NZS 4211:2008
Incorporating Amendment No. 1

STANDARDS NEW ZEALAND
PAEREWA AOTEAROA

New Zealand Standard

Specification for performance of windows

Superseding NZS 4211:1985

NZS 4211:2008

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COMMITTEE REPRESENTATION

This Standard was prepared under the supervision of the P 4211 Committee the Standards Council established under the Standards Act 1988.

The committee consisted of representatives of the following:

BRANZ Ltd

Connell Wagner Ltd

Department of Building and Housing

Glass Association of New Zealand

Institution of Professional Engineers New Zealand (IPENZ)

New Zealand Safety Glass Association

Window Association of New Zealand

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AMENDMENTS

No.	*Date of issue*	*Description*	*Entered by, and date*
1	May 2014	Align the wind zones in NZS 4211:2008 *Specification for performance of windows* to those zones specified in NZS 3604:2011 *Timber-framed buildings*.	Incorporated in this issue

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Specification for performance of windows

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REFERENCED DOCUMENTS

Reference is made in this document to the following:

NEW ZEALAND STANDARDS

NZS 3604:1999	Timber framed buildings
NZS 4223:- - - -	Glazing in buildings
Part 1:2008	Glass selection and glazing
Part 3:1993	Human impact safety requirements
Part 4:2008	Wind, dead, snow, and live actions
NZS 4229:1999	Concrete masonry buildings not requiring specific engineering design
NZS 4299:1998	Earth buildings not requiring specific design
NZS ISO/IEC 17025:2005	General requirements for the competence of testing and calibration laboratories

JOINT AUSTRALIAN/NEW ZEALAND STANDARDS

AS/NZS 1170 set	Structural design actions
AS/NZS 4284:2008	Testing of building façades

AUSTRALIAN STANDARDS

AS 2047:1999	Windows in buildings – Selection and installation
AS 4420:- - - -	Windows – Methods of test
Part 2:1996	Deflection test
Part 3:1996	Operating force test
Part 4:1996	Air infiltration test
Part 5:1996	Water penetration resistance test
Part 6:1996	Ultimate strength test
Part 7:xxxx	Torsional strength test (in preparation)

NEW ZEALAND LEGISLATION

New Zealand Building Code (NZBC) and Compliance Documents

WEBSITES

www.legislation.govt.nz

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LATEST REVISIONS

The users of this Standard should ensure that their copies of the above-mentioned New Zealand Standards are the latest revisions. Amendments to referenced New Zealand and Joint Australian/New Zealand Standards can be found on http://www.standards.co.nz.

REVIEW OF STANDARDS

Suggestions for improvement of this Standard are welcomed. They should be sent to the Chief Executive, Standards New Zealand, Private Bag 2439, Wellington 6140.

OUTCOME STATEMENT

This Standard will provide specifications to achieve a means of compliance with the New Zealand Building Code, and will ensure specifiers and consumers are provided with robust and effective window systems.

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FOREWORD

NZS 4211 *Specification for performance of windows* is a Standard for the performance testing of individual windows and doors for exterior use, that may be manufactured from various materials or combinations of materials. Windows and doors, including the glazing system and seismic subframes if any, shall be tested in the same condition as they would be supplied ex-factory to the site.

NZS 4211 is a specification for testing so that windows can be labelled or certified as complying with one or other of defined wind zones. NZS 4211 is also aimed at providing guidance for both specifiers and consumers who should:

(a) Establish the appropriate wind zone in accordance with NZS 3604 section 5;

(b) If the wind zone is beyond that given in NZS 3604 see section 10 of NZS 4211;

(c) Select a window that has been tested to NZS 4211 and is labelled as suitable for the relevant wind zone.

Amd 1
May '14

This amendment to NZS 4211 incorporates the Extra High wind zone for more exposed building sites, as introduced in NZS 3604:2011. As this now covers part of the previous specific design region between the Very High and the 'Extreme' wind zones, the 'Extreme' zone is accordingly reduced in range but is still limited up to the maximum Ultimate Limit State (ULS) 2500 Pa. The 'Extreme' zone allows windows to be tested to NZS 4211 procedures, without consideration of the installation details even though they are being installed into buildings that are generally covered by NZS 3604 but may require some specific design related to higher wind speeds. Establishing that the specific ULS pressure is above the Extra High wind zone of NZS 3604 and within the nominal 'Extreme' zone becomes the responsibility of the building design engineer using calculations in accordance with AS/NZS 1170.

This latest revision of NZS 4211 is particularly related to buildings not requiring specific design (for example, those buildings that are covered by NZS 3604) and the wind zones used are derived from NZS 3604 except that a new nominal 'Extreme' wind zone, up to Ultimate Limit State (ULS) 2500 Pa, is now provided for excessively exposed building sites. Establishing that the ULS pressure is above the Very High wind zone of NZS 3604 and within the nominal 'Extreme' zone becomes the responsibility of the building design engineer using calculations in accordance with AS/NZS 1170.

The windows of buildings that are not the subject of specific design will usually be for sites that do not have accurately determined wind speeds, and may be required to comply with the local building consent authority's assessment of the appropriate wind zone. Because of this they may not be as accurately related to the site as when specific engineering design to AS/NZS 1170 is required. Nonetheless microclimate should always be taken into account and windows selected on the basis of local knowledge.

This Standard excludes building façades and curtain walls, and does not provide a test for the weathertightness of the installation details at the window perimeter or the interface between the window and surrounding façade elements in an external wall. It does not ensure that the framing system is fit for purpose for glazing insulating glass units and other processed glass products. When complete building façades, overall system performance, and interaction of various façade components require assessment, then AS/NZS 4284 *Testing of building façades* shall be cited as the test method.

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New Zealand Standard

Specification for performance of windows

1 GENERAL

1.1 Scope

This Standard specifies requirements for the performance of windows to be installed in exterior walls within the wind pressure limitations of the wind zones defined in table 5 and table 6. The properties covered are strength, stiffness, operating facility, air infiltration, and water penetration.

This Standard specifically excludes:

(a) Skylights or roof windows;

(b) Interior windows;

(c) Fixed louvres;

(d) Acoustics, thermal, and security performance;

(e) The weathertightness of the window perimeter in the external wall or façade;

(f) The fire rating;

(g) Building façades (including curtain walls);

(h) Durability.

1.2 Interpretation

For the purposes of this Standard, the word 'shall' refers to requirements that are essential for compliance with the Standard, while the word 'should' refers to practices that are advised or recommended.

The term 'normative' has been used in this Standard to define the application of the appendix to which it applies. A 'normative' appendix is an integral part of the Standard and contains requirements.

1.2.1 Commentary clauses

Clauses prefixed by *'C'* and printed in italic type are intended as comments on the corresponding mandatory clauses. They are not to be taken as the only or complete interpretation of the corresponding clause, nor should they be used for determining in any way the mandatory requirements of compliance within this Standard.

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1.3 Purpose of this Standard

This Standard is intended to provide a means of compliance for window and door designers, systems' suppliers, manufacturers, and specifiers with the requirements of clauses B1 Structure, and E2 External Moisture of the New Zealand Building Code, for the performance of windows and doors to be installed in exterior walls.

This Standard provides a basis for testing and certifying the strength, rigidity, air infiltration, operation of opening sashes, and water penetration of window systems.

C1.3

Durability properties are covered by the New Zealand Building Code. The users of this Standard should also refer to their industry best practice guides.

Inadequate drainage of glazing rebates will affect the durability of insulating glass units and laminated glass.

1.4 Specific design

Amd 1 May '14

The calculation of ultimate limit state (ULS) and serviceability limit state (SLS) wind pressures between Extra High and Extreme (see tables 5 and 6) is the responsibility of the building design engineer.

For any window requiring specific design, the deflection test pressures shall be the positive and negative SLS wind pressures and the ULS wind pressures shall be calculated in accordance with AS/NZS 1170, and shall include all local pressure factors and internal pressures relevant to the location of the window on the building. Such information shall be supplied in writing to the testing agency by the building design engineer.

For any building not requiring specific design as defined in NZS 3604, NZS 4229, and NZS 4299, the window rating shall be not less than the wind zone of the installation site.

Such windows may be tested using NZS 4211 procedures where the test pressures are based on the positive and negative ULS and SLS pressures calculated in accordance with AS/NZS 1170, and should include local pressure and internal pressure factors relevant to the location of the window on the building.

Amd 1 May '14

Windows and doors that have calculated ULS test pressures beyond the scope of NZS 4211 should be tested together with their installation details in accordance with AS/NZS 4284.

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2 DEFINITIONS AND ABBREVIATIONS

2.1 Definitions

In this Standard, unless inconsistent with the context, terms have the following meaning:

Air conditioning — Primary control of temperature, humidity, movement, and purity of air throughout a building or its parts

Deflection — The amount of bending or flexing of the structural components in a **window**

Doors — See **window**

External wall — The enclosing part of the building that has one surface exposed to the outside and at an angle of more than 60° to the horizontal

Façade — External skin that transfers wind loads to the framing members or supporting structure (including curtain **walls**)

Fixed glass — Glass fixed into a **light** or a **sash**

Frame — The outer surrounding members of the **window** commonly called head and sill and jambs respectively. The **frame** may or may not incorporate integral linings and facings

Friction restraint — A rotating or sliding frictional device holding a hinged, pivoted or projected opening **light** in a selected open position and which is overcome by force during opening and closing. The term does not include any device such as a stay nipped by a thumbscrew in which the friction is manually released during **window** movement

Glass — Infill and glazing material fixed into a **light** or a **sash**. Glass shall be in accordance with NZS 4223

Glazing — Taken from NZS 4223:

1. The installation of glass in prepared openings in windows, door panels, partitions, and the like;
2. Glass or plastics glazing sheet material for installation into a building

Light — The unit of space resulting from the subdivision of a window between its frame members or **mullions** and **transoms**

Louvres, fixed — Non-operable ventilation devices that are not a **window** or **door**

Louvres, operable — A **window** unit comprising a series of operable blades of **glass**, or other material, overlapping each other

Mullion — The intermediate vertical members fixed between the head and sill of a **window frame** subdividing the **window** into **lights**

Rail — A horizontal member of a **sash** other than an interlocker

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Roof	That part of the building having its upper surface exposed to the outside and at an angle of 60º or less to the horizontal
Sash	An assembly of parts, being glazing contained by **stile** and **rail** members, that moves within, from, or across a **light** of a **window**
Sash, frameless	A **sash** with one or more unframed edges
Sash, projected	A **sash** supported and held open by frictional restraints
Sash, sliding	A **sash** which opens by moving horizontally or vertically without changing plane
Serviceability limit state (SLS)	State that corresponds to conditions beyond which specified service criteria for a structure or structural element are no longer met. The criteria are based on the intended use and may include limits on deformation, vibratory response, degradation, **weathertightness**, or other physical aspects
Skylight	A translucent or transparent area within the **roof**
Specific design	Requires calculation and design beyond the scope of this Standard
Stile	A vertical side member of a **sash** other than an interlocker
Structural members	The elements, including **mullions**, **transoms**, meeting **rails**, and meeting **stiles**, that perform the function of transferring loads to the perimeter **frame**
Suitably qualified person	A person with the skills and experience and qualifications to and determine compliance with this Standard assess
Transom	The intermediate horizontal members fixed between the jambs, or between jambs and **mullion**, or between **mullion** and **mullion** of a **window frame** subdividing the window into lights
Ultimate limit state (ULS)	States associated with collapse, or with other similar forms of structural failure. This generally corresponds to the maximum load-carrying resistance of a structure or structural element but, in some cases, to the maximum applicable strain or deformation
Wall	See **External wall**
Weathertight	A condition where water has been prevented from entering and accumulating behind the cladding in amounts that can cause undue dampness or damage to the building elements

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Window	Includes certain frames which may be called '**doors**' in some installations. The name used in practice tends to be based on function rather than on construction and this Standard covers any light enclosing: (a) A horizontally or vertically sliding **sash**; (b) A hinged or pivoted, or projected **sash** which closes against stops; (c) A reversible (spinner) **sash**; (d) **Fixed glass**; (e) Operable **louvres**; (f) Any combination of the above
Wind zone	Nominated wind pressure for a given site

2.2 Abbreviations

For the purposes of this Standard the following abbreviations shall apply:

IANZ	International Accreditation New Zealand
NATA	National Association of Testing Authorities
NZBC	New Zealand Building Code
SLS	Serviceability limit state
ULS	Ultimate limit state

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3 SEQUENCE OF MEASUREMENTS AND TESTS

In this Standard the following performance properties of a window shall be assessed in the following sequence:

(a) Deflection of structural members;

(b) Operation of opening sashes;

(c) Air infiltration;

(d) Water penetration;

(e) Ultimate strength of window and fixings;

(f) Torsional strength of sashes.

C3

The relationships between water penetration, wind pressure, and the other performance properties referred to in section 3 have been chosen as generally satisfactory for most installations. These choices are not intended to preclude a designer from requiring different properties or values if they desire a better performance or will accept a lower performance. Windows for which any lower performance is specified are outside the scope of this Standard.

The relationship between water penetration and wind pressure specified by this Standard is based on the relative cost of absolutely excluding water that is under substantial outside wind pressure. A window complying with this Standard may allow a little water penetration in very severe storms, which should occur only infrequently during its life.

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4 TESTING, MARKING, AND REPORTING

4.1 Tests referred to in this Standard apply to individual windows tested to demonstrate the compliance of a window manufacturer's range. A window, including glazing system and seismic subframe if any, shall be tested in the same condition as it would be supplied ex-factory to be installed on site.

All testing shall be performed by an NZS ISO/IEC 17025 accredited testing laboratory registered for such tests.

C4.1
Windows tested with different glazing system, hardware, or other components may perform differently.

4.2 Each window claimed by the manufacturer to comply with this Standard, shall be marked on the frame in letters not less than 2 mm high with:

(a) The manufacturer's name or brand name;

(b) The number of this Standard, NZS 4211:2008;

(c) The rating expressed as the appropriate wind zone or wind pressures, or the ULS pressures in the case of specific design up to Extreme; and

(d) The air infiltration level.

The marking shall be on a framework member, or on a durable affixed label, readable after installation.

4.3 Where a window is made up from repeated identical adjoining lights, it will only be necessary to test a minimum of two lights and a successful test result will be sufficient to indicate larger windows created by the addition of further identical adjoining lights will comply.

4.4 Each test report supporting a claim of compliance with this Standard shall contain the following information:

(a) Test report number;

(b) Date of test;

(c) Laboratory details including accreditation agency;

(d) Manufacturer's details;

(e) Customer details (if different to the manufacturer);

(f) Test and sample details including SLS and ULS wind pressures tested;

(g) Summary of test results;

(h) Detailed description and drawings of the test sample manufactured including extrusion, hardware and component numbers, and structural members tested; and

(i) Detailed test results.

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5 PERFORMANCE CRITERIA

5.1 For buildings not requiring specific design, the windows shall be capable of meeting the following requirements:

(a) The window rating shall be determined as the least demanding wind zone achieved by the test window for:

(i) Deflection in accordance with section 6

(ii) Water penetration in accordance with section 9, and

(iii) Ultimate strength in accordance with section 10;

(b) An air infiltration level shall be determined according to section 8 for a test pressure of 150 Pa;

(c) Where a window air infiltration level only is to be reported it is sufficient to demonstrate either:

(i) That total infiltration measured in 8.4 is less than the allowed window infiltration for that level, or

(ii) That the difference between the base and total air flows determined in 8.4, allowing for measurement errors is less than the allowed window infiltration for that level.

For all other buildings, windows shall be capable of meeting similar performance criteria at wind pressures compatible with the requirements of AS/NZS 1170.

5.2 This Standard requires the test sample window to be representative in both size and shape of the largest standard window assembly in the product range as specified for sale by the manufacturer. Where the product is not of the same size as those certified by testing, 5.2.1 or 5.2.2 shall apply.

5.2.1 Smaller size window assemblies (either shorter or narrower, or both), which have identical construction (sections and hardware) as a tested product, shall assume the same rating.

Smaller size window assemblies as described in 5.2.1 may be rated higher than the tested product, provided that:

(a) 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 the calculations are performed by a suitably qualified person who can provide substantiating documentation; or

(b) Where a higher rating is determined by calculation for a smaller sized window assembly, the maximum water penetration rating that can be used is that which the tested product has achieved.

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5.2.2 Larger size window assemblies (either taller or wider, or both), which have identical construction (sections and hardware) as a tested product shall assume the same or lower rating as the tested product provided that:

(a) The area of the window assembly is no greater than 10% in either the horizontal or vertical direction or no greater than 15% of total area of the tested product. This applies to any element within the assembly. See figure 1;

(b) The area of an adjustable louvre, or frameless sash windows, are no greater than 10% in the vertical direction only;

(c) 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 the calculations are performed by a suitably qualified person who can provide substantiating documentation;

(d) Where the window assembly contains a moveable sash then all the assemblies must comply with Appendix A;

(e) The assembly is glazed in accordance with NZS 4223;

(f) 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.

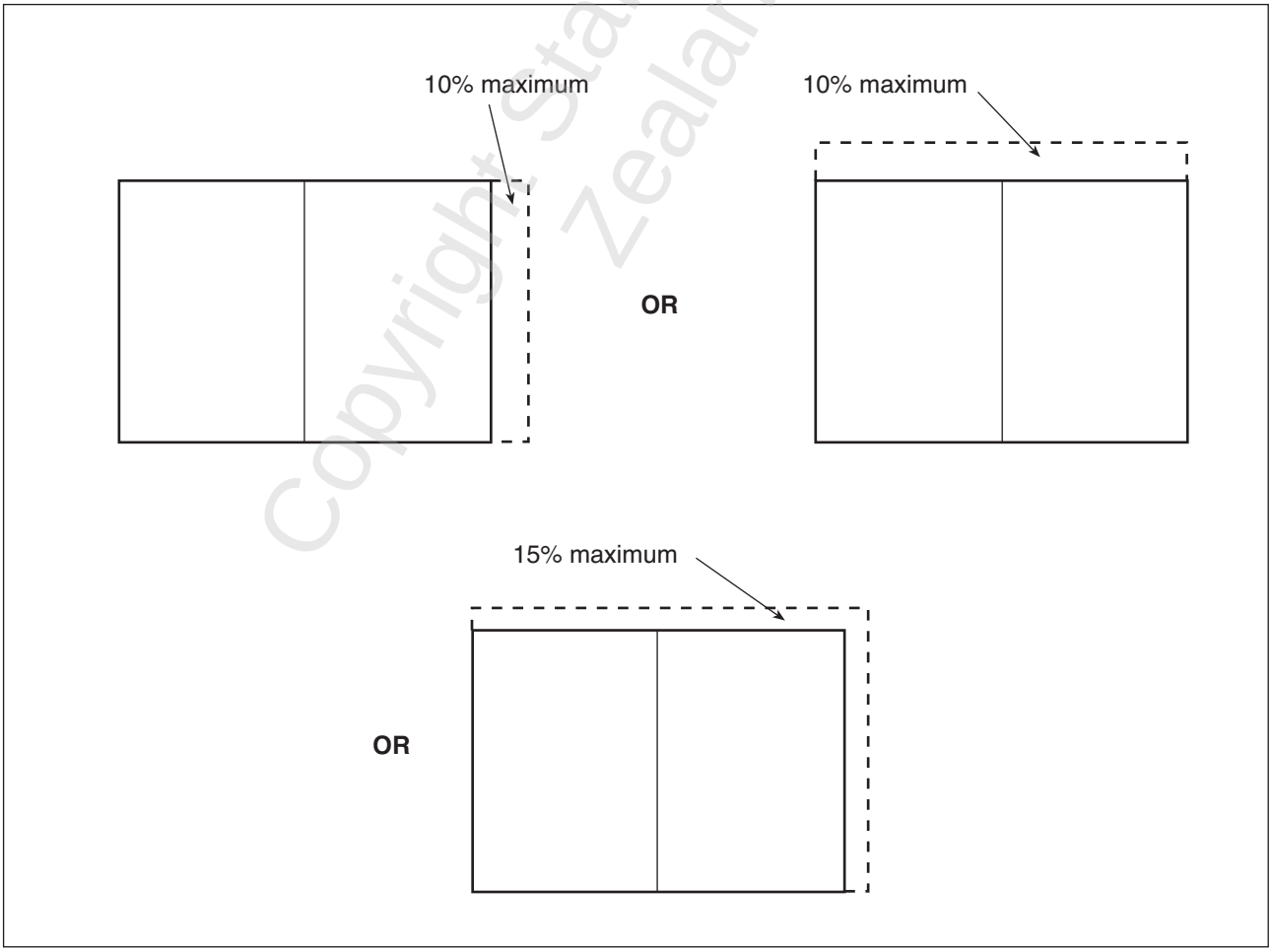

Figure 1 – Allowable dimensional increase

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5.2.3 Coupling is the joining of two or more assemblies together horizontally or vertically, which meets the same performance criteria as for the window. Where window structural couplings have been tested to this Standard, further testing of these same couplings in other configurations is not deemed necessary provided that the calculations for deflection and stress are based on actual test data for these couplings.

Care should be taken when certifying a rating of a window assembly larger than the tested unit to ensure that it is adequate structurally and in all other aspects for the rating chosen.

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6 SERVICEABILITY DEFLECTION

6.1 All windows shall comply with the deflection requirements of this section when tested in accordance with AS 4420.2.

6.2 Unless a smaller value of allowable deflection is separately specified for windows that are subject to specific design, in buildings requiring specific design, the maximum deflection due to bending of any structural member, including the outer window frame, measured relative to the end of the member at the serviceability limit state shall not exceed span/200th of the span.

6.3 For windows in not subject to specific design, the SLS test pressure corresponding to the wind zones of NZS 3604 are shown in table 1.

Table 1 – SLS test pressures for windows not requiring specific design

Wind zone as specified in NZS 3604	Serviceability limit state (SLS) test pressure p_s
Low	± 510 Pa
Medium	± 680 Pa
High	± 970 Pa
Very High	± 1250 Pa
Extra High	± 1515 Pa

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For the Extreme wind zone within the limits defined by table 6, the serviceability test pressures shall be supplied by the building design engineer.

C6.3

For the determination of Low to Very High wind zones refer to NZS 3604 and for confirmation of these refer to the local building consent authority which may have defined microclimatic variations.

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7 OPERATING OF OPENING SASHES

7.1 Opening sashes and doors shall be tested in accordance with AS 4420.3. The test force shall be not greater than the values for sashes or doors given in table 2.

The operating forces referred to in this section shall be applied under still air conditions and (except for the 'to initiate movement' in table 2) in both opening and closing directions. The force shall be applied to the fastener or handle in the direction of motion. If there is no fastener or handle, the force shall be applied midway between the slides or pivots and to the member most likely to be gripped by a user.

If there is any change in glazing configuration (heavier or multiple-paned glazing) or a change in seal design type to a window with a moveable sash, the product shall be retested for operating force.

For multiple sliding panel door configurations (for example, stacking doors) each panel shall be measured independently and the highest figures adopted for the total product.

NOTE – There is no requirement for evaluating operating forces on hinged or bi-fold windows and doors.

7.2 An open vertical sliding sash shall not move when an upward or downward vertical force of less than 10 N is applied.

7.3 Where friction restraints alone are relied on to control an open, pivoted or projected sash, they shall provide sufficient restraint to prevent the window from moving when a force in Newtons equal to 35 times the sash area in m^2 is applied to the edge furthermost from the hinges or pivots. This force shall be applied perpendicularly to the plane of the sash at all angles of opening up to 70% of the maximum opening distance.

Table 2 – Maximum operating force for opening sashes and doors

Function	Projecting sashes	Sliding sashes		Sliding doors
		Horizontal	Vertical	
To initiate movement	90 N	110 N	200 N	180 N
To sustain movement	90 N	90 N	160 N	110 N

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8 AIR INFILTRATION

8.1 All windows shall comply with the air infiltration requirements of this section when tested in accordance with AS 4420.4.

8.2 Windows in this Standard can be rated as suitable for conditioned and non air conditioned spaces.

For windows that have no opening sashes or door panels, the rate of air infiltration at a pressure differential of 150 Pa shall not exceed the value shown in table 3 for 'per m^2 of total window area'.

For windows and doors that have openable sashes or door panels, the maximum rate of infiltration shall be determined from the geometric mean of the respective calculated infiltration rates for both the 'per m^2 of total window area' and 'per m of opening length'.

Table 3 – Air infiltration

Rate of air infiltration	Litres per second (L/s)	
	Air conditioned	Non air conditioned
Per m^2 of total window area	1.6	8
Per m of opening joint length	0.6	2

C8.2

Example: For a window with an area of 5 m^2 and opening length of 6 m the following table shows the maximum infiltration rate.

Rate of air infiltration	*Litres per second (L/s)*	
	Air conditioned	*Non air conditioned*
Total window area = 5 m^2	*8*	*40*
Opening joint length = 6 m	*3.6*	*12*
Geometric mean	*√(8 x 3.6) = 5.36*	*√(40 x 12) = 21.91*

8.3 Windows with the 'air conditioned' rating shall be required to comply with both inward and outward infiltration. Non air conditioned windows shall be required to comply with inward infiltration only.

8.4 Three separate air infiltration rate measurements shall be made for each set of base (sealed) and total (unsealed) sample conditions, and where required, at both positive and negative differential pressures. The mean of each set of three readings shall be calculated, and the air infiltration rates of the test sample shall be the difference between the means of the base (sealed) and total (unsealed) measurements.

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9 WATER PENETRATION

9.1 All windows shall comply with the water penetration requirements of this section when tested in accordance with AS 4420.5. For a typical spray nozzle layout for water application see Appendix B.

9.2 For windows not requiring specific design, the maximum water penetration test pressure shall be taken from table 4.

Table 4 – Water test pressures for windows not requiring specific design

Wind zone as specified in NZS 3604	**Water test pressure** (Pa)
Low	153
Medium	204
High	291
Very High	375
Extra High	455

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For windows that require specific design, the water penetration test pressure shall be not less than 30% of the SLS pressure corresponding to the 'Extreme' wind zone in table 6.

C9.2

For the determination of wind zones refer to NZS 3604 and for confirmation of these refer to the local building consent authority which may have defined microclimatic variations.

The relatively low test pressures used for the water penetration tests at 30% of the SLS wind pressure are not claimed to represent actual pressures during rain storms. They are a rational set of continuously-applied static test pressures which have been found to correlate well with observed performance during the equivalent short term wind gusts at the specified SLS wind pressure.

9.3 Test pressure shall be applied in the positive direction only, and may be increased gradually so that the full test pressure is reached within 2 min. The maximum test pressure in accordance with 9.2 shall be maintained for 15 min.

Where testing is continued beyond the initial 15 min period, additional pressure increments will be for 10 min intervals.

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9.4 Water penetration shall be assessed by visual observation. The window shall be designed to permit no uncontrolled water penetration through the window at a static positive air pressure.

NOTE – Failure occurs when uncontrolled penetration takes place, or when controlled water is not drained away.

9.4.1 Uncontrolled water penetration is defined as:

(a) Water that is not contained in a purpose built collection or drainage area;

(b) Water that may wet window fixtures and finishes, reveal linings or window furnishings beyond the window frame; or

(c) Water that flows in a constant stream on the inside, or regular dripping.

9.4.2 Acceptable water penetration is defined as:

(a) Minor splashing which occurs due to air infiltration, within one minute after change of pressure;

(b) Minor intermittent leakage on the indoor side of operable sashes, which is contained on gaskets, sill tracks, and thresholds.

9.4.3 A purpose built collection or drainage area is defined as:

A system that allows water to collect or be drained to the outside (at the cessation of testing) from sills, other framing members, or in cavities.

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10 ULTIMATE STRENGTH

10.1 Windows shall not collapse when tested in accordance with AS 4420.6.

10.2 Collapse shall mean any one, or any combination of the following:

(a) Dislodgement or breaking of any glazing;

(b) Dislodgement of a frame or any part of a frame;

(c) Dislodgement of a sash from its 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.

10.3 The test pressure shall be not less than the value given in table 5.

Table 5 – ULS test pressures for windows not requiring specific design

Wind zone as specified in NZS 3604	Ultimate limit state (ULS) test pressure p_u
Low	± 720 Pa
Medium	± 960 Pa
High	± 1360 Pa
Very High	± 1760 Pa
Extra High	± 2130 Pa

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C10.3

For the determination of wind zones refer to NZS 3604 and for confirmation of these refer to the local building consent authority which may have defined microclimatic variations.

Windows and doors may be tested within the scope of NZS 4211 up to the ULS as given in table 6.

Table 6 – Extreme wind zones

Wind zone	Ultimate limit state (ULS) test pressure p_u
Extreme	2500

NOTE – This ULS figure has been chosen to align with the NZBC E2/VM1.

10.4 Any windows subjected to wind pressures beyond the value in table 6 shall be outside the scope of this Standard.

C10.4

Such windows should be tested to the requirements of AS/NZS 4284 where the test pressures should be the positive and negative ULS wind pressures calculated in accordance with AS/NZS 1170, and should include all local pressure factors and internal pressures relevant to the location of the window on the building.

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11 TORSIONAL STRENGTH OF SASHES

11.1 All projected sashes shall comply with the torsional test requirements of this section when tested in accordance with Appendix A.

11.2 The maximum deflection of a glazed projecting sash shall not exceed 0.04 times the length of the shortest of two members joined at the point of load, or 50 mm whichever is the lesser, when loaded with a force equivalent to 0.5 times the relevant maximum operating force for sashes from table 2. See figure 2 for an example of torsional test rig assembly.

C11.2
The torsional test is intended to measure the rigidity, and thus provide an indication of the likely smoothness of the opening action, of a sash hung on friction stays. The given figure of 0.04 is suitable for windows. If a sash possessing characteristics of greater rigidity is required, then a figure of 0.025 for the deflection limit should be substituted.

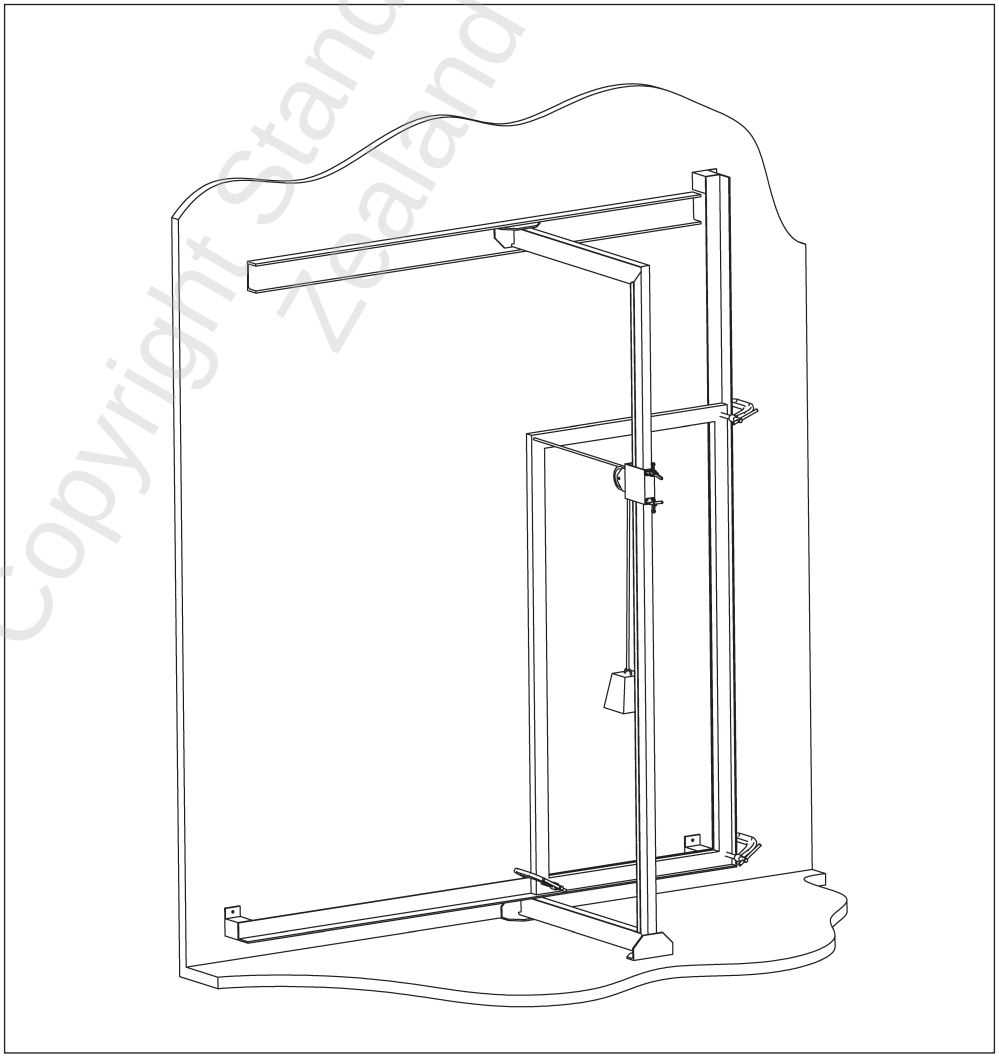

Figure 2 – Torsional test rig assembly

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APPENDIX A – SASH TORSIONAL TEST

(Normative)

All projected sashes shall comply with the following torsional test methodology and reporting.

Relevant clauses from AS 4420.7 (in preparation)

A1 PRINCIPLE

A sample unit is supported in its normal attitude, then subjected to a force perpendicular to the plane of the sash.

A2 APPARATUS

The following apparatus is required:

(a) Mounting frame – of a size to fit the test sample;

(b) Displacement measuring device – capable of measuring displacements to an accuracy of better than ±0.5 mm;

(c) Set of weights – calibrated to a traceable Standard, in increments of 10 N to an accuracy of better than ±0.1 N;

(d) Stand and pulley system – for applying force to corner of sash.

A3 PROCEDURE

The test shall be conducted as follows:

(a) The sash to be tested, complete with glass, shall be mounted vertically, and clamped at three corners so that these corners cannot move out of plane;

(b) The two corner clamps closest to the free corner shall each consist of a pair of rigid metal strips 5 mm wide, secured approximately parallel to each other, one on each side of the sash. The centre line of each strip shall be aligned across the inside and the outside corner angle of the frame of the sash. The third clamp shall securely hold the corner most remote from the free corner;

(c) The fourth corner shall be subjected to a force at right angles to the sash, applied and progressively increased in increments of 10 ± 0.1 N at 1 min intervals. The deflection shall be observed at each interval;

(d) The sash shall be tested in both directions and the greatest deflection shall be within the limit specified in AS 2047.

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A4 TEST REPORT

The following information shall be reported:

(a) Reference to the Standard, that is AS 4420.7;

(b) The name of the laboratory, authority or organisation that conducted the test, including laboratory registration authority (IANZ, NATA);

(c) The name of the client, sample manufacturer, and installer, as appropriate;

(d) An identification and detailed description of the test sample;

(e) Dated drawings of the test sample showing modifications, if any;

(f) Displacements measured at 10 N increments, in both directions;

(g) The date on which the test was carried out;

(h) A statement of compliance of the test sample with AS 2047.

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APPENDIX B – SPRAY NOZZLE LAYOUT

(Normative)

B1 To test the water penetration of windows, spray the face of the windows completely and continuously. A typical spray nozzle layout for water application is shown in figure B1.

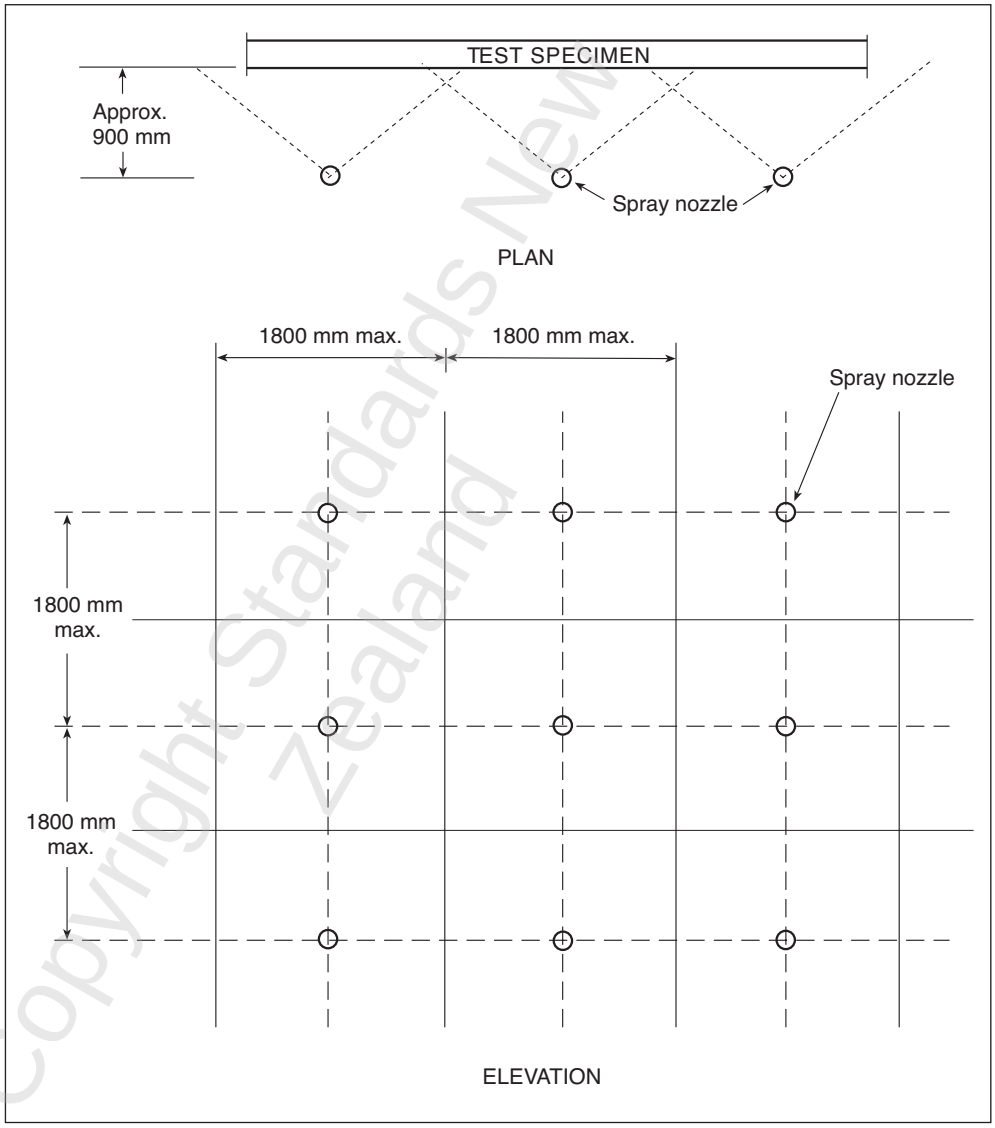

Figure B1 – Spray nozzle layout for water application

B2 Spray nozzles shall be a solid cone type giving approximately 90° – 100° spray angle with predominantly large droplet size (50% greater than 2 mm diameter). The top horizontal row of nozzles shall be positioned at a level within ±100 mm of the top of the test specimen.

NOTE – A Spraying Systems Co. (USA) 1/4HH-14WSQ nozzle is an example of an acceptable square pattern solid cone type that provides a suitable droplet size and coverage of 1.5 – 2.0 m^2.

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