 N depending on whether the specimen leaf is of cellulosic or metal construction. The resistance to loading shall be monitored continuously by means of a displacement transducer throughout the heating period until failure, as defined in 11.2, is reached, at which time the test may be terminated. The unexposed face

of the test construction shall be monitored for compliance with the integrity and insulation criteria throughout the heating period.

10.3.3 Non edge mounted items

From the commencement of heating, the unexposed face of the test specimen shall be monitored for compliance with the integrity and insulation criteria throughout the heating period.

10.3.4 Face fixed controlled door closing devices

10.3.4.1 Face fixed controlled door closing devices being evaluated for ignition risk when fitted on the unexposed face of a door or window assembly

The test specimen shall be installed as described in 6.7. From the commencement of the heating period the specimen shall be monitored for ignition of the closing device, or of any damping fluid leaking from it anywhere on the unexposed surface of the leaf. Ignition will be deemed to have occurred should any sustained flaming (i.e. flaming that lasts for 10 seconds or longer) take place.

10.3.4.2 Establishment of the self-closing ability of a face fixed overhead closing device

Prior to the commencement of heating a load cell or spring loaded transducer shall be mounted on the unexposed face of the test construction and set up so that it is permanently measuring and recording the force exerted by the closing device in the closing direction. To ensure that the load cell is measuring the actual force it will be necessary for the load cell to be fitted such that it holds the supporting construction off of the door stop by a distance of 5 ± 1mm. The closing force is monitored and recorded until the pressure drops to below that identified as the criteria in 11.3, after which time the test may be terminated.

In order to ensure that the closer is still operating, and hence that the closing force is still being applied, a moment in the opening direction shall be applied to the unexposed force of the moving element, equal to 110 % ± 5 % of the initial measured closing moment of the device. This applied moment shall be applied, such that it opens the moving element 2½ ± ½^{o} from the closed position and allows it to self-close. This load shall be applied at 3 minute intervals and shall be applied until either the moving element fails to open or it fails to return to the closed position or the measured pressure indicates failure against the criteria in 11.3.

10.4 Monitoring of criteria

Throughout the test the behaviour of the test specimen shall be monitored for compliance with the relevant performance criteria given in Clause 11.

10.5 Termination of test

The test shall normally be continued until the specimen fails less than one or more of the relevant performance criteria (see Clause 11). If, for any reason, the test is terminated prior to any failure occurring then the performance of the specimen shall be deemed to be equal to the duration of the test and the fact that failure had not occurred shall be noted.

11 Performance criteria

11.1 General

The specimen shall be assessed against one or more of the criteria for resistance to loading, ability to maintain a closing force, integrity and insulation given in Clauses 11.2 to 11.5 below. The criteria relevant to each item of building hardware under test are given in Clauses 11.6.1 to 11.6.4.

11.2 Resistance to loading

Failure of the specimen under loading applied to simulate distortion forces is deemed to have occurred when the point of application of the load moves at such a rate in the direction of the applied load that there is considered to be no resistance to the load; i.e. failure shall be deemed to have occurred when the rate of movement of the edge of the leaf or window panel exceeds 1 mm/min or when a maximum deflection, as measured by the displacement transducer, of 6 mm is reached, whichever occurs sooner.

The performance criteria ‘insulation’ and ‘integrity’ cannot be satisfied after the ‘resistance to loading’ criteria ceases to be satisfied.

11.3 Maintenance of closing force

The ability of a controlled door closing device to hold a door closed may diminish if the device is adversely affected by exposure to the furnace conditions. This loss of retention is only important when the controlled door closing device is the sole means of keeping the door closed, i.e. no other securing device is fitted.

Failure to hold the door closed is deemed to have occurred when the closing force drops to below 75 % of the initial value and the time at which this occurs shall be recorded as the time, in minutes, to the nearest elapsed minute. Failure shall also be deemed to have occurred when the moving element fails to open, or it fails to return to the closed position after the application of the opening force. In this case the failure shall be the elapsed time at which the door fails to open or close as a result of the application of the opening moment.

The performance criteria ‘insulation’ and ‘integrity’ cannot be satisfied after the ‘maintenance of closing forces’ criteria ceases to be satisfied.

11.4 Integrity (E)

The integrity criteria shall be as given in EN 1363-1 and EN 1634-1.

11.5 Insulation (I)

The insulation criteria shall be as given in EN 1363-1 and in EN 1634-1.

11.6 Criteria relevant to each item under evaluation

11.6.1 Single axis hinges

Hinges shall be evaluated for their influence on the assembly with respect to:

1) Integrity;

2) Insulation;

3) Resistance to loading.

11.6.2 Securing devices

Securing devices shall be evaluated for their influence on the assembly with respect to:

1) Integrity;

2) Insulation;

3) Resistance to loading.

11.6.3 Non-edge mounted items of building hardware

For items penetrating the window or leaf, non-edge mounted items shall be evaluated for their influence on the assembly in respect of:

1) Integrity;

2) Insulation.

11.6.4 Surface mounted overhead controlled door closing devices

For face fixed controlled door closing devices fitted on the non-exposed face of a door or openable window assembly:

a) Ignition Integrity - sustained flaming (more than 10s) due to ignition of any damping fluid or plastic components and/or finishes;

   and for overhead surface mounted controlled door closing devices for use on unlatched doors shall be evaluated with respect to;

b) Maintenance of closing force

   and also closing devices with slide arms or brackets which interfere with the gap between the leaf edge and the face of the frame shall also be evaluated with respect to:

c) Integrity.

A face fixed device would not normally be expected to reduce the insulation when fixed to the exposed face. A device tested to this method shall also be evaluated by method ‘B’ for non-edge mounted items of building hardware if it is to be fitted on uninsulated doors.

12 Expression of results

12.1 General

Test results shall be stated in terms of complete elapsed minutes between the commencement of heating and failure with respect to the criteria relevant to the element of building hardware under evaluation (see 12.2 to 12.5). The performance criteria ‘insulation’ cannot be satisfied after the ‘integrity’ criteria ceases to be satisfied.

The results of the test shall be contained in a test report as specified in Clause 13.

12.2 Single axis hinges and securing devices

For items of building hardware which are tested with a horizontal load applied to the specimen the test report shall contain a statement of the test results in the form given below:

— Integrity x minutes;

— Insulation y minutes;

— Resistance to loading z minutes.

The performance criteria ‘insulation’ and ‘integrity’ cannot be satisfied after the ‘resistance to loading’ criteria ceases to be satisfied.

12.3 Non-edge mounted items of building hardware

The test report shall contain a statement of the test results in the form given below:

— Integrity x minutes;

— Insulation y minutes.

12.4 Evaluating the ignition risk from attaching surface mounted overhead controlled door closing devices to the unexposed face of uninsulating steel or glazed doors

The test report shall contain a statement of the test results in the form given below:

— Ignition risk[4)] x minutes.

The performance criteria ‘insulation’ and ‘integrity’ cannot be satisfied after the ‘ignition risk’ criteria ceases to be satisfied.

12.5 Surface mounted overhead controlled door closing devices for use on unlatched door assemblies

These items shall be monitored for maintenance of the closing force for the duration of the test and the test report shall contain a statement of the test results in the form given below:

— Maintenance of closing force x minutes;

— Integrity (where applicable) y minutes.

The performance criteria ‘insulation’ and ‘integrity’ cannot be satisfied after the ‘maintenance of closing forces’ criteria ceases to be satisfied.

13 Test report

In addition to the information required by EN 1363-1, the full test report shall include the following specific information:

a) The name of the producer/supplier of the item of building hardware under test; its trade name and/or the manufacturer's code for the product, a visual representation and a full description of the product including any protection, with particular reference to the recommendations given in Clauses 9.2 to 9.5;

b) A full description of the associated construction including any protection applied adjacent to the item of building hardware;

c) The duration for which the test specimen complied with the relevant criteria, expressed in minutes from the start of the test;

d) The following statement at the end of the report:

4) As manifested by sustained flaming lasting more than 10 s.

'The results shall only be applied to assemblies of a similar mode and construction which have been tested at full size in accordance with EN 1634-1, and have been shown to have distortion characteristics within the field of direct application, if appropriate';

e) A statement on the field of direct application for the item of building hardware tested.

14 Field of direct application

14.1 General

14.1.1 Introduction

From the test result it is possible to determine a field of direct application for the item of building hardware, which will enable it to be used in a variety of situations without the need for further fire performance assessment.

The choice of materials used in the manufacture of the associated construction is important in determining the field of direct application of the item of building hardware.

NOTE For example, from a test on an edge-mounted item of building hardware where the specimen incorporates a high-density timber frame, the field of direct application would be limited to assemblies with a high-density timber frame with equal or lower charring rate. If a test were performed on an edge-mounted item of building hardware in association with a low density softwood frame then the field of direct application of the item of building hardware would include all timber/cellulosic frames of equal or higher density.

The sponsor shall choose suitable materials which will balance his requirements for as wide a field of direct application as possible in terms of construction with the suitability for use over the widest range of fire resistance requirements.

The field of direct application which follows is conservative. It will not cover every situation in which the item of building hardware may be used. A field of extended application may need to be determined from the information generated by this test together with the evidence on the door or window assembly being considered. This is particularly important when two or more of the aspects of the design change simultaneously.

Further assessments may be made based on the test report, which takes account of the compensating factors within the specification of materials and changes in dimensions. In all cases the field of direct application is limited to the use of building hardware on door and window assemblies, which have been proven by test to satisfy the criteria in accordance with EN 1634-1.

14.1.2 Basis of the field of direct application

The field of direct application is related to the composition of the associated construction. Factors such as known rate of charring of timber, density of timber, gauge of steel, thickness of leaf, inclusion of intumescent seals, will affect the fire resistance of an assembly local to the item of building hardware.

These factors will have limits placed upon them in the field of direct application. Therefore, if it is proposed to use an item of building hardware in a given door or window assembly, the composition of the construction local to the item of building hardware shall be expected to provide at least as great a contribution to the fire resistance as the associated construction which was tested.

The method for determining the field of direct application for each of the building hardware types covered by this European Standard is given in Clauses 14.2 to 14.5.

14.2 Single action hinges

14.2.1 General

The factors which will influence the fire resistance of a moving element and which are related to the performance of hinges are given in Clauses 14.2.2 to 14.2.9.

The tested hinge is suitable for use in conjunction with doorsets or openable windows requiring a fire resistance with respect to EN 1634-1 of no more than x min (where x is the time between commencement of the test and failure under either the integrity, insulation or resistance to loading criteria) when the:

— assembly has been tested to EN 1634-1 with hinges of the same material;

— dimensions of the hinge shall not be changed other than the height dimension of the hinge which may be increased by a maximum of 25 %;

— mode of operation remains the same; and

— method of fixing remains the same;

provided that the specification of the proposed assembly is within all of the limits given in 14.2.2 to 14.2.9.

14.2.2 Frame

a) For timber/cellulosic frames

The density and dimensions of the frame including the rebate depth shall be equal to or greater than those which were tested. A test on a timber frame is applicable to the use of a frame made from timber with a slower charring rate, but is not applicable to the use of a frame constructed from a timber with a faster charring rate, even if it has an equal or higher density.

NOTE It is generally assumed that a higher density timber chars more slowly than a lower density species but there are exceptions to this rule.

b) For metal frames

The frame shall be of the same metal and specification, and all cross-sectional dimensions, including the rebate depth, may be varied by ± 25 % except that a test on a mild steel frame is applicable to the use of a hinge in a stainless steel frame, but not *vice versa*.

Any change in thickness, except normal manufacturing tolerances, when forming part of an unfilled frame, shall be the subject of a field of extended application. A test on an unfilled frame is applicable to the use of the hinge on a back-filled frame.

14.2.3 Door leaf

14.2.3.1 Timber/cellulosic constructions

a) Leaf Height: If the pressure in the furnace was not greater than 12 Pa the hinge may only be used on leaves of height up to 2,1 m (hinge height 'a' of 2 m). If the pressure was 18 Pa there is no restriction on leaf height.

b) Leaf Thickness: A test with an associated construction with a thickness of 't' mm is suitable for use on leaves of similar construction with a thickness not less than 't' mm.

c) Mass: A test on a hinge with a simulated leaf or window of mass 'y' may only be used on opening elements with that mass or less.

d) Construction:

1) All-cellulosic construction: A test on a hinge where the fixings penetrate an all-cellulosic associated construction is applicable to the use of the hinge in conjunction with leaves or frames with a slower charring rate but not with a faster charring rate, or with protected sub-facings, or mineral core.

2) Cellulosic door leaves with protective sub-facings[5)]: A test on a hinge where the fixings penetrate an associated construction with a protected core is applicable to the use of the hinge on leaves with more protection, i.e. thicker boards, or mineral board constructed leaves, but not on all-cellulosic leaves.

3) All mineral construction: A test on a hinge where the fixings penetrate into an all mineral board associated construction is applicable to the use of the hinge on constructions with at least equal physical properties, but is not for assemblies consisting of all-cellulosic or protected cellulosic construction.

14.2.3.2 Metal constructions

a) Leaf Height: If the pressure in the furnace was not greater than 12 Pa the hinge may only be used on leaves of height up to 2,1 m (hinge height 'a' of 2 m). If the pressure was 18 Pa then there is no restriction on leaf height.

b) Leaf Thickness: A test with an associated leaf construction with a thickness of 't' mm is suitable for use on leaves of approximately the same construction with a thickness not less than ‘t' mm.

c) Mass: A test on a hinge with a simulated leaf mass of 'y' may only be used on leaves with a mass equal to or less than 'y'.

d) Construction: A test on a hinge directly attached to the leaf edge by welds, screws, etc., will apply to hinges attached to leaves made from metal of equal or greater thickness and formed in an identical manner but not on a leaf constructed from thinner metal unless the fixing is into material other than the metal.

14.2.4 Configuration of the assembly

A test is applicable to the use of hinges in both single leaf and double leaf configurations.

14.2.5 Door lipping/leaf edge construction

14.2.5.1 Timber door lippings

Any edge lipping or part of the timber leaf edge with which the hinge is in contact or which it penetrates shall have a charring rate equal to or slower than that of the associated construction used in the test.

14.2.5.2 Metal door leaves

The method of constructing the leaf edge shall not differ from that used in the tested associated leaf construction.

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5) This only applies to doors as no openable windows are constructed in this way.

14.2.6 Intumescent protection

If the hinge was tested with an intumescent material running continuously past the edge of the hinge blade, then the assembly to which it is to be fixed shall contain a minimum of the same volume of an intumescent material with identical or better critical properties, located no further from the edge of the hinge blade than that which was tested.

In the case of identical or better critical properties with locally applied additional protection (see Figure 8) a test with a mono-ammonium phosphate type, low pressure seal is applicable to the use of a pressure forming seal (e.g. sodium silicate or graphite) but not vice versa.

14.2.7 Hinge blade clearance

In the case of timber/cellulosic doors, the edge of the hinge blade shall be no closer to the door stop face of the leaf in the assembly in which it is to be used, than that tested.

14.2.8 Fixings

Any screw fixings through the hinge blades into the door edge and frame shall be of the same metal, length (if penetrating solid material for their full length) and have at least the same pull-out resistance as those tested. Any alternative method of fixing shall have the same strength at high temperature as that tested.

NOTE Pull-out and strength resistance may be determined by fixing manufacturer's specification.

14.2.9 Gaps

The gaps for single swing door assemblies shall be between the following dimensions for the different door types:

The leaf to frame gap:

1) Timber/cellulosic 0,5 to 4 mm;
2) Metal - 0,5 to 5 mm;

and the stop to leaf gap:

3) Timber/cellulosic - 0 to 4 mm;
4) Metal - 0 to 4,5 mm.

14.3 Securing devices

14.3.1 General

Several factors have been identified which influence the contribution to the fire performance of a single leaf door or window assembly as a result of fitting a securing device and which will affect the ability of the device to maintain closure of the element.

The tested securing device is suitable for use in single leaf doorsets or openable windows requiring a fire resistance with respect to EN 1634-1 of not more than x minutes (where x is the time between the commencement of the test and failure under either integrity, insulation or the resistance to loading criteria) when the assembly has been tested with securing devices of a similar type and design in an identical mode and operation provided that the specification of the proposed doorset is within all of the limits given below.

14.3.2 Frames

a) For timber/cellulosic frames:

The density and dimensions of the frame including the rebate depth shall be equal to or greater than those tested. A test on a timber/cellulosic frame is applicable to the use of a frame constructed from a timber with an equal or slower charring rate, but is not applicable to the use of a frame constructed from a timber with a faster charring rate, even if it has an equal or higher density.

Evaluation of a securing device in a double leaf application is applicable to the use of the securing device in solid timber frames of an equal or higher density of equal or slower charring rate to the leaf framing. If other leaf constructions are used a field of extended application will be required.

NOTE It is generally assumed that a higher density timber chars more slowly than a low density species but there are exceptions to this rule.

b) For metal frames:

The frame shall be of the same metal specification and all cross-sectional dimensions, including the rebate depth, may be varied by ± 25 %.

A test on a mild steel frame is applicable to the use of a securing device on a stainless steel frame, but not vice versa. The result of the test will apply equally to back-filled or unfilled frames.

14.3.3 Door leaves and openable windows

14.3.3.1 Timber/cellulosic door leaf or openable window

a) Leaf Height: The rules will vary for the components as given below:

1) Latchbolt/deadbolt: As the height of the latchbolt/deadbolt will not vary on a tall or short *door leaf* there is no restriction on the height of the leaf to be used with these items, provided it is not to be fitted more than 1,5 m above floor level.

2) Door edge bolt: If the pressure in the furnace was not greater than 12 Pa the bolt may only be used on opening elements of height up to 2,1 m. If the pressure was 18 Pa then there is no restriction on leaf height.

b) Leaf Thickness: A test on a latchbolt/deadbolt or edge bolt in conjunction with an associated leaf construction thickness of 't' mm is suitable for use on leaves of approximately the same construction as long as the thickness is not less than 't' mm.

c) Construction: For mortice-in deadlocks, latches and edge bolts the field of direct application is as given in the clauses 1) to 3) below. For face fixed items the exact nature of the construction is not important except for the ability of the construction to retain fixings which shall be the subject of a field of extended application.

1) All-cellulosic door leaf or window: A test on a securing device where the item is housed in an all-cellulosic associated construction is applicable to the use of the device in conjunction with a construction with a slower charring rate, but not with a faster charring rate, or for use in leaves or openable windows where the device is housed in constructions with either protective sub-facings or mineral boards.

2) Cellulosic constructions with protective sub-facings: A test on a securing device where the item is housed in a protected core associated construction is applicable to the use of the

device on elements with more protection, i.e. thicker boards, or mineral board construction, but not on leaves of all-cellulosic construction.

3) All mineral construction: A test on a securing device housed in an all mineral board associated construction is applicable to the use of the device on constructions with equal or higher density and strength properties and equal or better thermal properties, but not for use on leaves of all-cellulosic or protected cellulosic construction.

14.3.3.2 Metal doors and openable windows

a) Leaf Height: If the pressure in the furnace was not greater than 12 Pa the securing device may only be used on leaves of height up to 2,1 m (securing device height 'a' of 2 m). If the pressure was 18 Pa, then there is no restriction on height.

b) Leaf Thickness: A test with an associated leaf construction with a thickness of 't' mm is suitable for use on leaves of approximately the same construction as long as the thickness is not less than 't' mm.

c) Construction: A test on a securing device housed in an uninsulated metal associated construction is applicable to the use of the device in an uninsulated construction that is thicker, or in an insulating construction. A test in an insulated metal associated construction is applicable only to insulated constructions with similar or better thermal properties.

14.3.4 Configuration of the assembly

A test on a securing device securing a section of associated door leaf or window to another leaf or window assembly is applicable to the use of securing devices in single leaf doors or openable windows for securing the leaf to the frame. A test on a device securing a leaf or window to a frame is not applicable for securing the leaf to another leaf or window.

14.3.5 Door lipping/leaf or window edge construction

14.3.5.1 Timber lippings

Any edge lipping or part of the timber door or window edge with which the securing device or its forend plate is in contact or which it penetrates, shall have a charring rate equal to or slower than that of the associated construction used in the test.

14.3.5.2 Metal door leaves or openable windows

The method of constructing the edge shall not be different from that used in the associated construction.

14.3.6 Intumescent protection

14.3.6.1 Additional intumescent protection to door or window to frame gap

If the securing device was tested with an intumescent material running continuously past the item, then the assembly to which it is to be fixed shall contain a minimum of the same cross sectional area of an intumescent material with identical critical properties, located no further from the edge of the device than that which was tested.

In the case of locally applied additional protection, a test with a mono-ammonium phosphate type, low pressure seal is applicable to the use of a pressure forming seal, but not vice versa.

14.3.6.2 Direct protection to the device

Any additional intumescent material such as pastes, plugs or coatings, etc., incorporated in the tested securing device in timber/cellulosic assemblies shall also be incorporated in the assembly to be used.

14.3.7 Fixings

Any screws fixing the device to the door or window edge and/or frame shall be of the same metal, length (if penetrating solid material for their full length) and have at least the same pull-out resistance as those tested. Any alternative method of fixing shall have the same strength at high temperature as that tested.

NOTE Pull-out and strength resistance may be determined by fixing manufacturer's specification.

14.3.8 Position of locking plate and forend

The edge of the locking plate or the forend shall not be closer to the face of the leaf than that which was tested.

14.3.9 Gap

The gaps between any leaf or window edge, forend plate and the adjacent frame/locking plate shall not exceed 4 mm or the gap that existed between them in this test, whichever is the greater, in the case of timber/cellulosic or insulated metal door leaves, or more than 5,5 mm in the case of uninsulated metal door leaves and/or frames.

14.4 Surface mounted overhead controlled door closing devices

14.4.1 Maintenance of closing force for unlatched door assemblies

14.4.1.1 Closing devices without brackets and slide arms

Provided that the device has satisfied the maintenance of closing force criterion (see 11.3) for the required period given below, then the closing device is applicable for use on any doorset without limitation on the duration of the fire resistance period (14.4.1.1.a and 14.4.1.1b).

a) Timber/cellulosic door assemblies:

   A closing device shall have an unrestricted field of direct application in respect of the various forms of construction, if it maintained the closing force for 12 min when used in a timber/cellulosic door assembly, with exposed intumescent edge seals or 25 min when fitted with concealed intumescent edge seals (see C.3).

b) Metal door assemblies:

   1) Steel door assemblies:

      A closing device shall have an unrestricted field of direct application with respect to various forms of construction if it maintained the closing force for 15 minutes (see C.3).

   2) Aluminium door assemblies:

   The closing device shall have a field of application limited to the period of the maintenance of the closing force.

c) Timber/cellulosic leaf/metal framed assemblies:

The suitability of the closing device for such applications shall be the subject of a field of extended application.

14.4.1.2 Closing devices with slide arms and brackets

The closing device shall be required to maintain the closing force for at least the times given in 14.4.1.1a) and 14.4.1.1b) above, and maintain integrity for the test duration. Where the bracket or slide arm has been evaluated in a timber/cellulosic frame the closing device is applicable for use in frames where the charring rate is slower than that of the timber used in the associated frame section, but not *vice versa*, as well as in metal frames.

Any intumescent seal used either integrally or additionally to protect the bracket or slide mechanism shall be retained.

The evidence is only applicable for the fixings used in the test and any proposed changes shall be the subject of a field of extended application.

14.4.2 Power size

A test on any device at a particular power size is applicable for use of the device at the power rating tested or above, minimum power size 3 as defined in Table 2 of EN 1154:1996.

14.4.3 Closer cover

If an optional closer cover is fitted to the tested closing device the result is not applicable for a closer without a cover unless the cover has a melting point of less than 400 °C.

14.5 Non edge-mounted items of building hardware

14.5.1 Duration of performance

The tested item is applicable for use in doorsets requiring a fire resistance with respect to EN 1634-1 of no more than x min (where x is the time between the commencement of the test and the earlier of either integrity or, where required, insulation failure times), provided that the specification of the assembly to which it is to be attached is within the limits given below.

14.5.2 Door leaf or window construction

14.5.2.1 Timber/cellulosic elements door assemblies

Tests on items fitted onto or into an all-cellulosic associated construction are applicable for use on elements incorporating non-combustible sub-facings and mineral board cores. A test in conjunction with a protected cellulosic associated construction is applicable for use of the item on mineral cored door assemblies or openable windows but not leaves of all-cellulosic constructions.

A test on a softwood associated construction is applicable for use on associated constructions of slower charring rate timbers but a test using a hardwood associated construction is not applicable for use with a softwood associated construction.

14.5.2.2 Metal door assemblies

A test on a non-edge mounted item in an insulated metal associated construction is not applicable for use in a non-insulated door or window but a test on a non-insulated associated construction is applicable for use in insulating metal door assemblies.

14.5.3 Leaf thickness

Results apply to any construction of equal or greater thickness than that tested.

14.5.4 Fixings

Any screw fixings into the door or window shall be of the same metal, length (if penetrating solid material for their full length) and, if strength is important, have at least the same pull-out resistance as those tested. Any alternative method of fixing shall have the same strength at high temperature as that tested.

NOTE Pull-out and strength resistance may be determined by fixing manufacturer's specification.

14.5.5 Intumescent protection

If the tested specimen contained any intumescent protection between the specimen and the associated construction, then the door or window assemblies to which the item is to be attached shall contain similar intumescent materials in the same location to provide at least the level of thermal protection which existed in the tested specimen.

14.5.6 Removal of constructional material

In the case of timber/cellulosic assemblies the total volume of material removed to create a mortise for an item of building hardware shall not exceed that which was removed in this test. If more material has been removed the evidence may still be applicable if additional protection is applied, but this shall be the subject of an extended field of application.

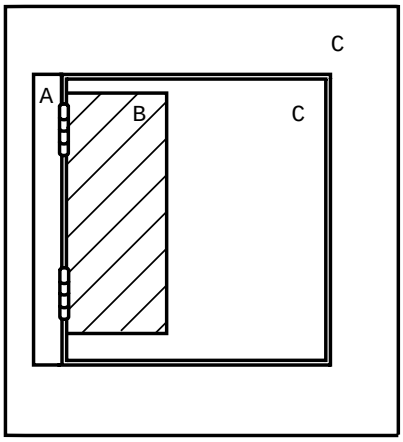
14.5.7 Size of air transfer grilles

The size of an air transfer grille may be increased beyond that tested in this European Standard but shall not exceed the size for which a glazed opening in the door construction is approved, nor be fitted closer than 125 mm to any edge of the leaf or glazed opening.

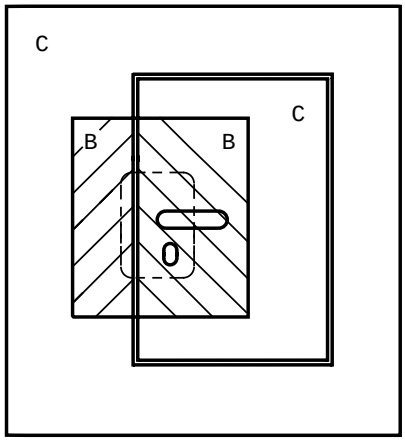
14.5.8 Ignition of closer damping fluid

The tested device may be used when attached to the unexposed face of any non-insulated metal door assembly, but if the device is to be fitted on a door which incorporates significant areas of non-insulating glass immediately below the closing device the evidence shall be the subject of an extended application analysis.

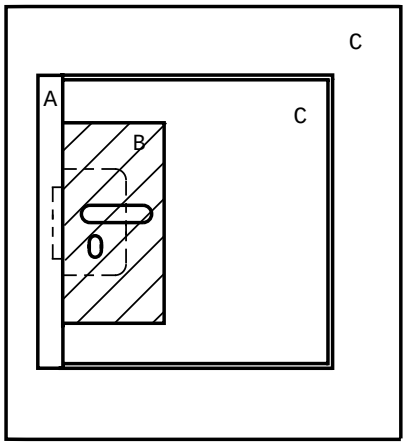
The mass of the closing device may be increased beyond that tested, assuming all other aspects of the closing device remain the same. The door construction may be of a type that provides reduced unexposed face surface temperatures. If the surface temperature of a door remains below that which caused ignition, even after a longer duration, then the closer device may be fixed to this leaf.



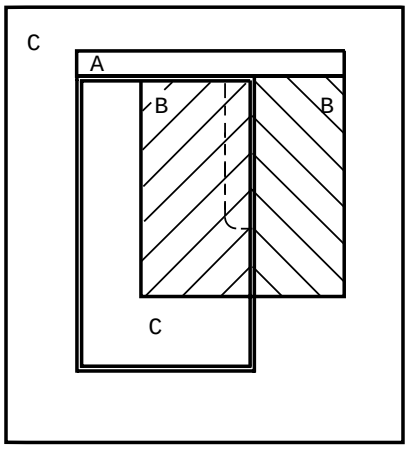
a) Evaluating a hinge



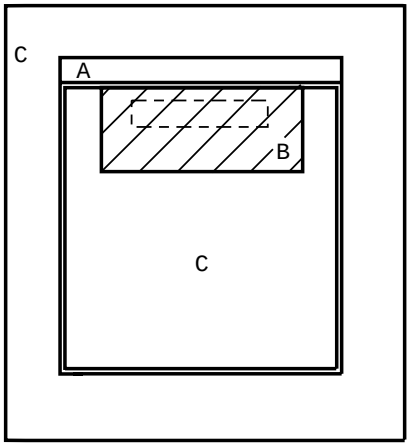
b) Evaluating a securing device for double leaf doors



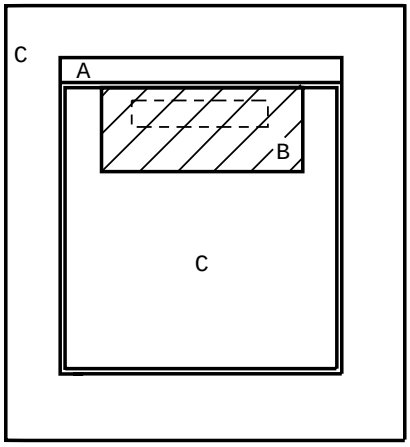
c) Evaluating a securing device for single doors



d) Evaluating a door edge bolt securing device



e) Evaluating surface mounted overhead closers

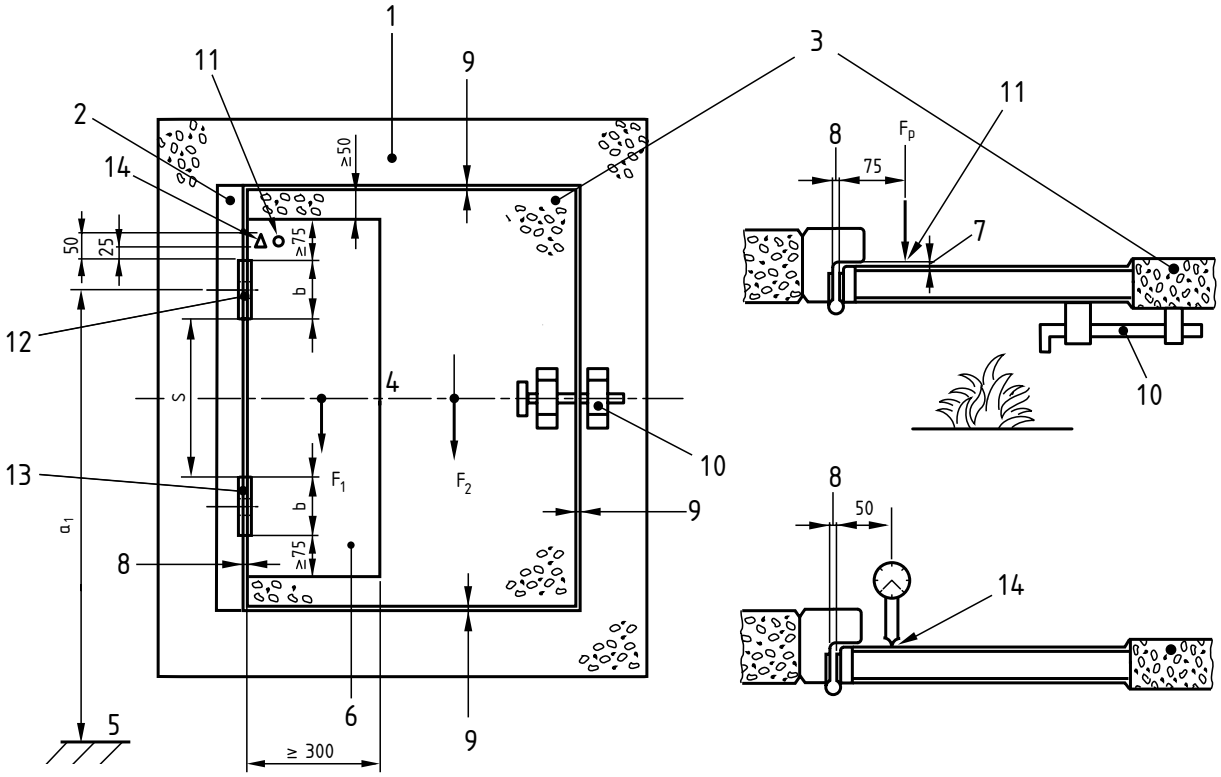


f) Evaluating non-edge mounted hardware

Key
A – Associated frames
B – Associated leaf constructions
C – Supporting construction

Figure 1 — Typical associated leaf/associated frame and supporting constructions for test constructions

Dimensions in mm



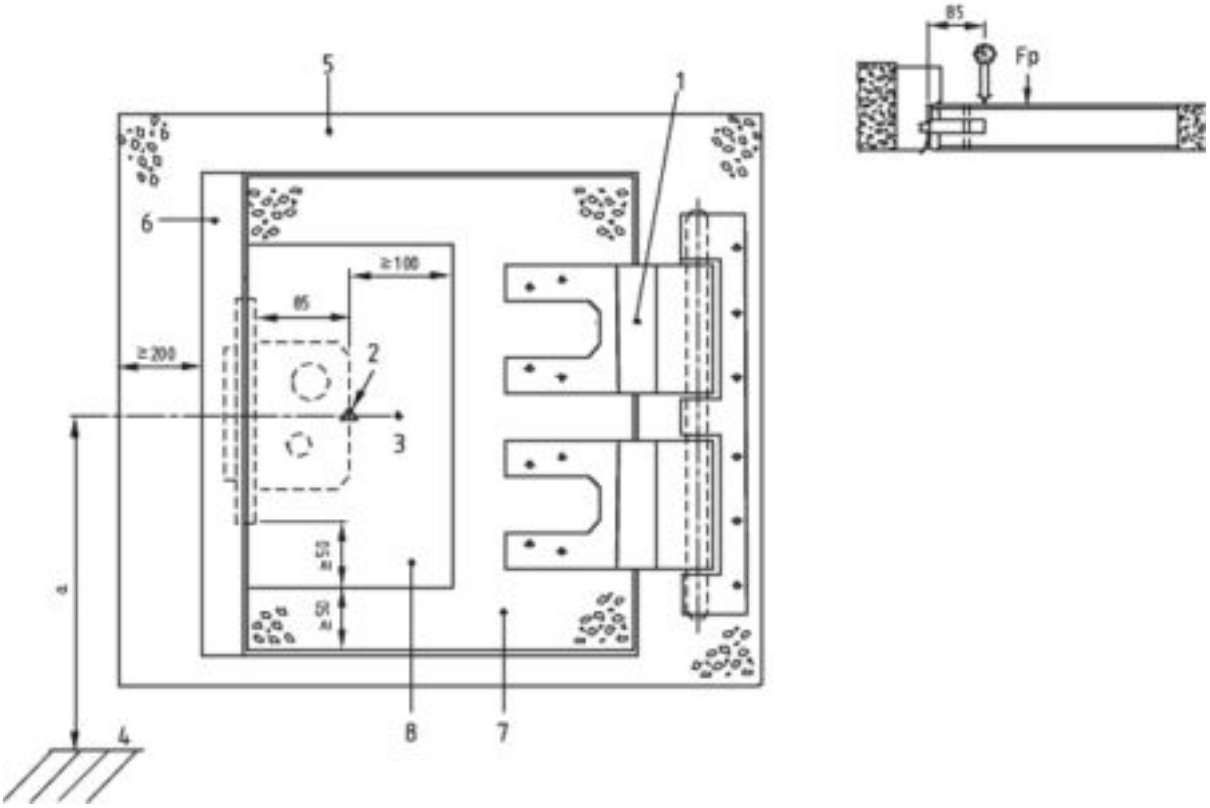
Key

1 Fixed supporting construction
2 Associated frame construction
3 Hinged supporting construction
4 Centre line of panel
5 Notional floor level
6 Associated door leaf/window construction
7 Stop/leaf gap
8 Leaf to frame gap (hinge edge)
9 Leaf to supporting construction gap (free edges)
10 Easily operated shoot bolt with keep
11 Point of perpendicular force application (F_p)
12 Specimen hinge (for classification)
13 Supporting hinge (not for classification)
14 Displacement measuring point

a_1 – the height of the centre of the top most hinge above notional floor level in metres
b – length of hinge
F_1 = mass of associated door leaf/window construction
F_2 = mass of moving supporting construction including any added weights
s – clear distance between hinges

Figure 2 — Basic test construction for single axis hinges

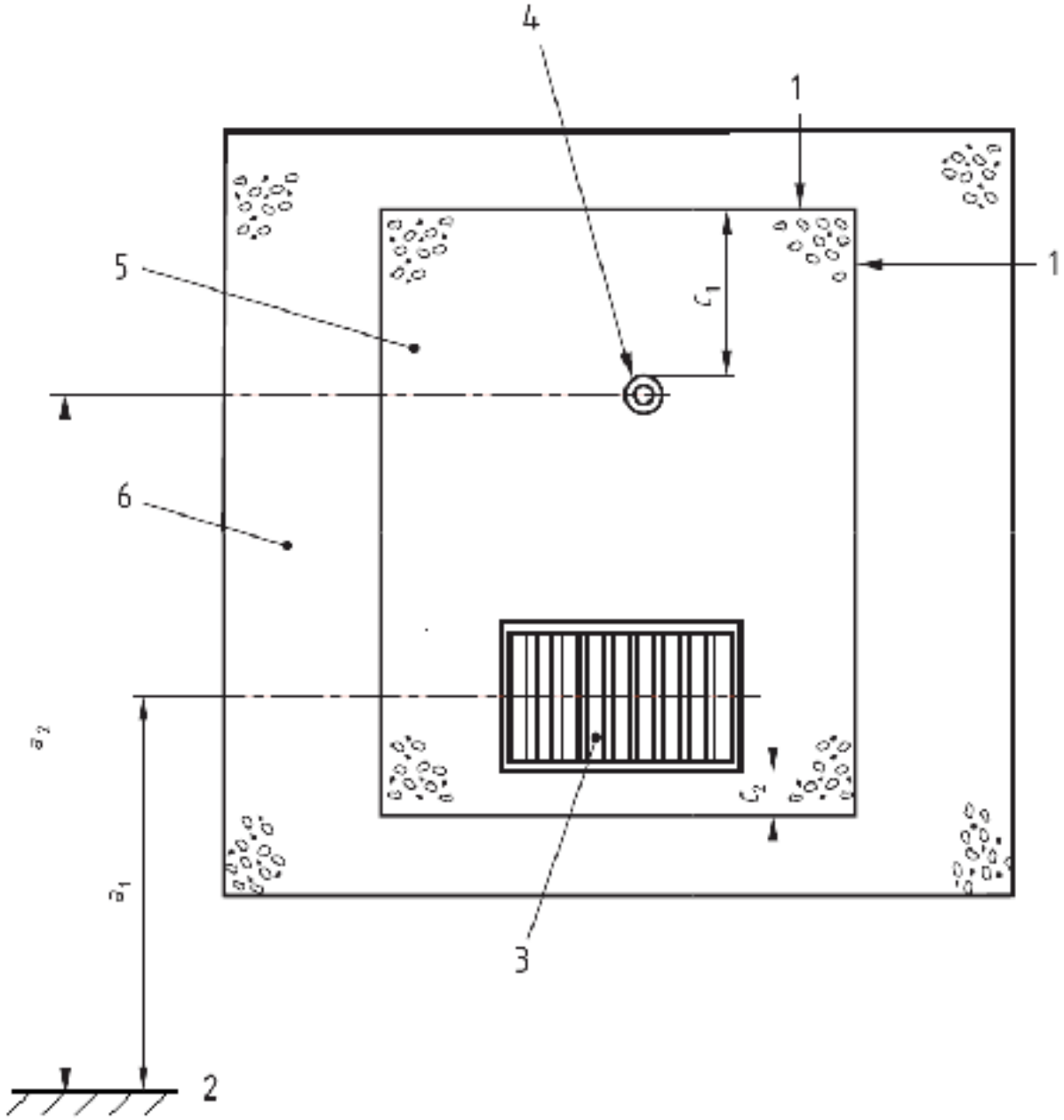
Dimensions in mm



Key

1 External pivot system
2 Displacement of measurement points
3 Point of perpendicular force application (F_p)
4 Notional floor level
5 Fixed outer supporting construction
6 Section of frame (associated construction)
7 Hinged supporting construction
8 Door leaf/window section (associated construction)
9 Specimen securing device (for classification)

Figure 3 — Basic construction for testing securing devices

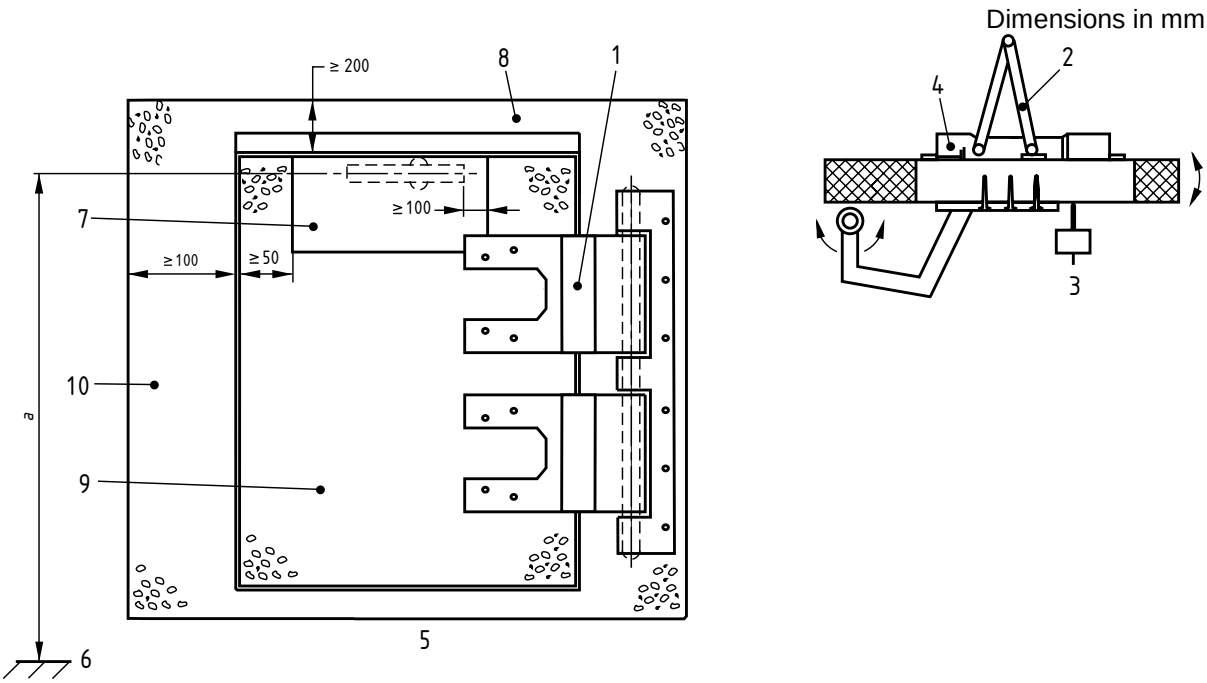


Key

1 Sealed joints
2 Notional floor level
3 Specimen air transfer grill (for classification)
4 Specimen spy glass (for classification)
5 Associated door leaf/window construction
6 Fixed supporting construction

a_1 and a_2 - the heights of the centres of the particular items above the notional floor level
c_1 and c_2 – minimum edge distance limitations imposed by the manufacturer or supplier

Figure 4 — Basic construction for testing non-edge mounted door hardware

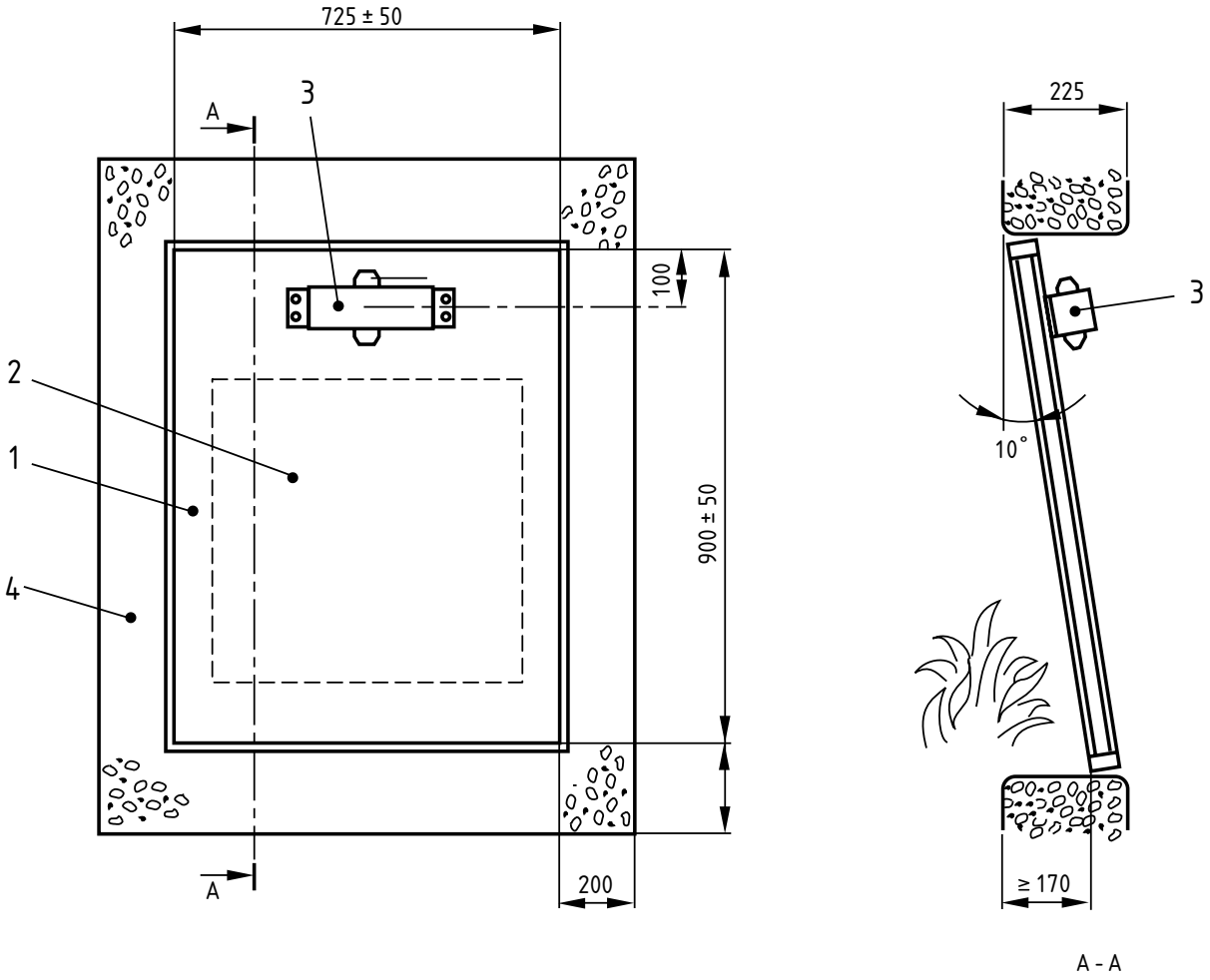


Key

1 External pivot system (supporting construction)
2 Closer arm
3 Load cell positioned in line with closer arm
4 Specimen surface mounted controlled overhead closing device (for classification)
5 View on unexposed face
6 Notional floor level
7 Associated door leaf/window construction
8 Frame header (associated construction)
9 Hinged supporting construction
10 Fixed supporting construction

Figure 5 — Basic construction for surface mounted overhead closing devices

Dimensions in mm

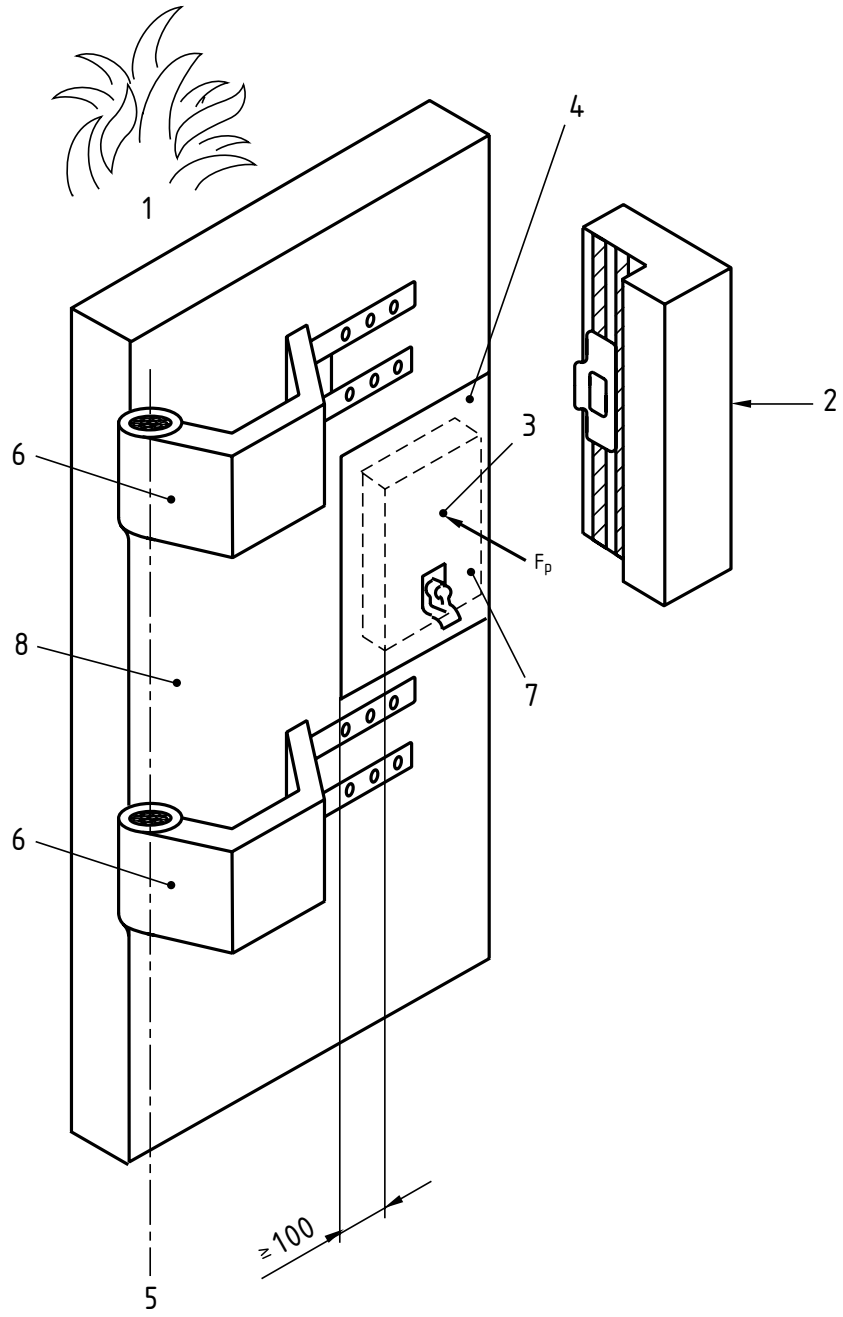


Key

1 Associated door leaf/window construction which may include a glazed panel
2 Poss ble glazed panel
3 Specimen surface mounted controlled overhead door closing device (for classification)
4 Fixed supporting construction

Figure 6 — Typical test construction for evaluation of the ignition risk of surface mounted controlled overhead door closing devices

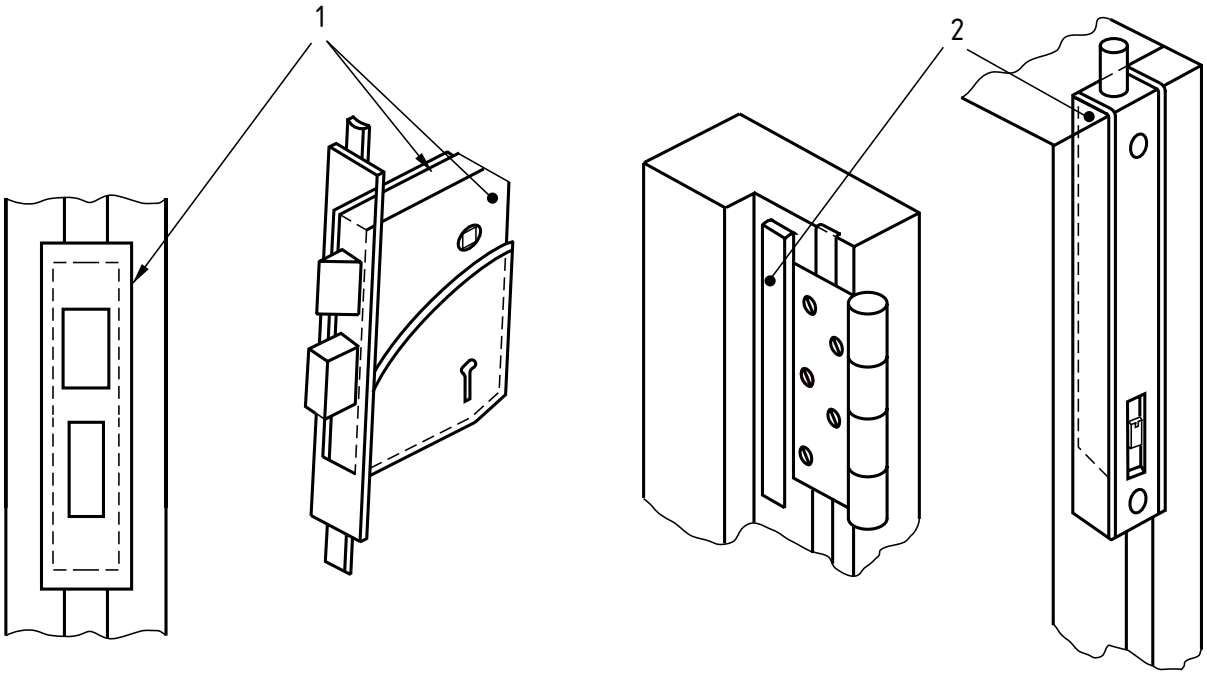
Dimension in mm



Key

1 Furnace exposure
2 Associated frame construction or section of leaf for double leaf doors
3 Point of application of applied force F_p
4 Associated door leaf/ window construcon
5 Axis of externally supported pivot
6 External pivot system (supporting construction, not for classification)
7 Specimen securing device (for classification)
8 Hinged supporting construction

Figure 7 — Example of external pivot arrangement



a) Strike plate b) Mortice lock/latch c) Hinge d) Edge bolt

Key
1 and 2 – Additional intumescent material

Figure 8 — Examples of hinges, mortice locks and edge mounted securing devices with intumescent protection

Annex A
(normative)

Decision Trees

These Decision Trees are provided to establish the suitability of the reduced size test for evaluation of the relevant parameter

The given examples of Decision Trees relate specifically to the following elements of building hardware.

a) Single axis hinge.

b) Securing device (lock and locking plate).

c) Surface mounted overhead controlled door closing device.

NOTE The process may be used for other components.

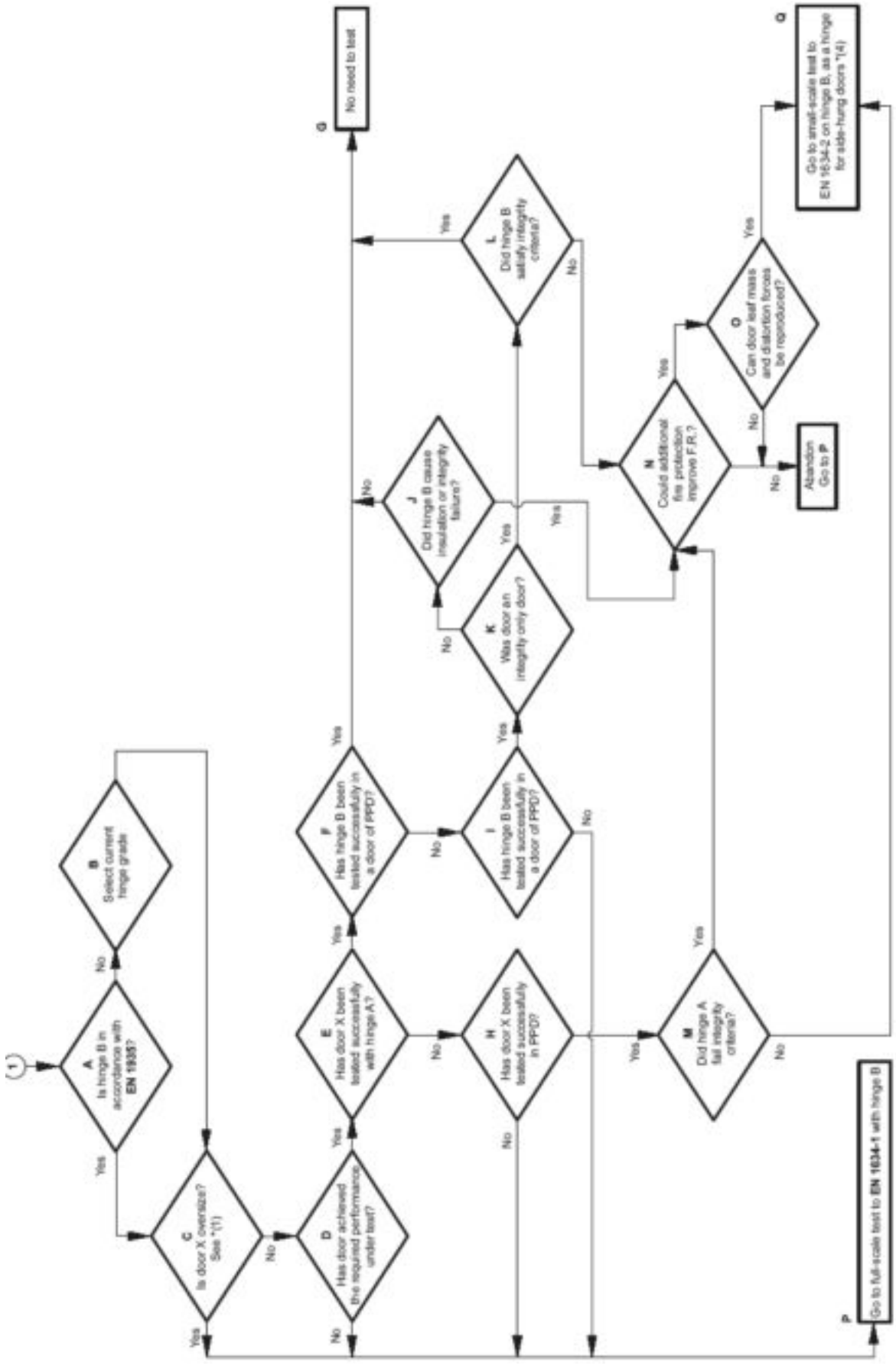


Figure A.1 — Decision tree – Proposal to replace hinge 'A' with hinge 'B' in doorset 'X'

Notes to Figure A.1

Hinge 'B' shall meet the requirements of B.1 in EN 1935:2002 and Annex A of EN 14600:2005.

*(1) 'Oversize' means any element of building hardware which is beyond the sizes/mass details given in Annex A of EN 14600:2005.

*(2) 'Particular Product Design' (PPD) means in respect of:

a) construction;

b) material;

c) size;

d) frame type;

e) other hardware.

*(3) 'Particular Product Design' (PPD) means in respect of:

a) construction;

b) material;

c) approximate size;

d) fixings.

*(4) Possibly with additional fire protection added to door (see Figure 8).

F.R. – Fire Resistance

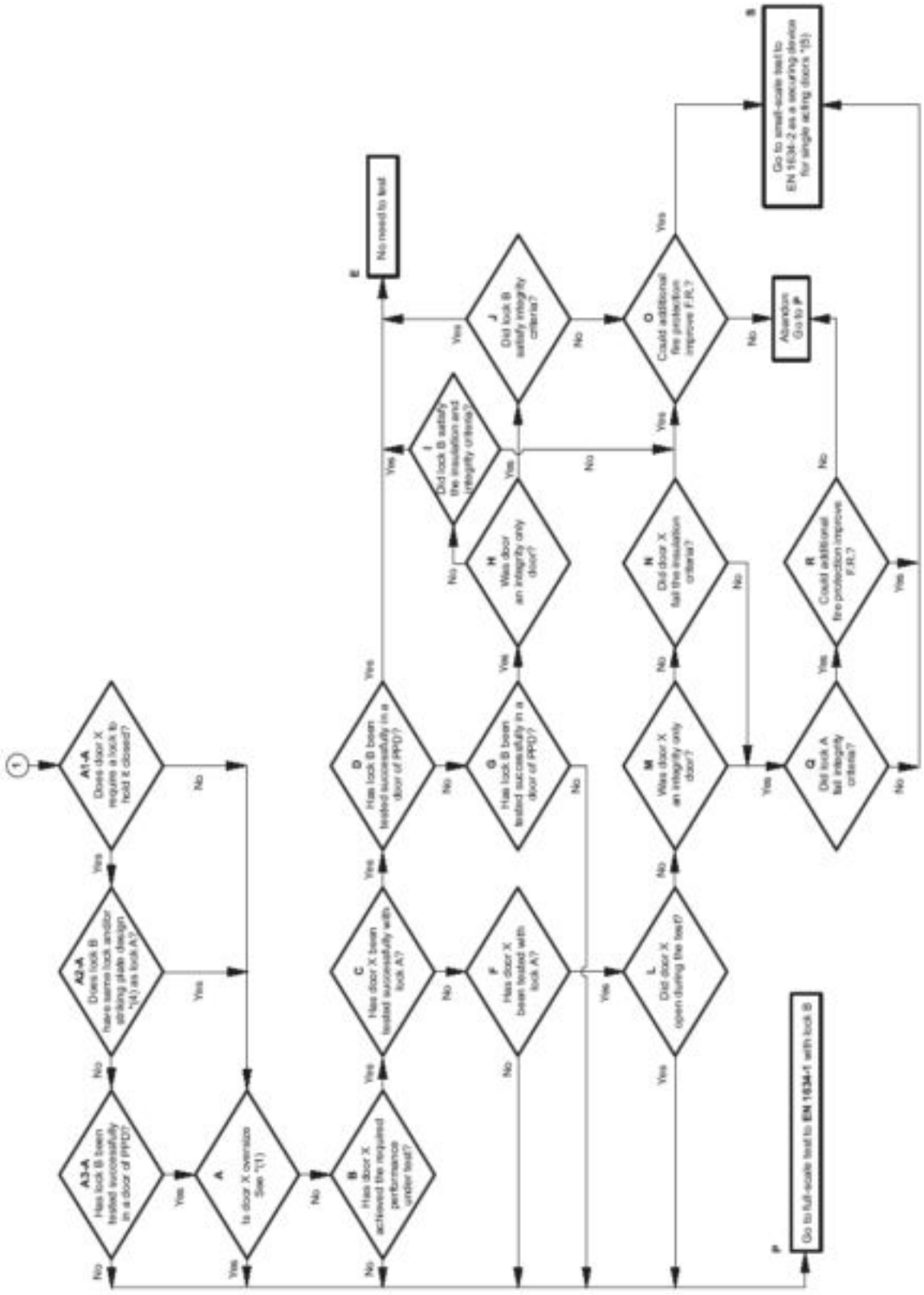


Figure A.2 — Decision tree Proposal to replace lock 'A' with lock 'B' in doorset 'X' Securing devices

Notes to Figure A.2

Lock B shall meet the requirements of EN 12209 for the door size/type.

*(1) 'Oversize' means any element of builders' hardware which is beyond the sizes/mass details given in Annex A of EN 14600:2005.

*(2) 'Particular Product Design' (PPD)' means in respect of:

a) construction;

b) material;

c) size;

d) fixings;

e) frame type;

f) other hardware.

*(3) 'Particular Product Design' (PPD) means in respect of:

a) construction;

b) material;

c) approximate size.

*(4) 'Particular Product Design' (PPD) means in respect of:

a) construction/type

b) material

c) dimensions

d) mechanism

*(5) Possibly with additional fire protection added to door 'X' (see Figure 8).

F.R. – Fire Resistance

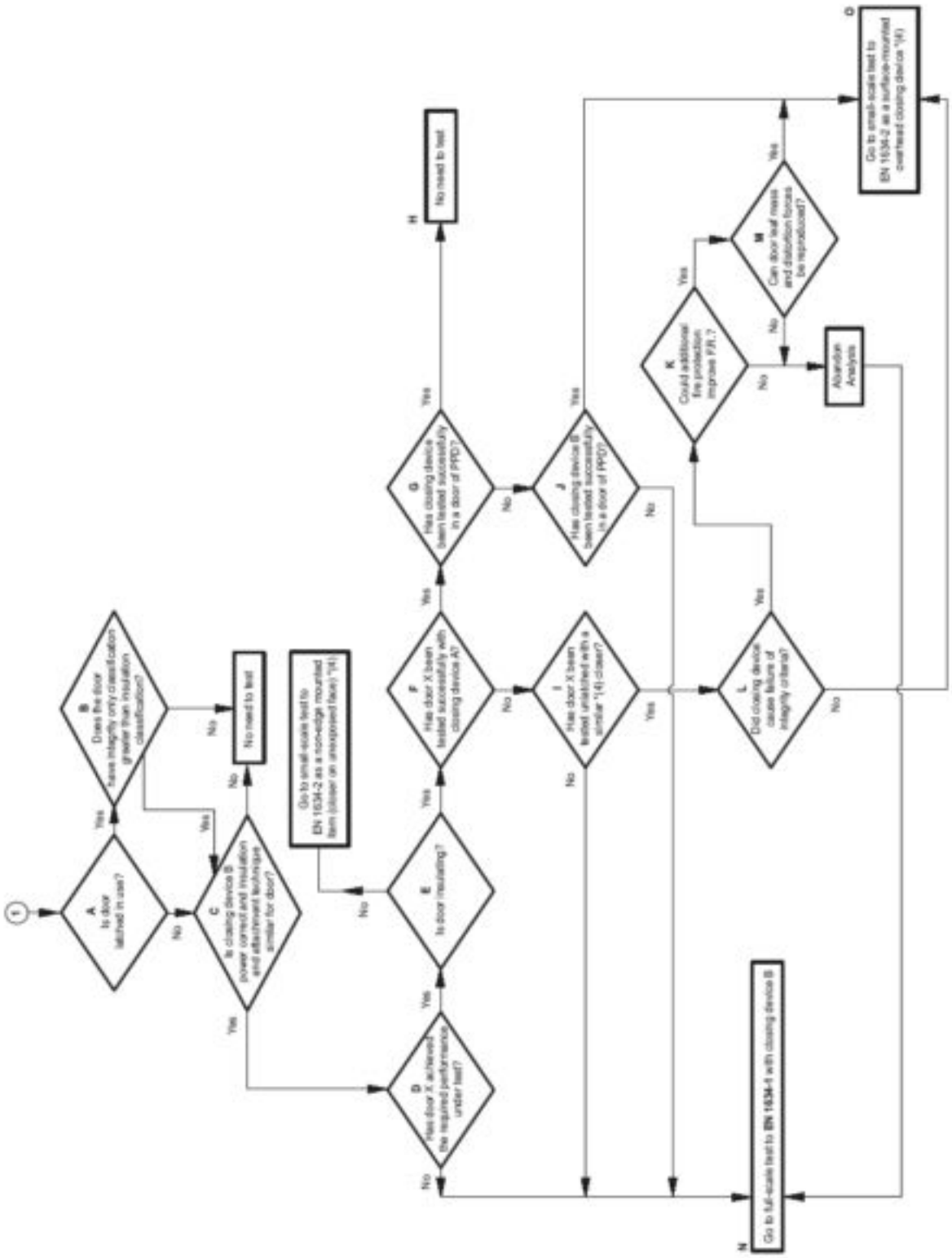


Figure A.3 — Decision tree Proposal to replace closing device 'A' with closing device 'B' in doorset 'X'

Notes to Figure A.3

Closing device 'B' shall meet the requirements of EN 1154.

*(1) 'Particular Product Design' (PPD) means in respect of:

a) construction;

b) material;

c) size;

d) frame type;

e) other hardware.

*(2) 'Particular Product Design' (PPD) means in respect of:

a) construction;

b) material;

c) approximate size;

d) fixings.

*(3) 'Particular Product Design' (PPD) means in respect of:

a) material;

b) figure/mode (i.e. 1 or 6);

c) power;

d) exposed face.

*(4) Possibly with additional fire protection added to door (see Figure 8).

F.R. – Fire Resistance

Annex B
(informative)

Guidance with respect to the test conditions

B.1 Pressure conditions used when testing single axis hinges

A hinge in the upper, positive pressure zone of a furnace produces a conductive heat path from the furnace atmosphere into the gap between the door edge and the frame. This can lead to ignition of cellulosic materials due to the rise in temperature together with the possible penetration by hot furnace gases leading to an integrity failure. In the case of an insulating metal leaf/frame construction this conductivity can lead to both an integrity and insulation failure, where measured.

Additional intumescent protection is often fitted behind or adjacent to such hinges to reduce the flow of heat or hot gases.

A hinge fixed to an assembly in the lower, negative pressure zone of a furnace is usually not as hot and the risk of conduction failure is reduced as air at ambient temperature is being drawn through the edge/frame gap as a result of the negative furnace pressure. Beyond 30 min exposure, a cellulosic frame is subjected to significant radiation and conduction which chars the frame. The incoming air is rich in oxygen and this increases charring and more rapid erosion of the frame and door/window edge. The cooling air may inhibit the action of any localized additional protection and an integrity failure can develop.

Tests therefore need to be carried out at positive and negative pressure to make a complete assessment of the performance of a hinge for use on timber/cellulosic doors or openable windows.

When there is no charring, i.e. in the case of a metal assembly, the greatest risk is that of conduction in the positive pressure zone and only one test at positive pressure is needed to establish the contribution of hinges for use on metal elements.

B.2 Application of load and measurement of displacement

The loading conditions applied to each element under test will represent those forces which exist or may develop as a result of thermal stresses during a full size test to EN 1634-1. In the case of components which support the mass of the swinging element, such as hinges, these forces should be modelled as realistically as possible. In addition to these static "cold state" forces other forces generated by deformations of the door or window, and/or frame, may develop in a full size test and these should also be modelled as accurately as possible.

It is essential that the horizontal load is applied correctly in order to comply with this European Standard and guidance is therefore given here.

The value of the applied load has to be calculated, based on its points of application relative to the axis of the external hinge and the edge of the leaf as shown in Figures 2 and 7.

A similar calculation is required to convert the measured values of displacement into the true value of the displacement of the edge of the moving element. This calculation is also based on the position of the displacement transducer relative to the external hinge and edge of the door leaf (see Figures 2 and 3.)

Annex C
(informative)

Role and criteria for building hardware in fire

C.1 Single axis hinges

In a full size door or window assembly the top hinge is subjected to a vertical shear load and horizontal tensile load acting in the plane of the leaf normal to the frame. The lower hinge experiences a similar vertical shear load but is subjected to a horizontal compressive load acting in the plane of the element normal to the frame. Under exposure to heat on one face, the hinges have to resist induced forces resulting from thermal distortion of the door leaf or window material, which act normal to the plane of the element.

Under fire exposure hinges have to remain capable of supporting the door leaf/window assemblies throughout the exposure period or until a degree of additional support is provided either by the expanding leaf becoming wedged into the frame of the assembly in the case of a metal construction or the activation of intumescent protection in the door edges in the case of a timber/cellulosic construction. The degree of support contributed is dependent on the gap sizes and/or the intumescent specification. The hinge should not, by means of conduction to the unexposed face, reduce the integrity performance of door or window assemblies with combustible edges by transmitting enough heat to cause ignition.

C.2 Securing devices

When a full size fire resisting door or window assembly is fitted with a securing device such as a latch and/or dead lock together with its locking plate (including electrically operated dead bolt releases) it may make both a positive and negative contribution to the potential fire resistance of the element. The primary function of a securing device is to keep the assembly closed both in normal use and in the event of a fire. During a fire distortions of the assembly may lead to the securing device having to resist bowing forces normal to the plane of the assembly in order to maintain closure and stability. In this way a securing device can make a positive contribution to the fire resistance of the assembly. Conversely the securing device may reduce the integrity of a timber/cellulosic construction by conducting heat energy from the exposed face to the unexposed face faster than at the edges, or may reduce the insulation of a metal construction and lead to a possible failure.

C.3 Surface mounted overhead controlled door closing devices

Most fire resisting doorsets and some openable windows need to be fitted with a mechanism to close the leaf and sometimes to ensure that it remains in the closed position. In the case of door leaves, an overhead surface mounted closing device is often fitted for this purpose, either on the opening or closing side of the leaf (projecting arm or parallel arm).

A closing device can make either a positive or a negative contribution to the fire resistance of the assembly to which it is fitted, and the test described in this European Standard details the methods used to establish whether the fitting of the device will reduce the integrity of the assembly either as a result of the fixings or in the case of an uninsulated door as a result of ignition of the closer, or any fluids contained within it.

In the event of a door leaf being unlatched the closer provides the means of keeping the leaf closed until either the leaf expands into the frame or any pressure forming intumescent seal is activated, so "gripping" the door in position.

For metal door assemblies the leaf is not expected to expand into a restrained position before 15 min. Timber/cellulosic type doors, with exposed intumescent will be sealed in 12 min. If seals are concealed, especially at the head, then a delay of 25 min is to be expected and the closer will not be adequately evaluated for this type of seal.

If the 'decision tree' indicates that the overhead controlled door closing device should be evaluated for this function then this European Standard provides a means for assessing the reduction in the closing force generated by the closer with respect to time under the standard time/temperature regime. The closer should be capable of exerting a sufficient closing force for a prescribed period (see Clause 14). The test method described determines the time for which a closer provides a positive closing force capable of resisting any opposing forces due to furnace pressure or thermally induced distortion, when the closer is fitted to the exposed face of an inward opening door.

A surface mounted overhead controlled door closing device that incorporates slide arms or fixing brackets that fit into the door leaf/window edge to frame gap may reduce the performance of a fire resisting element by encouraging the conduction of heat to the unexposed face by way of these components. In the case of cellulosic doors this could lead to a loss of integrity as a result of continuous flaming resulting from a localized burn-through or in the case of an insulating metal door a failure of the insulation criteria, unless the edge zone is exempted from such a failure.

C.4 Non-edge mounted items of building hardware

In addition to essential items of building hardware such as hinges and latches, a fire resisting element may also be fitted with non-essential items of building hardware, e.g. viewers, letter plates, air transfer grilles, pull handles.

Such items are not critical components (i.e. their presence is not essential to allow the door or window to function), however, their inclusion can cause potential problems with respect to maintaining the integrity and insulation performance.

Under fire exposure the presence of an item of non-edge mounted building hardware should not affect the ability of a fire resisting assembly to act as a barrier to flames and hot gases, or cause the unexposed surface of the assembly or articles in contact with the unexposed surface to flame or exceed the insulation criteria for an insulated door.

Items of building hardware are usually positioned in a range of different locations over the height of a full size assembly. The test method described in this European Standard is designed to evaluate the performance of an item of building hardware at the extremes of furnace pressure differential representing that range of possible locations. The item of building hardware should demonstrate that, within this pressure band, its incorporation does not unduly affect the integrity of a cellulosic leaf construction for the proposed fire resistance period.

The method may also be used to establish the suitability of a surface mounted controlled door closing device for fixing to an uninsulated metal door or glazed element by attaching it to the unexposed face of an associated construction consisting of a section of steel frame and door or window (Method 'B'). The method is not suitable for evaluating a closer fitted to the unexposed face where the heating of the closer is primarily due to radiation.

Annex D
(normative)

Guidance on the suitability of reduced size furnaces

The following requirements are given in the absence of a definition of a reduced size test furnace in EN 1363-1. Existing reduced size furnaces vary considerably.

The furnace shall be capable of testing the item of building hardware so that there is a minimum distance of 100 mm between the edges of the associated construction, including the hinged supporting construction and the internal faces of the furnace aperture and/or 200 mm between this and any point on the item of building hardware.

The furnace shall have a chamber depth, i.e. the distance between the exposed face of the specimen and the face of the furnace lining immediately opposite the specimen, of not less than 400 mm excluding any areas where flues or other openings enter the furnace chamber. The total area of such flues and other openings shall not exceed 25 % of the surface area of the wall in which they occur.

The furnace shall be operated and controlled in accordance with the requirements given in EN 1363-1.

NOTE More than one test construction to meet EN 1634-2 can be accommodated, if required, into a standard 3 m by 3 m furnace.

Annex E
(informative)

Guidance with respect to the test construction

E.1 External independent pivot

The use of an external independent pivot is required when testing items of building hardware which are normally mounted on the opening edge of a swinging/pivoted assembly, the function of which is to prevent the leaf from swinging about the hinge axis.

To measure the ability of the tested item to perform this function, the pivot of the test specimen should remain openable for the duration of the test so that the pivot does not prevent the leaf from swinging. The external independent pivot should therefore be protected from excessive heat and positioned at a suitable location which represents the width of a typical full size door leaf or window (i.e. up to (725 ± 25) mm from the opening edge).

The pivot should be robust and capable of supporting the mass of the test specimen and any loads applied to it with the minimum of out-of-axis rotation. The pivot should be securely mounted and be provided with a mechanism to support the test specimen at enough points to minimize local stresses within the element.

E.2 Selection of the associated construction

The choice of the associated construction is left to the discretion of the test sponsor or test designer, and is significant in determining the field of direct application for the tested item of building hardware, which (other than for specific applications) determines the value of the test.

An example may be a latch manufacturer who wishes to sell his product for use in doorsets with a 60 minute fire resistance rating. The manufacturer should select a test configuration and associated construction which would result in the most beneficial field of direct application for the product under consideration. The maximum field of direct application would be derived from testing in a thin, all-cellulosic associated construction, but if the latch required a large amount of material to be removed this could cause a burn-through and no positive result may be achieved. A test in a protected cellulosic associated construction may, however, cover 75 % of the required uses and would probably achieve a positive result. It is not necessary to try to gain the widest field of direct application for all products.

Where a sealing material is used to seal a gap between the associated leaf and frame constructions it should not restrict movement or develop any pressure that could inhibit movement and interfere with the measurement of the forces.

Annex F
(informative)

Route to classification

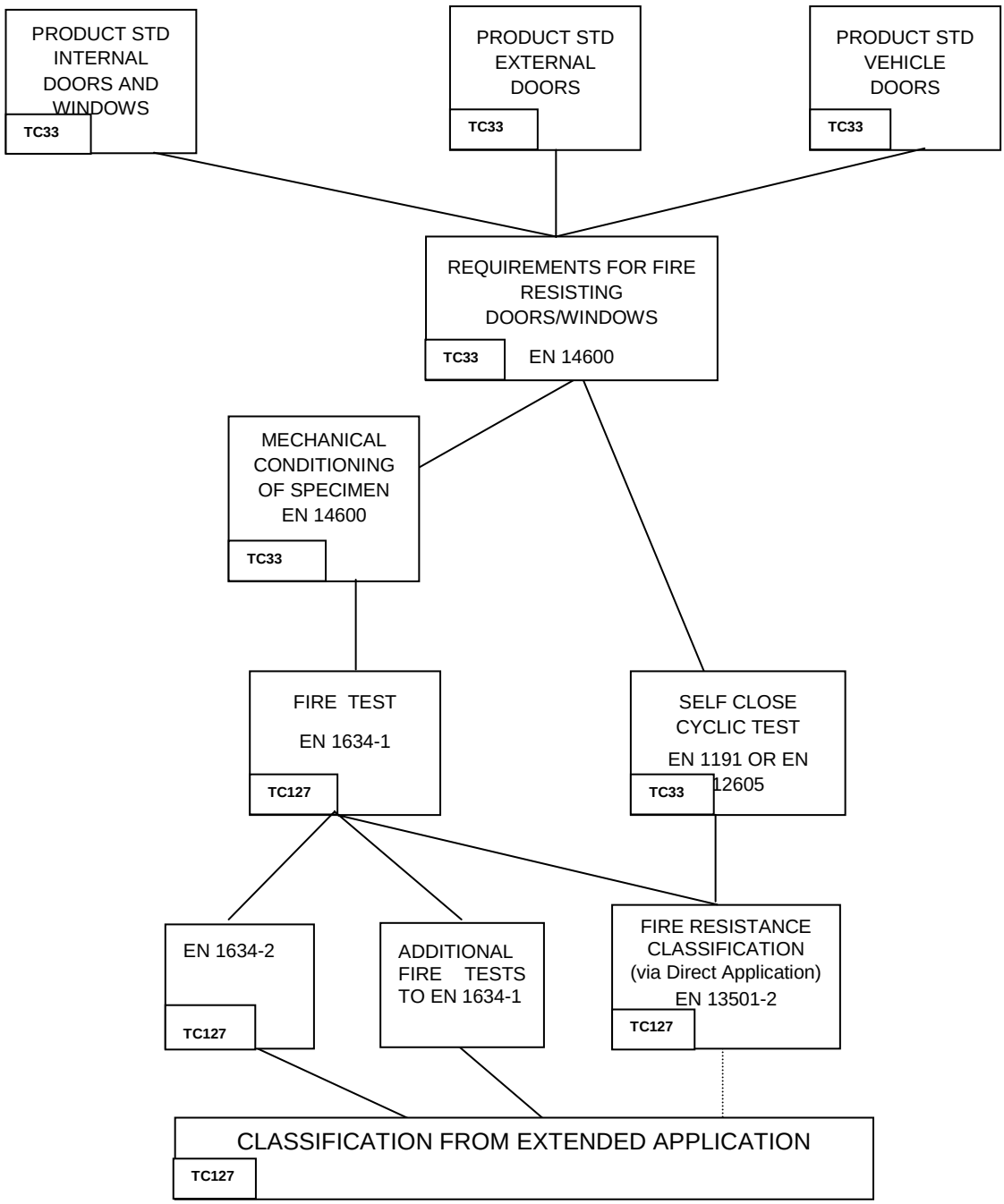


Figure F.1 — Route to classification

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