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BSI Standards Publication

Glass in building — Safety in case of fire, fire resistance — Glass testing methodology for the purpose of classification

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National foreword

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

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Glas im Bauwesen - Brandsicherheit, Feuerwiderstandsfähigkeit - Verfahrensweise von Glasprüfungen zur Klassifizierung

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Foreword

This document (EN 15998:2010) has been prepared by Technical Committee CEN/TC 129 “Glass in building”, the secretariat of which is held by NBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2011, and conflicting national standards shall be withdrawn at the latest by May 2011.

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Introduction

According to mandate M/135 "Glass in building", one of the essential characteristics that may be claimed is *Safety in case of fire − Resistance to fire (for glass for use in a glazed assembly intended specifically for fire resistance)*. However, glass products cannot be tested and classified for fire resistance without being incorporated into a fire resistant glazed assembly.

1 Scope

This European Standard specifies the testing methodology to be used for glass products that are claiming fire resistance. The methodology covers Initial Type Testing as defined in the relevant glass product standard.

NOTE This document provides guidance with the declaration of the characteristic, Safety in case of fire − Resistance to fire (for glass for use in a glazed assembly intended specifically for fire resistance) for the CE marking.

The same methodology can also be used to determine the performance classification for market applications (see Annex B).

The methodology covers all glass product types that may require testing and classification for fire resistance.

Fire resistance testing covers end use applications for example:

— doors;

— partitions, walls (including curtain walling);

— floors, roofs;

— ceilings.

2 Normative references

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

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

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

EN 1364-1, *Fire resistance tests for non-loadbearing elements — Part 1: Walls*

EN 1364-2, *Fire resistance tests for non-loadbearing elements — Part 2: Ceilings*

EN 1364-3, *Fire resistance tests for non-loadbearing elements — Part 3: Curtain walling — Full configuration (complete assembly)*

EN 1365-1, *Fire resistance tests for loadbearing elements — Part 1: Walls*

EN 1365-2, *Fire resistance tests for loadbearing elements — Part 2: Floors and roofs*

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

EN 13501-2:2007+A1:2009, *Fire classification of construction products and building elements — Part 2: Classification using data from fire resistance tests, excluding ventilation services*

EN 15254-4, *Extended application of results from fire resistance tests — Non-loadbearing walls — Part 4: Glazed constructions*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
extended field of application
EXAP
outcome of a process (involving the application of defined rules that may incorporate calculation procedures) that predicts, for a variation of a product property and/or its intended end use application(s), a test result on the basis of one or more test result(s) to the same test standard

[EN 13501-2:2007+A1:2009]

3.2
fire-resistant glass
glass product group, i.e. monolithic, multiple layers or insulating glass unit, that when used in a fire resistant glazed assembly can have its performance determined and classified in accordance with EN 13501-2

3.3
fire performance classification
result of a fire resistance test(s) expressed as required in EN 13501-2

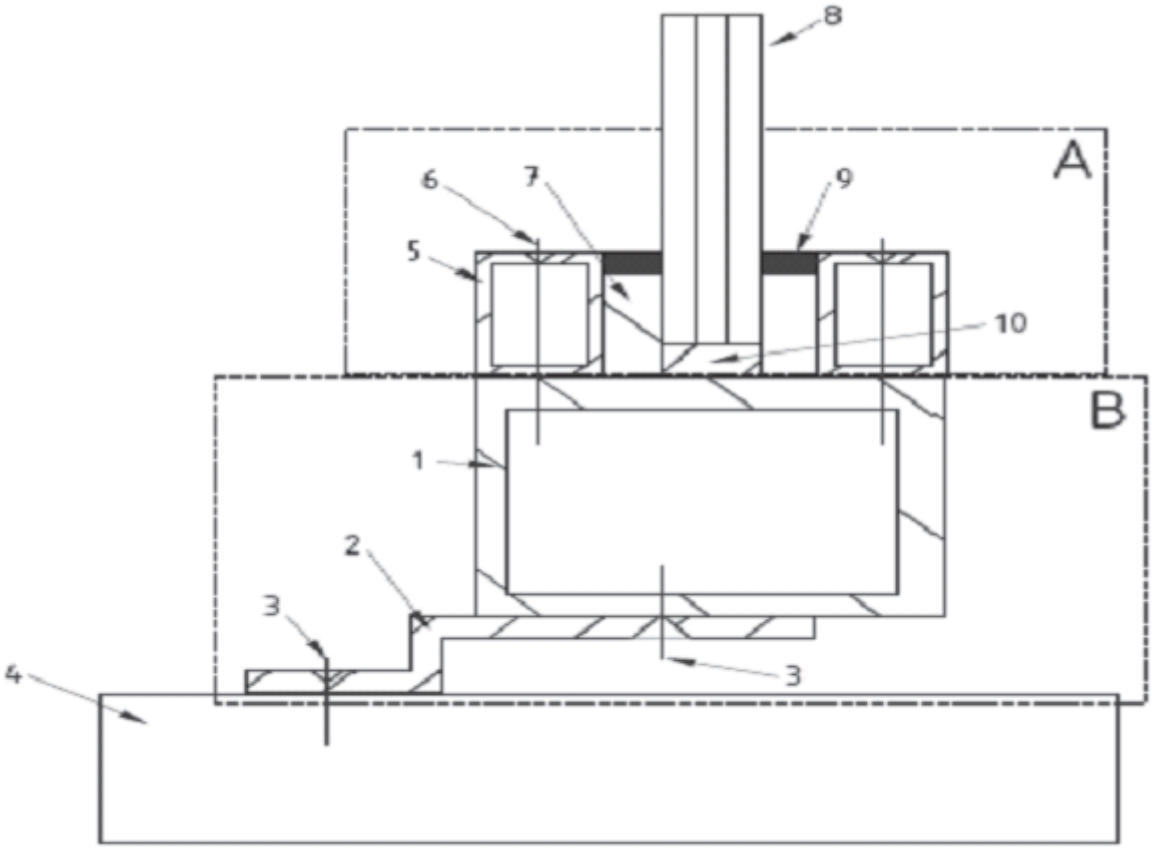
NOTE 1 The classification is reported with respect to integrity (E), integrity and radiation (EW), integrity and insulation (EI), and loadbearing capacity and integrity (RE) and loadbearing capacity, integrity an insulation (REI).

NOTE 2 The classification of a specific glass product will be one or more of E, EW, EI, RE, REI

NOTE 3 The time obtained for different classifications may be different, e.g. EW 30, EI 20.

3.4
framing system
frame profile and fixings to the supporting structure (e.g. wall)

NOTE See Figure 1, B.



Key

A glazing system

B framing systems

Framing system consisting of:

1 frame;

2 metal anchor, screwed or bolted to the wall 4 by a fixing anchor 3;

3 screw and fixing anchor;

4 wall.

Glazing system consisting of:

5 bead, screwed or clipped;

6 bead fixing;

7 glazing strip;

8 glass;

9 sealing of gasket;

10 setting block.

Figure 1 — Fire resistant metal framing and glazing system

3.5
glazed assembly
fire-resistant glass together with the framing system and glazing materials subjected to the fire resistance test

NOTE 1 Also referred to as glazed element, glazed construction, glazed screen.

NOTE 2 See Figure 1.

3.6
glazing system
fire-resistant glass together with the glazing materials used in the fire resistance test to glaze the glass into its framing system

NOTE See Figure 1, A.

3.7
glazing materials
materials used to glaze the fire-resistant glass into its frame, e.g. glazing strips, beads and bead fixings, setting blocks, gaskets and sealant

3.8
historic data
test data obtained by tests previously performed in accordance with the European Standard with the following provisos: same product, same characteristic(s), same or more onerous test method, sampling method and attestation of conformity

3.9
initial type testing
ITT
determination of the performance of a product (characteristic, durability), on the basis of either actual tests or other procedures (such as conventional, standardized, tabulated or general accepted values, standardized or recognized calculation methods, test reports when made available, etc.), in accordance with this European Standard that demonstrates compliance with this European Standard

NOTE The European Standard referred to is the applicable “Evaluation of conformity/product standard” for the glass product under consideration, e.g. EN 1279-5; EN 12150-2; EN 13024-2; EN 14449.

3.10
reference test
fire resistance test in accordance with the appropriate standard (see 4.3), on which the extended application is based and the results of which are used as the main source of data for the extended application

NOTE 1 This test may also be used as the initial type test to support CE marking of fire-resistant glass or as a market application test. In each case, Annex ZA of the product standard should be considered: e.g. involvement of a Notified Certification Body, sample traceability, product sampling (when necessary) and checks of the factory production control.

NOTE 2 The reference test provides the main source of data to determine the following:

— performance rating (integrity, integrity with radiation or integrity with insulation);

— maximum pane area and dimensions for the fire-resistant glass;

— maximum dimensions of the fire-resistant glazed element for each type of frame material.

NOTE 3 The reference test may also provide other data to assist in determining, through EXAP rules, the following:

— permitted dimensional changes to the framing system;

— any changes to the glazing system.

3.11
test report
document that covers the results of tests undertaken on a representative sample of the product from production or on a prototype design of the product

NOTE This definition comes from an “Evaluation of conformity/product standard”.

3.12
technical file
document, produced and maintained by the manufacturer, that contains all relevant information dealing with product traceability/testing/manufacture, etc.

3.13
virtual assembly
glazed assembly that is defined by the glass manufacturer for the Initial Type Testing of the characteristic "Safety in case of fire − Resistance to fire (for glass for use in a glazed assembly intended specifically for fire resistance)"

NOTE 1 The acceptable components and the scope of application for the "Virtual Assembly" are those defined by the relevant classification report.

NOTE 2 Classification is in accordance with EN 13501-2 and based upon:

a) fire resistance test(s) for direct application; or

b) for extended application according to EXAP rules.

4 Principles

4.1 General

According to EN 357:2004, 5.1, the fire resistance classification shall be related to the complete glazed element which incorporates the glass products and all given dimensions and tolerances.

Therefore the principle is established that the glass shall be fitted into a framing system, complete with seals and mounting and fixing arrangements. Therefore as a consequence the glass cannot be classified on its own. The classification relates to a complete glazed assembly. The glazed assembly is tested in accordance with the applicable test method (see 4.3).

The determination of the fire resistance classification is primarily undertaken for two separate reasons:

— determination of the fire resistance performance of the glass product as one of its characteristics for regulatory marking (see 4.2);

— determination of the fire resistance performance of a glazed assembly for specific market applications (see Annex B).

NOTE A test may satisfy both of the above items.

4.2 Testing to determine fire resistance as a product characteristic for a glass

According to any of the "Evaluation of conformity/product standards" for glass the characteristic “Safety in case of fire − Resistance to fire (for glass for use in a glazed assembly intended specifically for fire resistance)" can be determined and classified in accordance with EN 13501-2.

Therefore the testing shall be undertaken on a complete fire resistant glazed assembly. This requires the glass product manufacturer to specify all the details of the glass and glazed assembly to be tested. The glass

product manufacturer rarely, if ever, supplies all the components of the glazed assembly. The glazed assembly as tested is therefore known as a "virtual assembly" as it will not exist until all components come together, e.g. on site.

The glass product manufacturer when claiming a performance for the characteristic "Safety in case of fire − Resistance to fire (for glass for use in a glazed assembly intended specifically for fire resistance)" for the glass product shall ensure that all details of the tested glazed assembly are given. The data is available in the classification report as detailed in EN 13501-2.

4.3 Applicable fire resistance tests

Depending on end use application glazed assemblies shall be tested in accordance with the following standards:

— EN 1364-1 Walls: non-load bearing;

— EN 1364-2 Ceilings: non-load bearing;

— EN 1364-3 Curtain walling: non-load bearing;

— EN 1365-1 Walls: load bearing;

— EN 1365-2 Floors and roofs: load bearing;

— EN 1634-1 Doors.

4.4 Glass products

Any glass product may be tested as part of a fire resistant glazed assembly. However, not all products can be successfully classified. The product standards that could apply are given in Annex A.

4.5 Classification report(s)

EN 13501-2 details the form and content of a classification report. The report covers the results of fire resistance test(s). Details of the virtual assembly(ies) tested are also given.

The report(s) may cover the results of fire resistance test(s) on a particular glass product in several virtual assemblies.

NOTE The classification determined for a glass product may vary depending on the details of the framing system, glazing materials and size tested.

The report(s) are a significant addendum to a manufacturers claimed classification for the characteristic "Safety in case of fire − Resistance to fire (for glass for use in a glazed assembly intended specifically for fire resistance)".

5 Sampling

5.1 General

5.1.1 General remark

The sampling of glass products for incorporation into virtual assemblies for fire resistance testing depends on the reason the fire resistance test is being undertaken.

5.1.2 Classification of a glass product

When a fire resistance test is part of the Initial Type Testing (ITT) of the glass product for the characteristic "Safety in case of fire − Resistance to fire (for glass for use in a glazed assembly intended specifically for fire resistance)" then the responsibility for the sampling is specified in the applicable "Evaluation of conformity/product standard". Details of the sampling are given in 5.2.

5.1.3 Market application testing

When a fire resistance test is for market application the details of the sampling are given in Annex B.

5.2 For determination of fire resistance as a product characteristic for a glass

5.2.1 Classification of a glass product

The appropriate evaluation of conformity standard covering the characteristic "Safety in case of fire − Resistance to fire (for glass for use in a glazed assembly intended specifically for fire resistance)" requires an evaluation of conformity which covers the following tasks:

— initial examination of the factory production control system;

— initial inspection of the factory;

— overall control of the ITT;

— ongoing surveillance of the factory.

The control of the ITT includes the selection of samples for the testing. The rules are as follows:

a) for Initial Type Testing (ITT) the samples shall be representative of the product taken from any plant and/or line or from stock, or a sample declared to be a prototype;

b) all samples to be used for ITT testing purposes shall be accompanied with suitable documentation and/or marking to allow subsequent verification that the producer has fulfilled their obligations;

c) this documentation shall include at least the following information:

   1) manufacturer and manufacturing plant;

   2) place of sampling;

   3) when applicable, stock or batch number (from which the samples have been taken to ensure traceability);

   4) number or quantity of samples;

   5) identification of the construction product in accordance with the technical specification;

   6) marking of the product by the manufacturer;

   7) marking of the samples by the sampler;

   8) where necessary, properties to be tested;

   9) place and date;

   10) signatures;

11) registration number of the Notified Body.

NOTE 1 The role of the notified body is defined in Annex ZA of the appropriate product standard.

NOTE 2 During the sampling, additional samples may be requested to be taken for internal product control testing as described in the FPC schemes of the product standards. This is normally detailed in Annex A of the product standard. This action should be executed and recorded as part of the technical file.

NOTE 3 Prototype samples to be used for testing purposes should be suitably documented to allow subsequent verification that the actual product manufactured on the (future) production line is the same as the prototype.

NOTE 4 When sampling is done prior to a number of tests then the sampled products should be indelibly marked by the sampling body and stored in a manner that ensures the product does not deteriorate.

5.2.2 Market application testing

Details on sampling are given in Annex B.

5.3 Non-sampled test results

5.3.1 General

In the event that sampling is done under the responsibility of the manufacturer, there are consequences regarding the validity of the test report. There are two possibilities:

a) Case A: Fire resistance test conducted according to one of the standards listed in 4.3, glass product sampled by the manufacturer and the manufacturer demonstrates the traceability as below:

   1) manufacturer and/or manufacturing plant;

   2) stock or batch number, delivery paperwork;

   3) identification of the construction product in accordance with the technical specification;

or

b) Case B: Fire resistance test conducted according to one of the standards listed in 4.3, glass product sampled under the responsibility of the manufacturer who cannot demonstrate complete traceability.

5.3.2 Classification of a glass product

Neither Case A nor Case B can be accepted as an ITT test.

NOTE Historic data is appropriate for market application testing if done to the relevant product standard(s) even when sampled by the manufacturer and without full traceability.

5.3.3 Market application

The influence of test results from products sampled under the responsibility of the manufacturer is given in Annex B.

5.4 Historic data

For historic data to be used for ITT, the provisions of the relevant product standard regarding the sampling shall be followed. The samples shall be traceable through all stages of the manufacturing process (i.e. glass, raw materials, chemical composition, etc.) to demonstrate that the sampled product is equivalent to present production. This shall be supported by documented evidence contained in the factory production control (FPC)

schemes (identical and/or equivalent to the relevant harmonised product standard). In such cases, this shall be recorded as part of the technical file.

6 Use of test data in EXAP

The test data generated by test for either determination of fire resistance as a product characteristic or market application may be used to develop extended fields of application.

Details on the development of EXAP are given in EN 15254-4.

Annex A
(informative)

List of possible glass product standards (see 4.5)

A.1 Monolithic basic or special basic glasses

EN 572-3, *Glass in Building — Basic soda lime silicate glass products — Part 3: Polished wired glass*

EN 572-5, *Glass in Building — Basic soda lime silicate glass products — Part 5: Patterned glass*

EN 572-7, *Glass in Building — Basic soda lime silicate glass products — Part 7: Wired or unwired channel shaped glass*

EN 572-9, *Glass in building — Basic soda lime silicate glass products — Part 9: Evaluation of conformity/Product standard*

EN 1748-1-1, *Glass in building — Special basic products — Borosilicate glasses — Part 1-1: Definition and general physical and mechanical properties*

EN 1748-1-2, *Glass in building — Special basic products — Borosilicate glasses — Part 1-2: Evaluation of conformity/Product standard*

EN 1748-2-1, *Glass in building — Special basic products — Glass ceramics — Part 2-1: Definitions and general physical and mechanical properties*

EN 1748-2-2, *Glass in building — Special basic products — Glass ceramics — Part 2-2: Evaluation of conformity/Product standard*

EN 14178-1, *Glass in building — Basic alkaline earth silicate glass products — Part 1: Float glass*

EN 14178-2, *Glass in building — Basic alkaline earth silicate glass products — Part 2: Evaluation of conformity/Product standard*

prEN 15681-1, *Glass in building — Basic alumino silicate glass products — Part 1: Definitions and general physical and mechanical properties*

prEN 15681-2, *Glass in building — Basic alumino silicate glass products — Part 2: Evaluation of conformity/Product standard*

A.2 Monolithic thermally toughened glasses

EN 12150-1, *Glass in building — Thermally toughened soda lime silicate safety glass — Part 1: Definition and description*

EN 12150-2, *Glass in building — Thermally toughened soda lime silicate safety glass — Part 2: Evaluation of conformity/Product standard*

EN 13024-1, *Glass in building — Thermally toughened borosilicate safety glass — Part 1: Definition and description*

EN 13024-2, *Glass in building — Thermally toughened borosilicate safety glass — Part 2: Evaluation of conformity/Product standard*

EN 14179-1, *Glass in building — Heat soaked thermally toughened soda lime silicate safety glass — Part 1: Definition and description*

EN 14179-2, *Glass in building — Heat soaked thermally toughened soda lime silicate safety glass — Part 2: Evaluation of conformity/Product standard*

EN 14321-1, *Glass in building — Thermally toughened alkaline earth silicate safety glass — Part 1: Definition and description*

EN 14321-2, *Glass in building — Thermally toughened alkaline earth silicate safety glass — Part 2: Evaluation of conformity/Product standard*

prEN 15682-1, *Glass in building — Heat soaked thermally toughened alkaline earth silicate safety glass — Part 1: Definition and description*

prEN 15682-2, *Glass in building — Heat soaked thermally toughened alkaline earth silicate safety glass — Part 2: Evaluation of conformity/Product standard*

prEN 15683-1, *Glass in building — Thermally toughened soda lime silicate channel shaped safety glass — Part 1: Definition and description*

prEN 15683-2, *Glass in Building — Thermally toughened soda lime silicate channel shaped safety glass — Part 2: Evaluation of conformity/Product standard*

A.3 Laminated and laminated safety glasses

EN ISO 12543-2, *Glass in building — Laminated glass and laminated safety glass — Part 2: Laminated safety glass (ISO 12543-2:1998)*

EN ISO 12543-3, *Glass in building — Laminated glass and laminated safety glass — Part 3: Laminated glass (ISO 12543-3:1998)*

EN 14449, *Glass in building — Laminated glass and laminated safety glass — Evaluation of conformity/Product standard*

A.4 Insulating glass units

EN 1279-5, *Glass in building — Insulating glass units — Part 5: Evaluation of conformity*

NOTE An insulating glass units may contain one or more of the glass types/products in A.1, A.2 and A.3 above.

A.5 Coated glass

EN 1096-1, *Glass in building — Coated glass — Part 1: Definitions and classification*

EN 1096-4, *Glass in building — Coated glass — Part 4: Evaluation of conformity/Product standard*

NOTE 1 For a coated glass to be fire-resistant it must have as a substrate one of A.1, A.2 or A.3.

NOTE 2 The coating on a thermally coated glass may be either one that can be thermally toughened or one that is applied to a thermally toughened glass.

Annex B
(informative)

Market application testing

B.1 General

This is testing of a glazed assembly to an applicable standard (see 4.3) for specific end use application(s). Such testing may also be related to the determination of the fire resistance characteristic of a door, screen, wall, etc. as part of their manufacturer(s) ITT.

The outcome of such test may be useful in increasing the range of direct and extended applications for the glass product.

B.2 Sampling

B.2.1 General

When a fire resistance test is for a market application test then the sampling regime depends on the application.

— If the test is an ITT for the framing system manufacturer then the fire-resistant glass product shall be supplied appropriately marked [1)].

  The glass product supplied then has its own traceability that would ensure that the results could be used for extended field of application (EXAP).

— If the test is only project specific and the glass product manufacturer requires that the results are suitable for EXAP then full glass product traceability is necessary.

Details of the sampling are given in B.2.2 and B.2.3.

B.2.2 ITT for system manufacturer

It is sufficient that the fire-resistant glass product be supplied with appropriate CE Marking, accompanying information and manufacturer's traceability.

B.2.3 Test results to be used for extended applications (EXAP)

The fire resistant glass product may be sampled by the glass product manufacturer. However, the glass product supplied should be representative of production and should have manufacturing traceability.

B.2.4 Non-sampled test results

Case A and Case B, as defined in 5.3.1, can be accepted as market application tests subject to the following:

— Case A, confirmation that the existing Factory Production Control (FPC) and glass product traceability documentation are in agreement.

1) Appropriate marking is ensured by CE marking.

NOTE The Annex ZA of the relevant harmonised product standard defines the possibility to verify the provisions for factory production control with the involvement of a notified body.

— Case B, if the manufacturer repeats at least one test under ITT conditions, i.e. conducts a corroborative ITT test including sampling requirements, to show claimed performance is maintained by present product through FPC.

Bibliography

[1] EN 357:2004, *Glass in building — Fire resistant glazed elements with transparent or translucent glass products — Classification of fire resistance*

[2] EN 1096-1, *Glass in building — Coated glass — Part 1: Definitions and classification*

[3] EN 1096-4, *Glass in building — Coated glass — Part 4: Evaluation of conformity/Product standard*

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