

Glazing for buildings —

Part 3: Code of practice for fire, security and wind loading

ICS 81.040.20

Committees responsible for this British Standard

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- British Plastics Federaation
- British Woodworking Federation
- Consumer Policy Committee of BSI
- Council for Aluminium in Building
- Flat Glass Manufacturers' Association
- Glass and Glazing Federation
- Nottingham University
- Office of the Deputy Prime Minister — Building Division
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Foreword

This part of BS 6262 has been prepared by Subcommittee B/520/4. It partially supersedes BS 6262:1982, which will be withdrawn upon publication of all seven parts of the newly revised and restructured BS 6262.

BS 6262:1982 is being revised and also restructured to simplify its use and will be published in seven parts:

- *Part 1: General methodology for the selection of glazing;*
- *Part 2: Code of practice for heat, light and sound;*
- *Part 3: Code of practice for fire, security and wind loading;*
- *Part 4: Code of practice for safety related to human impact;*
- *Part 5: Code of practice for frame design considerations;*
- *Part 6: Code of practice for special applications;*
- *Part 7: Code of practice for provision of information.*

Requirements for standards of workmanship for glazing have been published separately as BS 8000-7 and, therefore, this subject is not dealt with in this standard.

Since the correct selection of materials to be used in glazing for buildings depends on many factors, the recommendations in this part of the standard should be used in conjunction with those in the other parts.

As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

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

Compliance with a British Standard does not of itself confer immunity from legal obligations.

In particular, attention is drawn to the following statutory regulations.

The Building Regulations 2000 [1].

The Building Regulations (Northern Ireland) [2].

The Building Standards (Scotland) Regulations 2004 [3].

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 35 and a back cover.

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1 Scope

This part of BS 6262 gives information and recommendations for vertical glazing in the external walls and interiors of buildings, with respect to fire safety, security and wind loading.

These recommendations apply only when the glass is installed in a glazing system specifically designed for the purpose.

These recommendations do not apply to:

- a) patent glazing (see BS 5516-1);
- b) glass in non-vertical applications (see BS 5516-2)
- c) glazing for commercial greenhouses (see BS 5502-21);
- d) glazing for domestic greenhouses.

Requirements for standards of workmanship for glazing have been published separately as BS 8000-7 and, therefore, this subject is not dealt with in this standard.

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.

BS 476-4, *Fire tests on building materials and structures — Part 4: Non-combustibility test for materials.*

BS 476-6, *Fire tests on building materials and structures — Part 6: Method of test for fire propagation for products.*

BS 476-7, *Fire tests on building materials and structures — Part 7: Method of test to determine the classification of the surface spread of flame of products.*

BS 476-20, *Fire tests on building materials and structures — Part 20: Method for determination of the fire resistance of elements of construction (general principles).*

BS 476-22, *Fire tests on building materials and structures — Part 22: Methods for determination of the fire resistance of non-loadbearing elements of construction.*

BS 5051-1, *Bullet-resistant glazing — Part 1: Specification for glazing for interior use.*

BS 5544, *Specification for anti-bandit glazing (glazing resistant to manual attack).*

BS 5357, *Code of practice for installation of security glazing.*

BS 6180, *Barriers in and about buildings — Code of practice.*

BS 6262-4, *Glazing for buildings — Part 4: Code of practice for safety related to human impact.*

BS 6399-2:1997, *Loading for buildings — Part 2: Code of practice for wind loads.*

BS EN 356, *Glass in building — Security glazing — Testing and classification of resistance against manual attack.*

BS EN 1063, *Glass in building — Security glazing — Testing and classification of resistance against bullet attack.*

BS EN 1363, *Fire resistance tests.*

BS EN 1364, *Fire resistance tests for non-loadbearing elements.*

BS EN 1634, *Fire resistance tests for door and shutter assemblies.*

BS EN 13123-1, *Windows, doors and shutters — Explosion resistance — Requirements and classification — Part 1: Shock tube.*

BS EN 13123-2, *Windows, doors and shutters — Explosion resistance — Requirements and classification — Part 2: Range test.*

BS EN 13124-1, *Windows, doors and shutters — Explosion resistance — Test method — Part 1: Shock tube.*

BS EN 13124-2, *Windows, doors and shutters — Explosion resistance — Test method — Part 2: Range test.*

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

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

BS EN 13541, *Glass in building — Security glazing — Testing and classification of resistance against explosion pressure.*

BS EN 13823:2002, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item.*

BS EN ISO 1182:2002, *Reaction to fire tests for building products — Non-combustibility test.*

BS EN ISO 1716:2002, *Reaction to fire tests for building products — Determination of the heat of combustion.*

BS EN ISO 9239-1:2002, *Reaction to fire tests — Horizontal surface spread of flame on floor-covering systems — Part 1: Determination of the burning behaviour using a radiant heat source.*

BS EN ISO 11925-2:2002, *Reaction to fire tests — Ignitability of building products subjected to direct impingement of flame — Part 2: Single-flame source test.*

3 Terms and definitions

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

3.1

aspect ratio

ratio of the longer side of a pane to its shorter side

3.2

glazing, noun

glass or plastics glazing sheet material, for installation into a building

3.3

glazing, verb

action of installing glass, or plastics glazing sheet material, into a building

3.4

insulating glass unit

an assembly consisting of at least two panes of glass, separated by one or more spaces, hermetically sealed along the periphery, mechanically stable and durable

[BS EN 1279-1:2004, definition 3.1]

NOTE The individual panes may be of different sizes and/or thicknesses.

3.5

insulating glass

fire resistant glass that can resist the passage of flames, smoke and heat through the glass for a period of time (normally 30 min or longer), when tested in accordance with an appropriate fire resistance test method, without the unexposed surface temperature exceeding a specified limit

NOTE 1 Appropriate fire resistance test methods are BS 476-22, BS EN 1363, BS EN 1364, BS EN 1634.

NOTE 2 See also 3.6.

3.6

integrity only glass

fire resistant glass that can resist the passage of flames and smoke through the glass for a period of time (normally 30 min or longer), when tested in accordance with an appropriate fire resistance test

NOTE 1 Appropriate fire resistance test methods are BS 476-22, BS EN 1363, BS EN 1364, BS EN 1634.

NOTE 2 See also 3.5.

3.7**pane**

single piece of glass or plastics glazing sheet material, in a finished size ready for glazing

3.8**plastics glazing sheet material**

plastics material in the form of a single sheet, or a combination of sheets laminated together, or an extruded multi-wall sheet

3.9**pane size**

dimensions of a pane

NOTE See Figure 1.

3.10**sight size**

dimensions of the opening which, when glazed with a transparent or translucent material, admits light

NOTE See Figure 1.

3.11**tight size**

dimensions of the rebated opening

NOTE 1 This is also known as the rebated size.

NOTE 2 See Figure 1.

3.12**edge cover**

distance between the edge of the glass and the sight line

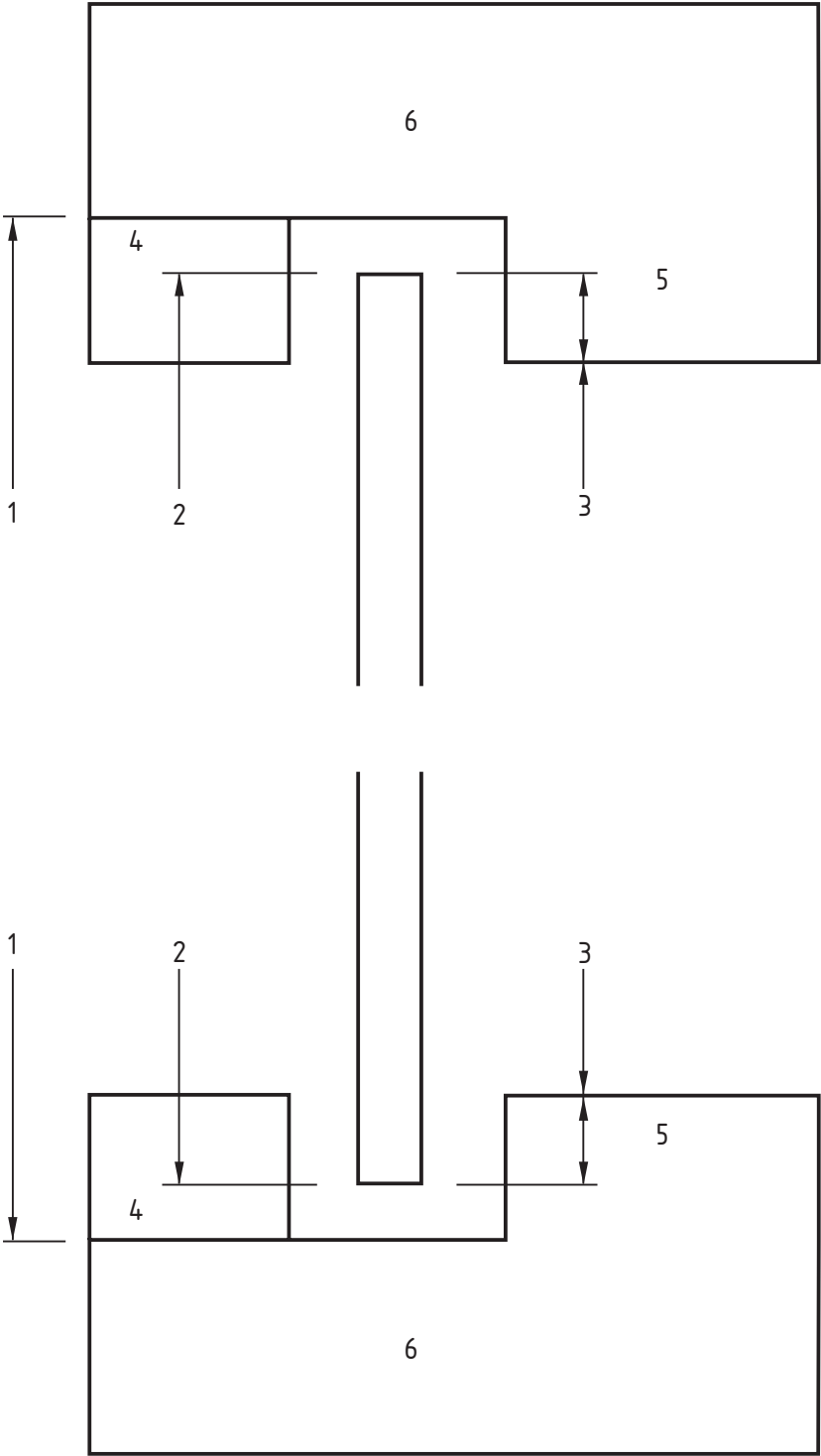
NOTE See Figure 1.

3.13**nominal dimensions**

design size excluding tolerances

3.14**vertical glazing**

glazing which is vertical, or within 15° of vertical



- Key
- | | | |
|--------------|--------------|--------------|
| 1 Tight size | 3 Sight size | 5 Edge cover |
| 2 Pane size | 4 Bead | 6 Frame |

Figure 1 — Definition of size

4 Fire

4.1 Regulations and test standards

Structural fire precautions might need to consider the performance of glass and plastics glazing sheet materials. These precautions are controlled for new building work by building regulations and bylaws and by other fire safety legislation for occupied premises.

For new buildings, control is exercised separately in England (excluding Inner London) and Wales, Inner London, Scotland and Northern Ireland. The extent of control depends on the type of glass or plastics glazing sheet material and the method of specification, the particular location and the applicable regulations (see BS 6262-1:2005, Annex A) [1], [2], [3].

In determining the appropriate fire properties of glazing the tests given in Table 1 apply. Both European Standards and British Standards are accepted, but these should not be mixed and matched.

NOTE Building regulations generally only apply to the provision of reasonable standards of health and safety for people in buildings. Requirements other than regulatory ones (e.g. property protection) might need to be taken into account.

Generally, regulations are written in terms of performance under the standard fire tests but BS 5588 and other codes of practice dealing with means of escape in case of fire make specific mention in connection with the use of glass when fire resistance is required.

Table 1 — British and European Standards

British Standards	European Standards
Reaction to fire	
<i>BS 476-4:1970.</i> This test determines whether building materials are non-combustible within the meaning of the definition. Determination of combustibility is made by reference to the duration of any flaming or the increase in the temperature of the sample or furnace above a defined limit. <i>BS 476-6:1989.</i> The tests provide a means of comparing the contribution of building materials to the growth of a fire by measuring the rate of heat evolution. The performance is expressed as a numerical index from 0 to 100 or more, low values indicating a low rate of heat release. <i>BS 476-7:1987.</i> The tests are used to determine the tendency of materials to support the spread of flames across their surfaces and specifies a method of classification. The performances are expressed as four classes, class 1 representing the best performance. NOTE For Class 0, Tp(a) and Tp(b) see the appropriate building regulations [1], [2], [3].	According to European Commission Decision 96/603/EC (consolidated 2003/424/EC), glass, including annealed, heat strengthened, chemically strengthened, toughened and laminated, has been classified, in accordance with BS EN 13501-2, as long as there is less than 1 % organic content, as Class A1, as provided for in European Commission Decision 2000/147/EC, without the need for testing. For plastics glazing sheet materials, reaction to fire is determined and classified in accordance with BS EN 13501-1 based on the results of the following tests. BS EN ISO 1182 to test for combustibility. BS EN ISO 1716 to test for contribution to the growth of fire. BS EN 13823, BS EN ISO 11925-2 and BS EN ISO 9239-1 to test for surface spread of flame.
Fire resistance	
<i>BS 476-20:1987 and BS 476-22:1987.</i> These tests determine whether elements of construction retain their integrity against the passage of hot gases and provide, where necessary, resistance to heat transmission and heat radiation. Performances are expressed in minutes to failure by appropriate criteria.	BS EN 1363, BS EN 1364 and BS EN 1634. These tests determine whether elements of construction retain their integrity against the passage of hot gases and provide, where necessary, resistance to heat transmission and heat radiation. Performances are expressed in minutes to failure by appropriate criteria. Classification should be in accordance with BS EN 13501-1.

4.2 Information

Glass and plastics glazing sheet materials might need to satisfy requirements for:

- a) surface spread of flame over room linings; and
- b) the fire performance of external cladding; and
- c) internal fire spread.

NOTE The information in the rest of this clause relates to fire performance of glass in relation to BS 476, since there is insufficient information to generalize performance in relation to the new European Standards.

Where glass is incorporated within elements of escape routes, etc., the glazed installation should satisfy the necessary period of fire resistance in terms of the criteria specified in BS 476-22.

The ability of elements to conform to fire resistance requirements will depend on the type of material, its thickness, size, height to width ratio of pane, type of frame, method of fixing, the form of the construction surrounding the glazed area, and whether or not the element consists of a single pane.

Only certain types of glazed installations are able to satisfy the fire resistance requirements specified in terms of BS 476-22. Periods up to two hours are obtainable for integrity and insulation, or integrity only, depending on the glazed elements and the frame design. No restrictions are made on the use of glazed systems meeting the full fire resistance performance in terms of both integrity and insulation, but those systems not providing adequate insulation might be limited under BS 5588 and building regulations, e.g. when dealing with building/room compartmentation, the protection of escape routes etc.

Reference to BS 6262-4 should be made when impact safety requirements need to be taken into account in addition to fire resistance.

Information on the fire performance of glazing, i.e. glass and plastics glazing sheet materials, and of glazed systems (e.g. fire-resisting doors and partitions) should be obtained from the manufacturers of the material, component or system.

4.3 Glass

4.3.1 Reaction to fire

Monolithic glass is not combustible and will generate no heat and make no contribution to the spread of a fire. On the other hand, it is thin and transparent and heat from a fire can quickly transmit through it, either by radiation or conduction.

Laminated glass can contain plastics materials, which in themselves are combustible. Being a relatively small proportion of the product and being encapsulated by the glass, these plastics do not produce significant amounts of heat. As such laminated glass makes a negligible contribution to the spread of fire. (See Table 2.)

Soda lime silicate glass is classified as non-combustible when tested in accordance with BS 476-4.

Laminated products in which the outer layers comprise soda lime silicate glass will have non-combustible exposed surfaces, and as such should be acceptable in any wall lining. (See Table 2.)

The fire performance properties of various types of glass are given in Table 2.

4.3.2 Fire resistance

4.3.2.1 Annealed glass, e.g. float glass, patterned glass, excluding wired glass

Under fire conditions annealed glass will crack and tend to fall from its frame. In very small panes, the cracked pieces can remain in position, depending on the framing system and glazing method, and provide limited integrity only (known as Copper light glazing).

NOTE For specific advice on maximum tested pane sizes of Copper light glazing, contact the supplier.

4.3.2.2 Annealed glass: wired glass

Wired glass will crack under fire conditions, but the presence of the wires tends to hold it together. Depending on the framing system and glazing method, wired glass can give considerable periods of integrity only.

Table 2 — Fire properties of glass (excluding fire resistance^a)

Type	Non-combustibility tested in accordance with BS 476-4:1984	Fire propagation index tested in accordance with BS 476-6:1989	Surface spread of flame ^b tested in accordance with BS 476-7:1987
Annealed (non-wired)	Non-combustible ^c	$I < 12$ and $i_1 < 6$	Class 1
Wired	Non-combustible ^c	$I < 12$ and $i_1 < 6$	Class 1
Toughened	Non-combustible ^c	$I < 12$ and $i_1 < 6$	Class 1
Laminated			
a) PVB (polyvinylbutyral) interlayer	Combustible	$I < 12$ and $i_1 < 6^c$	Class 1 ^c
b) intumescent interlayer	Non-combustible ^c	$I < 12$ and $i_1 < 6$	Class 1
c) gel interlayer	Non-combustible ^c	$I < 12$ and $i_1 < 6$	Class 1
d) resin interlayer ^d	—	—	—
Borosilicate	Non-combustible ^c	$I < 12$ and $i_1 < 6$	Class 1
Glass blocks	Non-combustible	$I < 12$ and $i_1 < 6$	Class 1
^a See Table 3. ^b The performance might be different where adhesive films have been applied. ^c Materials termed “non combustible” satisfy the requirements for class 0 combustible materials. ^d The performance of laminated glass constructed with resin interlayers has not been tested.			

4.3.2.3 Laminated glass

The individual panes of laminated glass will behave in the same way as for the particular glass type described elsewhere in this standard.

If the interlayer material is a plastic, not specifically designed for fire resistance, it will quickly break down and make no effective contribution to fire resistance.

If the interlayer is specially formulated to contribute towards fire resistance, the laminated glass, depending on the framing system and glazing method, can give considerable periods of integrity and insulation.

4.3.2.4 Toughened glass and heat soaked toughened glass

Thermally toughened and heat soaked thermally toughened soda lime silicate glass is very resistant to thermal breakage from solar radiation, but cannot normally be expected to survive fire conditions. It will break and fall from its frame.

Modified toughened glass (highly toughened soda lime silicate glass with specially treated edges glazed in specially designed glazing systems) can give periods of integrity only.

Thermally toughened borosilicate glass is extremely resistant to thermal breakage and, depending on the framing system and glazing method, can give periods of integrity only.

4.3.2.5 Heat strengthened glass

Heat strengthened soda lime silicate glass will perform in the same way as annealed glass (see 4.3.2.1).

4.3.2.6 Glazed installations/assemblies

Only certain types of glazed installations have performed adequately under BS 476-22:1987 test conditions or have been permitted under deemed-to-satisfy provisions in codes of practice and bye-laws.

Table 3 and Table 4 indicate the potential fire resistance of some types of glass, assuming they are glazed in an appropriate manner.

Table 3 — Fire properties of integrity only glass when tested in accordance with BS 476-22:1987 and glazed in suitably designed systems^a

Type	Nominal thickness mm	Type of system ^b	Comments	Test results ^c integrity only
Annealed (non-wired)	6	Small panes for Copper light panels	—	30 min
Wired	6 and 7	Timber or steel frames, single or multiple panes	—	up to 2 h
Modified toughened	5 to 12	Special glazing systems ^d	This should not be confused with normal toughened glass	up to 1 h
Special fire resistant laminated	7 to 13	Timber or steel frames, single or multiple panes	Performance depends on interlayer type	up to 1 h
Borosilicate	6	Steel frames, single or multiple panes	Glass with a low coefficient of expansion	up to 2 h
Glass ceramic	5 to 10	Steel frames, single or multiple panes	Glass with a low coefficient of expansion	up to 2 h
Glass blocks	80	—	—	up to 1 h

^a Integrity only glass should conform to BS 476-22, BS EN 1363, BS EN 1364 or BS EN 1634.

^b The detailing of the glazing system and its fixture to the building structure plays a critical part in the fire performance of glazed walls. Glazing systems which have test-proven fire resistance with appropriate glass types should be used. The manufacturer's recommendations should be followed.

^c This table is based on publicly available data. The levels of performance given do not represent the maximum that can be achieved, but indicate levels of performance which have been achieved using specific glazing systems and which can be substantiated with test evidence from either the glass or frame manufacturer.

^d The edge cover can affect the fire resistance

Table 4 — Fire properties of insulated glass when tested in accordance with BS 476-22:1987 and glazed in suitably designed systems^a

Type mm	Nominal product thickness	Type of system ^b	Test results ^c integrity and insulation
Intumescent	12 to 50	Timber or steel frames, single or multiple panes	up to 2 h
Gel interlayer ^d	22 to 74	Timber or steel frames, single or multiple panes	up to 90 min

^a Insulated glass should conform to BS 476-22, BS EN 1363, BS EN 1364 or BS EN 1634.

^b The detailing of the glazing system and its fixture to the building structure plays a critical part in the fire performance of glazed walls. Glazing systems which have test-proven fire resistance with appropriate glass types should be used. The manufacturer's recommendations should be followed.

^c This table is based on publicly available data. The levels of performance given do not represent the maximum that can be achieved, but indicate levels of performance which have been achieved using specific glazing systems and which can be substantiated with test evidence from either the glass or frame manufacturer.

^d Laminated glass incorporating inorganic interlayers, normally based on sodium silicate, that expand to several times their original thickness on exposure to fire conditions