AS 2047—1999
(Incorporating Amendment Nos 1 and 2)

Australian Standard™

Windows in buildings—
Selection and installation

**Building Code of Australia
primary referenced Standard**

Standards Australia

This Australian Standard was prepared by Committee BD/21, Windows. It was approved on behalf of the Council of Standards Australia on 30 April 1999 and published on 5 June 1999.

The following interests are represented on Committee BD/21:

Architectural Aluminium Fabricators Association

Australian Aluminium Council

Australian Building Codes Board

Construction Industry Engineering Services Group

CSIRO Building, Construction and Engineering

Flat Glass and Aluminium Association of Queensland

Flat Glass Council of Australia

Housing Industry Association

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(Incorporating Amendment Nos 1 and 2)

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Windows in buildings—Selection and installation

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee BD/21, Windows, to supersede, AS 2047.1—1996, *Windows in buildings, Part 1: Specification for materials and performance* and AS 2047.2—1996, *Windows in buildings—Part 2: Construction, installation and maintenance.* After allowing sufficient time for adjustment (nominally 12 months from publication), the superseded documents will be withdrawn.

This Standard incorporates Amendment No. 1 (January 2001) and Amendment No. 2 (June 2001). The changes arising from the Amendments are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure, or part thereof affected.

This Standard is the result of a consensus among Australian and New Zealand representatives on the Joint Committee to produce it as an Australian Standard.

The objective of this Standard is to provide window designers and manufacturers with a generic window code, setting out the performance requirements and specifications in the design and manufacture of all windows, regardless of materials.

This Standard has been revised to make it suitable for reference in the Building Code of Australia (BCA) as a Standard for regulatory reference.

The window rating system is a simplified system and windows specifically designed for corners have been omitted (see Appendix A).

The effects of atmospheric environments (corrosion and weathering) on materials used in window assemblies is currently being considered by the Committee members for improvement and inclusion in the next revision.

In this Standard, statement expressed in mandatory terms in notes to tables are deemed to be an integral part of the Standard.

The term ‘informative’ has been used in this Standard to define the application of the appendix to which it applies. An ‘informative’ appendix is only for information and guidance.

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STANDARDS AUSTRALIA

Australian Standard

Windows in buildings—Selection and installation

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard specifies requirements, materials, construction, installation and glazing for—

(a) windows;

(b) sliding glazed doors;

A1 (c) adjustable louvres;

(d) shopfronts; and

(e) window walls with one-piece framing elements.

NOTE: Window walls do not include curtain walls using stacked or vertically spliced framing systems, manufactured from any material and installed in external walls of all classes of buildings.

Throughout this standard the term 'window(s)' means window of any type, including louvre(s) and sliding door(s).

NOTES:

1 The window ratings, or classifications, differ from previous glass and window Standards due to the more accurate evaluation of the effect of wind conditions. They are based on either AS 1170.2, or the specific wind loading code developed for housing, i.e. AS 4055.

2 See Appendix A for information on wind loads applicable to windows covered by this Standard.

3 See Appendix B for alternative means of demonstrating compliance with this Standard.

4 Prefabricated bay windows that incorporate sloped glass are classified as windows in external walls.

5 Refer to AS/NZS 4284 for performance specification of building facade. Conformance to the requirements in AS/NZS 4284 will be deemed to satisfy the requirements of this Standard. However, sliding window sashes or doors will require the operating force test in accordance with AS 4420.3.

A1, A2 6 The following are not covered by this Standard:

(a) Hinged doors, including French and bi-fold doors.

(b) Revolving glazed doors.

(c) Fixed louvres.

(d) Skylights and roof lights and windows in other than the vertical plane.

(e) Windows in greenhouses and agricultural buildings.

(f) Sliding doors without frames such as internal doors and shopfront doors.

(g) Windows constructed on site and architectural one-off windows, which are not design tested.

(h) Second-hand windows, re-used windows, replacement windows, or recycled windows.

(i) Heritage windows, for heritage buildings as defined by the relevant State or Territory authority.

1.2 APPLICATION This Standard will be referenced in the Building Code of Australia by way of BCA Amendment No. 5 to be published by 1 July 1999.

1.3 REFERENCED DOCUMENTS The documents referred to in this Standard are listed in Appendix C.

1.4 DEFINITIONS For the purpose of this Standard, the definitions given in AS\NZS 4491 and those below apply.

1.4.1 Curtain wall—a non-load-bearing window wall that is not a panel wall.

1.4.2 Door—a sliding sash of a size suitable for use as access through walls.

1.4.3 Fenestration—the arrangement of windows and other openings on the external walls of buildings, especially the facade.

1.4.4 Fin—a piece of glass positioned such as to provide lateral support.

1.4.5 Fixing—any item that is used to secure members of a window assembly to each other, to secure an item of hardware to a window member, or to secure a completed window assembly into the building structure.

1.4.6 Flashing—an impervious membrane installed in such a manner as to prevent ingress of water into the building.

1.4.7 Frame—that part of a window assembly surrounding the sashes or fixed glazing. It is an assembly manufactured from timber, metal, glass, or other durable material or combinations of materials, such as glass fins and structural sealant forming part of the assembly of a glazed panel and supporting the full length of all the edges of the glass.

NOTE: Butt-jointed glass panels that are not in the same plane can satisfy the requirements for frames.

1.4.8 Glass—a hard, brittle, amorphous substance produced by fusion and usually consisting of mutually dissolved silica or silicates that also contain soda and lime. It may be transparent, translucent or opaque.

1.4.9 Glazing bar—a member that is added to a standard window construction to change the appearance of the window. It can be in the form in which the glass is glazed, clipped, or stuck onto either or both faces of the glass.

1.4.10 Glazing gasket—plastic or synthetic rubber members, used between the glass and the frame or the glass and the bead.

1.4.11 Hardware—equipment used in the opening, operating, closing, locking and stopping of sashes.

1.4.12 Head—the top horizontal framing member of a window assembly.

1.4.13 Jamb—a vertical side framing member.

1.4.14 Light—*see* window light.

1.4.15 Louvre—a window unit comprising a series of blades of glass, or other material, lapping each other.

1.4.16 Meeting stiles—vertical intermediate sash members that meet when the window is closed such that they combine to act in unison.

1.4.17 Meeting rails—horizontal intermediate sash members that meet when the window is closed such that they combine to act in unison

1.4.18 Mullion—a vertical intermediate framing member.

1.4.19 Multi-light window—a window incorporating more than one opening or fixed light, or both, within one perimeter frame, as low lights, high lights or side lights.

1.4.20 Newton—the force which, when applied to a body having a mass of one kilogram, causes an acceleration of one metre per second squared in the direction of application of the force.

1.4.21 Panel wall—a non-load-bearing window wall that is wholly supported at each storey.

1.4.22 Pascal (Pa)—the pressure or stress that arises when a force of one newton is applied uniformly over an area of one square metre.

1.4.23 Reveal—the visible part of each side of a window opening not covered by the frame, or the recess between the frame and the face of the wall.

1.4.24 Sash—the separate frame, to a window, carrying the glass. It may be fixed (inoperable) or movable (operable).

A1 **1.4.25 Sill**—the bottom horizontal framing member of a window assembly.

1.4.26 Stile, sash—a vertical side member of a sash.

1.4.27 Structural members—the elements, including mullions, transoms, meeting rails, and meeting stiles, that perform the function of transferring loads to the perimeter frame.

A1 NOTE: Glazing bars, awning and casement sash stiles and rails are not considered structural members for housing; however, they are considered structural members for residential and commercial buildings.

1.4.28 Transom—a horizontal intermediate framing member of a window assembly.

1.4.29 Weather seal—a material included in a window assembly to reduce the air infiltration or improve resistance to water penetration.

1.4.30 Wind—displacement of parallel members with respect to one another.

1.4.31 Window assembly—a complete unit comprising frame, couplings, sashes, glazing infill panels and hardware.

1.4.32 Window light—a single panel or glazing in a window assembly.

1.4.33 Window rating—a classification system providing for windows to be tested to determine their level of performance for strength and weatherproofness. Window ratings for housing are expressed in wind classification terms (see Table 2.1), and window ratings for buildings other than housing are expressed in permissible or limit state design wind pressure terms.

1.4.34 Window wall—a series of multi-light windows, generally spanning from floor to ceiling, and often continuous horizontally.

SECTION 2 PERFORMANCE

2.1 GENERAL This Section details performance criteria for window assemblies that are classified by a rating system for housing, and by design wind pressures for residential and commercial buildings.

NOTES:

1 The performance levels of windows given in this Section are the result of many years of testing units in laboratories and the evaluation of building sites after high winds and cyclones in various regions of Australia.

2 The window ratings, or classifications, differ from previous glass and window Standards due to the more accurate evaluation of the effect of these wind conditions. They are based on either AS 1170.2, or the specific wind loading code developed for housing, i.e. AS 4055.

A1 **2.1.1 Generic timber windows** Windows made to the details in Appendix G are deemed to comply with the appropriate structural performance and water penetration requirements of Clause 2.3.

NOTE: The objective of including the generic timber windows in the Standard, as an acceptable alternative to individual testing of specific fabricator products, is to enable small joineries to manufacture windows to the generic detail shown in Appendix G.

2.2 ATMOSPHERIC ENVIRONMENTS Materials shall be compatible with the atmospheric conditions of the site.

NOTE: Corrosion and weathering of materials used in window assemblies can occur in atmospheric environments where the materials are incompatible with the environment and other window assembly materials, and with other building materials.

2.3 WINDOW PERFORMANCE

2.3.1 Housing

A1 **2.3.1.1** *General* In this Standard, housing is defined as Class 1 buildings and Class 10 buildings, as described in the *Building Code of Australia*, and is governed by the limitations specified in AS 4055, except that windows in Class 10 buildings are not required to pass the air infiltration and water penetration requirements of this Standard.

2.3.1.2 *Window ratings* The following shall apply:

(a) Window assemblies shall be rated as determined in Table 2.1 and by achieving the test results detailed in Clauses 2.3.1.3 to 2.3.1.7 to the appropriate test in AS 4420, Parts 2 to 6.

(b) The supporting members shall have sufficient thickness of material and strength to ensure the performance of the window-operating hardware.

TABLE 2.1
WINDOW RATINGS FOR HOUSING

Window rating	Serviceability design wind pressure, Pa
N1	500
N2	700
N3	1 000
N4	1 500
N5	2 200
N6	3 000

NOTE: For cyclonic regions, i.e. regions C and D, the design wind pressure shall be in accordance with AS 1170.2.

2.3.1.3 *Deflection/span ratio* Window assemblies for housing shall be subjected to the deflection test in accordance with AS 4420.2. The test pressure shall be the design wind pressure as specified in Table 2.1. No structural members in a completely assembled and glazed window shall deflect by an amount greater than span/150 when tested at the serviceability design wind pressure.

A1 NOTE: Glazing bars, awning and casement sash stiles and rails are not members that require deflection tests; however, they should comply with the ultimate strength test requirements.

2.3.1.4 *Operating force test* Windows for housing shall be subjected to the operating force test in accordance with AS 4420.3. The test force shall be not greater than the value for windows or doors given in Table 2.2.

TABLE 2.2
OPERATING FORCE FOR TEST

Newtons

Force	Sliding window type		Sliding doors
	Horizontal	Vertical	
To initiate movement	110	200	180
To sustain movement	90	160	110

A1 **2.3.1.5** *Air infiltration* Windows for Class 1 buildings shall be subjected to the air infiltration test in accordance with AS 4420.4 and under either of the test pressures specified in Table 2.3. The air infiltration shall not exceed the value given in Table 2.3.

A1

TABLE 2.3
MAXIMUM AIR INFILTRATION

Building type or window type	Pressure direction	Maximum air infiltration, L/s m^2	
		Test pressure 75 Pa	Test pressure 150 Pa
Airconditioned	Positive, negative	1.0	1.6
Non-airconditioned	Positive	5.0	8.0
Louvre window	Positive	20.0	Not applicable
Adjustable louvres, residential and commercial buildings	Positive	20.0	32.0

NOTE: Reports relating to tests carried out under earlier editions of AS 2047 remain valid. Reports relating to tests carried out after the date of an amendment to a Standard should relate to the amended Standard.

A1

2.3.1.6 *Water penetration* Windows for Class 1 buildings shall be subjected to the water penetration resistance test in accordance with AS 4420.5, under the test pressures specified in Table 2.4. During and at the completion of the test there shall have been no penetration of uncontrolled water. Uncontrolled water is defined as—

(a) water that is not contained in a purpose-built drainage area;

(b) water that wets or is likely to wet insulation, fixtures and finishes, reveal linings or window furnishings beyond the window frame; or

(c) water that lies on transoms, rails, sills, etc., which has no designed means of escape to the outside of the product via the drainage system.

Acceptable water penetration is not deemed a failure if—

(i) minor splashing occurs due to air infiltration, within 1 min after change of pressure;

(ii) minor, intermittent leakage on the indoor side of openable sashes, which is contained on sash gaskets, sill tracks and thresholds that are part of a drainage system that allows water to flow to the outside of the product at cessation of the test (constant streams and regular dripping would be regarded as failure); or

(iii) water running down the indoor face of louvres, which is completely contained within a purpose-built drainage area.

A1

TABLE 2.4
WATER PENETRATION RESISTANCE TEST PRESSURES

Window ratings	Water penetration resistance test pressure, Pa (see Note)	
	All windows except ajustable louvres	Adjustable louvre windows
N1	150	150
N2	150	150
N3, C1	150	150
N4, C2	200	200
N5, C3	300	200
N6, C4	450	200

NOTE: Water penetration resistance test pressures are arbitrarily chosen, considering the method of test and shall be in positive direction only.

2.3.1.7 *Ultimate strength* Windows for housing shall not collapse when subjected to the ultimate strength test in accordance with AS 4420.6. 'Collapse' shall mean any one, or any combination, of the following:

A1

(a) Failure or dislodgment of any glazing.

(b) Dislodgment of a frame or any part of a frame.

(c) Removal of a light, either with or without its framing sash, from a frame.

(d) Loss of support of a frame, such as when it is unstable in its opening in the building structure.

(e) Failure of any sash, locking device, fastener or supporting stay, allowing an opening light to open.

The test pressure shall be not less than the value given in Table 2.5.

TABLE 2.5
ULTIMATE STRENGTH TEST PRESSURES

Window ratings	Ultimate strength test pressure, Pa
N1	700
N2	1 000
N3	1 500
N4	2 300
N5	3 300
N6	4 500

NOTE: For cyclonic regions, i.e. regions C and D, the design wind pressure shall be in accordance with AS 1170.2.

2.3.2 Residential buildings

2.3.2.1 *General* This Clause covers residential buildings of Class 2, Class 3 and Class 4 parts of buildings as described in the Building Code of Australia, and Class 1 buildings outside the limitations specified in AS 4055.

2.3.2.2 *Design wind pressure* The design wind pressure for serviceability limit state and ultimate limit state, shall be determined in accordance with AS 1170.2. All local pressure factors and internal pressure coefficients relevant to the location of the window on the building shall be considered.

NOTE: A guide to design wind pressure is given in Appendix A.

2.3.2.3 *Deflection/span ratio* Windows shall be subjected to the deflection test in accordance with AS 4420.2. The test pressure shall be the design wind pressures determined in Clause 2.3.2.2. No structural members in a completely assembled and glazed window shall deflect by an amount greater than span/180, when tested at the serviceability limit state design wind pressure.

2.3.2.4 *Operating force test* Windows shall be subjected to the operating force test in accordance with AS 4420.3. The test force shall be not greater than the value given in Table 2.2.

2.3.2.5 *Air infiltration* Windows shall be subjected to the air infiltration test in accordance with AS 4420.4. The air infiltration shall not exceed the amount given in Table 2.3.

2.3.2.6 *Water penetration* Windows shall be subjected to the water penetration resistance test in accordance with AS 4420.5. The test pressure shall be calculated as 30% of the positive serviceability limit state design wind pressure, as determined in Clause 2.3.2.2, but not less than 150 Pa, and in positive direction only. During the test there shall be no penetration of uncontrolled water, as specified in Clause 2.3.1.6. A1

2.3.2.7 *Ultimate strength* Windows shall not collapse when subjected to the ultimate strength test in accordance with AS 4420.6. ‘Collapse’ shall be as specified in Clause 2.3.1.7.

The test pressure shall be not less than the ultimate limit state design wind pressure determined in accordance with AS 1170.2. All local pressure factors and internal pressure coefficients relevant to the location of the window on the building shall be considered.

2.3.3 Commercial buildings

2.3.3.1 *General* This Clause covers commercial buildings of Classes 5, 6, 7, 8 and 9, as described in the Building Code of Australia.

2.3.3.2 *Design wind pressure* The design wind pressure for serviceability limit state and ultimate limit state, shall be determined in accordance with AS 1170.2. All local pressure factors and internal pressure coefficients relevant to the location of the window on the building shall be considered.

NOTE: A guide to design wind pressure is given in Appendix A.

2.3.3.3 *Deflection/span ratio* Windows shall be subjected to the deflection test in accordance with AS 4420.2. The test pressure shall be the design wind pressure determined in Clause 2.2.3.2. No structural members in a completely assembled and glazed window shall deflect by an amount greater than span/250, when tested at the serviceability limit state design wind pressure.

2.3.3.4 *Operating force test* Windows shall be subjected to the operating force test in accordance with AS 4420.3. The test force shall be not greater than the value given in Table 2.2.

2.3.3.5 *Air infiltration* Windows shall be subjected to the air infiltration test in accordance with AS 4420.4. The air infiltration shall not exceed the amount given in Table 2.3.

2.3.3.6 *Water penetration* Windows shall be subjected to the water penetration resistance test in accordance with AS 4420.5. The test pressure shall be calculated as 30% of the positive serviceability limit state design wind pressure, as determined in Clause 2.3.3.2, but not less than 150 Pa, and in positive direction only. During the test there shall be no penetration of uncontrolled water, as specified in Clause 2.3.1.6. A1

NOTE: When testing a window for water penetration, where insulation is removed in order to observe the indoor side of the window, the manufacturer should supply drawings indicating its intended location in order that the result may be determined.

2.3.3.7 *Ultimate strength* Windows shall not collapse when subjected to the ultimate strength test in accordance with AS 4420.6. 'Collapse' shall be as specified in Clause 2.3.1.7.

The test pressure shall be not less than the ultimate limit state design wind pressure determined in accordance with AS 1170.2. All local pressure factors and internal pressure coefficients relevant to the location of the window on the building shall be considered.

2.4 VERIFICATION OF SMALLER OR LARGER SIZE PRODUCTS AS 4420.1, generally requires the test sample window to be representative in both size and shape of the largest standard assembly in the product range as specified by the manufacturer. Where the supplied products are not of the same size as those verified by testing, one of the following shall apply:

(a) Smaller size products (either shorter or narrower, or both), which have the same construction (fenestration, sections and components) as a tested product, shall assume the same rating, provided they are in no way less favourably disposed and are glazed in compliance with AS 1288.

(b) Smaller size products as described in Item (a) shall be rated at a higher design wind pressure rating than the tested product, provided the calculations of deflection and stress for all structural members to arrive at the higher rating are certified using the actual test data for the structural members and provided they are in no way less favourably disposed and are glazed in compliance with AS 1288.

(c) Larger size products (either taller or wider, or both), which have the same construction (fenestration, sections and components) as a tested product in accordance with AS 4420.1, shall assume the same rating or lower rating as the tested product, provided the calculations of deflection and stress for all structural members to arrive at the rating are certified using the actual test data for the structural members, and provided they are in no way less favourably disposed and are glazed in compliance with AS 1288.

(d) Substitution of componentry and/or construction of a tested sample is permitted, provided that the finished product complies with or is equivalent to the performance of the tested sample.

(e) A window being manufactured for heritage restorations to identically match existing products is deemed to satisfy the requirements of this Standard. These windows shall be marked 'Heritage', if glazed to AS 1288. A1

(f) Where the above methods are considered inappropriate, determination of compliance with the requirements of this Standard shall be based on the results of statistical sampling and quality assurance.

NOTES:

1 Appendix D gives recommendations on nomination of window ratings and design wind pressures.

2 A product may only be given a higher rating than a tested product if the tested product has satisfied the water penetration and air infiltration requirements of the higher rating.

3 If a sliding sash or door is increased in size, the operating force determined during the test should be multiplied by the ratio of the area to determine if it still complies with the requirements at the increased size.

4 It is recommended that windows are initially tested to determine their maximum rating of resistance to water penetration to allow for the possibility of extrapolating the rating of a smaller product to a higher value at a later date.

2.5 USE AND RATING OF WINDOW COUPLING SYSTEMS Where window structural couplings have been tested in windows to this Standard, further testing of these same couplings in other configurations are not deemed necessary provided that—

(a) the calculations for deflection and stress are based on actual test data for these couplings; and

(b) they are in no way less favourably disposed and are glazed to comply with AS 1288.

NOTE: Coupling is the joining of two or more assemblies together, which meets the same performance criteria as for the window.

SECTION 3 FRAMING AND FINISHES

3.1 ALUMINIUM WINDOWS

3.1.1 Aluminium framing

3.1.1.1 *Aluminium alloys* Aluminium alloys as detailed in Table 3.1 shall be used in the construction of framing for windows, and shall comply with the applicable Standard.

TABLE 3.1
ALUMINIUM ALLOYS

Aluminium alloy description	Standard number
Welding wire	AS 1167.2
Sheet and plate	AS/NZS 1734
Rivets and bolts (wire)	AS/NZS 1865
Extrusions	AS 1866
Castings (see Clause 3.1.1.2, Note 2)	AS 1874

3.1.1.2 *Extrusion alloys* Extrusion alloys of the 6000 series and sheet alloys of the 5000 series are suitable, provided the alloying elements comply with the requirements of Table 3.1.

NOTES:

1 High-strength aluminium alloys containing copper, such as the 2000 series, have low corrosion resistance and are not suitable for outdoor exposure.

2 It is necessary for casting alloys to be selected on the basis of design, strength requirements, cast-ability and colour response to anodizing. The 300 series copper-containing alloys are not recommended.

3.1.1.3 *Aluminium extrusions* Aluminium extrusions shall have a minimum ultimate tensile strength of 150 MPa and a minimum yield strength of 110 MPa.

NOTES:

1 An example of aluminium extrusion is 6060-T5.

2 As aluminium extrusion technology continually advances, shapes with very thin walls can be produced. This increases the possibility of buckling of window members and stress analysis of members, in accordance with AS/NZS 1664.1 and AS/NZS 1664.2, is often necessary. Careful consideration should also be given to metal thickness relative to window size, loading requirements, and hardware attachment.

3.1.1.4 *Welding* When welding or brazing is used, it shall be applied in accordance with AS 1665 and any flux shall be completely removed immediately after brazing. Welded joints shall be dressed, as necessary, to ensure proper functioning of the window.

3.1.2 Finishes Aluminium framing members of windows require a surface treatment for the purposes of appearance, colour and improvement of their resistance to corrosion in aggressive environments.

Surface treatments shall comply with one of the following:

(a) Anodizing . . . . . to AS 1231.

(b) Thermoset powder coating . . . . . to AS 3715.

(c) Liquid organic coatings . . . . . to BS 4842 or AAMA 603.8.

(d) High performance organic coatings . . . . . AAMA 605.2.

All finishes are available in a range of grades to suit different environments.

NOTE: Refer to Appendix E for more information on recommended surface treatments for aluminium.

3.2 TIMBER WINDOWS

3.2.1 Timber framing

A1 **3.2.1.1** *Durability* Timber for window framing components shall be as follows:

(a) Durability class 1 (see AS 1720.2).

(b) Durability class 2 (see AS 1720.2).

(c) Any durability class, provided that it is protected from the ingress of moisture by appropriate detailing of joints and the application of a protective coating.

(d) Any durability class, provided that it is protected from the ingress of moisture by appropriate detailing of joints and the structure of the building (e.g. under a verandah overhang).

(e) Any durability class, provided that it is preservative treated in accordance with AS 1604.

NOTE: Information on timber species suitable for exterior joinery and on preservative treatment may be obtained from the CSIRO, Division of Building, Construction and Engineering, state forest authorities, or timber industry associations.

A1 **3.2.1.2** *Sapwood susceptible to Lyctid borers* Sapwood susceptible to Lyctid borers shall be immunized against such attack in accordance with AS 1604.

NOTES:

1 The method for the detection of Lyctid-susceptible sapwood is given in AS 1604.

2 Guidelines for the immunization of susceptible sapwood are given in AS 1604 and further information is available from state advisory bodies, forestry departments and the CSIRO.

3.2.1.3 *Moisture content* The moisture content of the timber shall be determined in accordance with AS/NZS 1080.1 and shall be not less than 10% and not more than 15% at the time of fabrication and delivery as complete assemblies.

A1

3.2.2 Permissible timber imperfections

3.2.2.1 *Bow, spring and twist* Bow and spring shall be measured as the maximum perpendicular distance of any point on the face (bow) or edge (spring) from a straight line joining the arris at one end of the piece to the same arris at the other end, as shown in Figure 3.1 and Figure 3.2. Twist shall be measured as the perpendicular distance of the fourth corner from the surface when three corners of a piece are in contact with a plane surface, as shown in Figure 3.3.

Bow, spring or twist shall be evenly distributed. The maximum permissible values for these imperfections are given in Table 3.3 and Table 3.4, as appropriate, and are specified as follows:

(a) For heads, jambs, mullions and transoms, the following imperfections shall be accepted:

(i) *Bow*—

(A) in pieces where the thickness is equal to or less than two-thirds of the width, not exceeding 6 mm per 2.7 m length or proportional equivalent (see Table 3.3); and

(B) in pieces where the thickness is greater than two-thirds of the width, not exceeding 3 mm per 2.7 m length or proportional equivalent (see Table 3.3).

(ii) *Spring*—evenly distributed to the outside of the frame and not exceeding 6 mm per 2.7 m length or proportional equivalent (see Table 3.3).

(iii) *Twist*—not more than 2 mm in a 150 mm wide piece 2.7 m long or proportionally equivalent (see Table 3.4).

(b) For sash stock, no bow, spring or twist shall be apparent.

(c) For sills, the following imperfections shall be accepted:

(i) *Bow*—not exceeding 13 mm per 2.7 m length or proportional equivalent (see Table 3.3).

(ii) *Spring*—evenly distributed to the outside of the frame and not exceeding 6 mm per 2.7 m length or proportional equivalent (see Table 3.3).

(iii) *Twist*—not more than 3 mm in a 150 mm wide piece 2.7 m long or proportional equivalent (see Table 3.4).

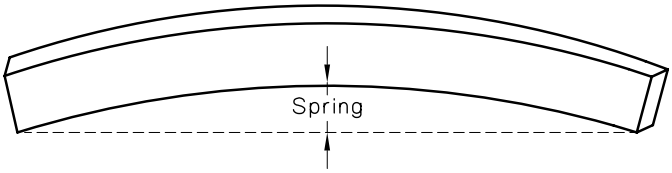


FIGURE 3.1 MEASUREMENT OF SPRING

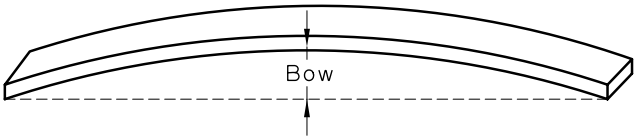


FIGURE 3.2 MEASUREMENT OF BOW

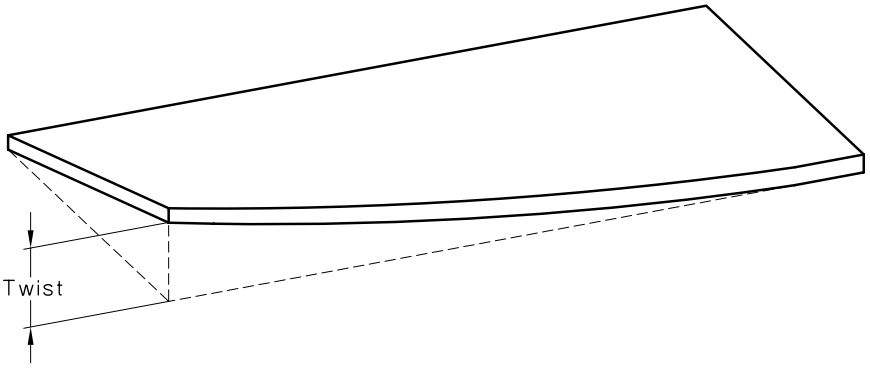


FIGURE 3.3 MEASUREMENT OF TWIST

TABLE 3.3

PERMISSIBLE BOW AND SPRING
(In millimetres, based on constant curvature)

Length m	Bow to Clause 3.2.2.1.(c)(a)(i)	Bow to Clause 3.2.2.1(a)(i)(A), Spring to Clauses 3.2.2.1(a)(ii) and 3.2.2.1(c)(ii)	Bow to Clause 3.2.2.1(a)(i)(B)
1.2	2	2	1
1.5	4	2	1
1.8	6	3	2
2.1	8	4	2
2.4	10	5	2
2.7	13	6	3
3.0	16	8	4
3.3	19	10	5
3.6	22	11	6

TABLE 3.4

PERMISSIBLE TWIST
(In millimetres, based on same angle of twist per unit length)

Length m	Width, mm									
	13		50		76		100		150	
	To Clause 3.2.2.1 (a)(iii)	To Clause 3.2.2.1 (c)(iii)	To Clause 3.2.2.1 (a)(iii)	To Clause 3.2.2.1 (c)(iii)	To Clause 3.2.2.1 (a)(iii)	To Clause 3.2.2.1 (c)(iii)	To Clause 3.2.2.1 (a)(iii)	To Clause 3.2.2.1 (c)(iii)	To Clause 3.2.2.1 (a)(iii)	To Clause 3.2.2.1 (c)(iii)
1.2	0	0	0	1	0	1	1	1	1	1
1.5	0	1	0	1	1	1	1	1	1	1
1.8	0	1	0	1	1	1	1	2	1	2
2.1	0	1	1	1	1	2	1	2	2	2
2.4	0	1	1	1	1	2	1	2	2	3
2.7	0	1	1	1	1	2	1	2	2	3
3.0	1	1	1	1	1	2	1	2	2	3
3.3	1	1	1	2	1	2	2	2	2	4
3.6	1	1	1	2	1	2	2	3	2	4

3.2.2.2 *Other imperfections* Other imperfections in timber window frames are acceptable as follows:

(a) Where faces and edges are exposed to view, sash stiles shall be free from all knots. All timber shall be free from loose knots, splits, resin pockets, bark pockets and gum pockets, but the following imperfections shall be accepted:

(i) *Slope of grain*—not exceeding 1 in 8 pieces of cross-section greater than 50 mm × 50 mm or an equivalent area, or 1 in 12 in pieces of cross-section less than 50 mm × 50 mm or an equivalent area.

(ii) *Surface checks*—only in members that are to be opaque-paint finished and provided they do not exceed 1 mm in width and 300 mm in length.

(iii) *Sound inter-grown knots*:

(A) *Round or oval knots*—in frame members only and not exceeding 25 mm in diameter for round knots or a mean diameter not exceeding 25 mm for oval knots, or one-quarter of the width of the face, whichever is less.

(B) *Spike knots*—provided the knot does not occupy more than one-quarter of the width of either face.

(iv) *Pin holes*—not exceeding 2 mm in diameter and not exceeding two holes per 200 mm × 50 mm or an equivalent area of the total exposed area of the component.

NOTE: Finger joint is not considered an imperfection.

(b) Where faces and edges are not exposed to view, all timber surfaces, which are not visible in the finished and assembled window, with sashes closed or open, may have defects in excess of those permitted in Clause 3.2.2.2(a) provided, that they do not affect the jointing of the members, the fixing of the components or unit assemblies, or the service to be reasonably expected from the window assemblies.

3.3 UNPLASTICIZED PVC (UPVC) WINDOWS

3.3.1 UPVC framing

3.3.1.1 *General* The plastic materials from which profiles are produced shall consist of polyvinyl chloride (PVC) to which may be added suitable additives such as impact modifiers, process aids, lubricants, pigments, stabilizers and pastes. These additives shall include a minimum of 4.2 parts of rutile titanium dioxide pigment per 100 parts by mass of PVC content, or other additives which can be demonstrated to be equivalent to 4.2 parts of rutile titanium dioxide.

Rework material of the same composition regenerated from the manufacturer's own production may be used. The permissible level of additives and rework material shall be controlled by the ability to comply with the test requirements of this Standard.

3.3.1.2 *Tolerances* The longitudinal axes of the profiles, as gauged at any external surface, shall not deviate by more than 3 mm/m from the straight line. The external dimensions shall not deviate by more than ±0.5 mm from the nominal dimensions.

Dimensions for the sealing grooves or glazing channels, glass mountings and guides for the metal fittings shall not deviate by more than ±0.4 mm from the nominal dimensions.

3.3.1.3 *Inserts and external stiffeners* All inserts and external stiffeners shall be either plastics or non-corrosive metals tested in accordance with AS 2331.3.1 for 48 h.

3.3.2 Finishes The profiles shall have uniform colouring and shall be free from foreign bodies, bubbles and other defects.

NOTE: Where defects are present, the product should demonstrate fitness for purpose.

3.4 WINDOWS OF OTHER MATERIALS

3.4.1 Framing

3.4.1.1 *General* This Standard shall be read to include all other types of window materials not expressly mentioned in Clauses 3.1, 3.2 and 3.3. This shall include, but shall not be limited to, windows constructed from reinforced resinous materials, ferrous and non-ferrous alloys, composite materials, combinations of materials, synthetic and other materials, capable of being profiled, machined, joined, assembled, glazed and constructed into a window suitable for complying with the performance criteria of this Standard. Where sections of this Standard are not applicable, then the appropriate Australian Standard or international Standard shall be used as the reference Standard.

3.4.1.2 *Compatible materials* All materials used in the construction of windows shall be compatible not only with components and hardware but also with associated materials and finishes.

3.4.1.3 *Tolerances* The construction of the completed window shall be capable of meeting a tolerance comparable with the tolerances specified in Clause 3.3.1.2.

3.4.2 Finishes The surface of the material shall be integrally durable with respect to colour, or shall be coated with a suitable finish which shall comply in all respects with the life cycle of finishes specified in Clauses 3.1.2, 3.2.2 and 3.3.2.

NOTE: The finished window should be able to demonstrate fitness for purpose.

SECTION 4 GLAZING

4.1 GENERAL The design of window assemblies shall allow for glazing or reglazing in situ without the need to remove the window from the building.

4.2 GLASS Glass installed in window assemblies shall comply with AS 1288.

A2 Other glazing material may be used as a substitute, provided it complies with the requirements of AS 1288.

Windows that comply with this Standard (AS 2047) may be glazed with leadlight, provided they are initially tested with the float glass in place, and the glazing, leadlight or otherwise, complies with AS 1288.

NOTE: Where compliance with AS 1288 and AS 2047 is shown, further testing or assessment is not required.Roman

4.3 GLAZING MATERIALS Glazing gaskets, tapes or sealants shall be of a material compatible with the framing and with each other when used in composite systems. They shall be resistant to weathering and shall be capable of maintaining a water-resistant seal between the glass and surrounding frame.

NOTE: Glazing includes materials other than glass, and should comply with the specific material's relevant codes or materials data.

SECTION 5 COMPONENTS

5.1 HARDWARE Hardware shall include all items necessary to operate, close and lock the window.

NOTES:

1 Specially protected or stainless steel hardware is preferred for use in severe or moderate atmospheric environments. All hardware should be securely attached by corrosion-resistant fasteners that are accessible, so as to permit adjustment and replacement from inside the building without damage to the window.

2 Cyclic loading does occur during a tropical cyclone and it could affect materials that are susceptible to low cyclic fatigue.

Hardware shall be installed to the window to ensure that the operating sash remains attached to the window frame. Sharp edges shall not protrude. Protrusions may cause injury to persons operating the windows.

5.2 FASTENERS

5.2.1 Nails, screws and metal dowels Nails, screws, washers, bolts, rivets and other fastening devices, incorporated in the window assembly, shall be compatible with the materials with which they will come in contact.

All steel fasteners shall be either of stainless steel in accordance with AS 1449, or zinc-coated in accordance with service condition No. 2 of AS 1789.

Decoratively plated steel fasteners may be used, provided that they are not less corrosion-resistant than the zinc-coated steel fasteners referred to in this Clause.

NOTE: Cyclic loading does occur during a tropical cyclone and it could affect materials that are susceptible to low cyclic fatigue.

5.2.2 Adhesives Adhesives used for fixing the joints in timber frames and sashes of windows shall be capable of forming bonds at least equivalent in performance to those bonds made by adhesives complying with AS 2754.2, and these bonds shall be capable of complying with the requirements of the type B bond test as set out in AS/NZS 2098.2.

Adhesives capable of achieving a bond strength less than the type B bond may be used to fix the joints of sashes which, in such cases, shall be permanently fixed by a method that will ensure a firm joint, even in the event of glue failure.

5.3 WEATHERPROOFING Weather seals shall be capable of being replaced without the necessity for removal of the window outer frame from the building structure.

5.4 SECURITY No window shall be openable without deformation and breakage, nor shall it be removable from outside when it is in the latched or locked position.

NOTE: Many windows, particularly of the sliding type, have simple latch locks that offer minimal security. The addition of key operation or separate key security locks is often specified, together with additional anti-lift devices, to minimize latch release. The fixing of these should not affect the weatherproofing of the window.

5.5 ANCHORING DEVICES Anchor brackets or other devices and their attachments shall be so designed and located that they will transmit the combination of loads to the supporting building structure.

The anchor brackets and attachments shall be made of material of sufficient strength and stability to last for the life of the window. Ferrous brackets, other than stainless steel, shall comply with AS 1397, or shall be steel bar coated in accordance with AS 1650.

NOTES:

1 Ferrous anchoring devices are equivalent to wall ties in masonry walls.

2 Where site working or re-bending of anchor brackets is necessary, any damage caused to the protective coating of fixing brackets by such re-working shall be made good.

3 Cyclic loading does occur during a tropical cyclone and it could affect materials that are susceptible to low cyclic fatigue.

SECTION 6 CONSTRUCTION

6.1 GENERAL Window assemblies shall be constructed to meet the materials and performance requirements of Sections 2, 3, 4 and 5.

6.2 TOLERANCES The sizes of rectangular window assemblies shall be within a tolerance of ±3.0 mm of the agreed sizes, and the maximum difference between diagonals shall be 4 mm.

6.3 JOINTS The joints between members shall be capable of withstanding all forces applied to the various components, as required by Section 2.

6.4 GLAZING

6.4.1 Glazed windows Glazing methods not covered in AS 1288 are acceptable provided the glazed assembly complies with Section 2.

NOTE: The majority of windows for housing are supplied factory-glazed and use individual proprietary methods which are not described in AS 1288.

6.4.2 Site glazing Glazing after the frame is installed in the building shall be in accordance with one or more of the methods in AS 1288.

6.4.3 Structural glazing This Section does not cover construction of structural glazing, refer to AS 1288 for details.

NOTES:

1 The use of structural silicone and adhesive glazing tapes for the bonding of glass or panels onto framing systems is a specialist procedure requiring very careful choice of materials and treatment of the bonding surfaces.

2 Consultation with all material suppliers is of critical importance. Only experienced structural glazers should be used and the process should be strictly in accordance with the manufacturer’s specific process.

6.5 REVEAL LININGS Where wood products are used for reveal linings they shall conform to the requirements of Clause 3.2.1 and the relevant States Timber Marketing Act.

6.6 FLASHINGS Flashing materials shall be in accordance with AS/NZS 2904 and shall be compatible with window assemblies.

NOTE: Flashings may be attached to windows at the time of assembly to facilitate their installation in the building.

SECTION 7 INSTALLATION

7.1 WINDOW SELECTION A window assembly shall suit the design wind speed or pressure of the site and the building in which it is to be installed. A window assembly shall have a window rating or design wind pressure not less than the wind classification of the site or location on the building in which it is to be installed.

A suitably competent and experienced person shall nominate the window rating appropriate to the site or the building.

7.2 INSTALLATION Openings in buildings into which windows are to be installed shall be of sufficient size to allow the window frame to be installed level and plumb.

Windows shall only be installed in locations for which they are designed in accordance with this Standard.

Window assemblies shall be fixed into the building using recognized building practices. Fixing shall not deform the window assembly. Non-load-bearing window assemblies shall not carry building loads.

Installed windows assemblies shall prevent water penetration and excessive air infiltration.

NOTE: Window manufacturers' installation procedures may need to be followed for particular installations.

7.3 THERMAL AND STRUCTURAL MOVEMENT

7.3.1 General A gap shall be provided between the window and the surrounding structure sufficient to prevent loads being imposed on the window, allowing for thermal expansion of the window and for structural movement as described in Clauses 7.3.2 and 7.3.3.

The gap shall be sealed with suitable flexible mouldings or flexible caulking to resist water penetration, or other weatherproofing methods shall be used.

7.3.2 Thermal movement The frame and its members shall be free to move in response to thermal change. In no circumstances shall provision for expansion be made by locating slotted fixing holes in anchor brackets to allow sliding movement between the anchor brackets and the structure. Where used, such slotted holes shall be located to allow sliding movement between the frame and anchor brackets.

7.3.3 Structural movement At the time of installation, allowance shall be made for differential movement of the structure of the window, such as creep and compression of the structure.

7.4 ON-SITE CARE

NOTE: Refer to Appendix F, for guidelines on on-site care.

SECTION 8 LABELLING AND CERTIFICATE

A1, A2 **8.1 GENERAL** Window assemblies for housing shall be labelled in accordance with Clause 8.2. Window assemblies for other than housing shall be labelled in accordance with Clause 8.2, or a certificate, in accordance with Clause 8.3, shall be provided.

NOTE: Where windows for housing are supplied as incomplete assemblies, a certificate and a label giving manufacturer's identification marks, window rating and water penetration resistance should be provided with the window.

A1, A2 **8.2 LABELLING** The label shall be so positioned that the window can be identified when viewed in situ. Each window shall have the following information marked anywhere on the window assembly, except on the glazing (the application of rating labels on fixed glazed timber windows is permitted):

(a) *Housing*:

(i) Manufacturer's identification mark.

(ii) Window rating and water penetration resistance.

(b) *Residential other than housing*:

(i) Manufacturer's identification mark.

(ii) Serviceability limit state residential ratings.

(iii) Ultimate limit state residential ratings.

(iv) Water penetration resistance.

(c) *Commercial*:

(i) Manufacturer's identification mark.

(ii) Serviceability limit state commercial ratings.

(iii) Ultimate limit state commercial ratings.

(iv) Water penetration resistance.

8.3 CERTIFICATE A certificate, indicating the window rating, shall be provided for window assemblies.

NOTES:

1 The manufacturer of the window assembly would normally provide this certificate.

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

3 Manufactures making a statement of compliance with this Australian Standard on a variation to their tested sample are advised to ensure that such compliance is capable of being verified.

A2

APPENDIX A
GUIDE TO DESIGN WIND PRESSURE
(Informative)

A1 INTRODUCTION Windows within the scope of this Standard are made of a range of materials having a wide variation in strength and flexibility.

Section 2 specifies the performance criteria of windows, for which the main loadings come from wind pressures determined in accordance with either AS 4055 for housing, or AS 1170.2 for other residential buildings and other buildings. Both wind load codes list the maximum design gust wind speeds for permissible stress, serviceability and ultimate limit state design methods, i.e. V_p, V_s and V_u respectively.

For overall strength, the V_u is applied to ensure the elements do not collapse or fail structurally under extreme loads caused by wind having a 5% probability of being exceeded in a 50 year period (return period of 1000 years). For other performance criteria, V_s (for serviceability) is applied to ensure the elements remain operative under peak loads having a 5% of probability of being exceeded in any one year (return period of 20 years). For the convenience of users who are familiar with permissible stress or allowable stress design method, performance requirements based on permissible stress design wind speed (V_p) are still available.

This Appendix provides further information on wind loads for housing, as described in Paragraph A2, and a guide to some design wind pressures for windows in all buildings other than housing, as described in Paragraph A3.

A2 WIND LOADS FOR HOUSING

A2.1 General In Clause 2.3.1, a simplified rating system for the performance requirements of windows for housing is provided. The local pressure effects on wall edges is described in Paragraph A2.2.

A2.2 Local pressure effects near wall edge Local external negative pressures higher than those that have been adopted in the tabulated classifications are likely to occur near wall edges. However, the pressures nominated are considered appropriate based on numerous scale model wind tunnel tests.

The introduction of a simple window rating system in Clause 2.3.1 will lead to the construction of a consistently sound and fit-for-use product for the great majority of windows for housing.

A3 WIND LOADS FOR BUILDINGS OTHER THAN HOUSING For windows in buildings other than housing, no minimum pressure ratings are recommended in Section 2 as each project should be carefully evaluated by either wind tunnel test or through calculation of each building facade by a suitably competent and experienced person.

Design wind pressure over all installation sites throughout Australia may range from under 200 Pa on a sheltered one-storey building to over 7000 Pa on the upper floors of a high-rise building in tropical cyclone and exposed areas. Hence, it is not usually economic to manufacture an all-purpose window that can be installed anywhere.

Therefore, it is presumed that windows should be manufactured in a variety of strengths. This Standard does not, however, specify any preferred incremental steps in designated strength. How many steps are offered, and their bounds, are left to each window manufacturer’s discretion.

Windows towards the upper end of the strength range are usually installed in designed buildings and are commonly made to order. A specific design wind pressure figure is available from the building designer.

The major numerical demand is for ex-stock windows near the lower end of the strength range. Furthermore, a large proportion of these windows are installed in houses and other buildings not requiring specific design. On such jobs there may be no person qualified to produce wind pressure calculations.

This Standard, therefore, allows installation of windows of ratings anywhere in broad areas, according to the basic wind classification of the area. Recourse to full calculations for the actual site can usually be expected to show a lower strength requirement, though maybe not significantly so in all cases.

An example for some design wind pressures for windows in buildings other than housing is shown in Table A1.

A1

TABLE A1

GUIDE TO SOME DESIGN WIND PRESSURES FOR WINDOWS IN BUILDINGS OTHER THAN HOUSING

pascal

Terrain category	Building height 10 m, 3-storey					
	Region A		Region B		Region C	
	Serviceability	Ultimate	Serviceability	Ultimate	Serviceability	Ultimate
TC4	600	1 000	600	1 500	1 200	4 000
TC3	700	1 200	700	1 800	1 400	4 000
TC2	1 000	1 800	1 000	2 600	2 100	5 000

NOTES:

1 The pressures indicated have been calculated using the basic wind speed of AS 1170.2. Pressures have been rounded to the nearest 100 Pa.

2 The pressures have been calculated on the basis of conservative assumptions. Detailed calculations based on specific buildings may yield higher or lower design wind pressure.

3 Region D (see Figure A1) has been omitted as buildings in this region require individual evaluation.

4 The coefficients and multipliers used are as follows:

(a) Net pressure coefficient, $C_{p,n}$—

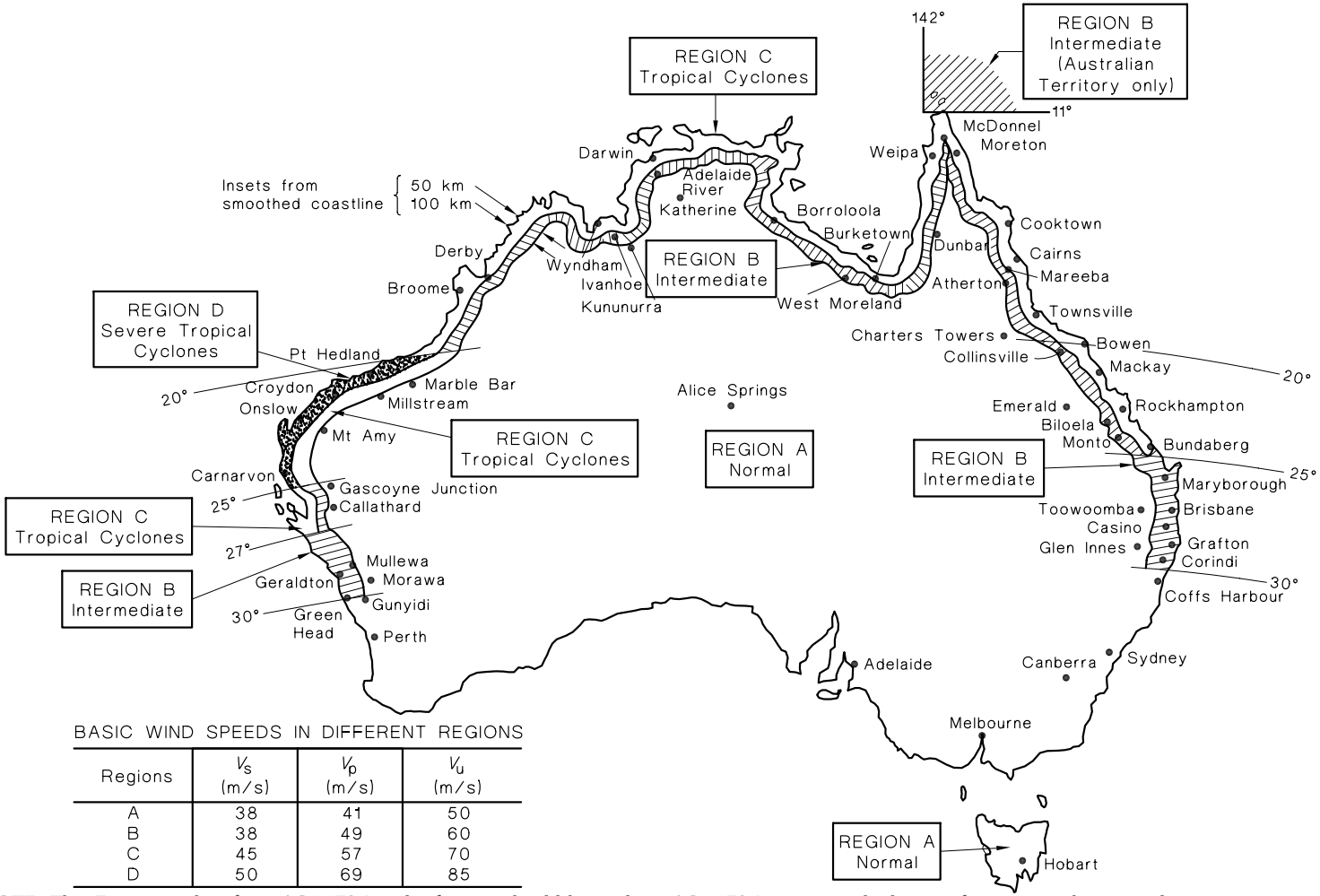
(i) For Regions A and B . . . . . 1.20.

(ii) For Regions C . . . . . 1.70.

(b) Shielding multiplier, M_s . . . . . 1.00 (no shielding).

(c) Topographic multiplier, M_t . . . . . 1.00 (flat ground).

(d) Structural importance multiplier, M_i . . . . . 1.00 (normal structure).



BASIC WIND SPEEDS IN DIFFERENT REGIONS

Regions	V_s (m/s)	V_p (m/s)	V_u (m/s)
A	38	41	50
B	38	49	60
C	45	57	70
D	50	69	85

NOTE: This Figure is taken from AS 1170.2 and reference should be made to AS 1170.2 to ensure the latest information is being used.

FIGURE A1 BOUNDARIES OF REGIONS A, B, C AND D

APPENDIX B
MEANS FOR DEMONSTRATING COMPLIANCE WITH THIS STANDARD
(Informative)

B1 SCOPE This Appendix sets out the following different means by which compliance with this Standard can be demonstrated by the manufacturer or supplier:

(a) Evaluation by means of statistical sampling.

(b) The use of a product certification scheme.

(c) Assurance using the acceptability of the supplier's quality system.

(d) Other such means proposed by the manufacturer or supplier and acceptable to the customer.

B2 STATISTICAL SAMPLING Statistical sampling is a procedure which enables decisions to be made about the quality of batches of items after inspecting or testing only a portion of those items. This procedure will only be valid if the sampling plan has been determined on a statistical basis and the following requirements are met:

(a) The sample shall be drawn randomly from a population of product of known history. The history shall enable verification that the product was made from known materials at essentially the same time, by essentially the same processes and under essentially the same system of control.

(b) For each different situation, a suitable sampling plan needs to be defined. A sampling plan for one manufacturer of given capability and product throughput may not be relevant to another manufacturer producing the same items.

In order for statistical sampling to be meaningful to the customer, the manufacturer or supplier needs to demonstrate how the above conditions have been satisfied. Sampling and the establishment of a sampling plan should be carried out in accordance with AS 1199, guidance to which is given in AS 1399.

B3 PRODUCT CERTIFICATION The purpose of product certification is to provide independent assurance of the claim by the manufacturer that products comply with the stated Standard.

The certification scheme should meet the criteria described in SAA HB18.28 in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective quality planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard.

B4 SUPPLIER'S QUALITY SYSTEM Where the manufacturer or supplier can demonstrate an audited and registered quality management system complying with the requirements of the appropriate or stipulated Australian or international Standard for a supplier's quality system or systems, this may provide the necessary confidence that the specified requirements will be met. The quality assurance requirements need to be agreed between the customer and supplier and should include a quality or inspection and test plan to ensure product conformity.

Guidance in determining the appropriate quality management system is given in AS/NZS ISO 9000.1 and AS/NZS ISO 9004.1.

B5 OTHER MEANS OF ASSESSMENT If the above methods are considered inappropriate, determination of compliance with the requirements of this Standard may be assessed from the results of testing coupled with the manufacturer's guarantee of product conformance.

Irrespective of acceptable quality levels (AQLs) or test frequencies, the responsibility remains with the manufacturer or supplier to supply products that conform with the full requirements of the Standard.

APPENDIX C
REFERENCED DOCUMENTS
(Normative)

The following documents are referred to in this Standard:

AS	
1167	Welding and brazing—Filler metals
1167.2	Part 2: Filler metal for welding
1170	Minimum design loads on structures (known as the SAA Loading Code)
1170.2	Part 2: Wind loads
1199	Sampling procedures and tables for inspection by attributes
1231	Aluminium and aluminium alloys—Anodized coatings for architectural applications
1288	Glass in buildings—Selection and installation
1397	Steel sheet and strip—Hot-dipped zinc-coated or aluminium/zinc-coated
1399	Guide to AS 1199—Sampling procedures and tables for inspection by attributes
1449	Wrought alloy steels—Stainless and heat-resisting steel plate, sheet and strip
1604	Timber—Preservative-treated—Sawn and round
1650	Hot-dipped galvanized coatings on ferrous articles
1665	Welding of aluminium structures
A1	
1789	Electroplated coatings—Zinc on iron or steel
1866	Aluminium and aluminium alloys—Extruded rod, bar, solid and hollow shapes
1874	Aluminium and aluminium alloys—Ingots and castings
2331	Methods of test for metallic and related coatings
2331.3.1	Part 3.1: Corrosion and related property tests—Neutral salt spray (NSS) test
2754	Adhesives for timber and timber products
2754.2	Polymer emulsion adhesives
3715	Metal finishing—Thermoset powder coatings for architectural applications
4055	Wind loads for housing
AS	
4420	Windows—Methods of test
4420.2	Method 2: Deflection test
4420.3	Method 3: Operating force test
4420.4	Method 4: Air infiltration test
4420.5	Method 5: Water penetration resistance test
4420.6	Method 6: Ultimate strength test

AS/NZS	
1080	Timber—Methods of test
1080.1	Moisture content
A1	
1664	Aluminium structures
1664.1	Part 1: Limit state design
1664.2	Part 2: Allowable stress design
1734	Aluminium and aluminium alloys—Flat sheet, coiled sheet and plate
1865	Aluminium and aluminium alloys—Drawn wire, rod, bar and strip
2098	Methods of test for veneer and plywood
2098.2	Part 2: Bond quality of plywood (chisel test)
2904	Damp-proof courses and flashings
4284	Test of building facades
4491	Timber—Glossary of terms in timber-related Standards
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
AAMA	
603.8	Voluntary performance requirements and test procedures for pigmented organic coatings on extruded aluminium
605.2	Voluntary specification for high performance organic coatings on architectural extrusions and panels
ABCB	
BCA	Building Code of Australia—1996
BS	
4842	Specification for liquid organic coatings for application to aluminium alloy extrusions, sheet and preformed sections for external architectural purposes, and for the finish on aluminium alloy extrusions, sheet and preformed sections coated with liquid organic coatings

APPENDIX D

NOMINATION OF WINDOW RATINGS AND DESIGN WIND PRESSURE

(Informative)

The following are recommended window ratings for housing and design wind pressures for buildings other than housing as follows:

(a) For housing and other residential buildings the purchaser should nominate the window rating when ordering the window assemblies.

(b) For other buildings the purchaser should nominate the design wind pressure for the window assemblies when ordering the windows.

(c) The manufacture of standard window assemblies should verify the window rating or design wind pressure.

APPENDIX E
SURFACE FINISH FOR ALUMINIUM
(Informative)

E1 ANODIZING Anodizing is available in four external grades, ranging from 10 to 25 µm thickness, with a fifth grade applicable for internal use. The selection of the correct grade is critical to the appearance and life expectancy of the aluminium.

The grade of anodizing should be specified with any order. The recommended grades are listed in Table F1.

TABLE F1

RECOMMENDED GRADES OF ANODIZING

Class	Typical thickness µm	Exposure classification	Typical condition
AA25	20 to 25	Severe	External application subject to heavy industrial pollution, with minimal cleaning
AA20	16 to 20	Moderate	External application such as coastal marine and light industrial urban locations, with minimal cleaning
AA15	12 to 15	Mild	External and internal application in urban and light industrial areas, with regular cleaning
AA10	8 to 10	Very mild	External and internal applications in urban and rural areas, with regular cleaning
AA5	4 to 5	Internal only	Suitable for internal partitions, shower screens, lift interiors

NOTES:

1 Immediate coastal frontage involving salt spray is a ‘severe’ environment and depends on prevailing winds and topography for extent of effect inland.

2 Classes AA15 and AA10 are not recommended for coastal or industrial fallout areas.

3 Class AA5 should not be used externally.

4 Items subject to wear, such as handrails and door push-plates, should use the thicker coatings.

5 Minimal cleaning = less than or equal to 4 times per year.
Regular cleaning = more than 4 times per year.
See Section 7 for installation recommendations.

E2 POWDER COATING Powder coating is available in two main grades, known as ‘standard’ and ‘architectural’, as follows:

(a) *Standard coating* Aluminium window products are normally supplied with the standard powder coat. The coating thickness and other properties should conform to AS 3715 as a minimum.

(b) *Architectural coating* Architectural coating usually is specifically requested and is distinguished by the available warranties of the powder manufacturers. The coating builds of these products and other properties should conform to AS 3715.

NOTE: Higher durability coatings should be used where colour and gloss retention are more critical.

E3 LIQUID ORGANIC COATING The normal film of liquid organic coating builds 20 to 30 μm. Other properties should conform to BS 4842 or AAMA 603.8.

E4 HIGH-PERFORMANCE COATING Where it is a specification requirement, high-performance coatings provide and maintain a superior level of performance in terms of film integrity, exterior weather-ability and general appearance over a period of many years. They are often used where, for practical reasons, regular maintenance cannot be guaranteed.

High-performance coatings should conform to AAMA 605.2.

APPENDIX F
ON-SITE CARE
(Informative)

Windows should be stored on site in a clean, dry area away from the damaging effects of cement, lime, paint, acid, and the like. During installation they should be protected from building fallout such as wet plaster, mortar, paint and welding splatter. Wet plaster and mortar should be removed immediately and the soiled area washed down with clean water. If removal is delayed and scraping becomes necessary, the surface finish may be damaged.

NOTE: Window framing may be affected by corrosive salts migrating from masonry construction and from the ground. Where necessary, care should be taken by the use of damp courses or other protective measures to eliminate this corrosive cause.

Acid used for cleaning brickwork should be prevented from dripping onto aluminium. Should this dripping onto aluminium occur, the acid should be immediately washed off with clean water.

If stripable coatings or pressure-sensitive tapes are used to protect exposed surfaces, care should be taken not to damage the finish during their removal. Prolonged exposure to sunlight can make temporary coating or tape difficult to remove.

Door tracks and window sills should be protected from damage by planks, scaffolding and barrows impacting them.

Refer to Section 3 for further details of protection of finishes for different framing material.

A1

APPENDIX G

GENERIC TIMBER WINDOWS

(Normative)

G1 GENERAL The generic timber designs have been developed to provide a compliance path for small timber joineries that cannot justify the expense of proprietary testing.

A2 The generic designs referenced as an acceptable alternative have been proofed by CSIRO as being capable of achieving an ultimate load of 1000 Pa for windows (N2 window rating for housing) and an ultimate load of 700 Pa for sliding doors (NI window rating for housing), and a water resistance capacity of 150 Pa. These results are based on engineering calculations and laboratory testing and assume that the profiles nominated are assembled in accordance with accepted trade practices, but cannot exempt a manufacturer's responsibility to produce products that are fit for the purpose for which they are intended.

NOTES:

1 At the time of publication of this amendment, structural performance and water penetration have been completed as these are BCA requirements that must be satisfied.

2 For information on test results for generic windows, see Appendix H.

G2 CONSTRUCTION In order for windows and doors to comply with this Standard as a generic product, the products shall be produced to the detail shown in Figures G1 to G4, as applicable.

NOTES:

1 Where plant-on beads/stops are shown as a feature of the generic timber window and door, the bead/stop should have a continuous seal applied between the bead/stop and the face to which it is securely fixed. Fixing should be at a maximum of 200 mm centres. Where stops are fitted to form a rebate to a sash face, the stops should be fitted after the sashes are fitted.

2 Frame and sash joints should be morticed and tenoned, and mechanically fixed and sealed with a flexible sealant. Where flat trenches are used, the joints should be fully sealed on all faces.

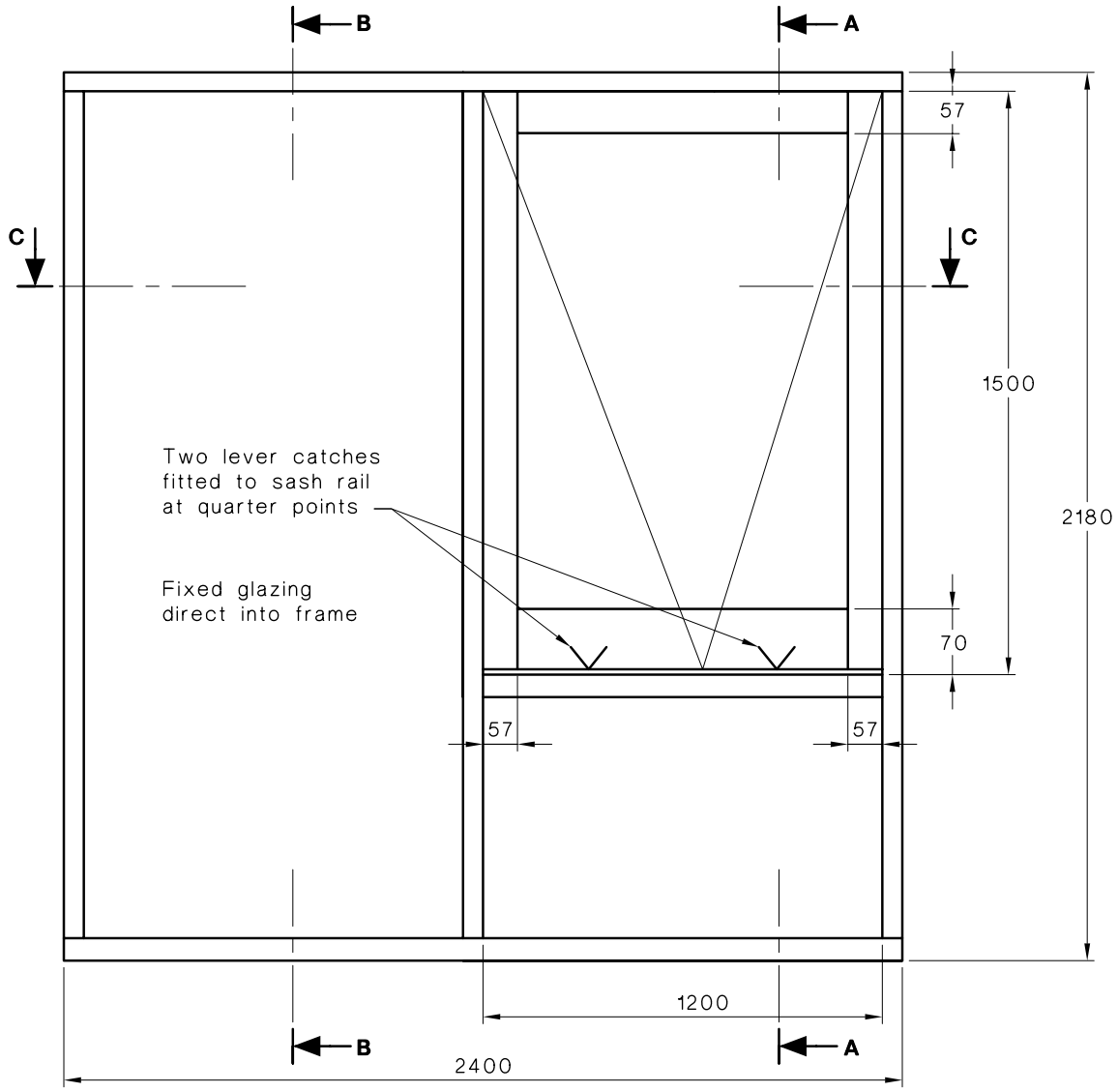
3 The generic windows and door subjected to the test were glazed with glass set into a continuous, full bed of silicone between the glass and the rebate face. Cedar glazing beads should be applied to the front face of the glass, fixed with stainless steel brads at maximum of 200 mm fixing centres.

4 Where putty glazing is used in lieu of bead glazing, standard industry practice should be used; e.g., the glass is set into a full and continuous bed of silicone, between the rebate face and the glass. Glazing springs should be applied at 200 mm centres. The glazing should be face-finished on the external face with putty.

5 The fixed glazing in the generic products tested was glazed direct into the frame into rebates formed by planting stops to the face of the window frame members. Where the fixed glazing is glazed into a fixed sash, the sash should be sealed into the frame with a continuous bead of mastic or silicone. Timber beads should be applied to the face of the sash, so as to securely fix the sash to the window frame.

6 The awning and casement windows subjected to testing, were fitted with 4 bar friction stays. Alternative hardware may be used, e.g. hinges, provided that the integrity of operation of the sash is not affected and that the sash closes tightly to the sash stops and the rebate sizes shown in the drawings are maintained.

A1

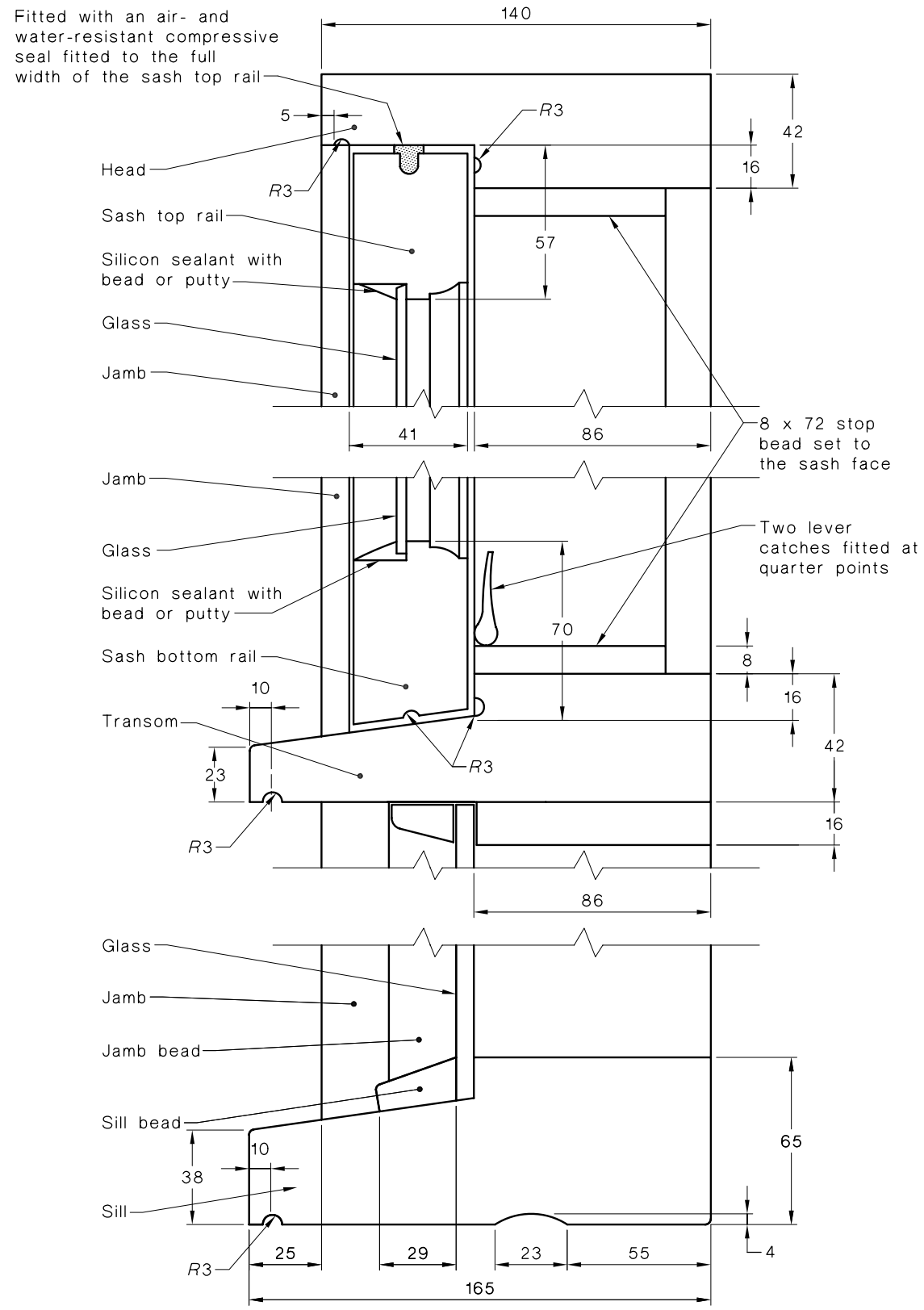


(a) ELEVATION OF WINDOW SUBJECTED TO TEST

DIMENSIONS IN MILLIMETRES

FIGURE G1 (in part) AWNING WINDOW

A1

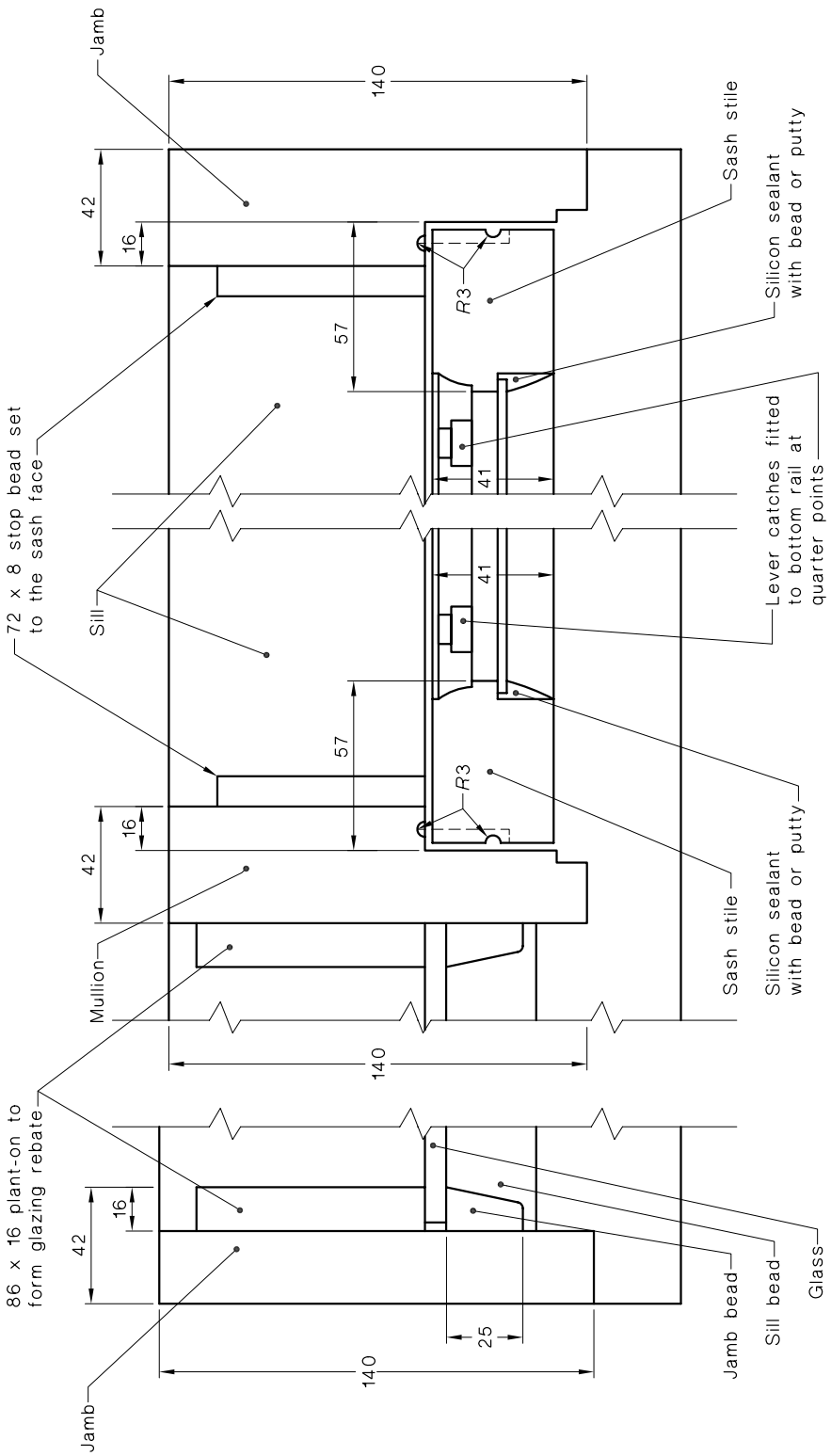


(b) VERTICAL SECTION A-A THROUGH AWNING WINDOW

DIMENSIONS IN MILLIMETRES

FIGURE G1 (in part) AWNING WINDOW

A1

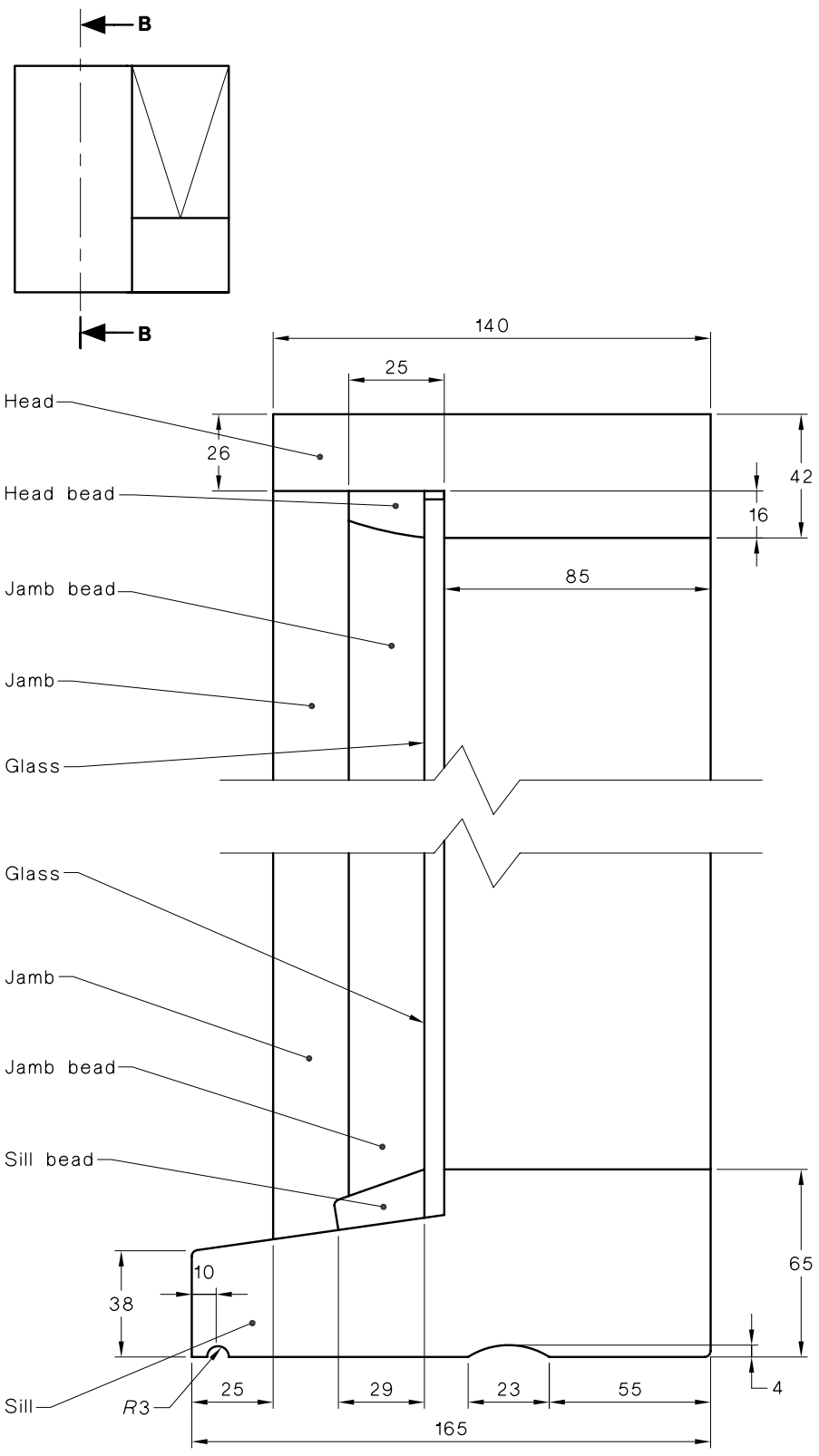


(c) HORIZONTAL SECTION C-C THROUGH OPERATIVE SASH AND FIXED LIGHT

DIMENSIONS IN MILLIMETRES

FIGURE G1 (in part) AWNING WINDOW

A1

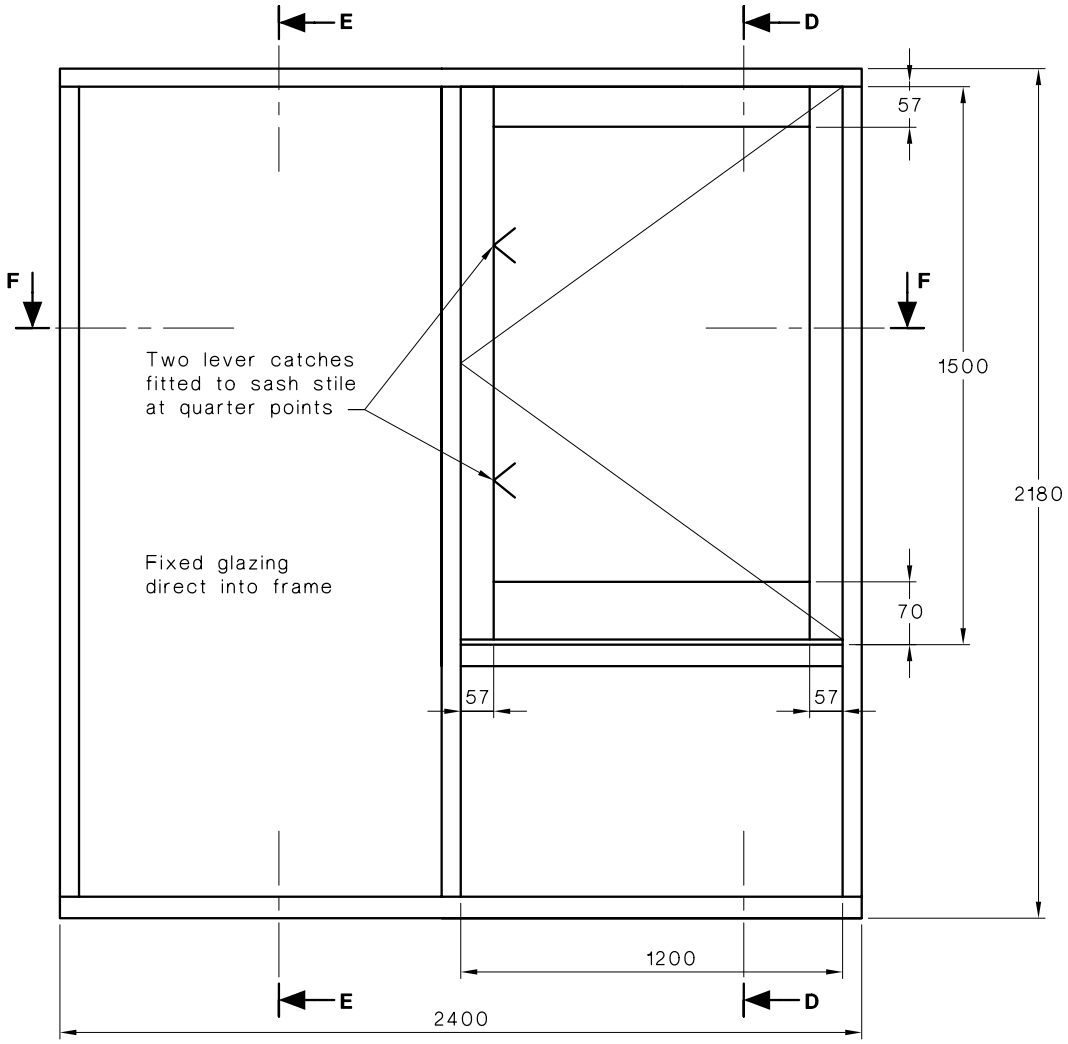


(d) VERTICAL SECTION B-B THROUGH FIXED GLAZING

DIMENSIONS IN MILLIMETRES

FIGURE G1 (in part) AWNING WINDOW

A1

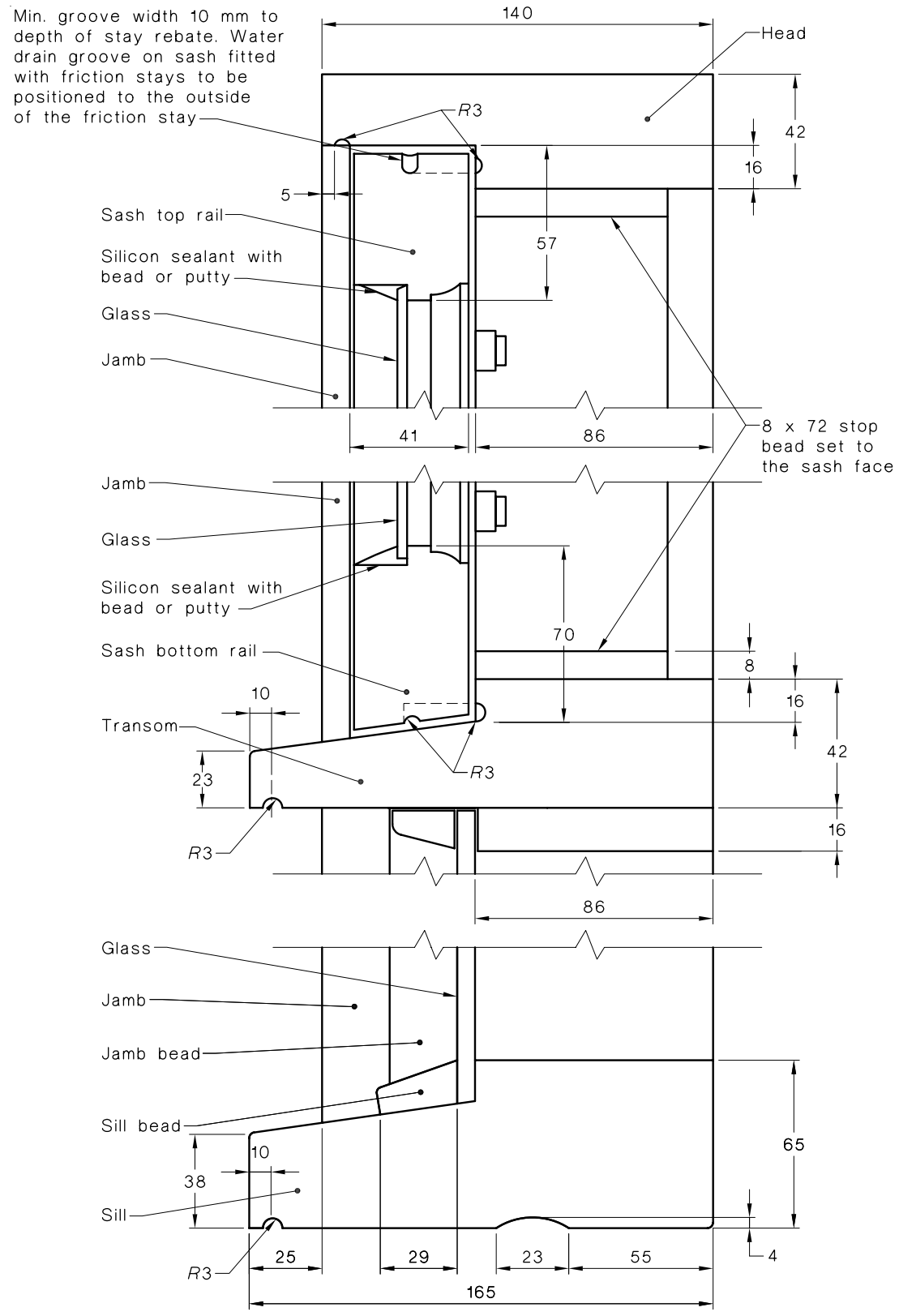


(a) ELEVATION OF WINDOW SUBJECTED TO TEST

DIMENSIONS IN MILLIMETRES

FIGURE G2 (in part) CASEMENT WINDOW

A1

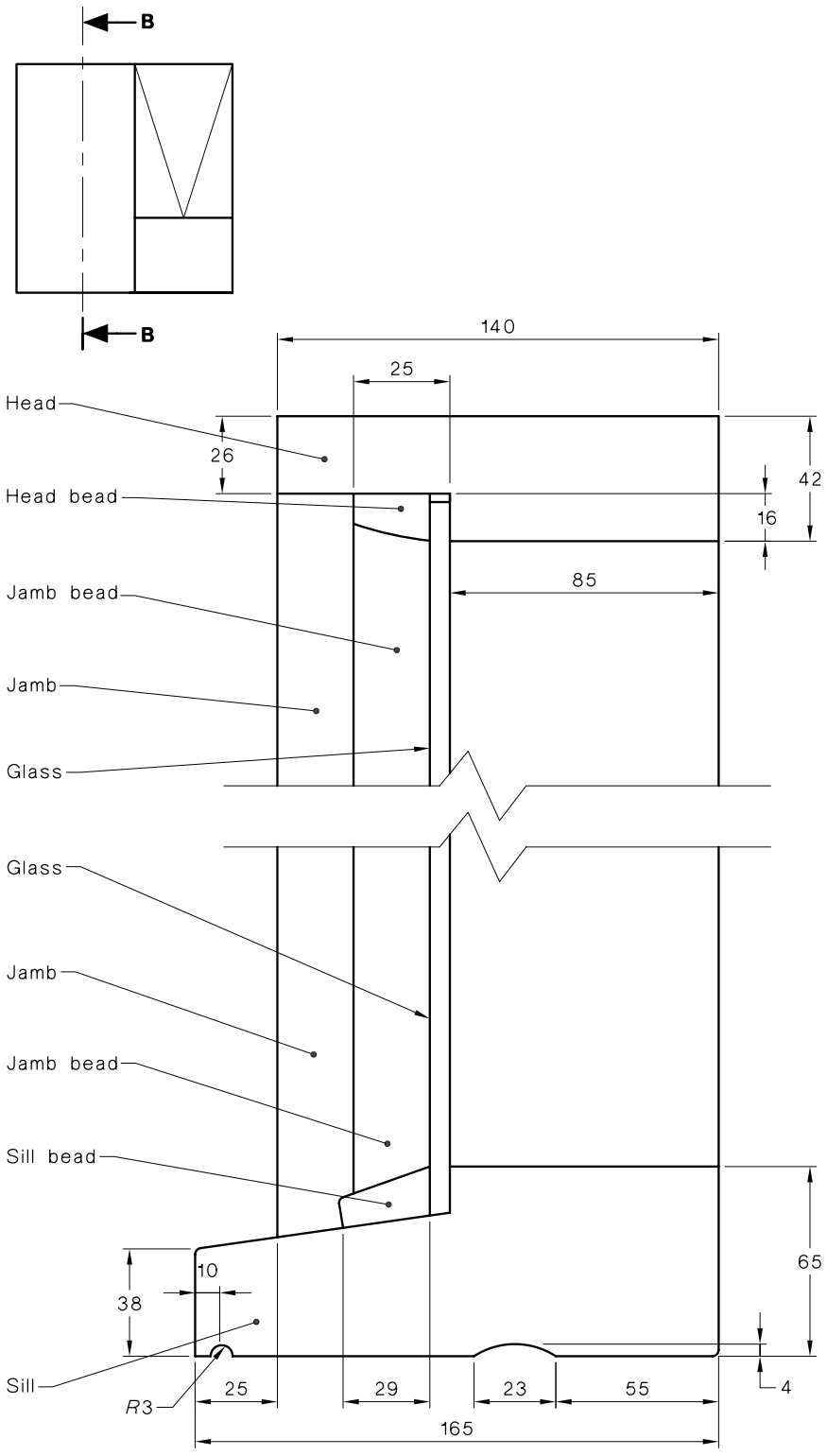


(b) VERTICAL SECTION D-D THROUGH OPERATIVE SASH AND FIXED GLAZED LIGHT

DIMENSIONS IN MILLIMETRES

FIGURE G2 (in part) CASEMENT WINDOW

A1

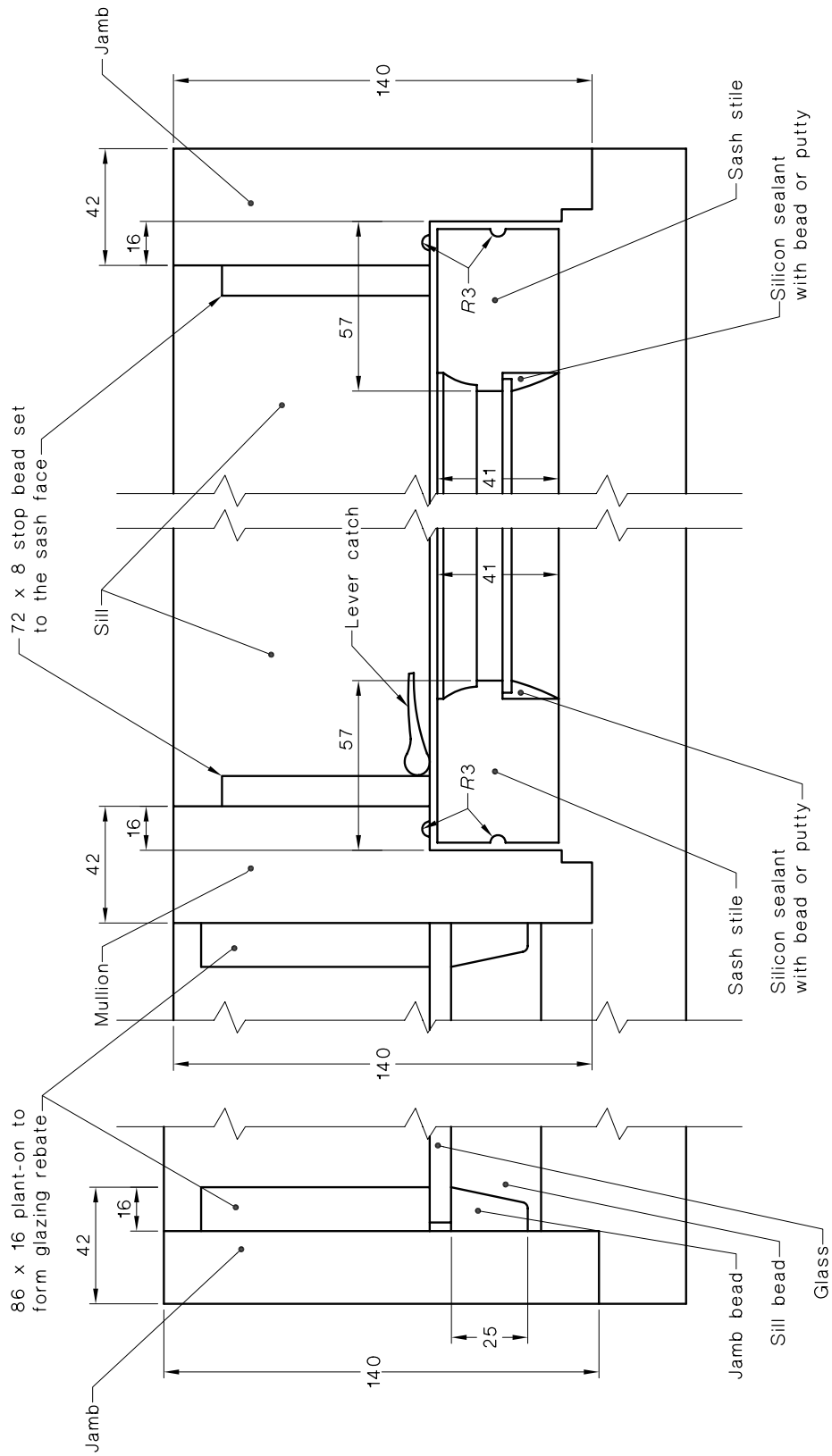


(c) VERTICAL SECTION E-E THROUGH FIXED GLAZING

DIMENSIONS IN MILLIMETRES

FIGURE G2 (in part) CASEMENT WINDOW

A1

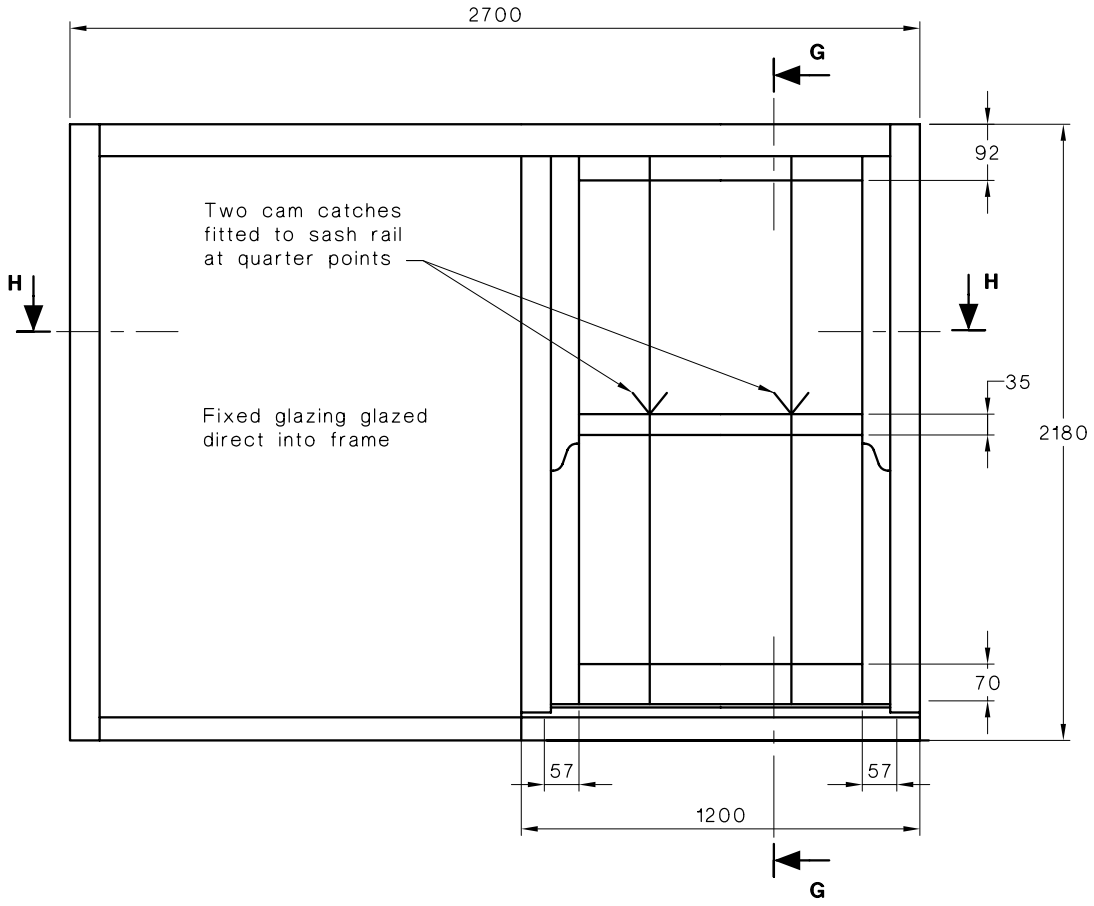


(d) HORIZONTAL SECTION F-F THROUGH OPERATIVE SASH AND FIXED GLAZING

DIMENSIONS IN MILLIMETRES

FIGURE G2 (in part) CASEMENT WINDOW

A1

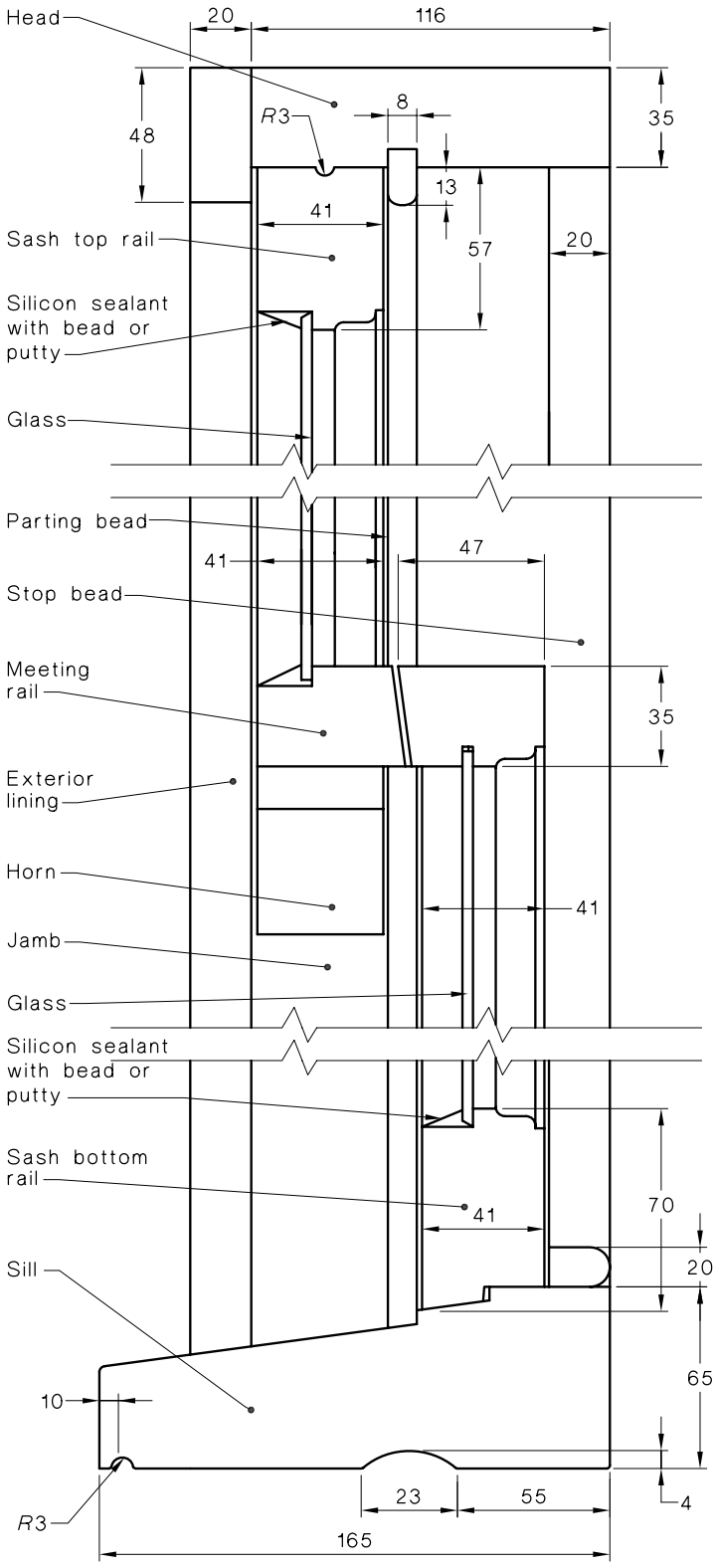


(a) ELEVATION OF WINDOW SUBJECTED TO TEST

DIMENSIONS IN MILLIMETRES

FIGURE G3 (in part) DOUBLE-HUNG WINDOW

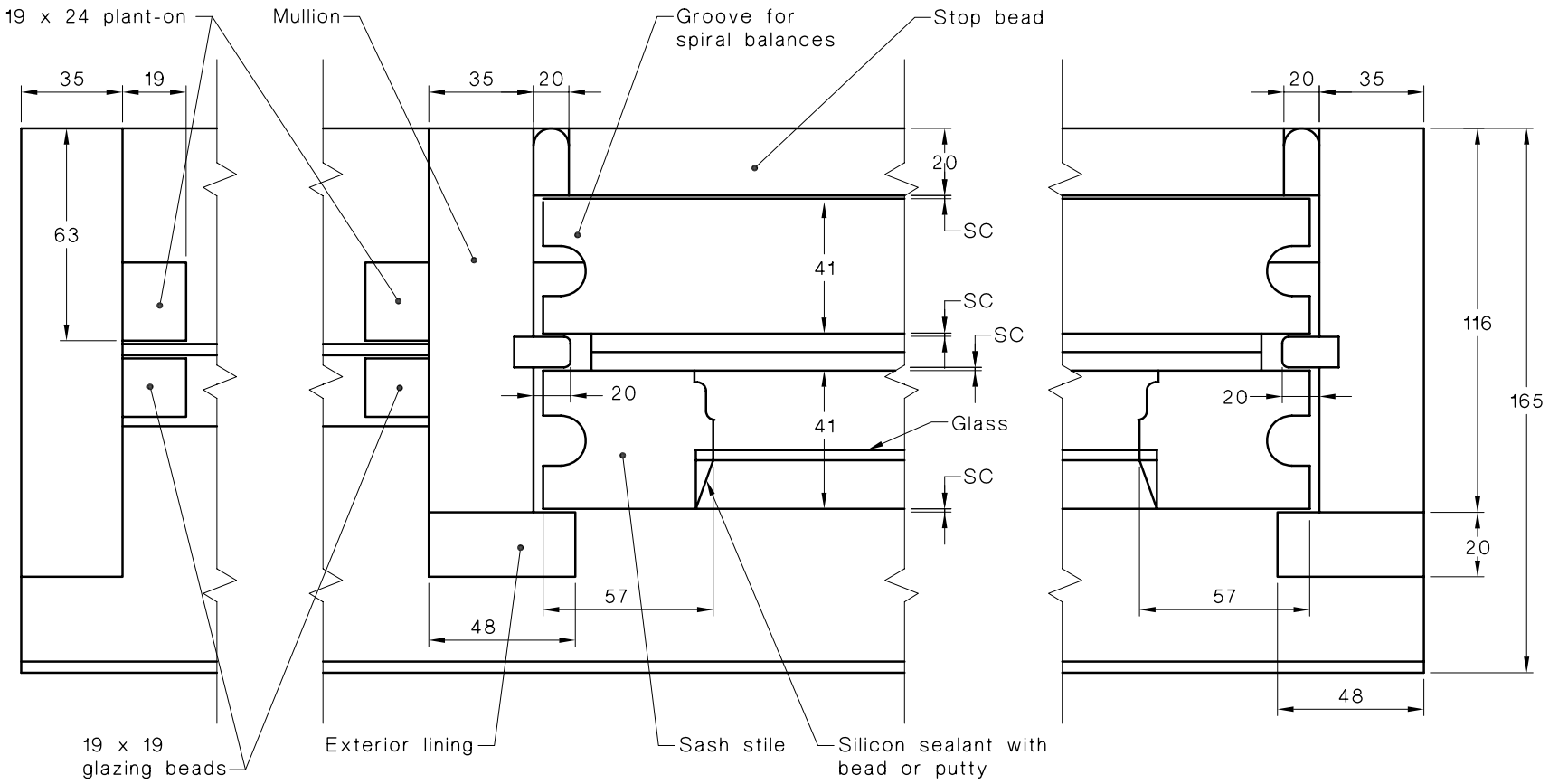
A1



(b) VERTICAL SECTION G-G THROUGH OPERATIVE AND FIXED GLAZING SASHES

DIMENSIONS IN MILLIMETRES

FIGURE G3 (in part) DOUBLE-HUNG WINDOW



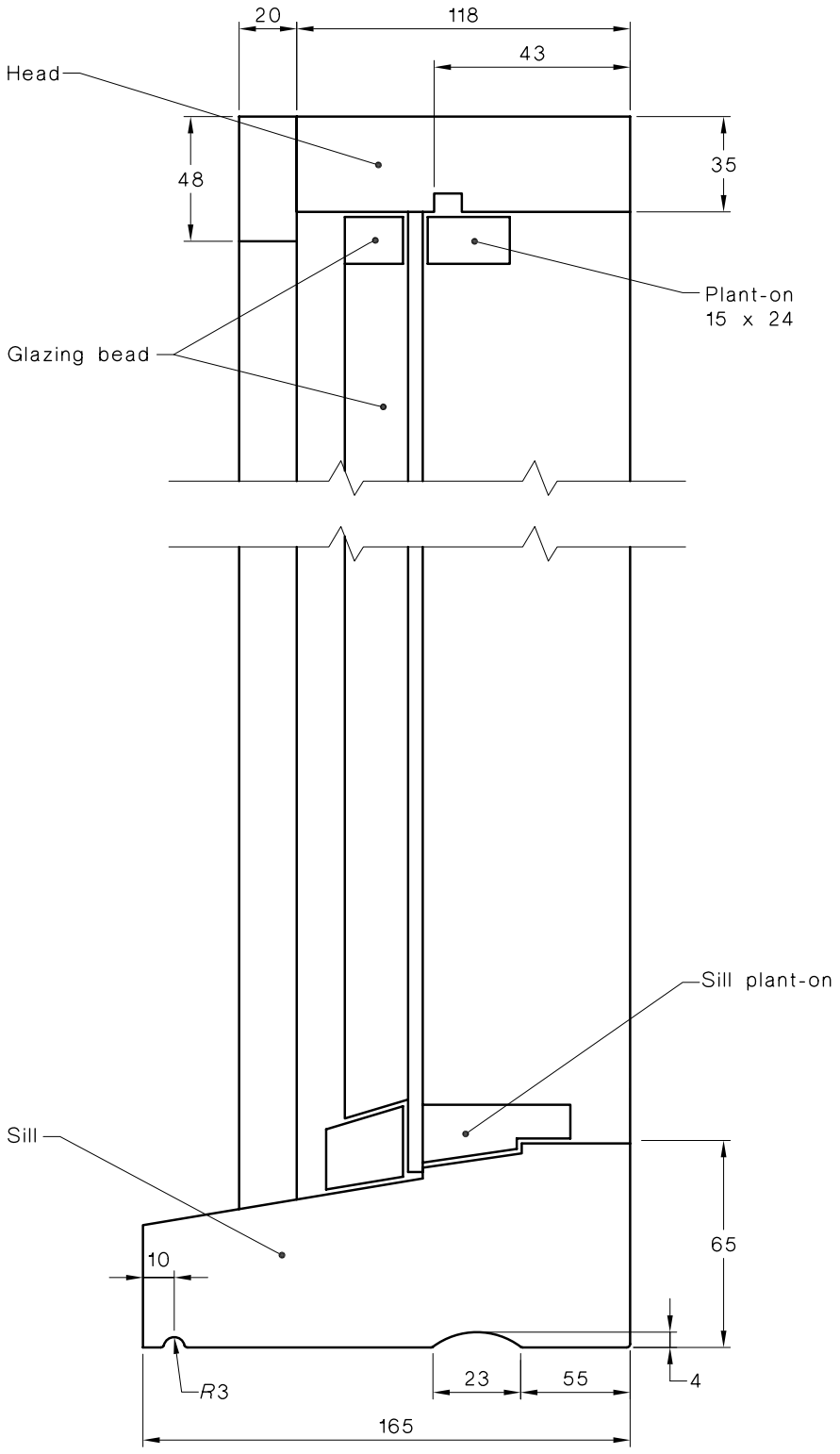
LEGEND:
SC = Minimum Sash Clearance, 1.5 mm

(c) HORIZONTAL SECTION H-H THROUGH OPERATIVE SASH AND FIXED GLAZING

DIMENSIONS IN MILLIMETRES

FIGURE G3 (in part) DOUBLE-HUNG WINDOW

A1

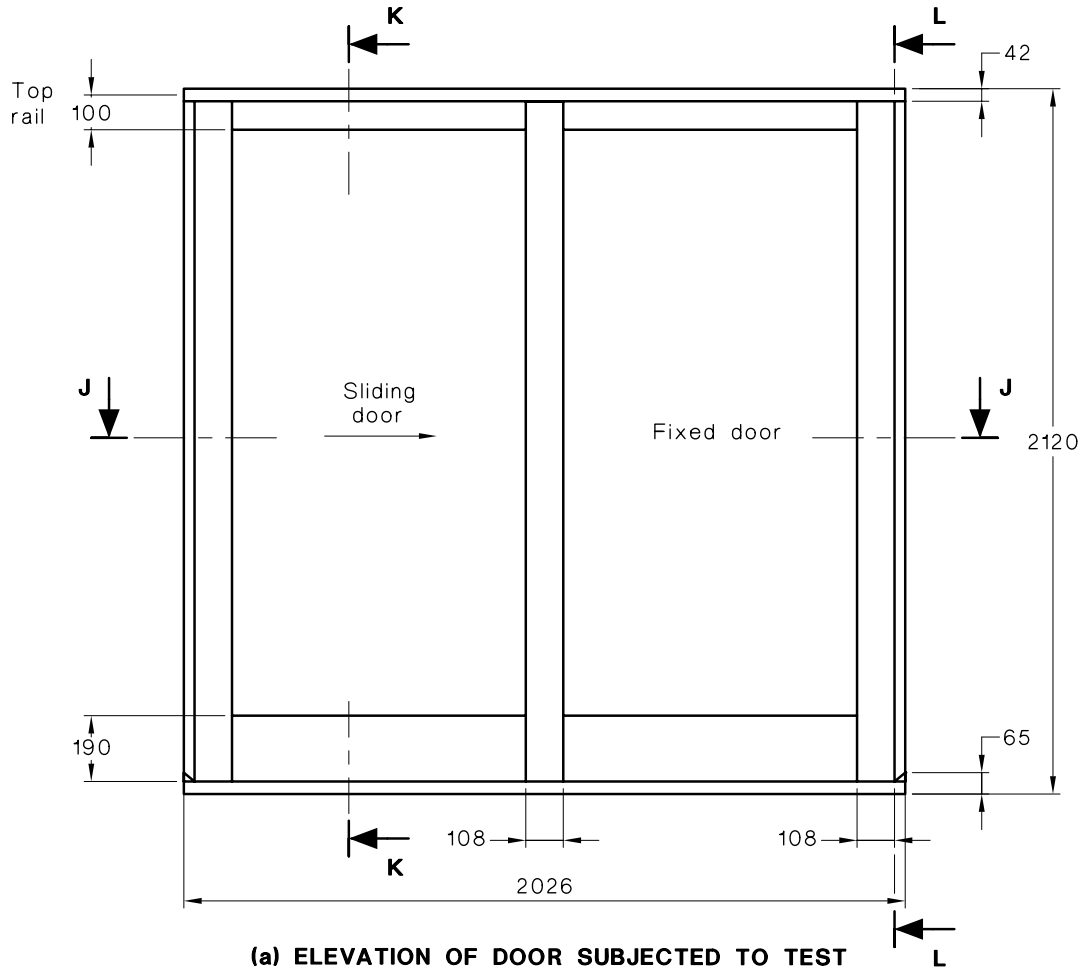


(d) SECTION I-I THROUGH FIXED GLAZING

DIMENSIONS IN MILLIMETRES

FIGURE G3 (in part) DOUBLE-HUNG WINDOW

A1

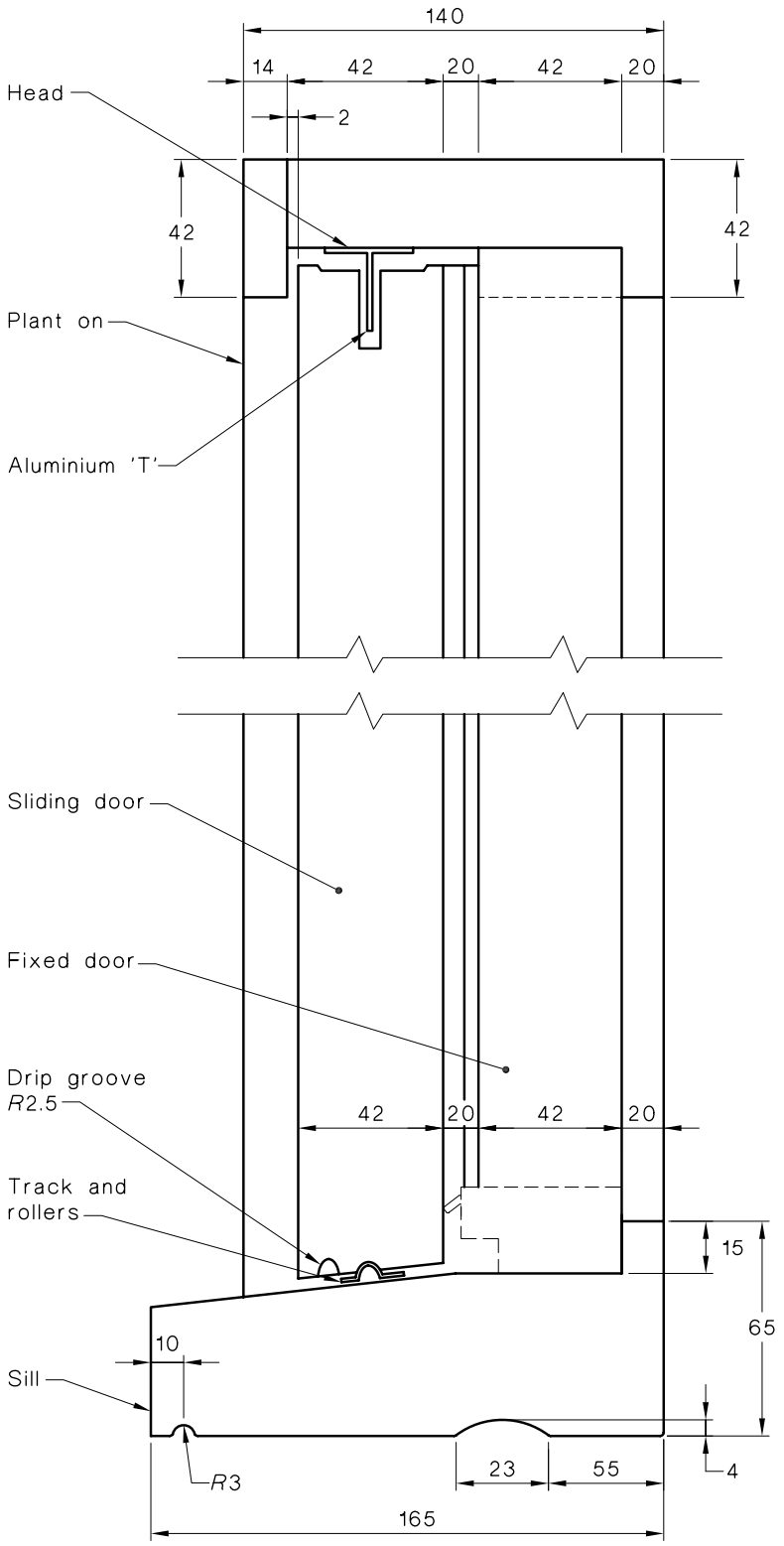


(a) ELEVATION OF DOOR SUBJECTED TO TEST

DIMENSIONS IN MILLIMETRES

FIGURE G4 (in part) SLIDING DOOR

A1

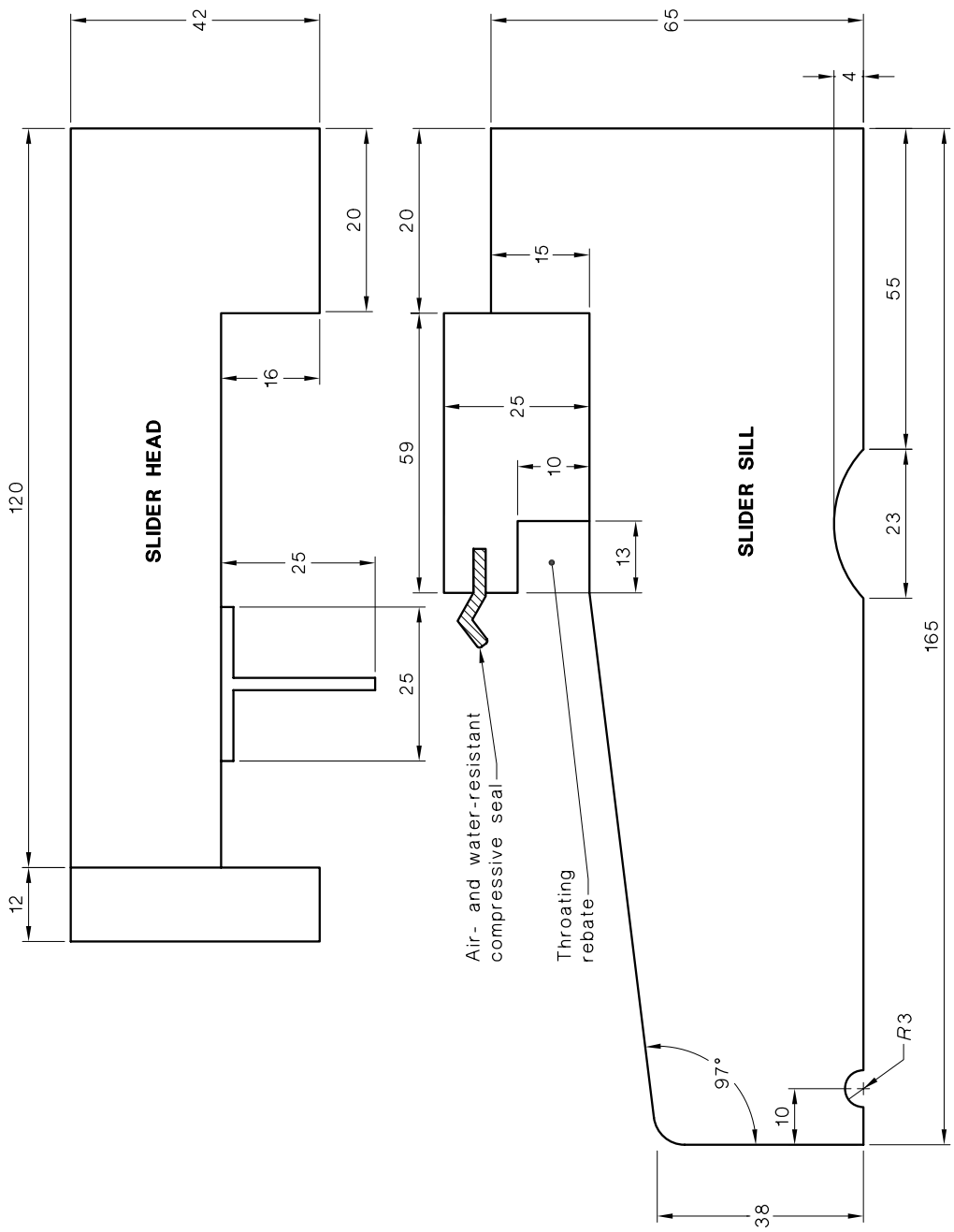


(b) SLIDING DOOR VERTICAL SECTION L-L THROUGH FIXED DOOR

DIMENSIONS IN MILLIMETRES

FIGURE G4 (in part) SLIDING DOOR

A1

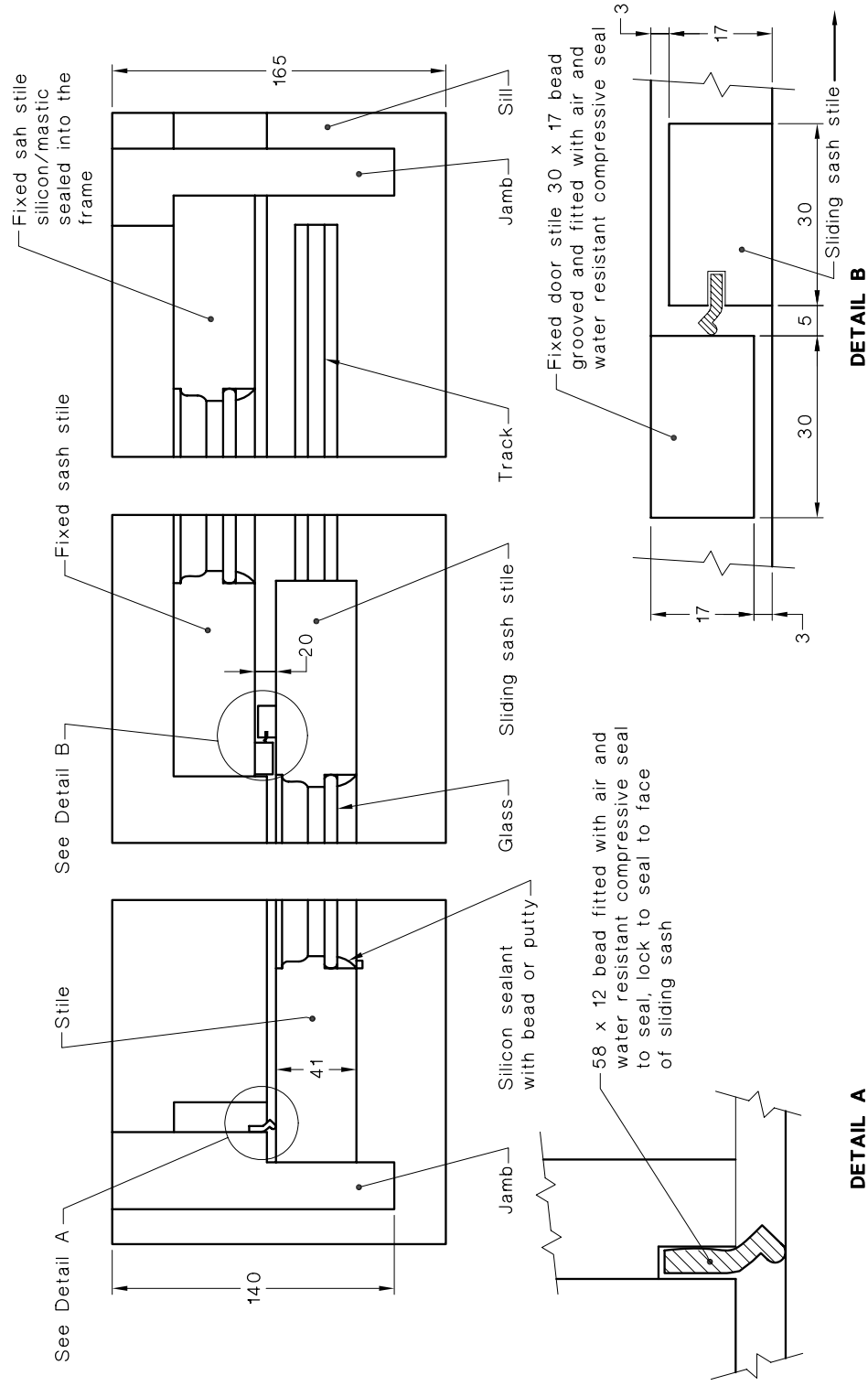


(c) VERTICAL SECTION K-K THROUGH HEAD AND SILL ON SLIDING DOOR

DIMENSIONS IN MILLIMETRES

FIGURE G4 (in part) SLIDING DOOR

A1



NOTE: Both plant-on beads are to be fixed and mastic/silicone sealed to respective door stiles. Positioning is important.

(d) HORIZONTAL SECTION J-J THROUGH FIXED AND SLIGING SASH ON SLIDING DOOR

DIMENSIONS IN MILLIMETRES

FIGURE G4 (in part) SLIDING DOOR

A2

APPENDIX H

GENERIC WINDOWS TEST RESULTS

(Informative)

Table H1 of this Appendix includes test results for generic windows, and is for guidinace only.

TABLE H1

GENERIC WINDOWS TEST RESULTS

Test	Double hung	Mullion fixed/dh	Awning	Casement	Sliding door
Serviceability design wind pressure	±700 Pa	±700 Pa	±700 Pa	±700 Pa	±500 Pa
Deflection/span	1:200	1:499	N/A	N/A	1:243
Air infiltration at ±75 Pa (see Note 1 below)	+1.4 L/s m^2 −3.7 L/s m^2	N/A N/A	+4.5 L/s m^2 −15.6 L/s m^2	+5.0 L/s m^2 −15.9 L/s m^2	+2.0 L/s m^2 −7.5 L/s m^2
Water penetration	150 Pa	N/A	150 Pa	150 Pa	150 Pa
Operating force Initial/maintain (see Note 2 below)	200N/140N	N/A	N/A	N/A	120N/80N
Ultimate design wind pressure (no collapse)	±1000 Pa	±1000 Pa	±1000 Pa	±1000 Pa	±700 Pa

NOTES:

1 Windows manufactured using the Appendix G generic timber window designs cannot claim compliance with Table 2.3, Maximum air infiltration provisions, unless the window is manufactured in exact accordance with those windows tested.

2 Windows manufactured using the Appendix G generic timber window designs cannot claim compliance with Table 2.2, Operating force test provisions, unless the window is manufactured in exact accordance with those windows tested.

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