

Australian/New Zealand Standard®

Safety glazing materials in buildings

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Architectural Aluminium Association of New Zealand
Architectural Aluminium Fabricators Association, Australia
Australian Association of Certification Bodies
Australian Building Codes Board
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Australian/New Zealand Standard[®]

Safety glazing materials in buildings

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PREFACE

This Joint Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee BD/7 on Glazing and Fixing of Glass to supersede AS 2208—1978, *Safety glazing materials for use in buildings (human impact considerations)*.

This Standard covers tests to be carried out for the different types of safety glazing material such as laminated, toughened, heat strengthened, toughened laminated, liquid laminated, safety wired, organic-coated, plastic and organic-backed safety mirrors.

This edition incorporates the following major changes from the previous edition:

- (a) The methods of test that were in Appendices B to H have been replaced by Appendices C to I.
- (b) Sampling and acceptance procedures that were in Appendices J and K and compliance verification given in Appendix P have been deleted and replaced by Appendix A.
- (c) Additional impact levels have been added to the impact test.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the Appendix to which they apply. A 'normative' Appendix is an integral part of a Standard, whereas an 'informative' Appendix is only for information and guidance.

Statements expressed in mandatory terms in notes to tables and figures are deemed to be requirements of this Standard.

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FOREWORD

Where glazing material is so situated that accidental breakage is reasonably foreseeable, the glazing materials and thicknesses required for wind loading may not be adequate. While the accident rate through breakage of glazing material glazed at low level is significant among most age groups, it is particularly high in the age groups up to 19 years. Research in the United Kingdom, New Zealand and Australia has shown that a high proportion of all reported accidents with glazing material involve glazed doors and side panels in all types of buildings. In certain specialized rooms, such as gymnasiums, breakage of glazing material located at high level is also a potential danger. In these and other similar danger areas, safety glazing materials meeting the requirements of this specification will reduce the risk of injury.

Although these safety glazing materials will break under sufficient impact their fracture characteristics are such that if broken the likelihood of cutting and piercing injuries will be minimized.

The aim of the impact test is to assess the fracture characteristics of a safety glazing material which has been broken at some predetermined minimum impact energy level dependent upon the intended application of the material. If the safety glazing material does not fracture at this minimum energy level, it must again be tested at higher energy levels until it is fractured, in order that the fracture characteristics can be assessed.

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Australian/New Zealand Standard

Safety glazing materials in buildings

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard sets out test requirements for classification of safety glazing materials for use in buildings. The test requirements for the different glazing materials are designed to promote safety and to reduce or minimize the likelihood of cutting and piercing injuries from human impact.

NOTES:

- 1 Alternative methods for determining compliance with this Standard are given in Appendix A.
- 2 This Standard is not intended to restrict the use of materials or methods of test not specified herein where such materials or methods of test can be demonstrated to be the equal of, or superior to, those specified.
- 3 Notes on safe performance criteria and human dynamics data are given in Appendix B.
- 4 This Standard identifies safety glazing marking requirements.

1.2 APPLICATION This Standard applies to all safety glazing materials for use as required by AS 1288.

1.3 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS

- | | |
|------|--|
| 1199 | Sampling procedures and tables for inspection by attributes* |
| 1288 | Glass in buildings—Selection and installation |
| 1399 | Guide to AS 1199—Sampling procedures and tables for inspection by attributes* |
| 1599 | Pressure sensitive adhesive packaging tapes |
| 2193 | Methods for calibrating and grading of force-measuring systems of testing machines |

AS/NZS

- | | |
|------------|--|
| ISO 9000 | Quality management and quality assurance standards |
| ISO 9000.1 | Part 1: Guidelines for selection and use |
| ISO 9004 | Quality management and quality system elements |
| ISO 9004.1 | Part 1: Guidelines |

SAA/SANZ

- | | |
|---------|--|
| HB18 | Guidelines for third-party certification and accreditation |
| HB18.28 | Guide 28—General rules for a model third-party certification scheme for products |

* Standard endorsed by Standards New Zealand as suitable for use in New Zealand.

ANSI	
Z97.1	Glazing materials used in buildings—Safety performance specification and methods of test
ASTM	
C1279	Test method for non-destructive photoelastic measurement of edge and surface stresses in annealed, heat-strengthened, and fully tempered flat glass
D756	Practice for determination of weight and shape changes of plastics under accelerated service conditions
D1499	Recommended practice for operating light- and water-exposure apparatus (carbon-arc type) for exposure of plastics
G26	Practice for operating light-exposure apparatus (Xenon-arc type) with and without water for exposure of nonmetallic materials
DIN	
50 017	Condensation water test atmospheres
NZS	
6507	Materials testing machines and force verification equipment

1.4 DEFINITIONS For the purpose of this Standard the definitions given below apply.

1.4.1 Drop height—the vertical distance from the horizontal centre-line of the maximum diameter of the impacting object when it is released relative to the horizontal centre-line of the impacting object when it is at rest (see Figure D1).

1.4.2 Heat-strengthened glass—Glass which has been subjected to a special heat treatment, so that the residual surface compression stresses lies between 24 MPa and 45 MPa.

1.4.3 Heat-strengthened laminated safety glass—laminated safety glass utilizing two or more panels of heat-strengthened glass in the make-up.

1.4.4 Laminated safety glass—a glass consisting of two or more sheets of glass permanently bonded together by one or more sheets of plastic interlayer.

1.4.5 Liquid-laminated safety glass—a glass consisting of two or more sheets of glass permanently bonded together by liquid chemicals that cure to form a plastic-type interlayer.

1.4.6 Safety double (or multiple) glazing unit—a double (or multiple) glazing unit in which all panels are of safety glazing material and are separated by airspaces.

1.4.7 Safety glazing materials—materials constructed, treated or permanently combined with other materials as to reduce the likelihood of cutting and piercing injuries resulting from human impact with them. All safety glazing materials are classified as either Grade A or Grade B according to the performance requirements in Section 3.

1.4.8 Safety organic-backed mirror—a glazing material consisting of a piece of mirror with a sheet of organic material permanently bonded to one side.

1.4.9 Safety organic-coated glass—a glazing material consisting of a piece of glass coated and permanently bonded on one or both sides with a continuous polymeric coating, sheet or film.

1.4.10 Safety plastic glazing material—a glazing material which contains as an essential ingredient an organic substance of large molecular mass, is solid in its finished state and at some stage in its manufacture or processing into finished articles can be shaped by flow. Plastic may consist of a single sheet of plastic material, a combination of two or more such sheets laminated together, or a combination of plastic material and reinforcement material in the form of fibres or flakes.

1.4.11 Safety wired glass—a single sheet of glass with wire completely embedded in the glass.

1.4.12 Toughened laminated safety glass—laminated safety glass utilizing two panels of toughened safety glass in the make-up.

1.4.13 Toughened safety glass—a glass which has been converted to a safety glass by subjection to a process of prestressing so that, if fractured, the entire piece disintegrates into small, relatively harmless particles. The residual surface compression is a minimum of 69 MPa.

1.5 TESTING Testing shall be carried out to ensure compliance of safety glazing materials with this Standard. Separate testing shall be carried out for different glazing materials, or for differences within a type of glazing material that could noticeably affect performance in the impact, fragmentation or environmental durability tests. Such differences may include, but are not limited to, nominal thickness or thicknesses, method of manufacture, types and amounts of additives and composition of base materials and adhesives.

1.6 CLASSIFICATION All safety glazing materials shall be classified as either Grade A or Grade B according to the performance requirements in Section 3.

1.7 MARKING Glazing material complying with this Standard shall be legibly marked with the following:

- (a) The name or registered trademark of the manufacturer or supplier.
- (b) The number of this Australian/New Zealand Standard, i.e. AS/NZS 2208.
- (c) A letter or other code to indicate plant of manufacture or supply.
- (d) Grade A or Grade B to indicate the grade of the material.
- (e) A number to indicate the nominal thickness for standard glazing material (see Table 2.1) in millimetres, or a number to indicate the minimum thickness for non-standard glazing material to the nearest tenth of a millimetre.
- (f) A letter or word or combinations thereof to indicate type of glazing material used in the product, as follows:
 - (i) The letter 'T' or word 'toughened', indicating a toughened safety glass.
 - (ii) The letter 'L' or the word 'laminated' indicating a laminated safety glass.
 - (iii) The letters 'TL' indicating that the material is toughened laminated safety glass.
 - (iv) The letters 'HSL' indicating that the material is heat-strengthened laminated safety glass.
 - (v) The letters 'LL' indicating that the material is liquid-laminated safety glass.
 - (vi) The letter 'W' or the word 'wired' indicating safety wired glass.
 - (vii) The letter 'F' or the word 'float' indicating that the component or components are float glass.
 - (viii) The letter 'P' or the word 'patterned' indicating that the component or components are patterned glass.
 - (ix) The letter 'S' or the word 'sheet' indicating that the component or components are made from sheet glass.
 - (x) The letters 'SP' indicating that the material is safety plastics for external and internal applications.

- (xi) The letters 'SPI' indicating that the material is safety plastics for internal applications only.
- (xii) The letters 'OC IN' indicating organic-coated glass. The marking shall be on the organic coating, the letters 'IN' indicating the side of the material which is not to be exposed to the elements.
- (xiii) Any combinations of the above letters, e.g. 'LWF' indicating laminated wired float.

Where non-permanent marking is used it shall be of a type that remains legible until examined by the appropriate authorities, that can be removed and that will self-destruct when removed.

NOTES:

- 1 An example of a trademark for a 6 mm thick laminated float glass, Grade A safety glazing material by ABC company is as follows:

LF

ABC Co.

To AS/NZS 2208—GRADE A—6

- 2 Manufacturers making a statement of compliance with this Australian/New Zealand Standard on a product, or on packaging or promotional material related to that product, are advised to ensure that such compliance is capable of being verified.

1.8 VENTS Toughened safety glass shall be free from vents exceeding 2 mm in length and any cracks or vents extending from tong marks towards the interior of the glass.

NOTES:

- 1 A vent is a minute crack which may be induced during the toughening process.
- 2 The production of small indentations (tong marks) close to the edge of sheets of toughened safety glass is a feature inherent in some manufacturing processes and the presence of such marks is permissible except as given above.

SECTION 2

DIMENSIONAL SPECIFICATIONS

2.1 GENERAL This Section sets out the required thickness, size tolerance, squareness of rectangular panels and flatness of panels for safety glass in order to comply with this Standard.

NOTES:

- 1 For safety material other than safety glass (i.e. plastic), the manufacturer's recommendation should be followed.
- 2 Prior to furnacing, toughened safety glass should be finished to a minimum standard whereby all edges are arrised. Arrised edges are formed by grinding a chamfer or bevel approximately 1 mm wide on all sharp edges and corners.

2.2 THICKNESS REQUIREMENTS

2.2.1 General The thickness obtained shall be within the limits provided in Table 2.1, measured in accordance with Appendix C.

2.2.2 Standard nominal thickness of safety glass Safety glass, as specified in this Standard, refers to safety glass having a standard nominal thickness. Limits on the standard nominal thickness of various types of glass are given in Table 2.1.

2.2.3 Non-standard thickness of glazing material Thicknesses of safety glass other than those specified in Table 2.1 may be utilized and shall not be a cause for rejection provided that the product meets all other appropriate test requirements of this Standard.

NOTE: The use of non-standard thickness will require interpolation to satisfy the requirements of AS 1288.

TABLE 2.1
THICKNESS LIMITS FOR STANDARD
NOMINAL THICKNESS OF GLASS

millimetres			
Type of glass	Standard nominal thickness	Glass thickness limits	
		Minimum	Maximum
Toughened glass, and heat-strengthened glass	3	2.8	3.2
	4	3.8	4.2
	5	4.8	5.2
	6	5.8	6.2
	8	7.7	8.3
	10	9.7	10.3
	12	11.7	12.3
	15	14.5	15.5
	19	18.0	20.0
	25	23.5	26.5
Laminated glass	5.38	4.6	5.4
	6.38	5.6	6.4
	8.38	7.6	8.4
	10.38	9.6	10.4
	12.38	11.6	12.4
	16.38	15.4	16.6
Toughened laminated glass, and heat-strengthened laminated glass	6.38	5.6	6.4
	8.38	7.6	8.4
	10.38	9.6	10.4
	12.38	11.6	12.4
Patterned glass, toughened patterned glass, and heat-strengthened patterned glass	3	2.5	3.9
	4	3.5	4.5
	5	4.5	5.5
	6	5.5	7.0
	10	9.0	10.8
	12	11.0	13.5
Wired glass	6	5.0	6.8

NOTES:

- 1 For glass that does not satisfy the thickness tolerances for the standard nominal thickness specified above, the minimum glass thickness shall be marked.
- 2 Linear interpolation as defined in AS 1288 shall apply for non-standard thickness.
- 3 Glass thickness limits specified for laminated glass exclude interlayer thickness.