BRITISH STANDARD

BS 5544:1978
Incorporating
Amendment No. 1

Specification for

Anti-bandit glazing (Glazing resistant to manual attack)

UDC 666.155:69.028.2

Cooperating organizations

The Glass Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

British Glass Industry Research Association
British Lampblown Scientific Glassware Manufacturers' Association Ltd.
British Plastics Federation*
Department of the Environment (Housing and Construction)*
Department of Transport
Flat Glass Manufacturers' Association*
Glass Manufacturers' Federation
Scientific Instrument Manufacturers' Association
Society of Glass Technology*
The Glass and Glazing Federation*

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

British Insurance Association
British Security Industry Association
Business Equipment Trade Association
City of London Police
Council of Bank Staff Associations
Department of the Environment (PSA)
Home Office
Industrial Safety (Protective Equipment) Manufacturers' Association
Metropolitan Police
Ministry of Defence
National Union of Bank Employees
Plastics and Rubber Institute
Post Office
The Committee of London Clearing Bankers on behalf of the Committee of Scottish Clearing Bankers, Co-operative Bank, Central Trustee Savings Bank and Yorkshire Bank

This British Standard, having been prepared under the direction of the Glass Standards Committee, was published under the authority of the Executive Board on 28 February 1978

Amendments issued since publication

Amd. No.	Date of issue	Comments
4762	February 1985	Indicated by a sideline in the margin

The following BSI references relate to the work on this standard:
Committee reference GLC/12
Draft for comment 76/52197 DC

ISBN 0 580 09859 1

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Foreword

General. This British Standard has been prepared, at the request of the Home Office, by a representative Technical Committee under the direction of the Glass Standards Committee. It specifies minimum performance requirements and test methods for that type of security glazing known as anti-bandit glazing.

Anti-bandit glazing is intended to delay access to a protected space, such as a showcase, shop window or premises, for a short period of time.

Where protection for personnel is required, security glazing should be chosen of a grade which will give adequate protection against the attack-threat. Anti-bandit glazing complying with the requirements of this standard is most unlikely to comply with the requirements of BS 5051-1 and BS 5051-2 for bullet-resistance. On the other hand bullet-resistant glazing complying with the requirements of BS 5051-1 and BS 5051-2 will probably provide resistance to manual attack, but it is important that it should be tested for compliance with the requirements of this standard if it is intended for use as anti-bandit glazing.

In preparing this standard it was considered inadvisable to draw up detailed specifications for each type of security glazing known to be satisfactory

a) because these would not have replaced the need for performance tests, and

b) because it would be extremely difficult to keep such specifications comprehensive and up to date by including new or improved materials or combinations of materials as they become available.

Service life. Some types of anti-bandit glazing have been in use for a number of years and are known to maintain their resistance to attack over this period of time. In view of the lack of agreement on accelerated exposure tests, particularly when related to plastics materials and their adhesion to glass, the committee has not included any weathering requirement in this standard. It is recommended that users and suppliers should give consideration to this aspect, particularly when the anti-bandit glazing is to be used in exposed conditions other than the ambient conditions of a temperate climate.

Fixing. The protection provided by security glazing depends as much on the design, fixing and maintenance of the adjacent assembly as it does upon the glazing itself and it is essential that the glazing is fixed so as to resist strongly dislodgement from its fixing. The general guidance given in BS 5357 on the fixing of security glazing should be followed and this should be supplemented by the specific advice of the manufacturer on the installation of his own products.

Anti-bandit glazing panels that differ greatly in area from the test pieces specified in Appendix A and Appendix B may provide less protection in service than would be indicated by the performance of the test piece.

Cleaning. It is essential that anti-bandit glazing is always cleaned in accordance with manufacturers' recommendations. This point is of particular importance when cleaning plastics materials.

Damaged glazing. If the surface of any anti-bandit glazing is damaged, whether by attack, accident or even severe abrasion due to incorrect cleaning, then the performance of such glazing under manual attack is suspect and the manufacturer's advice should be sought.

Vehicle glazing. If anti-bandit glazing is used in a road vehicle windscreen it should also, as nearly as possible, meet the requirements of BS 857 or BS 5282.

Certification. Attention is drawn to the certification facilities described on the inside back cover of this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 6, an inside back cover and a back cover.

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1 Scope

1.1 This British Standard specifies requirements and test methods for anti-bandit glazing by which is meant a type of security glazing designed to resist manual attack and to delay access to the protected space for a short period of time.

The criterion of failure is when a hole of specified size (relating in practice to a hand) is produced in the anti-bandit glazing.

1.2 Spalling from the surface remote from the attack has not been taken into account.

2 References

The titles of the publications referred to in this standard are listed on the inside back cover.

3 Definitions

For the purposes of this British Standard the following definitions apply.

3.1
security glazing
a glazing material which affords protection against a specified level of attack

NOTE The term "security glazing" as used in this British Standard applies to products that have the obvious characteristics of a conventional glass, but it is understood to include also such products as

a) rigid plastics,

b) laminates of glass with one or more plastics interlayers,

c) laminates of glass incorporating high tensile steel wire mesh in a plastics interlayer,

d) glass and/or plastics bonded with one or more plastics interlayers,

e) any combination of the above.

3.2
anti-bandit glazing
a type of security glazing designed to resist manual attack and to delay access to the protected space for a short period of time

NOTE The glass or plastics components of an anti-bandit glazing unit may be separated by air spaces.

3.3
level of attack
the designated test force directed against a security glazing

3.4
protected space
the space protected by the complete installation, e.g. a showcase, shop window or part of premises

3.5
manual attack
an attack such as might be made by a man armed with an axe, crowbar or pickaxe

3.6
test piece
a specified piece of anti-bandit glazing submitted to a specified test procedure

3.7
sample
a specified number of test pieces which together are representative of the anti-bandit glazing material intended to comply with the requirements of this British Standard

4 Minimum performance requirements

4.1 Sample for resistance to impact. The sample shall be representative of the anti-bandit glazing intended to comply with the requirements of this British Standard, and shall be of the same nominal thickness.

The sample shall consist of 10 test pieces each 600 mm × 600 mm, the edges of which shall be free from visible chips, cracks and flaws.

4.2 Resistance to successive impacts of low energy

4.2.1 *Sample.* The sample shall consist of nine test pieces taken from the sample described in **4.1**.

4.2.2 *Acceptance.* The material shall be considered to be acceptable if at least eight of the test pieces are not penetrated by any impact of the steel ball when tested by the method described in Appendix A.

4.3 Resistance to high energy impact

4.3.1 *Sample.* The sample shall consist of one test piece taken from the sample described in **4.1**.

4.3.2 *Acceptance.* The material shall be considered to be acceptable if the test piece is not penetrated by the steel ball when tested by the method described in Appendix B.

4.4 Boil test (specific to glass/PVB laminated safety glass). This test is used as an assessment of quality of lamination.

NOTE The boil test described was developed for the assessment of glass laminated with polyvinyl butyral and if other types of laminates are considered, a modification of the test may be necessary and should be agreed between the user and the supplier.

4.4.1 *Sample.* The sample shall be representative of the anti-bandit glazing intended to comply with the requirements of this British Standard, and shall be of the same nominal thickness.

The sample shall consist of three test pieces each 300 mm × 300 mm.

4.4.2 *Acceptance.* The material shall be considered to be acceptable if none of the test pieces develops flaws or other defects in the area specified when tested by the method described in Appendix C.

5 Marking

The following particulars shall be indelibly and distinctly marked on every panel of installed anti-bandit glazing, e.g. by means of a permanent label.

a) The manufacturers' name or trade mark.

b) The number of this British Standard i.e. BS 5544.

NOTE A permanent label is considered to be one which cannot be removed intact and re-used.

Appendix A
Test for resistance to successive impacts of low energy

A.1 Conditioning of test pieces. Store the test pieces for a minimum of 4 h at a temperature of 20 ± 5 °C with the test surface exposed to free air at that temperature.

A.2 Test conditions. Carry out the test at a temperature of 20 ± 5 °C.

A.3 Apparatus. The following apparatus shall be used.

A.3.1 *A hardened steel ball* with a mass of 2 260 ± 20 g and a diameter of approximately 82 mm.

A.3.2 *Means for dropping the ball freely* from heights of 3 m and 9 m so that the ball strikes the test piece once only for every test drop within a 125 mm circle the centre of which is located at the approximate centre of the test piece. An electro-magnet may conveniently be used for this purpose.

A.3.3 *A supporting fixture* such as that shown in Figure 1. The clamping arrangements consist of two steel frames with machined edges 15 mm wide fitting one over the other and faced with rubber gaskets about 3 mm thick and 15 ± 1 mm with of hardness 70 IRHD. The test piece is secured between the two clamping frames by two M 20 bolts[1)] located through the horizontal extension of each of the four sides of the two frames as indicated in Figure 1 and Figure 2.

The test piece when correctly clamped in position for an impact test shall:

a) have a freely exposed testing area of at least 550 mm × 550 mm;

b) be clamped in position by applying a torque of 20 Nm progressively to each of the eight clamping bolts.

A.4 Procedure. Immediately preceding the test, condition the test piece as described in **A.1**. Place the test piece in the fixture and clamp it as described in **A.3.3**, the plane of the test piece being horizontal to within 3°.

Release the steel ball from a height of 3 m so that it falls freely and strikes the test piece as described in **A.3.2**.

After 5 s retrieve the steel ball disturbing the test piece as little as possible, but brush away any loose fragments.

Repeat the ball drop until five impacts have been made, or until the test piece fails, whichever is the sooner.

A.5 Interpretation of results. If the ball passes completely through the test piece within 5 s after an impact, the result for that impact shall be recorded as a “failure”.

If the ball does not penetrate, but remains on top of the test piece, bounces off it, or is wedged in the hole for 5 s or more, the result shall be recorded as a “pass”.

[1)] See BS 4190.

Appendix B
Test for resistance to high energy impact

B.1 Conditioning of test pieces. The conditioning of test pieces shall be carried out as described in **A.1**.

B.2 Test conditions. Test conditions shall be as described in **A.2**.

B.3 Apparatus. Apparatus shall be used as described in **A.3**.

B.4 Procedure. Immediately preceding the test, condition the test piece as described in **A.1**. Place the test piece in the fixture and clamp it as described in **A.3.3**, the plane of the test piece being horizontal to within 3°.

Release the steel ball from a height of 9 m so that it falls freely and strikes the test piece as described in **A.3.2**.

NOTE CARE SHOULD BE TAKEN THAT NO ONE IS STRUCK BY THE STEEL BALL REBOUNDING FROM TEST PIECES OF SOME TYPES OF ANTI-BANDIT GLAZING.

B.5 Interpretation of results. If the ball passes completely through the test piece within 5 s after the impact, the result shall be recorded as a “failure”.

If the ball does not penetrate, but remains on top of the test piece, bounces off it, or is wedged in the hole for 5 s or more, the result shall be recorded as a “pass”.

Appendix C
Boil test

C.1 Conditioning of test pieces. The conditioning of test pieces shall be carried out as described in **A.1**.

C.2 Procedure. Immerse the test pieces vertically on edge for at least 3 min in water at 66 ± 5 °C and then transfer quickly to, and similarly immerse in, boiling water for 2 h. Remove, allow to cool and examine.

C.3 Interpretation of results. A test piece shall be recorded as having passed the test if neither bubbles nor defects are formed more than 13 mm from an uncut edge, more than 13 mm from any crack which may occur during the test, or more than 25 mm from a cut edge.

Any defects within 13 mm of an uncut edge, or crack developed during the test, or within 25 mm of a cut edge shall be disregarded.

Any test piece in which the glass cracks to such an extent as to confuse the results shall be discarded without prejudice and the test repeated on another test piece.

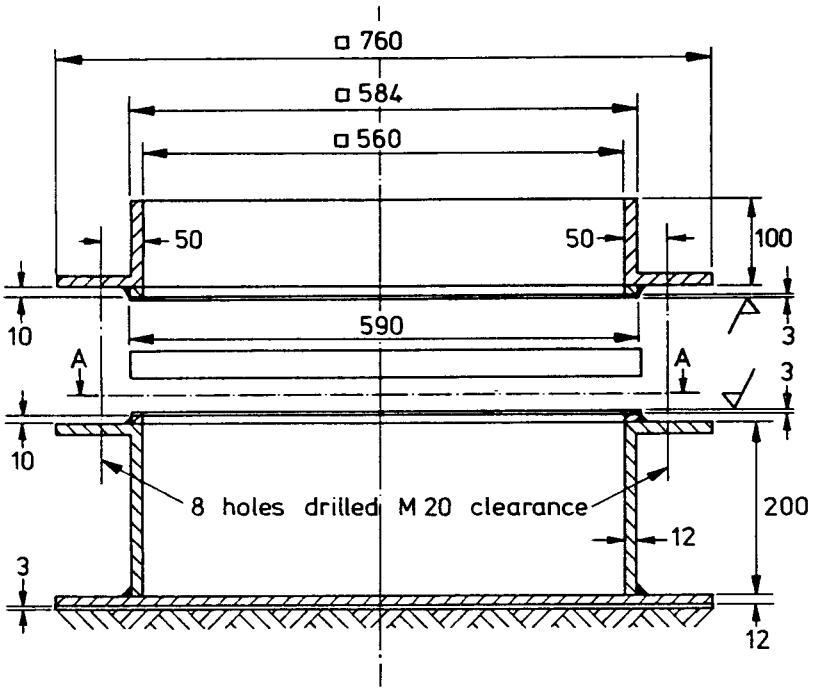
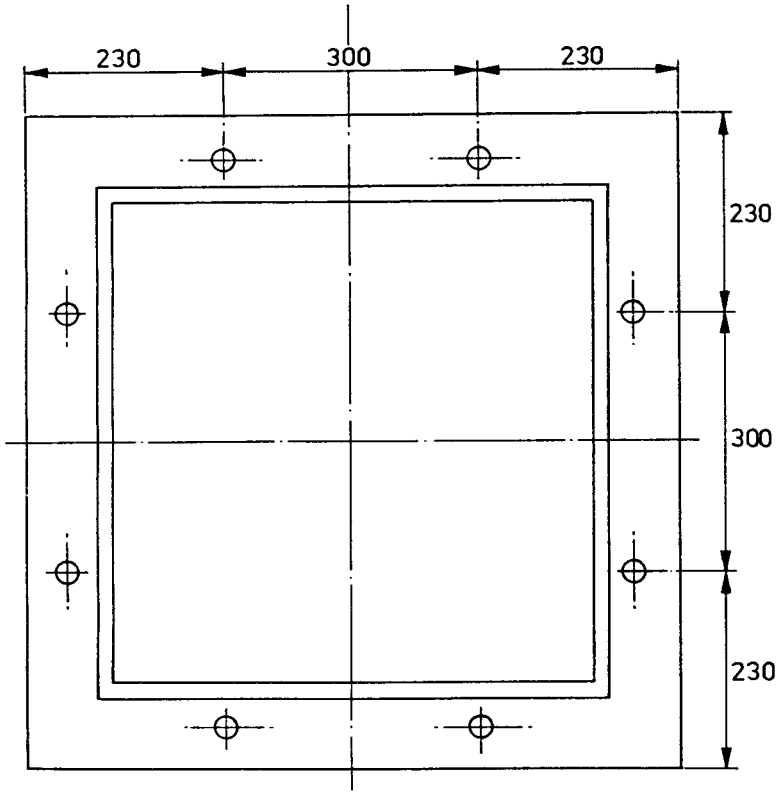


Figure 1 — Apparatus for impact testing: elevation



View on A - A

All dimensions are in millimetres.

Figure 2 — Apparatus for impact testing: plan

Publications referred to

BS 857, *Safety glass for land transport*.

BS 4190, *ISO metric black hexagon bolts, screws and nuts*.

BS 5051, *Security glazing*.

BS 5051-1, *Bullet-resistant glazing for interior use*.

BS 5051-2, *Bullet-resistant glazing for exterior use*.

BS 5282, *Road vehicle safety glass*.

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

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