BRITISH STANDARD

BS EN
1366-7:2004

Fire resistance tests for service installations —

Part 7: Conveyor systems and their closures

The European Standard EN 1366-7:2004 has the status of a British Standard

ICS 13.220.50

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 1366-7:2004.

The UK participation in its preparation was entrusted by Technical Committee FSH/22, Fire resistance tests, to Subcommittee FSH/22/5, Fire resistance testing of doors, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

Cross-references

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Fire resistance tests for service installations - Part 7: Conveyor systems and their closures

Essais de résistance au feu des installations techniques - Partie 7: Fermetures de passages pour convoyeurs et bandes transporteuses

Feuerwiderstandsprüfungen für Installationen - Teil 7: Förderanlagen und ihre Abschlüsse

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Contents

Foreword

This document (EN 1366-7:2004) 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of an identical text or by endorsement, at the latest by December 2004, and conflicting national standards shall be withdrawn at the latest by December 2004.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

EN 1366 ‘Fire resistance tests for service installations’ consists of the following parts:

Part 1: Ducts

Part 2: Fire dampers

Part 3[1)]: Penetration seals

Part 4[1)]: Linear joint seals

Part 5: Service ducts and shafts

Part 6[1)]: Raised access floors and hollow floors

Part 7: Conveyor systems and their closures

Part 8[1)]: Smoke extraction ducts

Part 9[1)]: Single compartment smoke extraction ducts

Part 10[1)]: Smoke control dampers

Part 11[1)]: Fire protective systems for essential services

Annex A and annex B are normative and annex C is informative.

[1)] In course of preparation.

This document includes a Bibliography.

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

Introduction

This part of this European Standard was developed to provide a method of fire resistance testing for assessing the contribution of a closure for a conveyor system together with all its anchoring parts and the frame/guide included to the fire resistance of a separating element when penetrated by a conveyor system including any relevant penetrating components.

Caution

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

An assessment of all potential hazards and risks to health should be made and safety precautions should be identified and provided. Written safety instructions should be issued. Appropriate training should be given to relevant personnel. Laboratory personnel should ensure that they follow written safety instructions at all times.

1 Scope

This part of this European Standard specifies a method of fire testing to determine the fire resistance of closure and conveyor system assemblies designed for installation within openings of separating elements, including any sealing necessary between the closure for a conveyor system and any penetrating components like conveyor tracks, electrical cables and pneumatic pipes being essential parts of the closure and conveyor system assembly together with the penetration seal.

This part of European Standard is not applicable to other test methods required to fully assess closures for conveyor systems, e.g. test methods to evaluate the serviceability and reliable functioning of interconnected systems.

The fire testing of fire dampers for heating and ventilation systems, fire doors and shutters for normal traffic paths and the movement of liquid and combustible gas, are specifically excluded from this European Standard.

This European Standard is read in conjunction with EN 1363-1.

In the absence of any European Technical Specification for closure and conveyor system assemblies, this European Standard gives advice on the classification of durability for closure and conveyor system assemblies.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

prEN 520, *Gypsum plasterboards — Definitions, requirements and test methods.*

EN 1191, *Windows and doors — Resistance to repeated opening and closing —Test method.*

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

EN 1363-2, *Fire resistance tests — Part 2: Alternative and additional procedures*

prEN 1366-3, *Fire resistance tests for service installations — Part 3: Penetration seals.*

EN 1634-1, *Fire resistance tests for door and shutter assemblies — Part 1: Fire doors and shutters.*

EN 12605, *Industrial, commercial and garage doors and gates — Mechanical aspects — Test methods.*

EN 13501-2, *Fire classification of construction products and building elements — Part 2: Classification using data from fire resistance tests, excluding ventilation services.*

EN ISO 13943, *Fire safety — Vocabulary (ISO 13943:2000)*.

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 1363-1, prEN 1366-3, EN 1634-1, EN ISO 13943 together with the following apply.

3.1
anchoring
means of attachment of the closure for the conveyor system to the various components of the supporting or associated supporting construction to ensure correct functioning

3.2
associated supporting construction
specific construction in which the closure and conveyor system assembly is to be installed in practice and which is used to close off the furnace and provide the levels of restraint and thermal heat transfer to be experienced in normal use

3.3
clearing device
device which is generally part of the conveyor system used to clear the closure area of transportable goods during shutting of the closure for the conveyor system

3.4
closing device
device to be attached to a closure for a conveyor system which provides a return to closed condition

NOTE The closing device ensures that the closure for the conveyor system is closed from any open position.

3.5
closure and conveyor system assembly
complete assembly of the closure for the conveyor system and, where relevant, its frame or guide, which is provided for closing off a permanent opening in a separating element. This includes the anchoring parts for the connection with the separating element, a length of any penetrating component on either side of the construction and the penetration seal, any sealing system between the closure for a conveyor system, the conveyor system and any closing and/or separating device

3.6
closure area
vicinity at the opening which needs to be cleared in order to permit the shutting of the closure for the conveyor system

3.7
closure for a conveyor system
device to shut an opening for a conveyor system within a fire separating element

NOTE A closure for a conveyor system includes any component used to close the opening e.g. frames, guide rails, pivoting flaps, fittings and interlocking devices.

3.8
conveyor system
arrangement used to transport materials through an opening in a fire separating element

NOTE This can be conveyor tracks, remotely controlled or automatic equipment.

3.9
conveyor track
arrangement that guides the items to be transported

NOTE This can be e.g. belts, slides, rails, screws, chains and ducts or pipes in which airborne particles are moved.

3.10
penetration
aperture in a separating element for the passage of a penetrating component

3.11
penetrating component
elements such as cables, pneumatic and/or hydraulic pipes and the conveyor system which pass through the separating element and which may influence the performance of a closure for the conveyor system in relation to its fire resistance

3.12
penetration seal
system used to maintain the fire resistance of a separating element at the position where there is provision for penetrating components (e.g. essential parts of conveyor system, conduits, electrical cables and pipes) to pass through the fire separating element

3.13
separating device
arrangement used to separate a continuous conveyor system penetrating an opening in a fire resisting separating element to allow a closure to fully advance to its closed position

3.14
standard supporting construction
form of construction of known fire resistance used to close off the furnace and support the test specimen being evaluated

3.15
test specimen
complete closure and conveyor system assembly which is to be installed in a standard or associated supporting construction to allow it to be evaluated

4 Test equipment

The test equipment specified in EN 1363-1, and if applicable EN 1363-2, shall be used.

5 Test conditions

5.1 Heating conditions

The heating conditions and the furnace atmosphere shall conform to those given in EN 1363-1, or if applicable, EN 1363-2.

NOTE In the presence of any intumescent material used for the test specimen, requirements may exist to apply in addition to the standard temperature-time curve the slow heating curve as given in EN 1363-2.

5.2 Pressure conditions

5.2.1 Vertical installation

5.2.1.1 Closure for a conveyor system assembly installed in practice with its bottom edge not more than 0,5 m above floor level (floor position)

The furnace pressure for a vertically oriented test specimen shall conform to the conditions as given in EN 1363-1 (see Figure 1).

5.2.1.2 Closure for a conveyor system assembly installed in practice with its bottom edge more than 0,5 m above floor level (raised position)

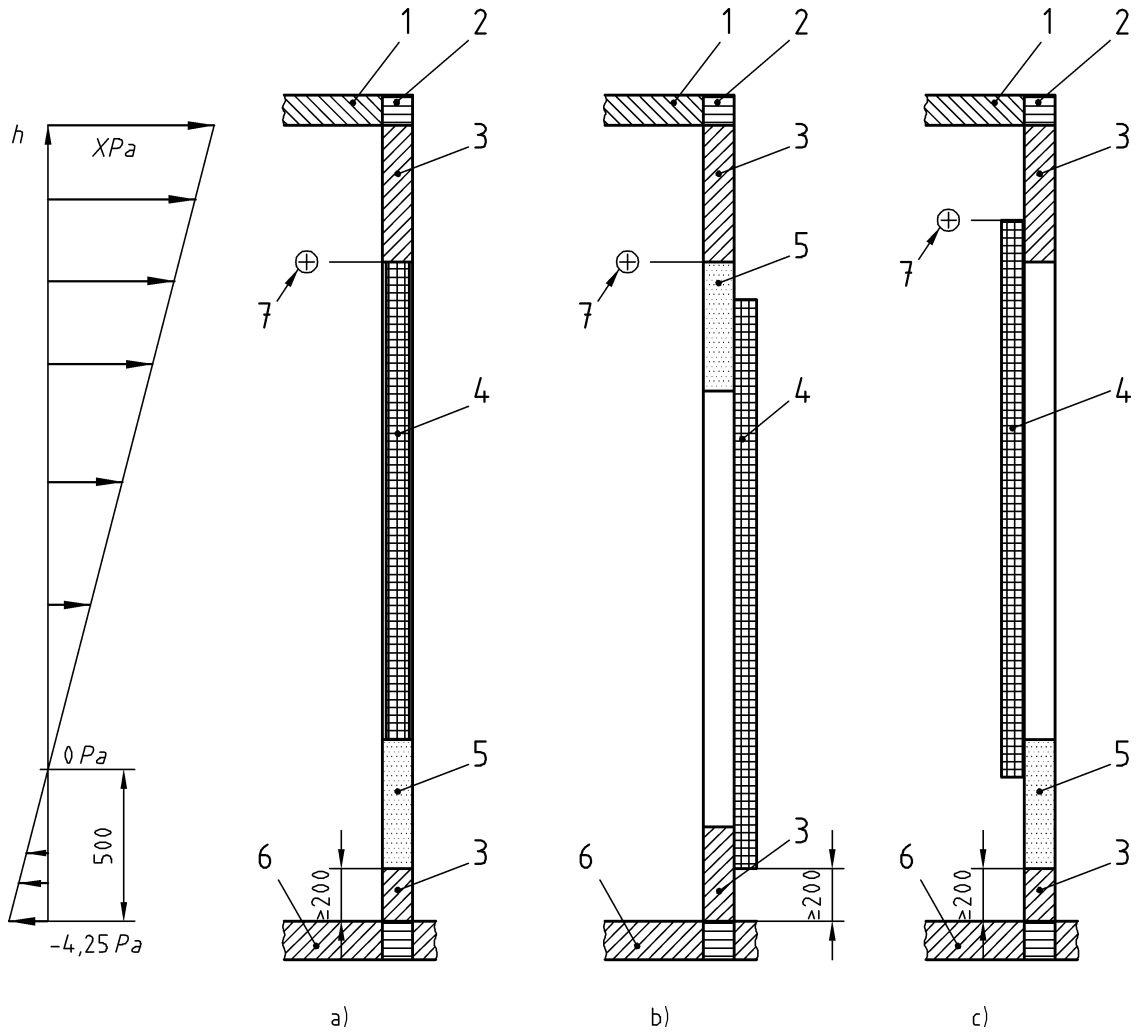
The furnace pressure for a vertically oriented test specimen shall conform to the conditions as given in EN 1363-1 with the exception that the pressure at bottom edge of the test specimen shall be maintained at a minimum of (5 ± 2) Pa. The pressure at the top of the test specimen may be larger than 20 Pa (see Figure 2).

5.2.2 Horizontal installation

The furnace pressure shall be measured at a distance of (100 ± 10) mm below the bottom horizontal plane of the test specimen. The furnace pressure shall be maintained at (20 ± 2) Pa (see Figure 6).

NOTE The bottom horizontal plane can be the bottom plane of the closure or the bottom plane of any penetration seal.

Dimensions in millimetres

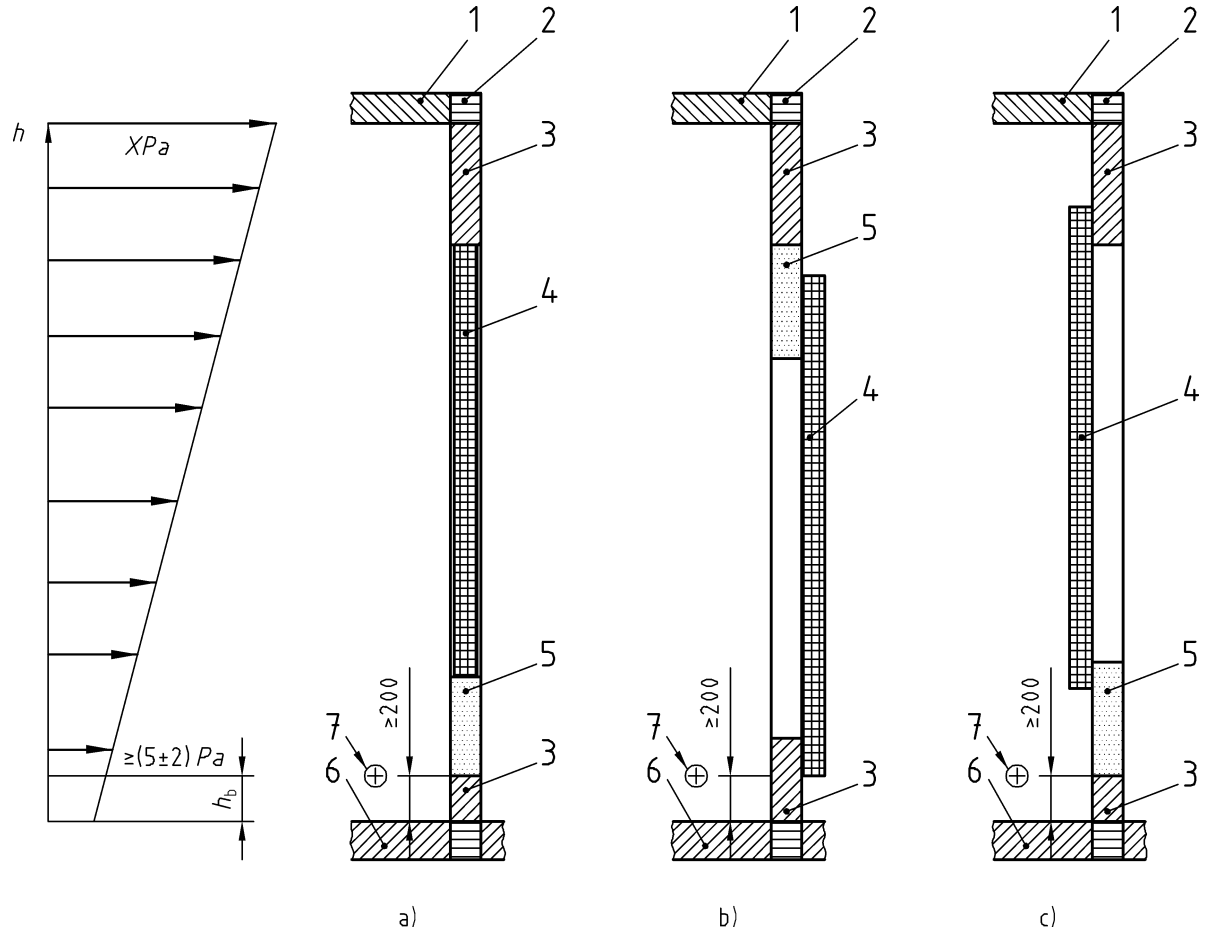


Key

1	Furnace cover	7	Controlled pressure position; maximum 20 Pa at the top of the test specimen for arrangements at floor position
2	Test frame		
3	Supporting construction		
4	Closure for a conveyor system	*h*	Height above furnace floor
5	Penetration seal	*X*	Pressure at height *h* above furnace floor
6	Furnace floor	a) to c)	Different installations of the test specimen

Figure 1 — Examples of different installations of closure and conveyor system assemblies in a vertical installation - pressure condition for floor position

Dimensions in millimetres



Key

1 Furnace cover
2 Test frame
3 Supporting construction
4 Closure for a conveyor system
5 Penetration seal
6 Furnace floor
7 Controlled pressure position; minimum (5 ± 2) Pa at the bottom of the test specimen for arrangements at raised position

h Height above furnace floor
h_b Height of the bottom edge of the test specimen above floor level
X Pressure at height h above furnace floor
a) to c) Different installations of the test specimen

Figure 2 — Examples of different installations of closure and conveyor system assemblies in a vertical installation - pressure condition for raised position

6 Test specimen

6.1 General

The test specimen shall be representative of the closure and conveyor system assembly as used in practice. Penetrating components shall be installed as given in 7.5.

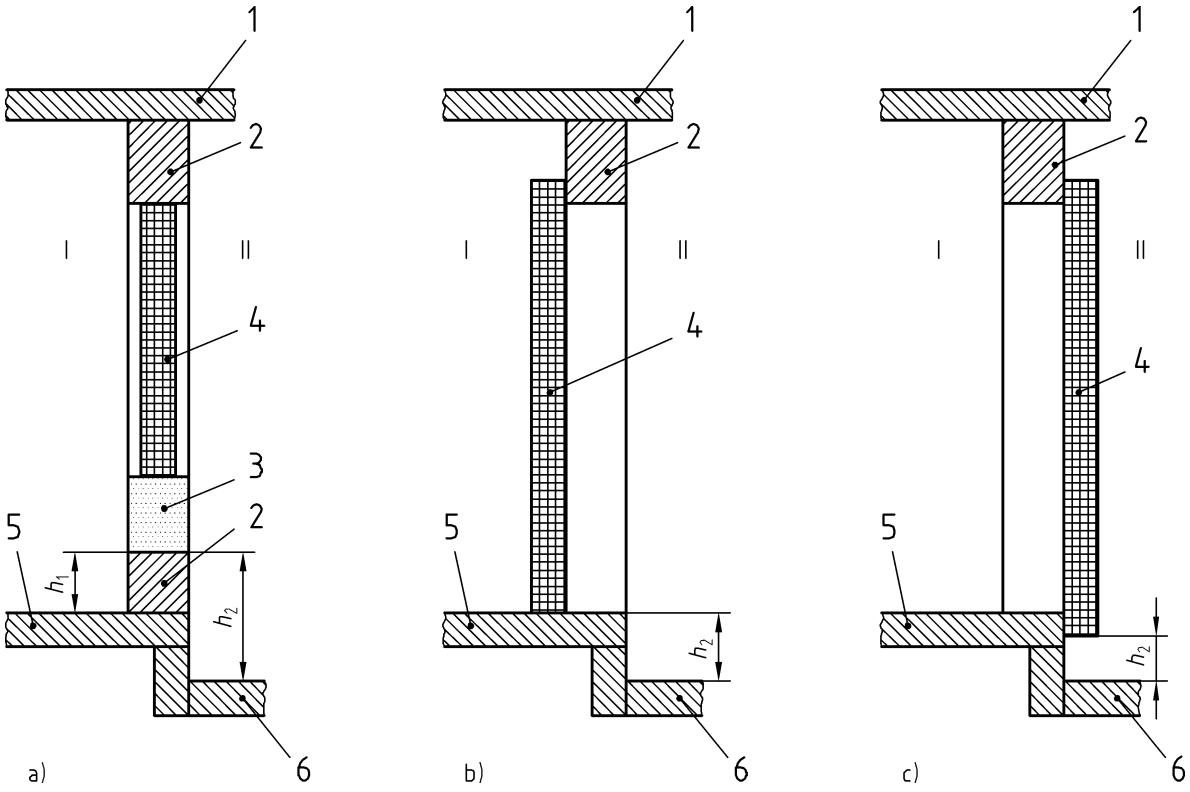
6.2 Size

The test specimen and all its components shall be full size unless limited by the size of the front opening of the furnace which will generally be 3 m $\times$ 3 m or in case of horizontal test specimen by the top opening of the furnace. Test specimens which cannot be tested at full size shall be tested to the maximum size possible consistent with 7.2.3.

6.3 Number

The number of test specimens shall be selected as described in EN 1363-1. If testing is carried out from one side only, whether due to the fact that the test specimen, including both floor arrangements on either side in terms of their height, is symmetrical or because it is only required to resist fire from one side, this shall be stated in the test report.

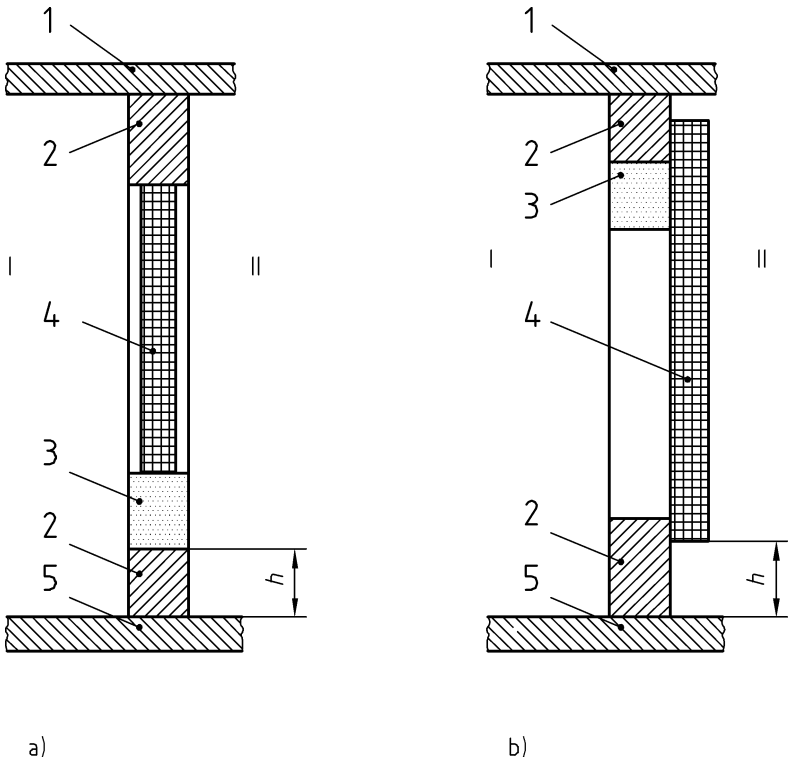
Figure 3 and Figure 4 give examples of different arrangements. From side I in Figure 3 the different arrangements shall be considered installations at floor position (see 5.2.1.1) provided $h_1 \leq 500$ mm. For $h_1 > 500$ mm this arrangement shall be considered a raised installation (see 5.2.1.2). Any arrangement from side II in Figure 3 shall be considered as a raised installation (see 5.2.1.2) provided $h_2 > 500$ mm. Any arrangement in Figure 4 shall be considered from either side as a raised installation (see 5.2.1.2) provided $h > 500$ mm. For $h \leq 500$ mm they shall be considered installations at floor position (see 5.2.1.1).



Key

1	Ceiling	a) to c)	Different installations of the closure and conveyor system assembly
2	Wall construction	h_1	Height from the floor to the bottom of the closure and conveyor system assembly from side I
3	Penetration seal	h_2	Height from the floor to the bottom of the closure and conveyor system assembly from side II
4	Closure for a conveyor system		
5	Floor on side I		
6	Floor on side II		

Figure 3 — Examples of different installations of closure and conveyor system assemblies in a vertical installation in practice – installation at different heights; floor on side I and side II at different heights



Key

1	Ceiling	a) to b)	Different installations of the closure and conveyor system assembly
2	Wall construction		
3	Penetration seal		
4	Closure for a conveyor system	*h*	Height from the floor to the bottom of the closure and conveyor system assembly from side I and side II
5	Floor		

Figure 4 — Examples of different installations of closure and conveyor system assemblies in a vertical installation in practice – installation at different heights; floor on side I and side II at the same height

6.4 Design

6.4.1 General

The design of the test specimen and the choice of supporting construction shall take into account the requirements of clause 13 if the widest field of direct application is to be achieved.

The test specimen shall be fully representative of the closure and conveyor system assembly intended for use in practice, including any appropriate surface finishes, fittings and penetrating components which are an essential part of the test specimen and may influence its behaviour in the test.

Annex C gives general guidance on the design of closure and conveyor system assemblies and their classification for self closing durability.

6.4.2 Pipe and cable end configuration

When pipes (e. g. for supply purposes) other than those for transportation of goods/materials are part of the test specimen, the pipe end configurations shall be capped on the exposed side of the test specimen.

Capping of pipes shall be carried out by closing the exposed pipe end with a mineral wool disc of a thickness of (75 ± 10) mm and a density of (150 ± 50) kg/m^3 fixed in place with an appropriate adhesive (e.g. sodium silicate adhesive). Alternatively, the pipe may be capped by welding a disc of the same material as the pipe onto the end of the pipe together with the mineral wool above. In cases of a vertical test specimen any mineral wool shall be fixed additionally by mechanical means.

The heated ends of solid elements such as electrical conductors shall be left uncapped. Cables projecting from the unheated face of the test specimen shall be capped using a proprietary method to prevent hot gases escaping.

6.4.3 Subsequent addition of penetrating components within the penetration seal of a test specimen

If it is the intention of the test to represent the effect of adding extra penetrating components or altering the number and/or type of penetrating components running through the penetration seal subsequent to installation in practice at a later servicing life, then the following procedure shall be followed.

After installation of the penetration sealing system together with the initial penetrating components into the appropriate supporting construction, the test construction shall be conditioned in accordance with clause 8. After this period any required modifications shall be made to the penetrating component(s) as required to be evaluated and the test construction conditioned again in accordance to clause 8 before testing.

Any such procedures shall be fully described in the test report.

NOTE This applies particularly for part configuration test specimens as described in 7.6.

6.4.4 Conveyor tracks as pipes or ducts for transportation of airborne particles

Conveyor tracks such as pipes or ducts for the transportation of suspended particles together with their closures shall be designed and installed as in practice (see 7.7 for different configurations).

6.5 Construction

The test specimen shall be constructed as described in EN 1363-1.

6.6 Verification

The sponsor shall provide a specification to a level of detail sufficient to allow the laboratory to conduct a detailed examination of the test specimen before the test and to agree the accuracy of the information supplied. EN 1363-1 provides detailed guidance on verification of the test specimen.

When the method of construction precludes a detailed survey of the specimen, without having to permanently damage it or if it is considered that it will subsequently be impossible to evaluate construction details from a post test examination, then one of two options shall be exercised by the laboratory, either:

a) the laboratory shall request to oversee the manufacture of the closure or any other parts of the assembly which are to be the subject of the test; or

b) the sponsor shall, at the discretion of the laboratory, be requested to supply, over and above the number of test specimens, an additional assembly or that part of the assembly for which details cannot be verified from the test specimen. The laboratory shall then choose which specimen shall be submitted to the test and which shall be used to verify the construction.

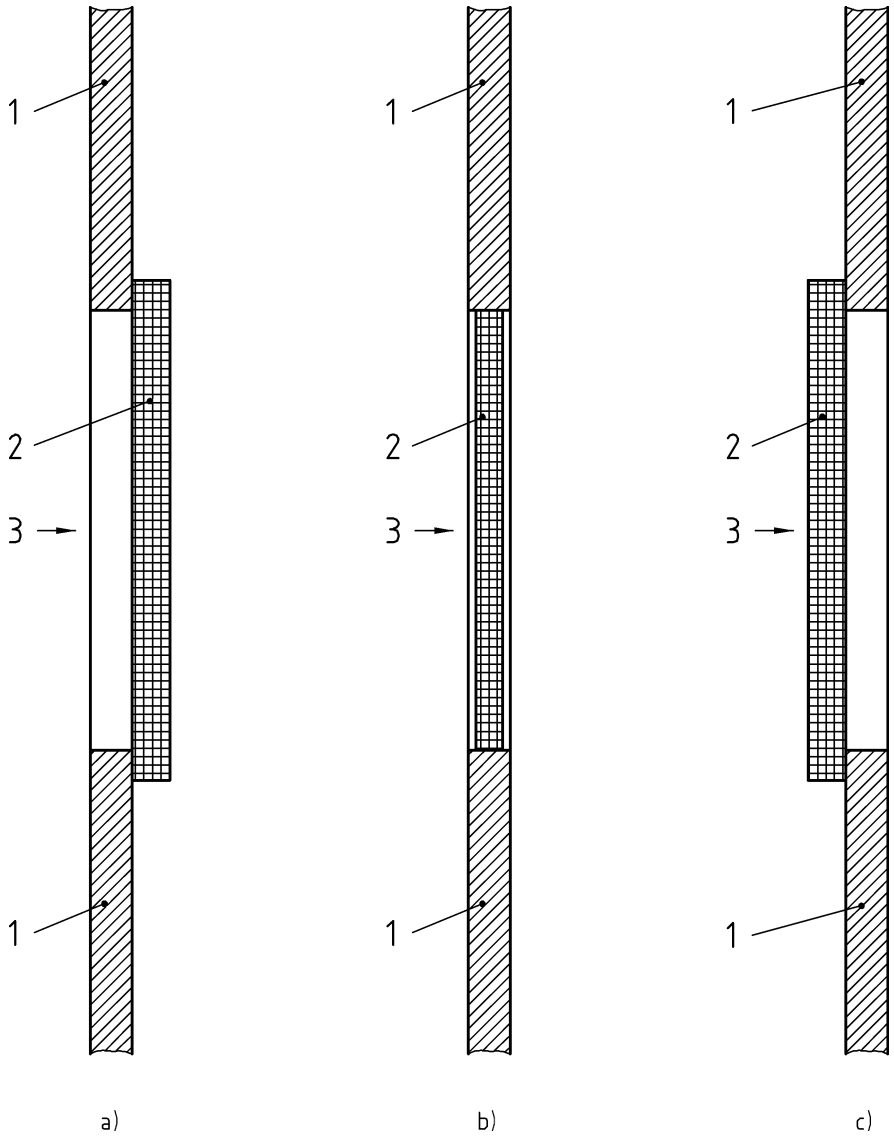
7 Installation of test specimen

7.1 General

The test specimen shall be installed, as far as practicable, in a manner representative of its use in practice. Figure 5 to Figure 7 show different installation conditions for vertical and horizontal separating elements in a schematic arrangement.

Although the Figures 5 to 7 are shown with horizontal and vertical supporting constructions and test specimens, it is possible for conveyor systems to pass through either non-horizontal or non-vertical supporting constructions or at an angle other than an angle of 90 in two different directions to the supporting construction.

NOTE 1 For clarity, penetrations and penetrating components (including conveyor systems) are not shown except for Figure 6 where penetrations are shown.



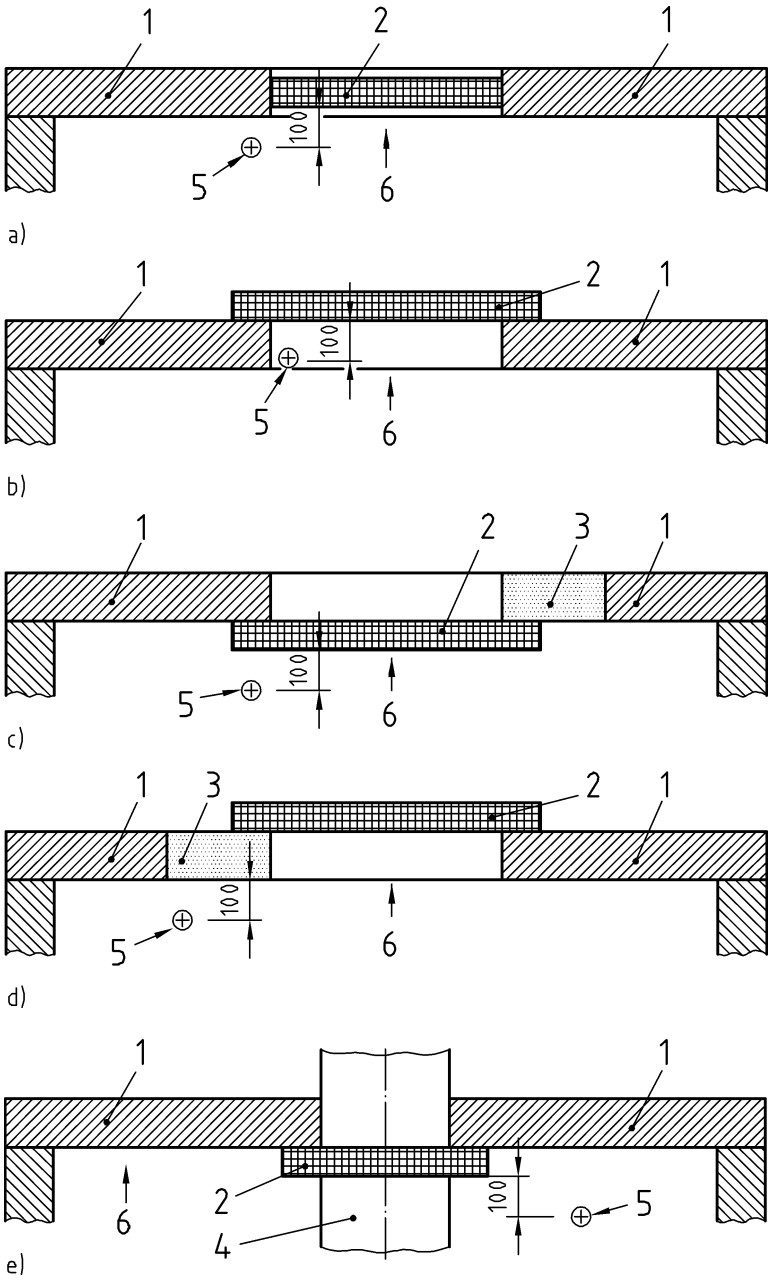
Key

1 Vertical separating element
2 Closure for a conveyor system
3 Direction of fire exposure

a) to c) Different installations of the test specimen

Figure 5 — Closure and conveyor system assemblies; schematic arrangement with supporting construction, vertical installation; horizontal cross section

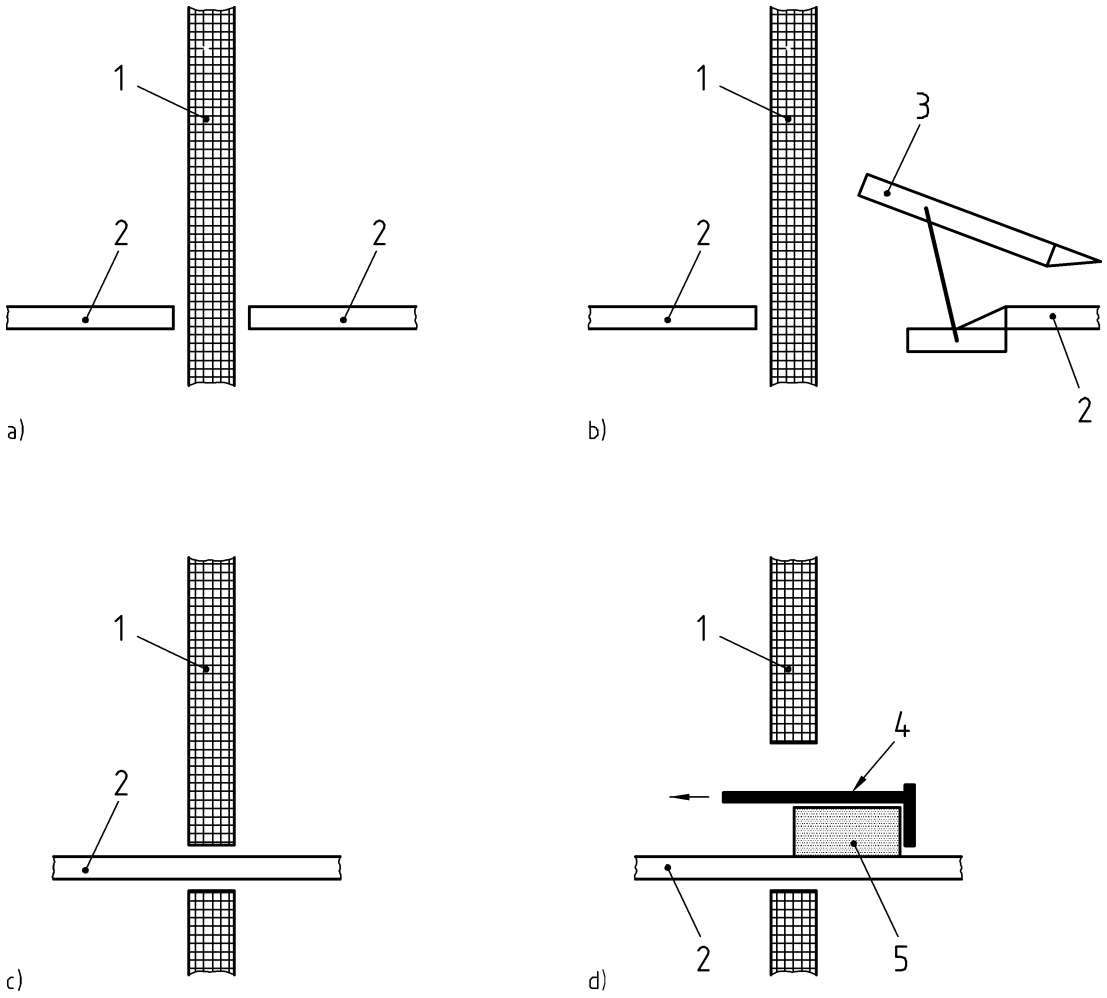
Dimensions in millimetres



Key

1	Horizontal separating element	5	Controlled pressure position together with level for plate thermometer
2	Closure for a conveyor system	6	Direction of fire exposure
3	Penetration seal	a) to e)	Different arrangements of the test specimen
4	Exposed duct/pipe part		

Figure 6 — Closure and conveyor system assemblies; schematic arrangement with supporting construction, horizontal installation; vertical cross section



Key

1 Closure for a conveyor system
2 Conveyor track
3 Separating device for the conveyor track
4 Clearing device to clear the closure area of any Goods
5 Transported goods
a) to d) Different arrangements of conveyor tracks around a closure

Figure 7 — Closure and conveyor system assemblies; schematic arrangements of conveyor tracks in the closure area

The test specimen shall be mounted in a supporting construction which covers the type in which it is intended to be used. The design of the connection between the closure and conveyor system assembly and the supporting construction, including any fixings and materials used to make the junction, shall be as used in practice and shall be regarded as part of the test specimen. The closure and frame/guide assembly shall be mounted within or on the supporting construction as done in practice.

NOTE 2 There is no need to install e.g. a guide for a closure for a conveyor system which is used to open and shut the closure which otherwise would extend considerably over the test construction limiting therefore the size of the test specimen.

The whole area of the test specimen, together with at least the minimum dimensions of the supporting construction required by 7.2.3, shall be exposed to the heating conditions.

7.2 Supporting construction

7.2.1 General

The fire resistance of any supporting construction, either floor or wall, shall be at least commensurate with that anticipated for the closure for a conveyor system.

The supporting construction chosen for the test may be a standard supporting construction or the actual construction to be used in practice referred to as associated supporting construction. If one of the standard supporting constructions given in 7.2.2 is used, the results may be applicable to a wider field of direct application in accordance with the provisions in clause 13. In accordance with clause 13 the result of a test in an associated supporting construction shall only be applicable to that form of construction.

7.2.2 Standard supporting constructions

7.2.2.1 General

The choice of a standard supporting construction shall reflect the intended normal use of the closure and conveyor system assembly. Care shall be taken in selecting a sufficiently rigid standard supporting construction in particular for test specimens intended to represent products to be installed at a height *h* greater 0,5 m above floor level (raised position) and for any horizontal installation.

The standard supporting construction shall be chosen from those given in EN 1363-1 together with 7.2.2.2 and 7.2.2.3.

7.2.2.2 Vertical installation

7.2.2.2.1 High density rigid construction

Table 1 — Standard high density rigid wall constructions (masonry or normal concrete)

Fire resistance, *t* min	**Thickness** mm	**Density** kg/m^3
120	110 ± 10	1 200 ± 400
180	150 ± 10	1 200 ± 400
240	175 ± 10	1 200 ± 400
NOTE This supporting construction may be made from blocks, bonded together with mortar or adhesive.		

7.2.2.2.2 Low density rigid construction

Table 2 — Standard low density rigid wall constructions (aerated concrete)

Fire resistance, t min	Thickness mm	Density kg/m^3
30	75	650 ± 200
60	100	650 ± 200
90	125	650 ± 200
120	150	650 ± 200
180	175	650 ± 200
240	200	650 ± 200
NOTE This supporting construction may be made from blocks, bonded together with mortar or adhesive.		

7.2.2.2.3 Flexible construction

Table 3 — Standard flexible wall constructions (gypsum plasterboard type F to prEN 520)

Fire resistance min	Wall constructions			
	Number of layers on each side	Thickness mm	Insulation D/ρ	Thickness ± 10 % mm
30	1	12,5	40 / 40	75
60	2	12,5	40 / 40	100
90	2	12,5	60 / 50	125
120	2	15	60 / 100	160
180	3	12,5	60 / 100	175
240	3	15	80 / 100	190
D is the thickness in mm of mineral wool (stone wool) insulation inside the wall. ρ is the density in kg/m^3 of mineral wool (stone wool) insulation inside the wall.				

7.2.2.3 Horizontal installation

7.2.2.3.1 High density rigid construction

The standard supporting constructions for concrete floor separating elements shall have a density of (1 200 ± 400) kg/m^3 and a thickness of (150 ± 10) mm.

7.2.2.3.2 Low density rigid construction

The standard supporting constructions for concrete floor separating elements shall have a density of (650 ± 200) kg/m^3 and a thickness of (150 ± 10) mm.

7.2.2.3.3 Flexible construction

In the case of flexible floor constructions, e.g. timber joist floors, the minimum size of the standard supporting construction shall be 4 m in span and 2 m in width.

7.2.3 Erection of the standard supporting constructions

For high and low density rigid standard supporting constructions the wall or floor shall be erected with no freedom to distort perpendicular to the plane of the wall or floor along the vertical edges for walls or the longer side for floors, i.e. it shall be fixed to the inside of the test frame as in practice with all four edges supported.

For flexible standard supporting constructions the wall or floor shall be erected so that it can distort freely perpendicular to the plane of the construction along the vertical edges for walls or along the unsupported sides for floors.

The standard supporting construction shall be built within a test frame conforming to EN 1363-1. The supporting construction shall be prepared in advance of the fitting of the test specimen leaving an aperture of the required size, except when it is normally erected in conjunction with the closure and conveyor system assembly using fixing methods as in practice. There shall be a minimum zone of supporting construction of 200 mm wide exposed within the furnace, each side and over the top and bottom of the aperture into which the test specimen is to be fixed. If in practice for closure and conveyor system assemblies at floor position there is less than 200 mm supporting construction at the bottom, then the actual size may be used with a restricted field of direct application (see also 7.3).

7.3 Bottom edge of the closure

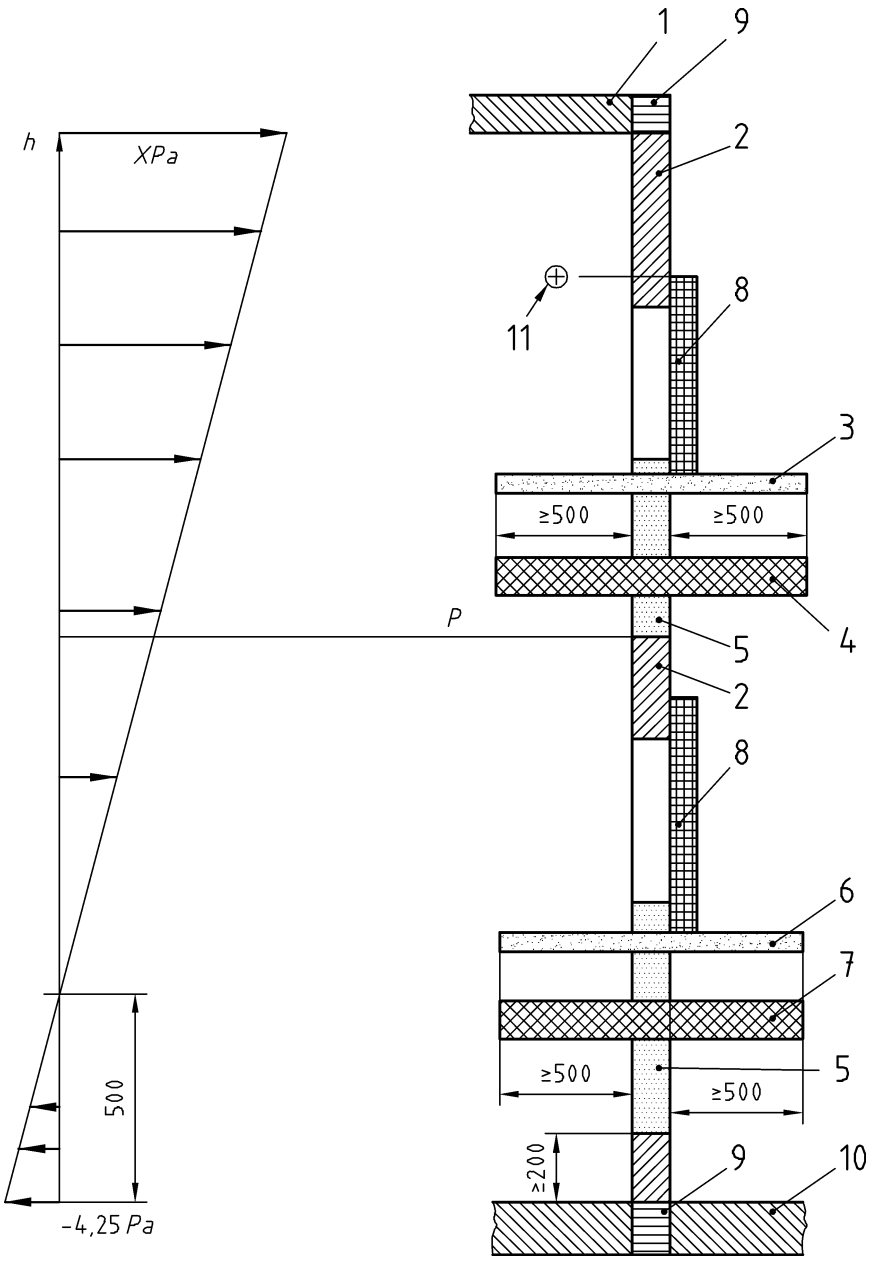
The bottom edge of the closure shall be at least 200 mm above the floor level of the furnace unless this dimension is less in practice, in which case this measurement may be used with a restricted field of direct application (see clause 13).

7.4 Multiple test specimens

The test construction may incorporate more than one test specimen (see Figure 8), either as a full size test specimen or as a part configuration (see 7.6), providing that there is a minimum separation of 200 mm between each test specimen and between the test specimens and the edge of the furnace allowing for the minimum width of supporting construction. When more than one test specimen is incorporated into a single supporting construction care shall be taken to ensure that there is no interaction between different test specimens during the test. This in particular means no support of one part of a test specimen by the parts of another test specimen.

Particular attention shall be focused on maintaining the required furnace conditions during the entire test duration, particularly after one test specimen has failed performance criteria. Each test specimen shall be the subject of a separate evaluation.

Dimensions in millimetres



Key

1 Furnace cover
2 Vertical supporting construction
3 Conveyor track
4 Penetrating component
5 Penetration seal
6 Conveyor track
7 Penetrating component
8 Closure for a conveyor system
9 Test frame
10 Furnace floor
11 Controlled pressure position at the top of the highest Test specimen; maximum pressure 20 Pa

h Height above furnace floor
X Pressure at height h above furnace floor
P Pressure at the bottom of the top test specimen. If P is at least (5 ± 2) Pa, this test specimen will qualify for a raised position

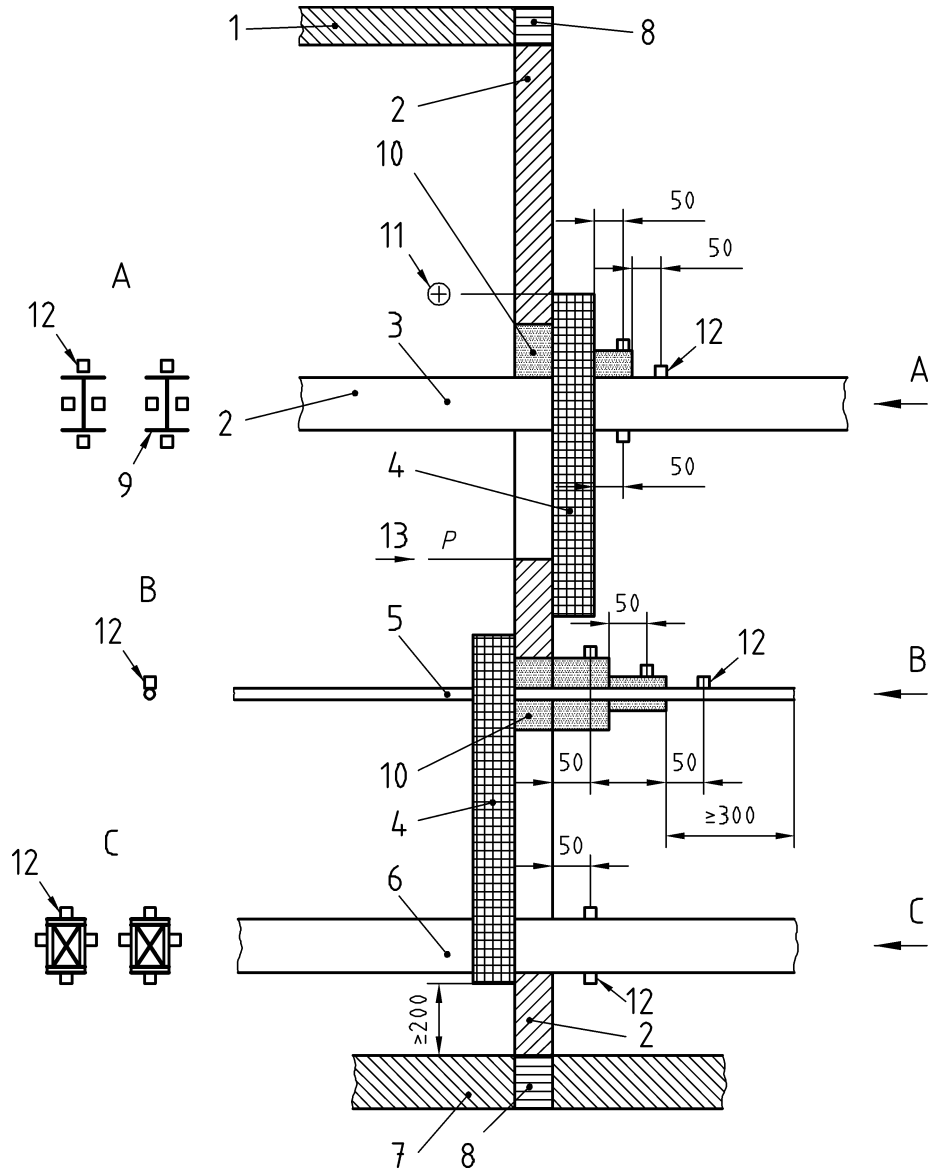
Figure 8 — Example of multiple test specimens in a single vertical test construction – pressure condition as for floor position

7.5 Detail at any penetration

In the following it is considered that the penetration is at the bottom of the test specimen. However, in practice this may be at the top or elsewhere which will be reflected by the test specimen. The requirements which are given for the bottom location shall simply be exchanged to the required position, e.g. change the word bottom to top.

Particular care shall be focused on the details at the bottom edge of the closure including any penetration seals. Any penetrating components (e.g. supply lines, electrical cables, pneumatic and hydraulic lines, parts of the conveyor track) shall have a minimum length of 500 mm on either side of the supporting construction of which at least 300 mm shall extend beyond the extremities of the penetration sealing system (see Figure 8 and Figure 9). All of these penetrating components and any conveyor track shall be constructed and installed in a manner representative of practice. Additional support of these penetrating components including the conveyor track may be required at either end. This, however, shall not give more support or restraint to the penetrating components or the conveyor track than it would in practice at that point (see also 7.6 for part configuration).

Dimensions in millimetres



Key

1 Furnace cover
2 Vertical supporting construction
3 Conveyor track
4 Closure for a conveyor system
5 Penetrating components (e. g. a pipe)
6 Conveyor track
7 Furnace floor
8 Test frame
9 Example of a conveyor track profile
10 Penetration seal
11 Controlled pressure position at the top of the highest test specimen; maximum pressure 20 Pa
12 Unexposed thermocouple
13 Direction of fire exposure

P Pressure at the bottom of the top test specimen. If P is at least (5 ± 2) Pa, this test specimen will qualify for a raised position

Figure 9 — Example of multiple test specimens with penetrating components in a single vertical test construction – pressure condition as for floor position; positioning of thermocouples on the unexposed side of the penetrating components

7.6 Part configuration test specimen for the assessment of penetrating components

In order to prevent the need for repeated tests on full size test specimens due to changes in the penetrating components, a part configuration test is permitted. The use of part configuration tests is explained in annex B.

For a part configuration test specimen the penetration area to be tested shall be surrounded by at least 200 mm of closure leaf and/or closure frame and/or supporting construction as applicable to the particular detail (see Figures 10 and 11). All sides of this part configuration test specimen shall be supported by the same supporting construction of at least 200 mm width as used for the full size test specimen unless in practice a smaller height at the bottom is required then this may be used (see also 7.2.3 and 7.3). The part of the closure of at least 200 mm width shall be fully restrained on all sides adjacent to the supporting construction. The cut off edge shall be prepared similar to the relevant edge of the original test specimen to allow for a good contact with the supporting construction. The gap between the closure and the penetration shall be as in practice together will the penetration detail.

Pressure:

a) Pressure condition for floor position (see Figure 10)

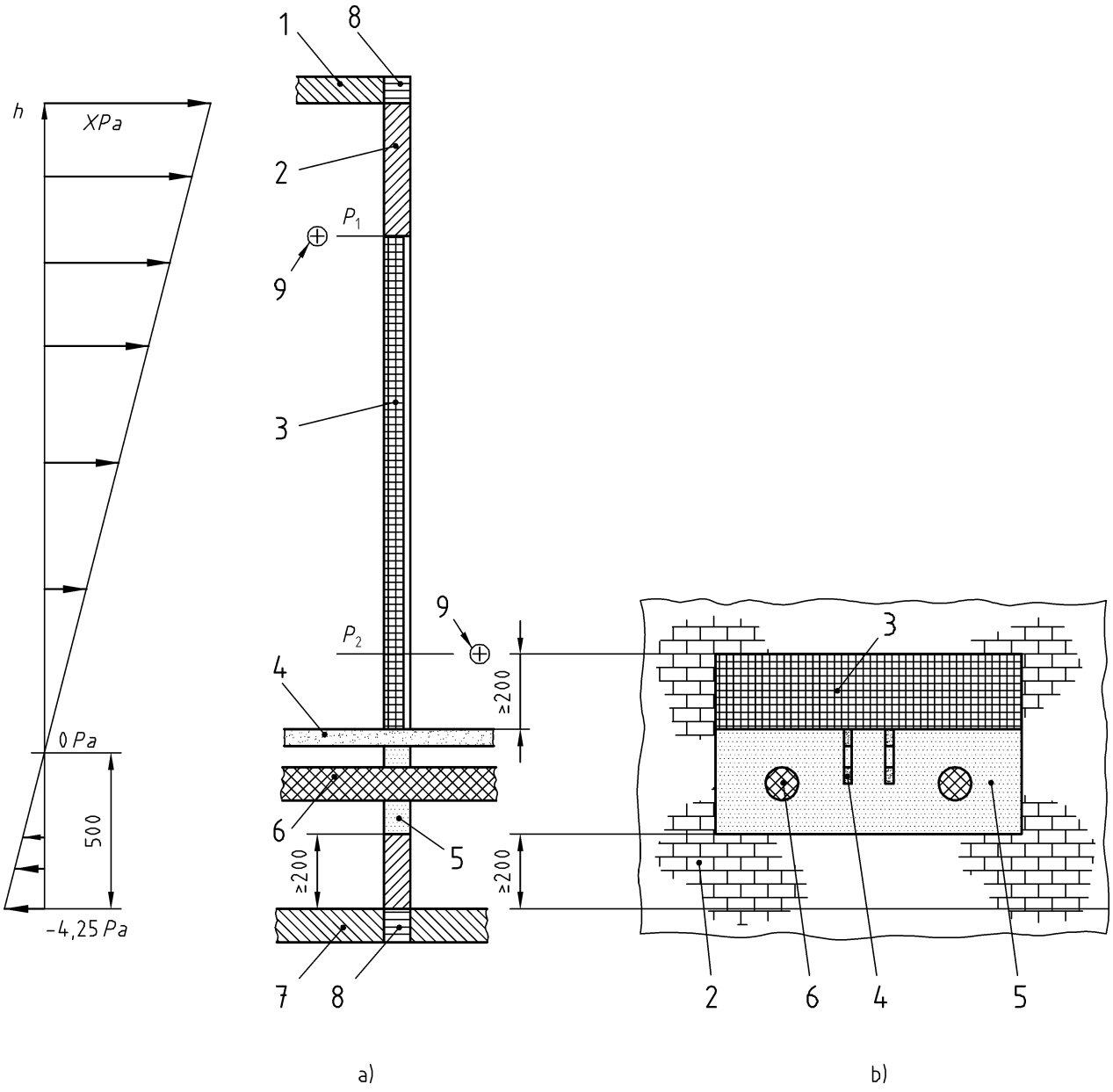
   The pressure P_2 at the top of the part configuration test specimen shall be at least the same pressure as for the full size test specimen at the same appropriate vertical position.

b) Pressure condition for raised position (see Figure 11)

   The pressure P_2 at the bottom of the part configuration test specimen shall be at least the same pressure as for the full size test specimen at the same appropriate vertical position.

NOTE The part configuration test specimen is particularly suitable for a test construction to incorporate more than one part configuration test specimen.

Dimensions in millimetres



Key

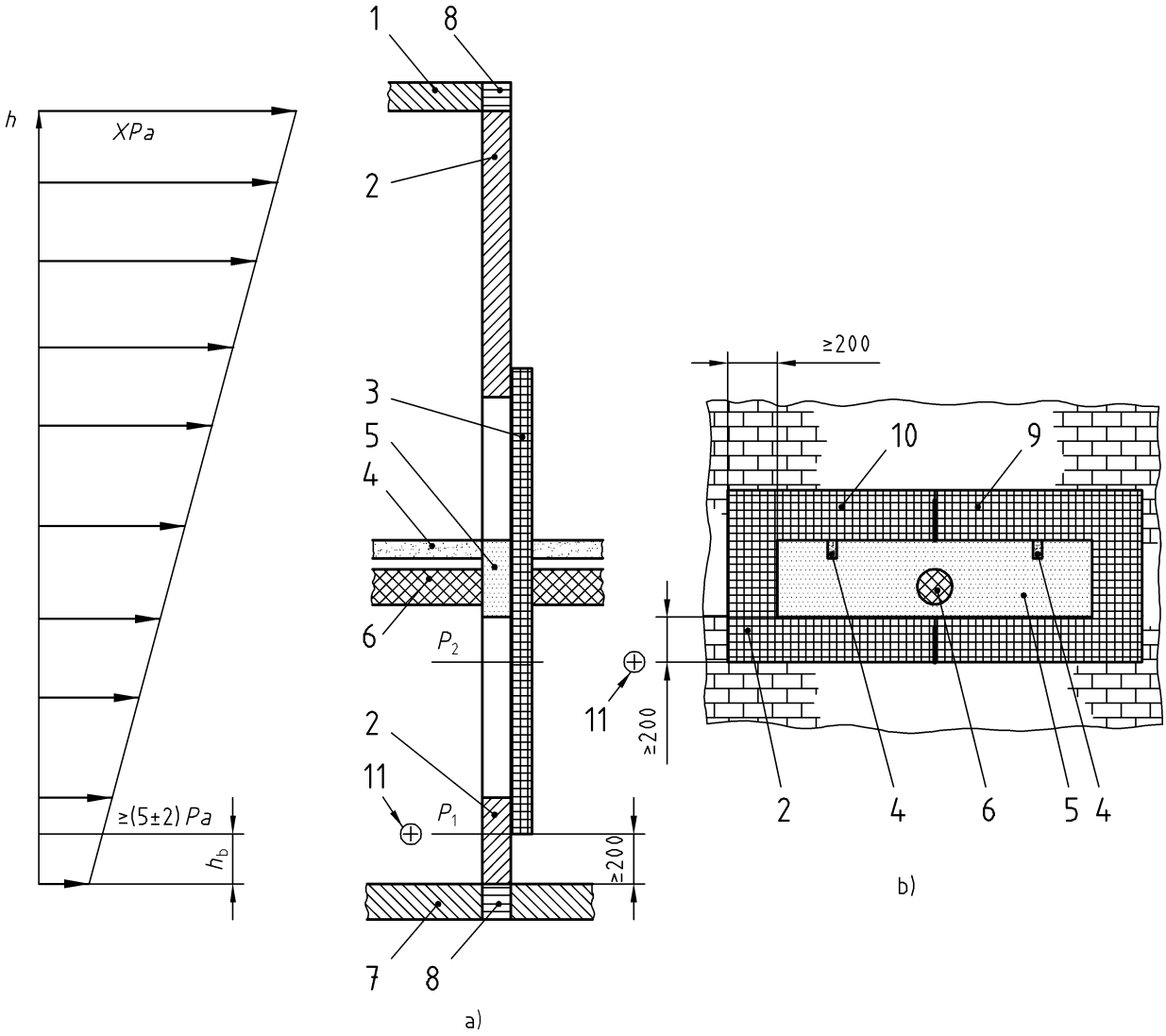
1 Furnace cover
2 Vertical supporting construction
3 Closure for a conveyor system
4 Conveyor track
5 Penetration seal
6 Penetrating components
7 Furnace floor
8 Test frame
9 Controlled pressure position at the top of the part configuration test specimen; maximum pressure 20 Pa (see also 7.6)

a) Full size test specimen
b) Part configuration test specimen

h Height above furnace floor
P_1 Pressure at the top of the full size test specimen
P_2 Pressure at the top of the part configuration test specimen
X pressure at height *h* above furnace floor

Figure 10 — Example for a part configuration test specimen with penetrating components in a single vertical test construction – pressure condition as for floor position

Dimensions in millimetres



Key

1 Furnace cover
2 Vertical supporting construction
3 Closure for a conveyor system
4 Conveyor track
5 Penetration seal
6 Penetrating components
7 Furnace floor
8 Test frame
9 Right leaf of closure
10 Left leaf of closure
11 Controlled pressure position at the bottom of the part configuration test specimen (see also 7.6)

a) Full size test specimen
b) Part configuration test specimen

h Height above furnace floor
h_b Height of the bottom edge of the test specimen above floor level
P_1 Pressure at the bottom of the full size test specimen
P_2 Pressure at the bottom of the part configuration test specimen
X Pressure at height h above furnace floor

Figure 11 — Example for a part configuration test specimen with penetrating components in a single vertical test construction – pressure condition as for raised position

7.7 Conveyor track as a duct or pipe configuration

7.7.1 General

The installation of the test specimen shall be as in practice. Two different cases are distinguished as given in 7.7.2 and 7.7.3.

NOTE Part configuration testing is not envisaged for conveyor tracks in the form of ducts or pipes.

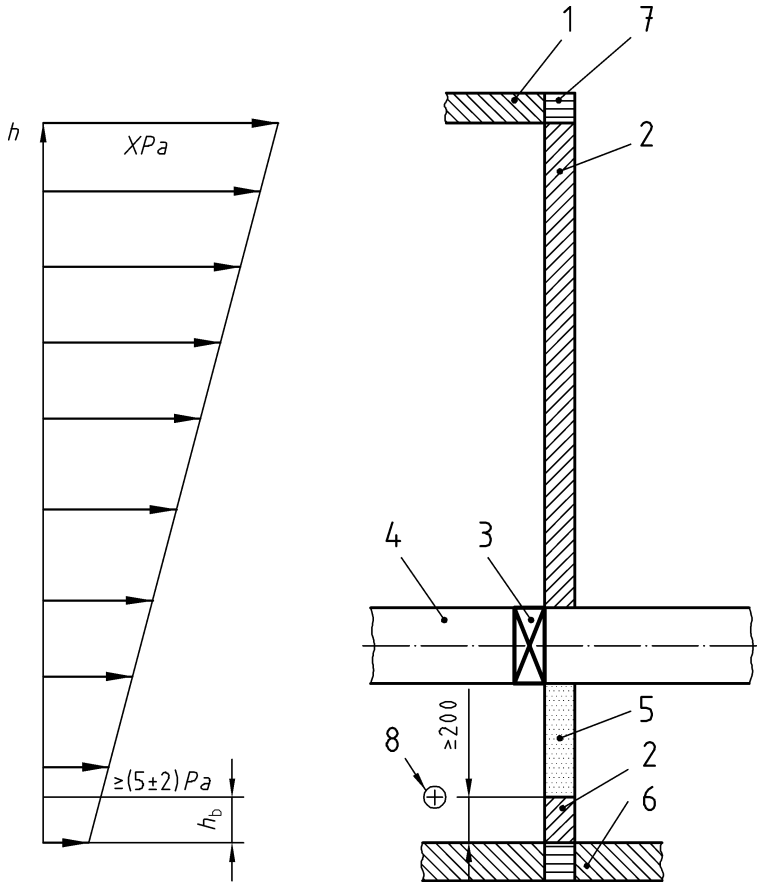
7.7.2 Uninterrupted duct or pipe penetration

For an uninterrupted duct or pipe penetration (see Figure 12) the duct or pipe configuration shall be assessed for the insulation criterion using the locations for thermocouples as given in 9.1.2.3.1.

7.7.3 Separated duct or pipe penetration

Separated ducts or pipe penetrations where the two ends are not thermally insulated from each other shall be treated as uninterrupted duct or pipe penetrations as given in 7.7.2. Where the two separated ends of the penetrating duct or pipe are thermally insulated from each other and the closure is fully assessed together with the unexposed pipe or duct then this may result in a wider field of direct application (see 9.1.2.3.2 and Figure 13 and Figure 21).

Dimensions in millimetres



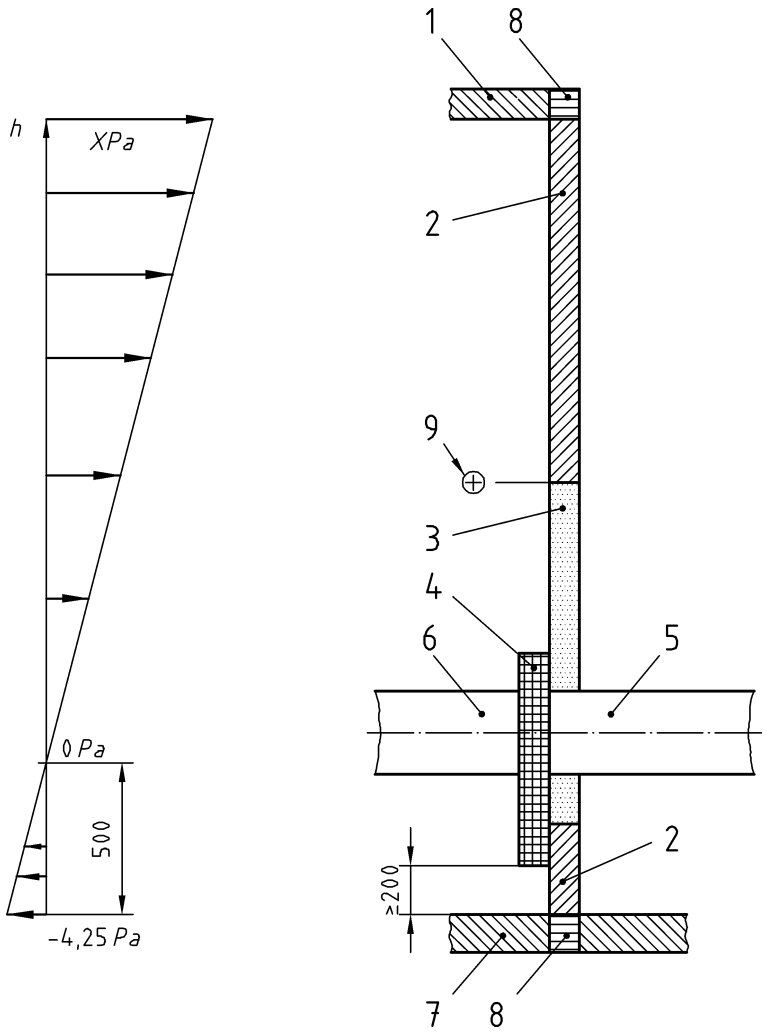
Key

1 Furnace cover
2 Vertical supporting construction
3 Closure for a conveyor system
4 Uninterrupted duct or pipe penetration
5 Penetration seal
6 Furnace floor
7 Test frame
8 Controlled pressure position at the bottom edge of the part configuration test specimen

h Height above furnace floor
h_b Height of the bottom edge of the test specimen above floor level
X Pressure at height h above furnace floor

Figure 12 — Example for an uninterrupted duct or pipe penetration as a test specimen in a single vertical test construction – pressure condition as for raised position

Dimensions in millimetres



Key

1 Furnace cover
2 Vertical supporting construction
3 Penetration seal
4 Closure for a conveyor system
5 Unexposed part of separated duct/pipe
6 Exposed part of separated duct/pipe
7 Furnace floor
8 Test frame
9 Controlled pressure position at the top of the part configuration test specimen

h Height above furnace floor
X Pressure at height h above furnace floor

Figure 13 — Example for a separated duct or pipe penetration as a test specimen in a single vertical test construction – pressure condition as for floor position

7.8 Gaps

The adjustment of the gaps in a closure for a conveyor system shall be within the tolerances of the design values stipulated by the sponsor. These shall be representative of those used in practice so that appropriate clearances exist, e.g. between the fixed and moveable components.

Where the sponsor seeks the widest field of direct application, the gaps shall be set in between the middle value and the maximum value within the range of gaps given by the sponsor.

NOTE Suitable examples of gap measurements are given in EN 1634-1.

7.9 Different heights of the floor on either side of the test specimen

In practice different arrangements on either side of the closure in terms of the height of the floor may be encountered (see Figure 3 and Figure 4). This situation is treated as an unsymmetrical arrangement. For the test specimen this also means an unsymmetrical condition. If the test specimen will be required to be tested from both sides then only the different height of the test specimen above floor level on either side will need to be considered for an otherwise fully symmetrical test specimen. The unexposed side of the test specimen does not need to take the different height of the floor level into account, that means that the floor during the test may be level on the two sides.

8 Conditioning

8.1 Moisture content

The test specimen shall be conditioned in accordance with EN 1363-1.

8.2 Hygroscopic sealing materials

Hygroscopic materials used to seal the gap between the supporting construction and the closure for a conveyor system where the gap is ≤ 10 mm wide shall be conditioned for seven days before fire testing.

Hygroscopic materials used to seal the gap between the supporting construction and the closure for a conveyor system where the gap is > 10 mm wide shall be conditioned for 28 days before fire testing.

8.3 Mechanical conditioning (Opening and closing tests prior to the fire resistance test)

8.3.1 General

For the purposes of fire testing, mechanical conditioning of the test specimen shall be carried out within the supporting construction in the test frame prior to the fire resistance test. If such tests are not carried out in front of the furnace, the test positions for mechanical conditioning and fire resistance testing shall be identical.

8.3.2 Operability test

Prior to the fire resistance test, the operability of the test specimen shall be demonstrated by a minimum of 25 opening and closing cycles of operation. Where possible this shall be performed in accordance with the procedures of EN 1191 or EN 12605.

8.3.3 Shakedown test

Prior to the fire resistance test, test specimens whose performance is dependent on loose or friable core insulation material shall be subject to 5 000 cycles of operation with a 50 % increase of the normal operational speed in accordance with EN 1191 or EN 12605 for manual closures or at the maximum operational speed possible with power operated closures.

For test specimens where this shakedown test is necessary, it shall be deemed to cover the requirement for the operability test to 8.3.2.

8.3.4 Release mechanism test

The release mechanism(s), if applicable, which are used to override the normal operating conditions of a closure, which are incorporated onto the test specimen shall be tested for functional response by 25 operations either prior to the fire resistance test on that test specimen or on an alternative test specimen. This test may be completed in conjunction with the operability test (see 8.3.2).

9 Application of instrumentation

9.1 Thermocouples

9.1.1 Furnace thermocouples (plate thermometers)

Plate thermometers shall be provided in accordance with EN 1363-1. They shall be evenly distributed over a vertical plane 100 mm from the nearest plane of the test specimen (excluding any plane through penetrating components) for a vertical installation or over a horizontal plane 100 mm below the nearest plane of the test specimen (excluding any plane through penetrating components) for a horizontal installation (see Figure 6).

In addition no part of the plate thermometer in the area of any penetration shall be closer than 100 mm to any projecting part of the seal, a penetrating component including a conveyor system or any part of the furnace at the start of the test.

In addition where ducts or pipes are used as conveyor systems at least one plate thermometer shall be positioned at a distance of 100 mm from the surface of the duct or pipe.

There shall be at least one plate thermometer for every 1,5 m^2 of the exposed surface area of the test specimen, subject to a minimum of four.

For a vertical installation the plate thermometers shall be oriented so that side ‘A’ faces the back wall of the furnace.

For a horizontal installation the plate thermometers shall be oriented so that side ‘A’ faces the floor of the furnace.

9.1.2 Unexposed face thermocouples

9.1.2.1 General

Where no evaluation against the insulation criteria is required for the closure and conveyor system assembly, or any part thereof, no unexposed thermocouples for temperature measurements are required.

Where compliance with the insulation criteria is required to be evaluated, thermocouples of the type specified in EN 1363-1 shall be attached to the unexposed face for the purpose of obtaining the average and maximum surface temperatures. General principles for the attachment and exclusion of thermocouples given in EN 1363-1 shall apply.

The sponsor shall instruct the laboratory if he requires evaluation of the closure for a conveyor system against the supplementary procedure as given in 9.1.2.2.1.3 as this requires the application of additional thermocouples for this purpose.

The temperature of the supporting construction in which the closure for a conveyor system is mounted is not required to be measured and therefore no thermocouples are required to be attached to it.

NOTE It is assumed that the supporting construction has at least the same insulation performance as the expected insulation performance of the test specimen (see also 7.2.1).

There are three different groups of unexposed thermocouples fixed to the closure for a conveyor system:

— T_F on the frame/guide of the closure, if applicable, (max 360 °C/max 180 °C for an insulation classification of either I_1 or I_2), see 9.1.2.2.1.1;

— T_{C1} and T_{C1a} (max 180 °C) on the closure at 100 mm from the border line of the visible part of the closure (T_{C1}) or for the supplementary procedure at 25 mm from the border line of the visible part of the closure (T_{C1a}) , see 9.1.2.2.1.2 and 9.1.2.2.1.3;

— T_{C2} (max 180 °C, average 140 °C) on the closure within its centre area which are used to determine the average temperature together with the maximum temperature, see 9.1.2.2.2.

If the closure incorporates discrete areas of different thermal insulation ≥ 0,1 m^2, the requirements given in EN 1634-1 shall be followed.

When the total area of a single portion of the closure for a conveyor system represents less than 0,1 m^2, it shall be disregarded for the purpose of ascertaining the average unexposed face temperature.

The arrangement of thermocouples on closures for conveyor systems with a shape of the closure other then rectangular shall be as given in annex A.

Additional rules for the application of unexposed thermocouples for a conveyor system in the form of ducts or pipes are given in 9.1.2.3.

Additional rules for the application of unexposed thermocouples for any penetration seal and any penetrating components other than conveyor tracks are given in 9.1.2.4.

Additional rules for the application of unexposed thermocouples for a penetrating conveyor track are given in 9.1.2.5.

Additional thermocouples shall be fixed to other areas of the test specimen where the temperature might be expected to be higher than allowed for the appropriate position within the area of the test specimen permitted for assessment (see 9.1.2.2.1.4 as a principle example for the closure).

The information obtained on unexposed face surface temperatures of the test specimen shall be supplemented by additional data derived from measurements obtained using a roving thermocouple (see 9.1.2.2.1.5).

9.1.2.2 Unexposed thermocouples for closures for conveyor systems

9.1.2.2.1 Maximum temperature of the closure for a conveyor system

9.1.2.2.1.1 Thermocouple T_F (max 360 °C/max 180 °C) on the frame/guide of the closure for a conveyor system

These thermocouples shall be located at a distance of 100 mm from the visible edge (on the unexposed face) of the leaf of the closure, if the frame/guide is wider than 100 mm, otherwise they shall be located at the boundary between the frame/guide and the supporting construction. The distance between the centres of the thermocouples T_F shall be less than 500 mm at the top of the horizontal member of the frame of the closure for a conveyor system in a vertical installation. For vertical installations no thermocouples are required at the bottom half of the frame. In addition, for a horizontal installation there shall be a minimum of two thermocouples at a distance less than 500 mm between centres on all members of the frame with a minimum of four thermocouples 50 mm in from each corner of the leaf opening. The thermocouples shall be evenly spaced along each member of the frame. Examples for the locations of these thermocouples are given in EN 1634-1 together with Figure 14 and Figure 19.

9.1.2.2.1.2 Thermocouple T_{C1} (max 180 °C) on the leaf of the closure

These thermocouples shall be located on the leaf of the closure 100 mm from the gap between the guide/frame and the leaf or the border line of the visible part of the closure. The distance between the centres of the thermocouples T_{C1} shall be less than 400 mm at the top of the horizontal edge of the closure for a conveyor system in a wall installation. For wall installations no thermocouples are required at the bottom half of the closure leaf. In

addition, for a floor installation there shall be a minimum of two thermocouples at a distance less than 400 mm between centres on all edges with a minimum of four together as close as possible to a corner of the leaf. The thermocouples shall be evenly spaced along each edge. Examples for the locations of these thermocouples are given in EN 1634-1 together with Figure 16 to Figure 19.

9.1.2.2.1.3 Thermocouple T_{C1a} (max 180 °C) (Supplementary procedure) on the leaf of the closure

If required by the sponsor, these thermocouples shall be located on the leaf of the closure 25 mm from the gap between the guide/frame and the leaf or the border line of the visible part of the closure. The distance between the centres of the thermocouples T_F shall be less than 450 mm at the top of the horizontal edge of the closure for a conveyor system in a vertical installation. For vertical installations no thermocouples are required at the bottom half of the closure leaf. In addition, for a horizontal installation there shall be a minimum of two thermocouples at a distance less than 450 mm between centres on all edges with a minimum of four together as close as possible to a corner of the leaf. The thermocouples shall be evenly spaced along each edge. Examples for the locations of these thermocouples are given in EN 1634-1 together with Figure 16 to Figure 19.

9.1.2.2.1.4 Additional thermocouples

Additional thermocouples shall be fixed to other areas of the leaf of the closure or frame/guide, e.g. over any through connection or position where the temperature might be expected to be higher than given above. The additional thermocouples shall be placed not less than 100 mm from the edges of the closure leaf and shall not be placed within any other area of the test specimen not permitted for assessment.

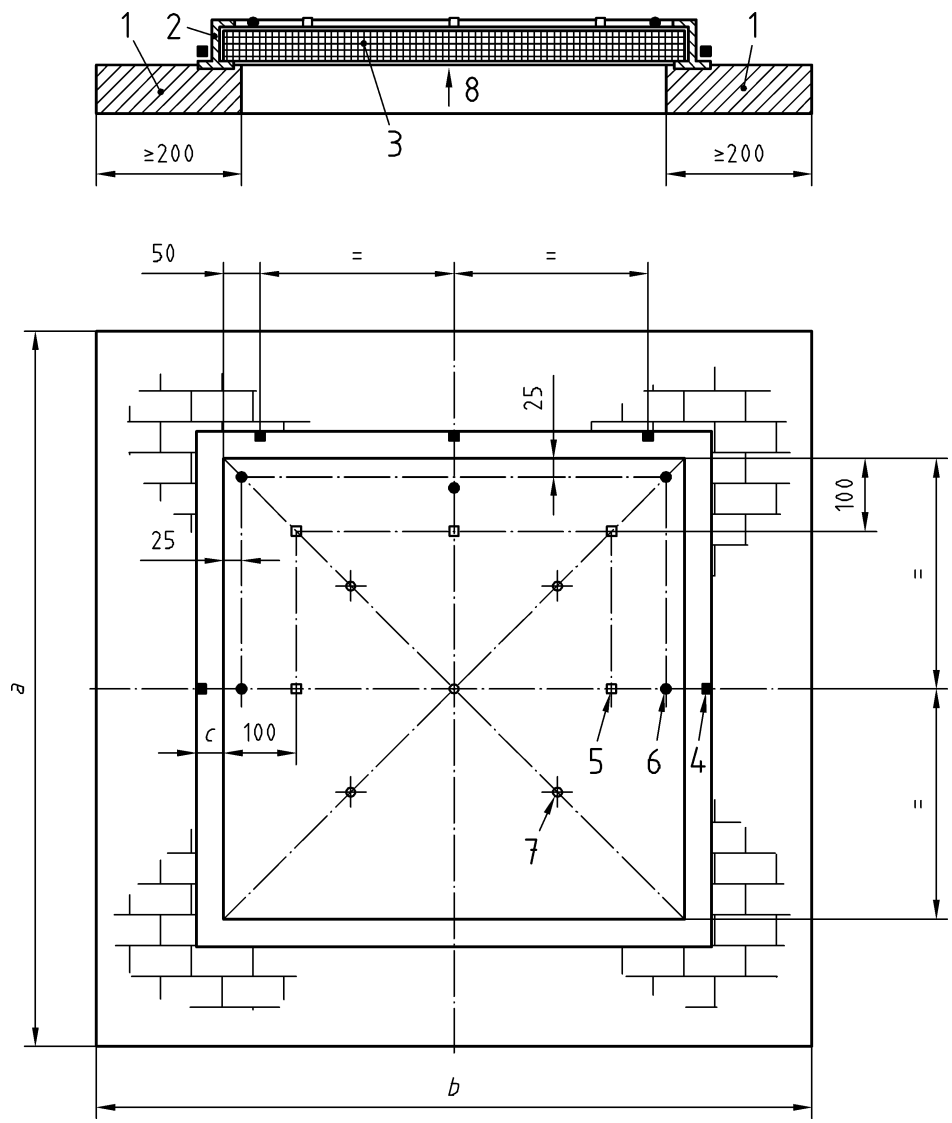
9.1.2.2.1.5 Roving thermocouple for the test specimen

The information obtained on unexposed face surface temperatures of the test specimen shall be supplemented by additional data derived from measurements obtained using a roving thermocouple as specified in EN 1363-1, applied to identify any local "hot spots" in areas where temperatures may be taken or where temperatures measured by the fixed thermocouples are not reliable.

9.1.2.2.2 Average and maximum temperature; T_{C2} (max 180 °C, average 140 °C) of the closure for a conveyor system

These thermocouples T_{C2}, (for single or double leaf closures) are placed one at the centre of the leaf (leaves) and one at the centre of each quarter section. These shall not be located closer than 50 mm to any joint, stiffener or through component, nor closer than 100 mm to the edge of the leaf (leaves) or curtain. (see Figure 16 to Figure 19 referring to single leaf closures only; further examples are given in EN 1634-1, e.g. for double leaf closures).

Dimensions in millimetres



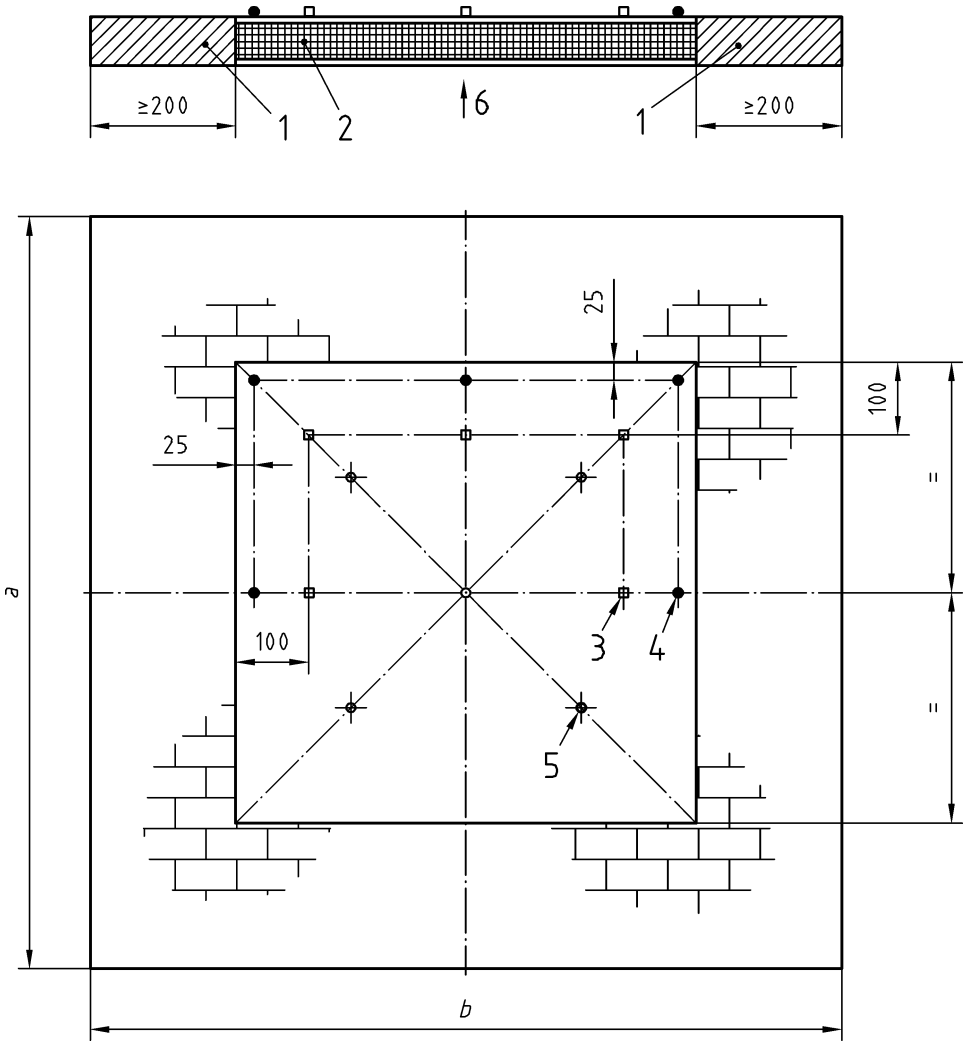
Key

1 Vertical supporting construction
2 Frame/guide
3 Closure for a conveyor system
4 T_F: thermocouples on the guide/frame for maximum temperature rise (max. 360 °C)
5 T_{C1}: thermocouples on the closure leaf for maximum temperature rise
6 T_{C1a}: additional thermocouples for maximum temperature rise (supplementary procedure)
7 T_{C2}: thermocouples within the centre of the closure leaf for average and maximum temperature rise
8 Direction of fire exposure

a Height of the test construction (generally 3 000 mm)
b Width of the test construction (generally 3 000 mm)
c Width of the guide/frame

Figure 14 — Closure and conveyor system assembly - arrangement of thermocouples on the unexposed side; example for vertical installation A

Dimensions in millimetres



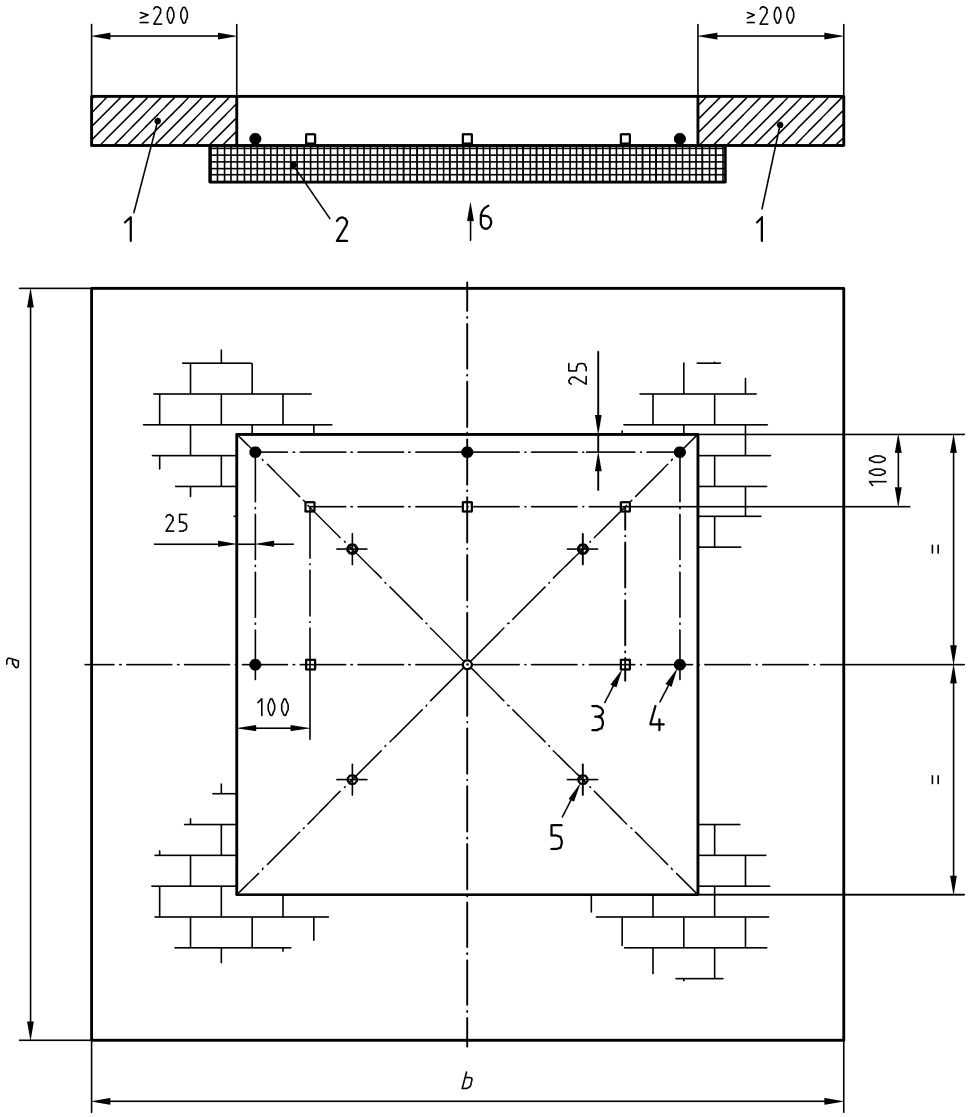
Key

1 Vertical supporting construction
2 Closure for a conveyor system
3 T_{C1}: thermocouples on the closure leaf for maximum temperature rise
4 T_{C1a}: additional thermocouples for maximum temperature rise (supplementary procedure)
5 T_{C2}: thermocouples within the centre of the closure leaf for average and maximum temperature rise
6 Direction of fire exposure

a Height of the test construction (generally 3 000 mm)
b Width of the test construction (generally 3 000 mm)

Figure 15 — Closure and conveyor system assembly - arrangement of thermocouples on the unexposed side; example for vertical installation B

Dimensions in millimetres



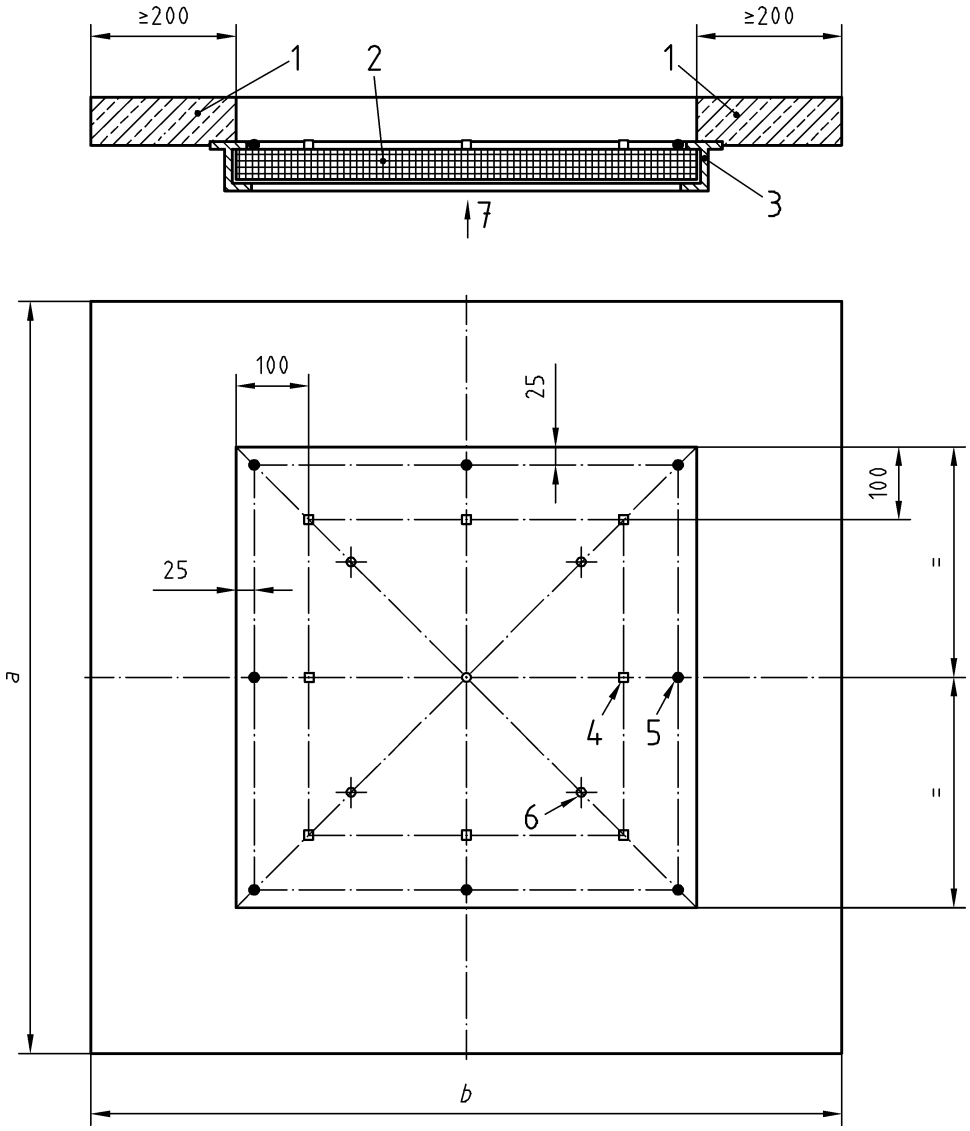
Key

1 Vertical supporting construction
2 Closure for a conveyor system
3 T_{C1}: thermocouples on the closure leaf for maximum temperature rise
4 T_{C1a}: additional thermocouples for maximum temperature rise (supplementary procedure)
5 T_{C2}: thermocouples within the centre of the closure leaf for average and maximum temperature rise
6 Direction of fire exposure

a Height of the test construction (generally 3 000 mm)
b Width of the test construction (generally 3 000 mm)

Figure 16 — Closure and conveyor system assembly - arrangement of thermocouples on the unexposed side; example for vertical installation C

Dimensions in millimetres



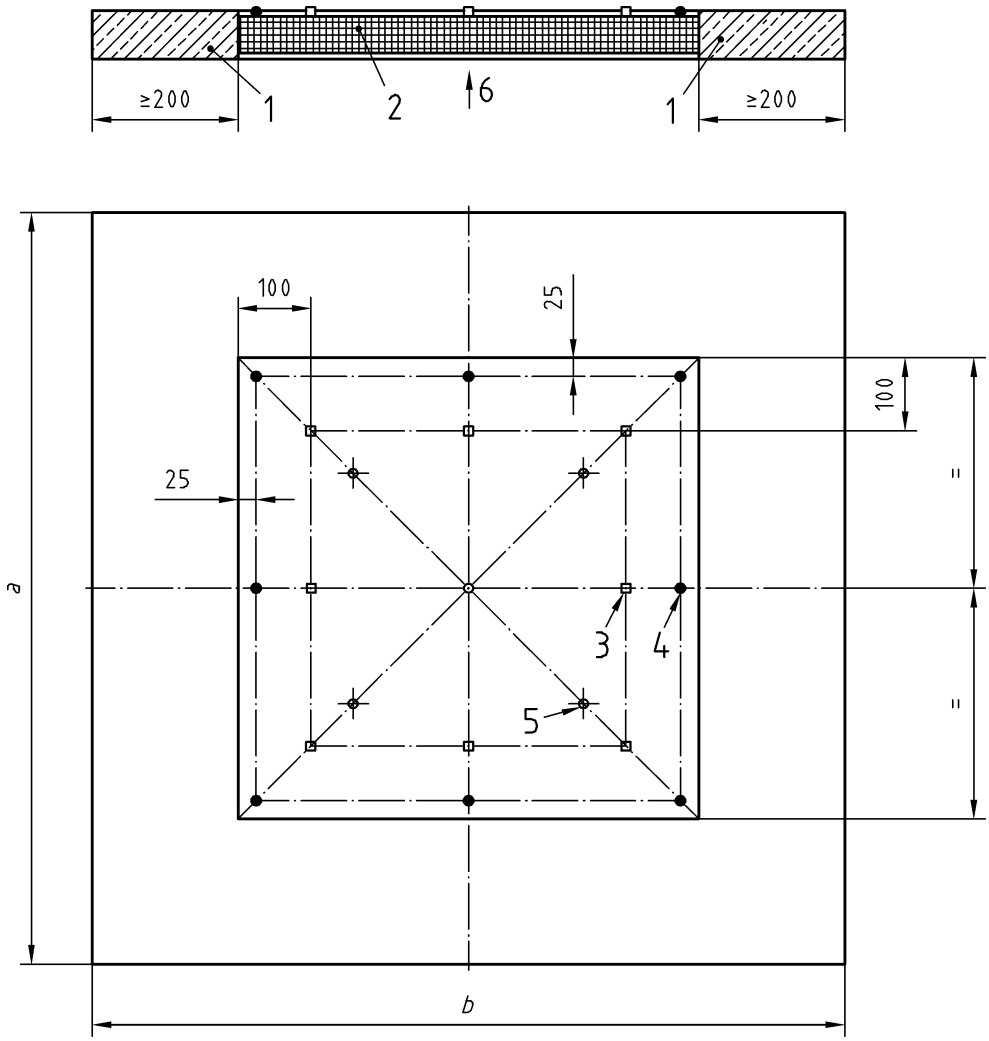
Key

1 Horizontal supporting construction
2 Closure for a conveyor system
3 Frame/guide
4 T_{C1}: thermocouples on the closure leaf for maximum temperature rise
5 T_{C1a}: additional thermocouples for maximum temperature rise (supplementary procedure)
6 T_{C2}: thermocouples within the centre of the closure leaf for average and maximum temperature rise
7 Direction of fire exposure

a Depth of the test construction (generally 3 000 mm)
b Width of the test construction (generally 3 000 mm)

Figure 17 — Closure and conveyor system assembly - arrangement of thermocouples on the unexposed side; example for horizontal installation A

Dimensions in millimetres



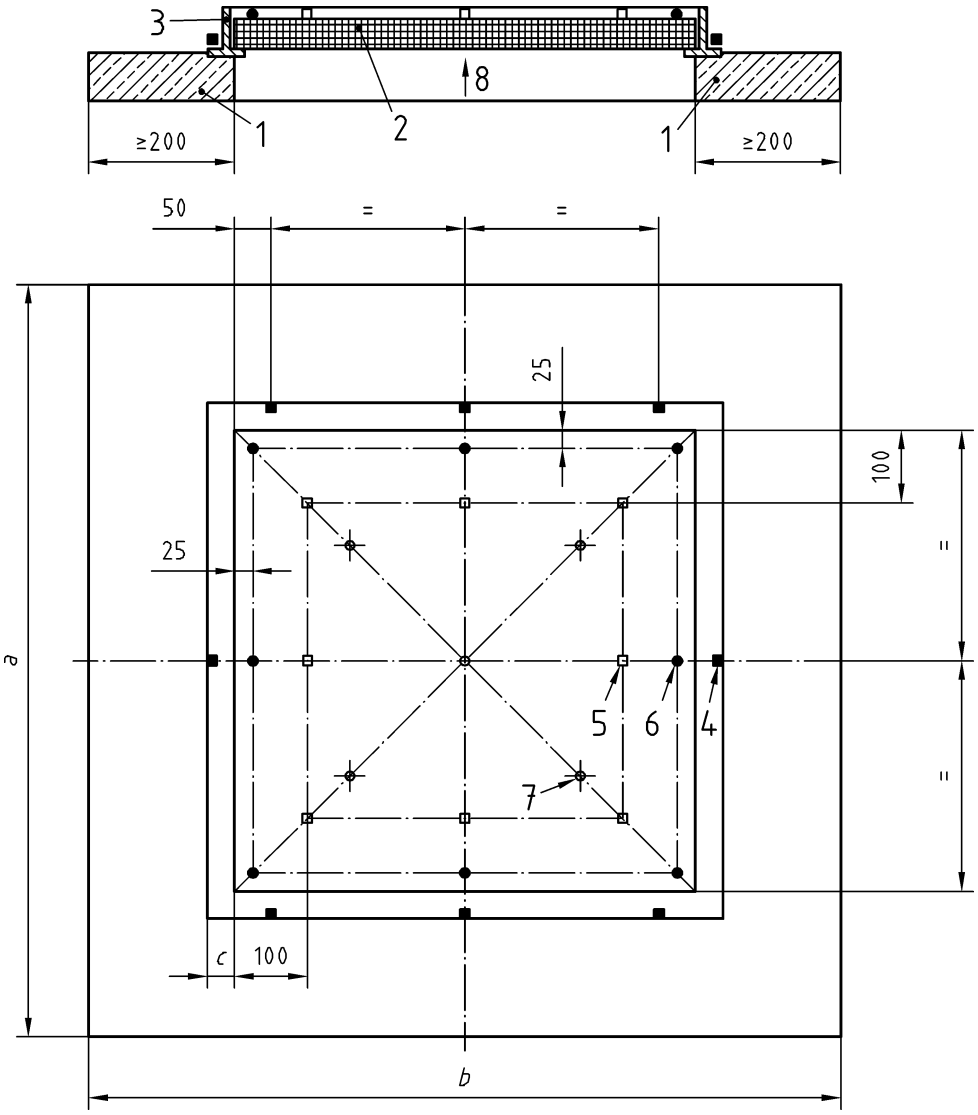
Key

1 Horizontal supporting construction
2 Closure for a conveyor system
3 T_{C1}: thermocouples on the closure leaf for maximum temperature rise
4 T_{C1a}: additional thermocouples for maximum temperature rise (supplementary procedure)
5 T_{C2}: thermocouples within the centre of the closure leaf for average and maximum temperature rise
6 Direction of fire exposure

a Depth of the test construction (generally 3 000 mm)
b Width of the test construction (generally 3 000 mm)

Figure 18 — Closure and conveyor system assembly - arrangement of thermocouples on the unexposed side; example for horizontal installation B

Dimensions in millimetres



Key

1 Horizontal supporting construction
2 Closure for a conveyor system
3 Frame/guide
4 T_F: thermocouples on the guide/frame for maximum temperature rise (max. 360°C)
5 T_{C1}: thermocouples on the closure leaf for maximum temperature rise
6 T_{C1a}: additional thermocouples for maximum temperature rise (supplementary procedure)
7 T_{C2}: thermocouples within the centre of the closure leaf for average and maximum temperature rise
8 Direction of fire exposure

a Depth of the test construction (generally 3 000 mm)
b Width of the test construction (generally 3 000 mm)

Figure 19 — Closure and conveyor system assembly - arrangement of thermocouples on the unexposed side; example for horizontal installation C

9.1.2.3 Unexposed thermocouples for a conveyor system as a duct or pipe configuration

9.1.2.3.1 Uninterrupted duct or pipe penetration

9.1.2.3.1.1 Maximum temperature

There shall be four thermocouples T_1 around the perimeter of the duct or pipe equally spaced with one at the highest point at a distance of 25 mm from the supporting construction. Four thermocouples T_s shall be provided on the supporting construction around the duct or pipe equally spaced with one at the highest point at a distance of 25 mm from the duct or pipe surface (examples for the positioning are given in EN 1366-2).

9.1.2.3.1.2 Average and maximum temperature

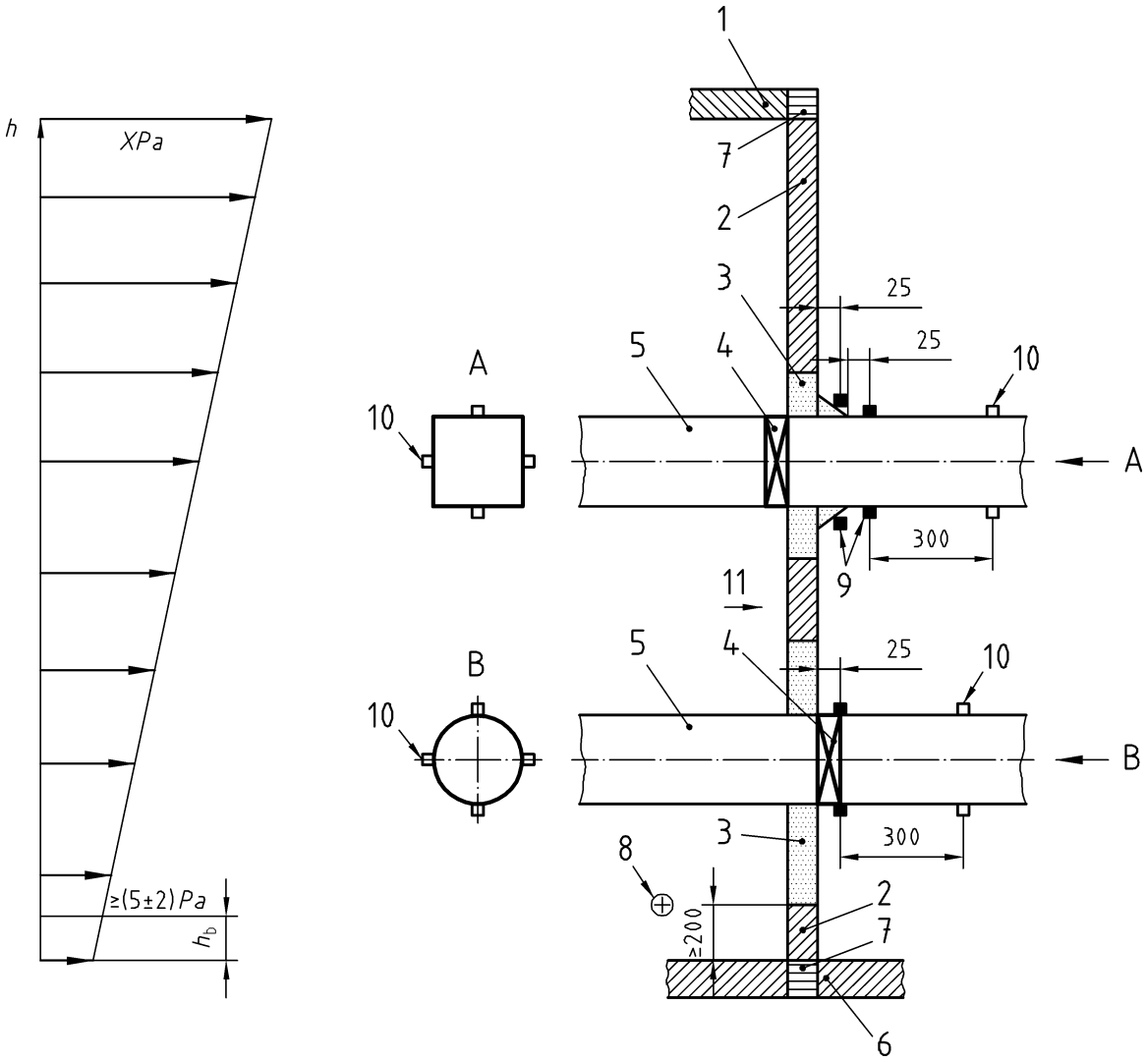
There shall be four thermocouples T_2 around the perimeter of the duct or pipe equally spaced with one at the highest point at a distance of 300 mm from any thermocouples T_1. Examples for the positioning of thermocouples are given in EN 1366-2 and in Figure 20.

9.1.2.3.2 Separated duct or pipe penetration

The positioning and procedure given in 9.1.2.3.1 shall be followed. To achieve a wider field of direct application, in addition the closure may be tested and assessed on request of the sponsor using the different thermocouples given in 9.1.2.2 (see Figure 21).

NOTE The classification of a duct or pipe configuration can only result in an I classification for the insulation criteria rather I_1 or I_2 unless the closure itself is assessed as well.

Dimensions in millimetres



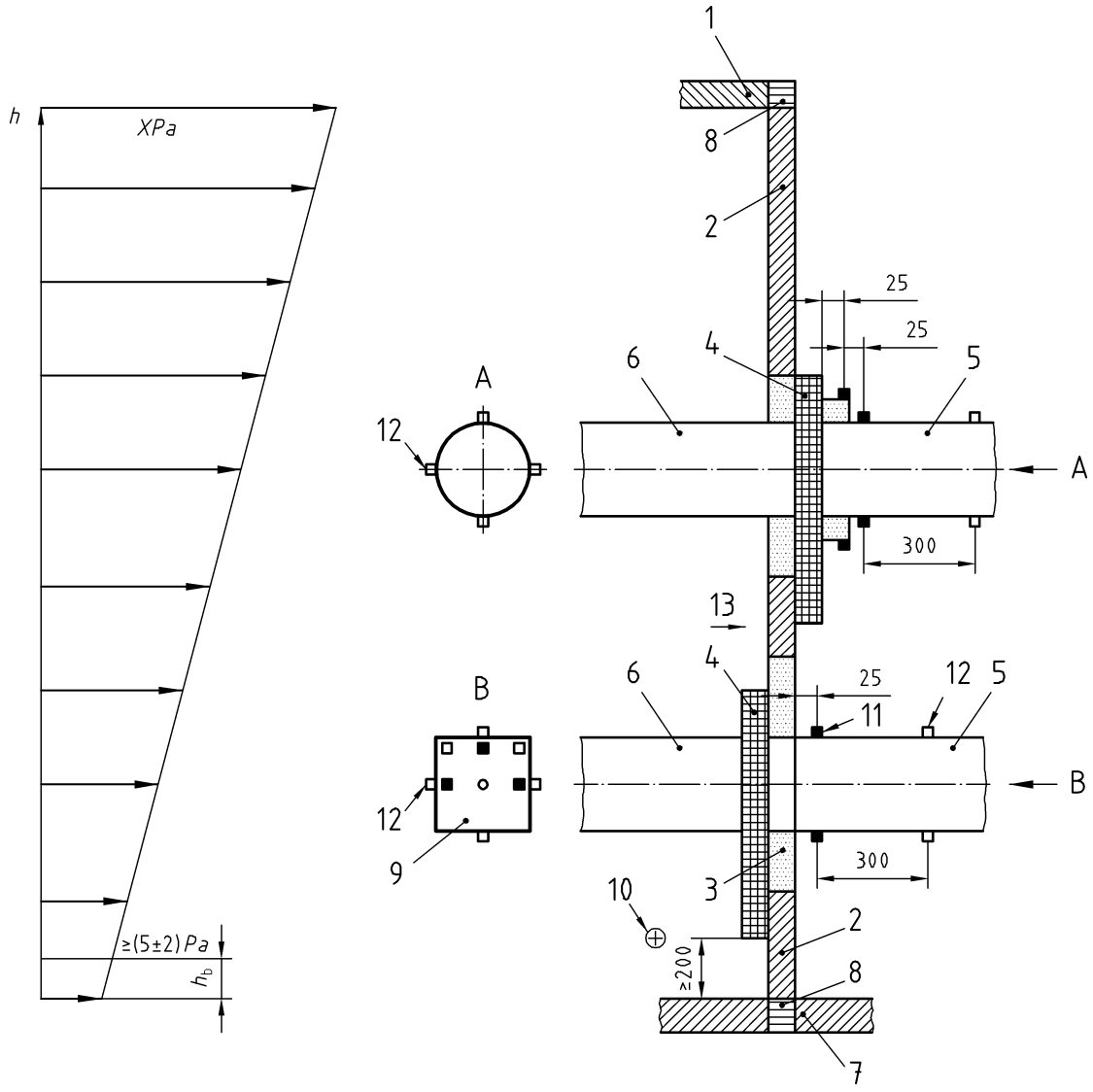
Key

1 Furnace cover
2 Vertical supporting construction
3 Penetration seal
4 Closure for a conveyor system
5 Pipe/duct as a conveyor system
6 Furnace floor
7 Test frame
8 Pressure at the bottom of the lowest test specimen with at least (5 ± 2) Pa
9 T_1: thermocouples on the edge of the unexposed pipe/duct part for maximum temperature rise (see also prEN 1366-3)
10 T_2: thermocouples on the unexposed pipe/duct part for average and maximum temperature rise (see also prEN 1366-3)
11 Direction of fire exposure

h Height above furnace floor
h_b Height of the bottom edge of the test specimen above floor level
X Pressure at height h above furnace floor

Figure 20 — Example of multiple test specimens as uninterrupted duct or pipe penetrations in a single vertical test construction – pressure condition and thermocouple arrangement on the unexposed side of the pipe/duct as a conveyor system as for raised position

Dimensions in millimetres



Key

1 Furnace cover
2 Vertical supporting construction
3 Penetration seal
4 Closure for a conveyor system
5 Unexposed pipe/duct part (thermally separated)
6 Exposed pipe/duct part
7 Furnace floor
8 Test frame
9 Example of an arrangement of additional unexposed thermocouples on the leaf of a closure for a conveyor system (only schematically)
10 Pressure at the bottom of the lowest test specimen with at least (5 ± 2) Pa
11 T_1: thermocouples on the edge of the unexposed pipe/duct part for maximum temperature rise (see also prEN 1366-3)
12 T_2: thermocouples on the unexposed pipe/duct part for average and maximum temperature rise (see also prEN 1366-3)
13 Direction of fire exposure

h Height above furnace floor
h_b Height of the bottom edge of the test specimen above floor level
X Pressure at height h above furnace floor

Figure 21 — Example of multiple test specimens as separated duct or pipe penetrations in a single vertical test construction – pressure condition and thermocouple arrangement on the unexposed side of the thermally separated pipe/duct as a conveyor system as for raised position

9.1.2.4 Unexposed thermocouples for a penetration seal and penetrating components other than conveyor tracks

Thermocouples for maximum temperature rise only shall be positioned as given in prEN 1366-3 for the different penetrating components and the penetration seal, with the exception that the distance shall be 50 mm from the supporting construction instead of 25 mm.

9.1.2.5 Penetrating conveyor tracks

For penetrating conveyor tracks thermocouples for maximum temperature rise only shall be positioned at a distance of 50 mm from the supporting construction or the penetration seal with four thermocouples as a minimum and with at least one at the top of it and one at least on each different material used for a member of the conveyor system (see Figure 9).

9.2 Integrity measurement

In addition to the cotton pads specified in EN 1363-1, additional cotton pads shall be provided with a reduced size of 30 mm $\times$ 30 mm $\times$ 20 mm. An additional wire frame holder as described in EN 1363-1 modified to accommodate the smaller cotton pad shall also be provided. This modified holder shall still maintain the 30 mm clearance required from adjacent surfaces. The additional cotton pads may be required for the area of the test specimen within the penetration (see prEN 1366-3).

9.3 Pressure

The pressure measuring devices in the furnace shall be installed in accordance with EN 1363-1 with the following deviations for raised positions.

The position for controlling the pressure shall be arranged as follows:

— for vertical installation at floor position: one position for controlling the pressure at the top of the test specimen (see Figure 1). For more than one test specimen in one test construction one position for controlling the pressure shall be used at the top of the highest test specimen;

— for vertical installation at raised position: one position for controlling the pressure at the bottom edge of the test specimen (see Figure 2). For more than one test specimen in one test construction one position for controlling the pressure shall be used at the bottom edge of the lowest test specimen (see Figure 21);

— for horizontal installation: 100 mm below the bottom horizontal plane of the test specimen (see Figure 6).

9.4 Deflection/deformation

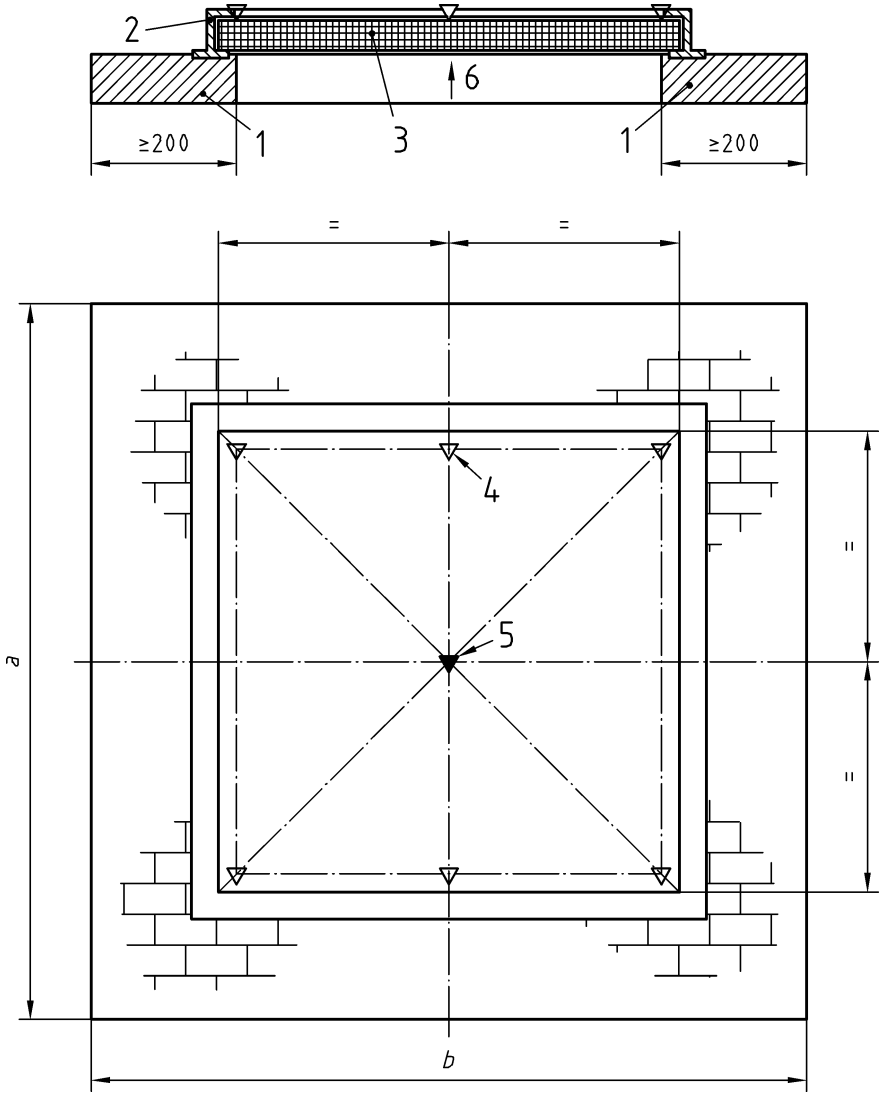
Appropriate instrumentation shall be provided to determine a history of all significant movements (i.e. greater than 3 mm) of the test construction during the test.

The measurement shall be taken against a fixed datum. The interval between measurements shall be chosen to present a history of deflection/deformation during the test.

A suitable method for determining deflection/deformation of the test construction including proposals for selection of suitable intervals between measurements is given in EN 1363-1 (Figure 22 gives an example of locations to be measured).

NOTE Measurement of deflection/deformation is a compulsory requirement although there are no performance criteria associated with it. Information relating to the relative deflection/deformation between components of the test specimen, between the test specimen and the supporting construction and of the supporting construction itself may be important in determining the extended field of application of the test result. Figures given in EN 1634-1 show recommended positions for measuring deflection/deformation.

Dimensions in millimetres



Key

1 Vertical supporting construction
2 Frame/guide
3 Closure for a conveyor system
4 Suggested position for measuring deformation
5 Expected position of greatest movement
6 Direction of fire exposure

a Height of the test construction (generally 3 000 mm)
b Width of the test construction (generally 3 000 mm)

Figure 22 — Closure and conveyor system assembly – example of an arrangement of deformation measurements for a vertical installation on the unexposed side

9.5 Radiation

If radiation is to be measured, radiometers shall be positioned as described in EN 1363-2.

10 Test procedure

10.1 General

The test shall be carried out using the equipment and procedures in accordance with EN 1363-1, and if appropriate EN 1363-2, modified if necessary as described in this standard.

10.2 Pre-test measurements, examination and preparation

Prior to the fire resistance test an examination shall be carried out in the following sequence:

a) mechanical conditioning of the test specimen shall be carried out within the supporting construction, see 8.3;

b) gap measurements to examine the clearance between moving components and fixed components of the closure for a conveyor system (e.g. between the leaf of the closure and the frame/guide);

c) retention force measurements when a closing mechanism provides assistance to fire resistance by retention of the test specimen. To measure this retention force the closure shall be slowly opened, using a force gauge attached to the closure and operating it against the direction of closing, to a distance of 100 mm away from its closed position. The highest gauge reading between the closed and 100 mm positions shall be recorded;

d) final setting of the test specimen subjecting the closure to a final closing involving opening the closure to a distance of approximately 300 mm with a minimum of the total possible movement of the closure and conveyor system assembly if this is less than 300 mm and returning it to the closed position. During this examination the test construction shall be in its final position on or at the furnace.

10.3 Fire resistance test

10.3.1 Integrity

Where difficulties arise in attempting to use the cotton pad for the assessment of loss of integrity in accordance with EN 1363-1 because any penetration carries a high density of penetrating components, the reduced size cotton pad specified in 9.2 shall be used. The gap gauges shall not be used within the penetration area of the test specimen to evaluate integrity.

10.3.2 Insulation

When monitoring for insulation the roving thermocouple shall not be employed where fixed thermocouples are not permitted.

Temperatures recorded from thermocouples that become embedded in softening material or covered by intumescent material shall be disregarded.

10.3.3 Radiation

Details of the procedure for assessing radiation are given in EN 1363-2.

10.3.4 Other observations

Throughout the fire resistance test observations shall be made and a written record kept of all changes and occurrences which, although they do not affect the performance criteria, could create hazards within a building. This relates in particular to the excessive development of smoke from the test specimen.

10.3.5 Terminating the test

The test shall be terminated in accordance with EN 1363-1.

11 Performance criteria

11.1 Integrity

Integrity of the test specimen shall be assessed in accordance with EN 1363-1.

11.2 Insulation

11.2.1 General

For closure and conveyor system assemblies which incorporate discrete areas of different thermal insulation, compliance with the insulation criteria shall be determined separately for each area in accordance to EN 1634-1.

11.2.2 Maximum temperature rise

The test specimen shall be evaluated against the maximum temperature rise criterion specified in EN 1363-1 (180 °C) with the exception that the limit for temperature rise of any frame/guide of the closure for a conveyor system shall be 360 °C. Compliance shall be derived from temperatures recorded from the thermocouples specified in 9.1.2.2.1 (except 9.1.2.2.1.3), 9.1.2.3.1.1, 9.1.2.4, 9.1.2.4 as applicable and any additional thermocouples and the roving thermocouple as given in 9.1.2.1 subject to the provisions given in 10.3.2.

11.2.3 Maximum temperature rise (supplementary procedure)

The test specimen shall be evaluated against the maximum temperature rise criterion specified in EN 1363-1. Compliance shall be derived from temperatures recorded from the thermocouples specified in 9.1.2.2.1 (except 9.1.2.2.1.2), 9.1.2.3.1.1, 9.1.2.4, 9.1.2.4 as applicable and any additional thermocouples and the roving thermocouple as given in 9.1.2.1 subject to the provisions given in 10.3.2.

11.2.4 Average temperature rise

The test specimen shall be evaluated against the average temperature rise criterion specified in EN 1363-1 including any duct or pipe configuration as a conveyor system. No average temperature rise shall be evaluated for any penetration together with its penetrating components and any conveyor track which shall only be evaluated against maximum temperature rise. Compliance shall be derived from temperatures recorded from the thermocouples specified in 9.1.2.2.2 or 9.1.2.3.1.2, as applicable.

11.2.5 Multiple test specimens in one test

If multiple test specimens are included in a single test construction, then the performance of each test specimen shall be judged and recorded separately. The furnace conditions shall be maintained during the entire duration of the test.

12 Test report

In addition to the items required by EN 1363-1, the following shall also be included in the test report:

a) a reference that the test was carried out in accordance with EN 1366-7;

b) any deviations from the test method;

c) details of how the test specimen was verified as described in 6.6;

d) a reference to which standard supporting construction was chosen, if appropriate;

e) information concerning any mechanical conditioning performed upon the test specimen as required by 10.2 a;

f) the gap measurements as required by 10.2 b);

g) details about the installed position and whether intended for use in a vertical or horizontal position together with the pressure regime used (e.g. test construction intended for installation only for positions at floor level) in particular the height of the bottom edge of the test specimen and the height of the supporting construction at the bottom of the test specimen in relation to the furnace floor for wall installations;

h) details as required for tests on full test specimens for any part configuration tests (see annex B) carried out;

i) the retention forces as required by 10.2 c);

j) if only one test was required, which face of the test specimen was exposed and why only one test was carried out;

k) in case of a multiple test construction with several test specimens, the position of the test specimens in the test construction together with information on where the position for controlling the pressure was and if intended for floor position or raised position;

l) for pipe or duct configurations any additional assessment on the closure for this conveyor system;

m) a description of the associated supporting construction, if appropriate;

n) further observations during testing, in accordance with 10.3.4;

o) the result stated in terms of the elapsed time, in completed minutes, between the commencement of heating and the time to failure of integrity and when required insulation and/or radiation under the normal and if appropriate, the supplementary procedure.

13 Field of direct application of test results

13.1 General

The field of direct application of results is restricted to governing the allowable changes to the test specimen following a successful fire resistance test. These variations can be introduced automatically without the need for the sponsor to seek additional evaluation, calculation or approval.

NOTE When extended product size requirements are envisaged the dimensions of certain components within the test specimen may be less than those intended to be used at full size in order to maximise the extrapolation of the test results by modelling the interaction between components at the same scale.

13.2 Closure for a conveyor system

13.2.1 The field of direct application as given in EN 1634-1 shall be also applicable for closures for conveyor systems for the purpose of this standard.

13.2.2 Test results from a closure for a conveyor system tested in a wall with a vertical opening direction shall also apply for otherwise identical closures for conveyor systems with a horizontal opening direction.

13.2.3 Test results from a closure for a conveyor system tested in a wall with a horizontal opening direction shall also apply for otherwise identical closures for conveyor systems with a vertical opening direction.

13.3 Penetration seal including its penetrating components and the conveyor track

13.3.1 The field of direct application as given in prEN 1366-3 shall be also applicable for the penetration seal including its penetrating components and the conveyor track for the purpose of this standard.

13.3.2 Test results from part configuration test specimens (see 7.6) intended for different installations shall be applicable for the full test specimen if the part configuration test specimen achieved a fire resistance time of at least 10 % higher than its full test specimen.

13.3.3 For a complete closure and conveyor system assembly which will not fit the furnace, two separate part configuration test specimens may be tested at their maximum size allowed by the furnace as given in B.3. The worst of the two results of the two part configuration test specimens as given in B.3.3 shall apply to the complete closure and conveyor system assembly put together.

NOTE This is strictly speaking outside of the field of direct application, but for the purpose of this test method it was included as part of the field of direct application.

13.3.4 The worst of the two test results from two identical test specimens, except the size of their otherwise identical conveyor tracks, tested with their smallest and largest rails (together with their supporting elements if applicable) penetrating a separating element shall also apply to any intermediate size of rail element with an otherwise identical conveyor track.

13.4 Conveyor system as separated duct or pipe configuration

When the test was done in accordance with 7.7.3 and the evaluation on the duct/pipe part and the closure were done separately (see 9.1.2.3.2) resulting in an at least 20 % higher fire resistance time for the duct/pipe part than the closure, then the fire resistance time achieved for the closure shall also be applicable for any duct/pipe configuration with the same kind of attachment as used for the test specimen and with a similar insulation property of the duct/pipe part.

NOTE For example, if during a single test the evaluation of the duct/pipe part gave a fire resistance time of 82 min solely based on the duct/pipe part and the evaluation of the closure part gave a fire resistance time of 63 min solely based on the closure part, then the fire resistance time of the closure part may be extended to other duct/pipe configurations as given above, as 82 min is more than 20 % larger than 63 min.

13.5 Full test specimen

13.5.1 Test results on a test specimen with less than 200 mm supporting construction at the bottom of it and/or with less than 200 mm of its bottom edge above the floor shall be restricted to that height above floor level as tested with the standard conditions for pressure in accordance with EN 1363-1 (floor position).

13.5.2 Test results on a test specimen with at least 200 mm supporting construction at the bottom of it and at least 200 mm of its bottom edge above the floor, tested at floor position, shall be applicable to any height of its bottom edge above floor level in practice up to 0,5 m if all the standard conditions for pressure in accordance with EN 1363-1 were used (in particular, the neutral pressure zone was 0,5 m above floor level with the deviation as given in EN 1363-1).

13.5.3 Test results on a test specimen with at least 200 mm supporting construction at the bottom of it and at least 200 mm of its bottom edge above the floor when tested at floor level with a pressure of at least (5 ± 2) Pa at the bottom edge of the test specimen shall be acceptable for closure and conveyor system assemblies installed in practice at any height above floor level (raised position).

13.5.4 Where multiple test specimens are tested at different heights and the pressure condition was for floor position for the lowest test specimen then providing that the pressure at the bottom of any higher test specimen is at least (5 ± 2) Pa the results related to these higher test specimens shall be acceptable for closure and conveyor system assemblies installed in practice at any height above floor level (raised position).

13.5.5 The field of direct application as given in EN 1634-1 for the supporting construction shall be also applicable for the full test specimen for the purpose of this standard.

13.5.6 The worst of the test results of two otherwise identical test specimen with a different size shall be valid also for any intermediate size.

13.5.7 The worst of the test results of otherwise identical test specimens tested in a vertical orientation and in a horizontal orientation with arrangement Figure 6c, shall also apply to arrangement Figure 6b in both orientations.

The worst of the test results of otherwise identical test specimens tested in a vertical orientation and in a horizontal orientation with arrangement Figure 6b, shall also apply to arrangement Figure 6b with fire from above.

The worst of the test results of otherwise identical test specimens tested in arrangement Figure 6b and Figure 6c in a floor, shall also apply to arrangement Figure 6b and Figure 6c with fire from above.

14 Classification

The classification for the fire resistance of closure and conveyor system assemblies on the basis of this test method shall be done in accordance with EN 13501-2.

Annex C gives general guidance on the design of closure and conveyor system assemblies and identifies particular requirements and classifications related to self closing durability, clearing and separating devices.

Annex A
(normative)

Arrangement of unexposed thermocouples on closures for conveyor systems with non-rectangular shapes

The location of thermocouples on closures for conveyor systems with a shape of the closure other then rectangular shall be in accordance with the following procedure:

a) calculate the area $A_{c,any}$ of the unexposed part of the closure leaf/leaves;

b) find the equivalent square with the area of $A_{c,square} = A_{c,any}$;

c) find the number and position of thermocouples for the equivalent square as given in 9.1.2.2.1 and 9.1.2.2.2 as applicable;

d) transfer the number of thermocouples from c) to the non-rectangular shape of the closure leaf/leaves.

The resulting number of thermocouples shall be positioned on the non-rectangular closure using the same principles as for a rectangular shape closure. The distances between the thermocouples and the visible edge of the leaf of the closure shall as far as possible be in accordance with the requirements as given in 9.1.2.2.1 and 9.1.2.2.2.

The principle idea as given for the leaf of the closure shall be followed with any frame/guide:

a) find the equivalent length of the frame/guide as used for the closure to be assessed, for a frame/guide with the same length and width surrounding a square shaped closure;

b) find the number and position of the thermocouples for the equivalent frame/guide around the square as given in 9.1.2.2.1.1 and transfer them to the frame/guide to be assessed.

The resulting number of thermocouples for the frame/guide around the non-rectangular closure leaf shall be positioned on the frame/guide to be assessed using the same principles as for the frame/guide around the rectangular leaf of closure. The distances between the thermocouples and the visible edge of the leaf of the closure and/or the boundary between the frame/guide and the supporting construction shall as far as possible be in accordance with the requirements as given in 9.1.2.2.1.1.

The basic principle for the positioning of the thermocouples for measuring the average temperature rise is to have five thermocouples over the total area of the leaf/leaves of the closure with one in the centre of gravity of the area and four distributed with equal distances between each of them over the circumference of the reduced area using an enlargement factor of 0,5 with the centre of enlargement to be the centre of gravity of the area. Two of these four thermocouples shall be within the top part of the area and two at the bottom part of the area for a vertically oriented test specimen.

The same idea shall be applicable for the thermocouples for measuring the maximum temperature rise. For vertically oriented test specimens the required number of thermocouples shall be equally distributed over the top half of the area at distances as given in 9.1.2.2.1. For horizontally oriented test specimen the required number of thermocouples shall be equally distributed over the total area at distances as given in 9.1.2.2.1.

Annex B
(normative)

Part configuration test specimen

B.1 General

Part configuration test specimens are used in two different ways for the purpose of assessing the fire resistance of a closure and conveyor system assembly (see B.2 and B.3).

B.2 Changes to the penetrating components

In order to prevent the need for repeated tests on full size test specimens due to changes in the penetrating components, a part configuration test is permitted (see 7.6).

B.3 Large test specimen

B.3.1 General

In those cases where the test furnace is too small to enable the intended test specimen to be subjected to the necessary heat exposure, and if no other furnace is available, tests on the test specimen may be conducted in sections of the complete closure for a conveyor system and the complete penetration assembly (part configuration test specimen) if the penetration is directly adjacent to the closure leaf. The largest complete test specimen possible shall be tested in full size before assessing the results from any part configuration test specimen.

The pressure conditions as given in 7.6 shall be followed for the part configuration test specimen based on the test condition of the full size specimen. If the test on the full size test specimen is carried out as for floor position, then the appropriate part configuration test specimen shall be tested as for floor position using the position for controlling the pressure at the top of the part configuration test specimen with a minimum pressure as for the appropriate position of that part configuration test specimen in the test with the full test specimen (see Figure 10). This means that the pressure P_2 on the top of the penetration part configuration test specimen taken from the full test specimen shall be the minimum pressure to be used for the top of the penetration part configuration test specimen after enlarging the penetration part with an enlargement factor α as given in B.3.2.1. The same goes for the closure part configuration test specimen where the pressures P_1 from the full test specimen as given in Figure 10 shall be used for the closure part configuration test specimen at its top. The same principle shall be applicable for a raised position (see Figure 11 for the position for controlling the pressure and the following note) with the position for controlling the pressure at the bottom of the part configuration test specimen.

NOTE Figure 11 shows an arrangement with a penetration within the closure part. This specific arrangement cannot be extended to this part configuration test method for test specimens which are too large.

B.3.2 Installation and part configuration test specimen

The part configuration test specimen with the complete penetration assembly shall be constructed and installed as given in 7.6.

The part configuration test specimen with the complete closure for a conveyor system shall be constructed as given in clause 7 as applicable. The complete penetration part of the full test specimen shall be ignored and be replaced by the supporting construction using the minimum dimensions as given in 7.2.3.

The following procedure shall be used for the two part configuration tests and the assessment:

a) the largest complete test specimen possible for the furnace shall be tested in full size;

b) the maximum size of the part configuration test specimen as given in B.3.2.1 shall be determined;

c) in one test the complete closure for a conveyor system (excluding any penetration) at maximum size permitted by the test furnace as determined in b) anchored in the supporting construction shall be included in the test frame and tested;

d) in another test the complete part configuration test specimen for the penetration (see 7.6) at maximum size permitted by the test furnace as determined in b) installed in the supporting construction shall be included in the test frame and tested.

B.3.2.1 Establishing the size of the part configuration test specimen

Generally either the closure for a conveyor system part configuration or the penetration assembly part configuration of the complete test specimen is the limiting factor in terms of the size for a given furnace and test construction. To find the maximum size of the two part configuration test specimens, the complete test specimen shall be enlarged with an enlargement factor α_{max} so that one of the two part configuration test specimens would just fit the test construction. The smaller part configuration test specimen shall be tested using the same enlargement factor α_{max} to determine its size to get the same relative proportions as the complete test specimen tested at its maximum size.

If a smaller size than the maximum size is only required of the two largest possible part configuration test specimens resulting from an enlargement factor α_{max}, then this may be used with an enlargement factor α with $1 < \alpha < \alpha_{max}$ to establish the sizes of the two part configuration test specimens.

B.3.3 Classification of the complete closure and conveyor system assembly

The classification for the fire resistance of the complete closure and conveyor system assembly shall be determined from the smaller of the two test results of the part configuration test specimens. If the lower of the two resulting fire resistance times from the tests on the two part configuration test specimens is not more than 10 % above the classification time resulting from the lower fire resistance time, then the next lower classification time shall be used. For example, a fire resistance time of the first test with the closure for a conveyor system may be 67 min, the fire resistance of the second test with the part configuration test specimen for the penetration may be 63 min. The lower value for the fire resistance time is 63 min which is less than 10 % up from the next lower classification time being 60 min plus 6 min equals to 66 min. The next lower classification time of 45 min shall be used in this example for the complete closure and conveyor system assembly. In any case, the classification time of the entire conveyor system shall not be larger than the classification time of the largest complete test specimen tested at full size.

Annex C
(informative)

General guidance on the design of closure and conveyor system assemblies and their classification for self closing durability

C.1 General

In the absence of any European Technical Specification for closure and conveyor system assemblies, this informative annex provides for a suitable classification for non-fire related characteristics for this product together with general guidance for its design.

C.2 Self closing durability

C.2.1 General

Self closing tests for closure and conveyor system assemblies should, where applicable, be carried out in accordance to prEN 14600.

These tests may be done on different test specimens other than with that used for fire testing.

NOTE The classes and classification for the performance criterion "self closing" C0 to C5 are given in prEN 14600.

If a classification for any self-closing device as part of a closure is envisaged, the tests may be done in accordance to prEN 14600.

The following expansions of performance parameters for non-fire related characteristics are given as:

C — for closures for conveyor systems equipped with a self-closing device, e.g. EI_2 30-C0, where the classes C0 to C5 are defined in prEN 14600.

T — operational capability of a clearing device to clear the free area of the closure and/or a separating device

C.2.2 Self-closing

The self-closing property refers to the ability to release ‘hold open’ devices for closures for conveyor systems and to ensure reliable shutting of the closures for conveyor systems in the event of fire or failure of the power supply. This includes the ability to automatically shut a closure for a conveyor system from a defined position in the event of a fire/smoke signal and, if resistance exists, to overcome such resistance.

The sustained operational capability of any clearing device (see Figure 7 d) and/or any separating device (see Figure 7 b) for a conveyor system, which is part of the closure and conveyor system assembly, may be required. The performance of these devices for the conveyor system is identified using a ‘T’. This performance criterion is added to the C criterion, if a durability test was carried in accordance to prEN 14600 together with any clearing device and/or separating device indicating the same number of cycles as used for the C-class (0 to 5) like C1-T.

C.2.3 Test report

In addition to the items given in clause 12 full details about the clearing device and/or any separating device of the conveyor system should be given together with the results of the self-closing test.

C.3 General guidance for closure and conveyor system assemblies

C.3.1 General

The effectiveness of closure and conveyor system assemblies in protecting against the spread of fire and smoke does not depend solely on their fire resistance classification. It also depends to a substantial extent on whether, in the event of a fire, and taking into consideration all the various factors interfering with the conveyor system and the material being transported on or in it, the closure for the conveyor system is capable of sealing the apertures. Due to the many possibilities for failure, in terms of fire safety technology such apertures in the separating elements are considered to represent a considerable risk when penetrated by conveyor systems. For this reason building authorities and fire insurers focus particular attention in making sure that the fire risk for such elements with closure and conveyor system assemblies is acceptable.

The reliable closing of such apertures can only be achieved through the use of an interconnected system in which the mechanical and electrical functions of the closure and conveyor system assemblies are carefully co-ordinated with the interacting components of the aperture monitoring and controlling system, the conveyor system, the control devices and the power supply, as part of an integrated system. The assessment of a closure and conveyor system assembly for its fire resistance is only one evaluation needed to assure that the complex mechanism will function reliably during its expected life span. Regular maintenance of the closure and conveyor system assembly during its working life will be necessary to protect the safety functions.

C.3.2 Design for closure and conveyor system assemblies and their test specimens

The heat may have a strong impact on the load bearing capacity of the selected anchoring particular for larger and heavier closure and conveyor system assemblies. Hence, proof of structural load bearing capacity may be required, and therefore sufficient safety factors for the load bearing capacity should be provided for the anchoring. Larger and heavier closure and conveyor system assemblies may require additional structural analysis for the intended separating element, particular for closure and conveyor systems to be used in the raised position.

Where elongation, shrinkage or bending are likely to be significant factors, the necessary compensatory measures should be included in the construction of the test specimen. This means that adequate connections, attachments etc. should be included in the test specimen.

In practice closure and conveyor system assemblies are installed to fire resisting separating elements. For the purpose of their design all effects of bending, elongation, shrinkage etc. of the individual parts of the elements should be taken into consideration.

For the penetrating components there are substantial differences between the cables, electrical wiring and pipes used in practice, especially with regard to their insulation and heat conducting properties, as well as their intended use. When testing according to this standard every effort should be made to take every possibility into consideration when evaluating the worst case for testing purposes, in order to avoid practical restrictions using the field of direct application.

C.3.3 Thermally induced changes on the test construction

Thermally induced changes in the test specimen may have an unfavourable effect on the standard supporting construction or associated supporting construction. This may lead to premature failure of a supporting construction that is too light, because the forces acting upon it cannot be absorbed. If the supporting construction fails prematurely, this will result in a reduced fire resistance time for the closure and conveyor system assembly.

Bibliography

EN 1366-2, *Fire resistance tests for service installations — Part 2: Fire dampers*.

prEN 14600, *Fire resisting and/or smoke control doorsets and operable windows — Requirements and classification.*

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